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Global Warming and Climate Change

Prospects and Policies in Asia and Europe

Edited by Antonio Marquina

Global Warming and Climate Change

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Global Warming and Climate Change

Prospects and Policies in Asia and Europe

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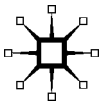

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Series Editor Preface

Energy, Climate and the Environment

Concerns about the potential environmental, social and economic impacts of climate change have led to a major international debate over what could and should be done to reduce emissions of greenhouse gases, which are claimed to be the main cause. There is still a scientific debate over the likely scale of climate change, and the complex interactions between human activities and climate systems, but, in the words of no less than the Governor of California, Arnold Schwarzenegger, 'I say the debate is over. We know the science, we see the threat, and the time for action is now.'

Whatever we now do, there will have to be a lot of social and economic adaptation to climate change – preparing for increased flooding and other climate-related problems. However, the more fundamental response is to try to reduce or avoid the human activities that are seen as causing climate change. That means, primarily, trying to reduce or eliminate emission of greenhouse gases from the combustion of fossil fuels in vehicles and power stations. Given that around 80 per cent of the energy used in the world at present comes from these sources, this will be a major technological, economic and political undertaking. It will involve reducing demand for energy (via lifestyle choice changes), producing and using whatever energy we still need more efficiently (getting more from less), and supplying the reduced amount of energy from non-fossil sources (basically switching over to renewables and/or nuclear power).

Each of these options opens up a range of social, economic and environmental issues. Industrial society and modern consumer cultures have been based on the ever-expanding use of fossil fuels, so the changes required will inevitably be challenging. Perhaps equally inevitable are disagreements and conflicts over the merits and demerits of the various options and in relation to strategies and policies for pursuing them. These conflicts and associated debates sometimes concern technical issues, but there are usually also underlying political and ideological commitments and agendas which shape, or at least colour, the ostensibly technical debates. In particular, at times, technical assertions can be used to buttress specific policy frameworks in ways which subsequently prove to be flawed

The aim of this series is to provide texts which lay out the technical, environmental and political issues relating to the various proposed policies for responding to climate change. The focus is not primarily on the science of climate change, or on the technological detail, although there will be

accounts of the state of the art, to aid assessment of the viability of the various options. However, the focus is the policy conflicts over which strategy to pursue. The series adopts a critical approach and attempts to identify flaws in emerging policies, propositions and assertions. In particular, it seeks to illuminate counter-intuitive assessments, conclusions and new perspectives. The aim is not simply to map the debates, but to explore their structure, their underlying assumptions and their limitations. Texts are incisive and authoritative sources of critical analysis and commentary, indicating clearly the divergent views that have emerged and identifying the shortcomings of these views. However the books do not simply provide an overview, they also offer policy prescriptions.

The present book explores some of the security aspects of climate change issues that face the world by looking in detail at Asia and Europe, surveying key issues and potential solutions in relation to, for example, climate change adaptation and mitigation, and the issue of climate-related migration. There are many conflicting views of how best to proceed in order to respond to climate change and the security threats it may involve, for example as to whether adaptation is more urgent than mitigation, and over who should take the initiative – and pay for them. There are also uncertainties over how countries might best prepare to cope with climate threats and deal with the social, economic and political conflicts that could emerge, both nationally and internationally, as climate impacts increase. Opinions differ in part because the intensity of the impacts on each area may differ. And the level of commitment varies, as of course does the capacity to deal with the threats. However, what seems to be emerging is a view that, since climate change will affect everyone to some degree, directly or indirectly, common global solutions are needed. What remains in doubt is whether agreement can be reached on these solutions in time to avoid major social and economic problems, and be achieved without requiring or leading to the adoption of divisive, inequitable or authoritarian policies.

Contributors

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Introduction

Antonio Marquina

This book is the result of a project on global warming and climate change that was developed in 2008 by the ASEM Education Hub Thematic Network on Human Security. This network of professors and researchers from European and Asian universities was created in 2007 and is supported by the Asia-Europe Foundation (ASEF). The discussion of the papers of the different working groups took place in Madrid from 15 to 17 of October 2008.

The focus of the book is on policies and the comparison of policies implemented in Asia and Europe for dealing with the principal consequences of climate change, and its possible impacts on conflicts and security. First, the impacts of global warming and climate change on natural resources, in particular water and food, and on the frequency and expansion of natural disasters is clarified, and, as a consequence of these three issues, the critical repercussions that can be foreseen on environmentally induced migration is discussed.

Scenarios of abrupt climate change are not dealt with. The trends that are the basis of our reflection are gradual warming trends. In fact, the EU target of a maximum of 2ºC above pre-industrial levels was established with the perspective of reducing a non-linear climate change with daunting consequences. The paper from the High Representative and the European Commission to the European Council, 'Climate Change and International Security' clearly states that 'unmitigated climate change beyond 2ºC will lead to unprecedented security scenarios as it is likely to trigger a number of tipping points that would lead to further accelerated, irreversible and largely unpredictable climate changes'.

In the first part, the book follows the German Advisory Council that identified four 'conflict constellations' as a result of climate change:

1. Climate-induced degradation of freshwater resources
2. Climate-induced decline in food production
3. Climate-induced increases in storms and flood disasters
4. Environmentally induced migration.

Thus, the book presents two chapters on water availability and policies in Asia and in Europe, one chapter on prospects for food security made by the FAO (Food and Agriculture Organization), five chapters on natural disasters, and two chapters on environmentally induced migration, one focusing on the southern periphery of Europe, another one on Southeast Asia.

Within this framework, the book explains the security interactions of climate change in Europe and Asia in order to present a selection of cases on policies of mitigation and adaptation, as crucial parts of conflict prevention that will permit a comparison between EU policies and the policies of selected Asian countries. In this way, several significant comparisons are made and the consequences for future policies and preventive security afterwards are presented.

Structure of the book

Climate impacts

Chapter 1 describes the challenges raised by the recent IPCC reports; their major findings on impacts on systems, sectors, and regions; and their rate of confidence. This chapter was prepared by Ana Yabar, Director of the Institute of Environmental Sciences at the Complutense University of Madrid, who has been a member of IPCC WG-III since 2001.

As an example of impacts, Chapter 2 then analyses water availability and policies in Asia. This is a very broad chapter that covers practically all the Asia ASEF member countries, describing the shortages, water management policies, and reforms introduced. The chapter explains that in Asia water availability impacts are likely to be felt severely given the lack of resources and infrastructure constraints, and increasing water demand. The chapter was written by Professor Maizatun Mustafa from the International Islamic University of Malaysia.

From the European side, Chapter 3 presents the effects of climate change on hydrological resources in Europe, the diversity of water availability in Europe depending on the countries, and worrying projections on water availability, in particular in the Mediterranean. For this reason, Spain is selected as a special case to exemplify the severe impact of climate change on water availability in southern Europe. This chapter was prepared by Teodoro Estrela and Elisa Vargas from the Directorate General of Water at the Spanish Ministry of Environment.

Chapter 4, by Tomás Lindeman and Daniela Morra from the FAO, focuses on the implications of climate change in agriculture and food security, in particular in Asia, explaining the challenges, the projected changes in food requirements in the medium-term, and the proactive responses needed to cope with the effects of climate change in agriculture and rural areas.

Responding to natural disasters

The impact of natural disasters is examined at length and disaster preparedness is discussed. The reason for the selection of different cases reflects the growing importance attributed to natural disasters in Asia and Europe. In the case of Europe, Chapter 5, by Kostas Ifantis from the University of Athens, explains the instruments developed by the European Union to address the various aspects of disaster preparedness, response, and recovery. He deals with the particular importance of the Greek initiatives and proposals in this domain, the strengthening of early warning systems, and the publication in March 2008 of the EU Communication on 'Reinforcing the Union's Disaster Response Capacity', and in February 2009 the Communication on 'EU Strategy for Supporting Disaster Risk Reduction in Developing Countries', which will permit stronger coordination and consistency in EU policies for managing natural disasters and delivering results. In this regard, the book emphasizes the increasing importance of the armed forces and special military units for dealing with natural disasters and civil protection. Chapter 10, by Lt Col. José Miguel González Requena, presents the increasing involvement of NATO, including the NATO Response Force, for international assistance mitigation of the consequences of natural and man-made disasters; and the importance of this topic in the different NATO dialogue initiatives with third countries. That is also an important field of cooperation in the EU Mediterranean dialogue, the 5+5 dialogue, and other bilateral initiatives for cooperation. In Switzerland, Spain, Norway, and France, special units for dealing with natural and man-made disasters have been created.

Four countries in Asia were selected because of their different peculiarities: Japan, a disaster-prone country; China, one of the countries most affected by natural disasters; India, because of its heavy dependence on monsoons for its economy and population; and Vietnam in Southeast Asia, given the impact on the country of tropical storms. Chapters 6 through 9 are written by recognized experts: Professor Haruo Hayashi from Kyoto University; Professor Luo Tianhong from Renmin (People's) University of China; Professor P. R. Chari, former Director of the Institute for Defence Studies and Analyses in New Delhi; and Professor Luan Thuy Duong, Deputy Director General of the Diplomatic Academy of Vietnam. The chapters deal with the importance of diverse natural disasters in the different countries, the evolution of policies implemented for coping with them, and international cooperation. The role of the armed forces is particularly emphasized in China.

Migration

Once these three impacts of climate change are explained, the repercussions of them on environmentally induced migration are described. Two regional areas are focused on – in Europe, the Mediterranean, given its present critical

importance for dealing with irregular flows; and for Asia, Southeast Asia, given the traditional importance of migration in this region.

Both chapters present the principal environmental push factors that might lead to increasing migration flows in these regions. Chapter 11 on the Mediterranean, written by Professor Antonio Marquina, former president of STRADEMED, explains the traditional European focus on socioeconomic factors affecting migration, the recent changes for accommodating environmental push factors, the prospects, the difficulties for a clear evaluation of environmentally induced migration, and the possible consequences for the region. Chapter 12 on Southeast Asia deals with a region where few specific and relevant studies exist on the impact of climate change. The Chapter, written by professor Carolina Hernández from the University of the Philippines, shows the possible implications for millions of people living in the region, in a context of increasing population growth.

Mitigation and adaptation

After this exploration of migration issues, the second part of the book focuses on policies of mitigation and adaptation, given their critical importance for conflict prevention. The interest of this part of the book is in a better understanding of the policies that are being developed in Asia and the European Union. Awareness of the importance of mitigation and adaptation policies is growing in Asia, but there is still a long way to go in many countries. The European Union, relatively speaking, is a far ahead of the majority of Asian states in terms of mitigation and adaptation policies. Japan has a comparable level to that of the European Union and, in another context, South Korea. It is specifically in adaptation policies that the gap is biggest in Asia. This will be clearly seen in the diverse chapters that deal with Asia in the second part of the book.

The selection of topics in this part has the following rationale: Germany was selected in the context of EU mitigation policies agreed during the German EU Presidency in the first semester of 2007. Chapter 13, by Frank Umbach, formerly responsible for International Energy Security at the DGAP in Berlin, shows us the targets adopted and the role of Germany in this regard. Other chapters, on EU policies on renewables, written by Professors Julián López Milla and Javier de Quinto, and on the nuclear energy debate in Italy, written by Professor Massimo de Leonardis, contribute to explain the interest in non-fossil fuel uses for emissions reduction in the EU. In the case of renewables, Chapter 15 explains the targets approved for the year 2020 and the implication of these ambitious targets. The selection of Italy for explaining the renewed interest in nuclear energy in many countries in Europe has this rationale: In 2008, when we started the programme we considered that the Italian case was the most relevant case for understanding the debates and changes going on in Europe, linking mitigation, diversification, and security of supply with nuclear energy. In fact, we were

right. Chapter 14 shows the radical change that has taken place in Italy with regard to the use of nuclear energy in electricity generation and the recent agreement between Sarkozy and Berlusconi for the construction of nuclear plants in Italy confirms this.

On EU adaptation policies, Chapter 16 by Alfonso Gutiérrez Teira, Head of the Impact, Vulnerability and Adaptation Service at the Spanish Ministry of Environment, Marine and Rural Affairs, deals with the recent approaches of the EU and the regional dimension given to policies of adaptation in the EU. In order to give some continuity to the EU policies presented on water availability in Europe, the chapter explains the policies for adaptation in Spain, one of the countries that will be most affected by climate change in Europe.

With regard to Asia, the book deals mainly with policies of mitigation in Japan, China, India, South Korea, and several selected countries in Southeast Asia. A realistic approximation to adaptation is still a task for numerous countries in Asia, as the different chapters show. Shigeru Sudo, in Chapter 19, explains the policies in Japan; Professor Shi Dan (Chapter 18) from the Chinese Academy of Sciences, and Professor Michal Meidan (Chapter 17) from the Asia Centre in Paris, deal with the policies of China; Professor Jae-seung Lee from Korea University explains the mitigation and adaptation policies of Korea in Chapter 20; and Professor Devika Sharma deals with the policies of India in Chapter 21. A broad analysis on the region of Southeast Asia is given by Professor Mely Caballero-Anthony from RSIS, Singapore in Chapter 22; Chapter 23 on Malaysia is written by Professor Mazlin Mokhtar from the National University of Malaysia; Chapter 24 on Thailand is written by Professor Keokam Kraisoraphong from Chulalongkorn University; and Chapter 25 on the Philippines is written by Professor Pia Bennagen from the Institute for Strategic and Development Studies. All these chapters contribute to the presentation of a rich panorama of the process of awareness of the importance and implications of climate change in Asia. A comparison between the policies of the European Union and the policies under development in Asia shows us the weak points of these countries and the path they may have to take in order to prevent future conflicts.

Prospects for the future

The book closes with two exploratory chapters looking at the future. The first, Chapter 26, by Mark Beeson, professor of international relations of the University of Birmingham, and the second, Chapter 27, by Professor Antonio Marquina. Professor Mark Beeson's chapter aims to provoke thought about the difficulties Asian reforms will have, considering the rise of 'environmental authoritarianism' as a possibility. The concluding chapter by Professor Antonio Marquina analyses the input of the various preceding chapters with regard to conflict prevention, presenting the asymmetries that exist between Asia and Europe, and the implications for human security and the security of states.

Security and environment in Asia and Europe

These security aspects take on a fundamental importance, given the probable implications of climate change that are presented in the book.

Climate change has serious implications for people, their possibilities in terms of development, and the satisfaction of their basic needs. It constitutes a problem to be tackled within the context of human security.

However, at the same time, it has important implications for state security. The possible relative weakening of various states because of an increase in poverty, loss of opportunities, competitivity, and capacity, combined with a possible increase in opportunities, wealth, capacity, and resources in other states, depending on the impact of climate change, is not a trivial matter. Current regional security contexts in Asia and Europe could be seriously affected or transformed. Climate change cannot be reduced merely to a problem of human security.

Therefore, other aspects must be taken into account. The current international system is increasingly multipolar. The decline in the power of the United States is a reality, as is the weakening power of the European Union. The expectations generated by the European Union in the 1990s, of an international actor capable of conditioning the behaviour of other actors, are clearly on the wane. The pretensions of the European Union, on entering into competition with other international actors in Europe, Africa, Asia, and even in Latin America, have received a serious corrective in recent years, and show its incapacity to effectively tackle security problems on its periphery. The European Union adopted a post-modern stance on security after the Cold War, gradually separating itself from Westphalian approaches to sovereignty, and accepting political and economic globalization supported by liberal values and the growing importance of the market. The United States maintained world order and its leadership was not questioned. European security was based on these assumptions, as were debates about the European Union as a civil international actor or as a normative actor. The most palpable result of this was the European security strategy, 'A Secure Europe in a Better World',[1] which to a great extent contains an approach to human security concepts as being the purpose of European security. The question is whether in a multipolar, increasingly competitive and, consequently, potentially more conflictive, world, these approaches need to be seriously revised. They are not fully viable when strong interests in competition with those of the European Union are on the table and the role of the United States in world affairs is being profoundly revised. The degree of this revision will be seen after the current economic crisis has been overcome. At present, the role of the United States in world security is still of capital importance.

This explains why the United States must not stay on the sidelines when environmental challenges, which have such important implications, are being tackled.

The US approach to climate change

One of the main problems that the international community had when tackling environmental challenges in previous years was precisely that the United States, considered to be the world's biggest polluter, had neither signed the Kyoto protocol nor adopted policies to reduce its greenhouse gas emissions. To this, the growing impact of emissions in developing countries, such as India, China, or Brazil, must be added. These countries were not willing to reduce their emissions, given the strong impact it would have on their economic development. China has become the country with the largest greenhouse gas emissions. Without the agreement of these countries to substantially reduce emissions it was not possible to tackle the grave consequences that climate change was having and was going to produce in the future.

The election of Barack Obama as president of the United States is going to change this panorama. During the presidential campaign, Barack Obama vowed to reduce carbon dioxide emissions by 80 per cent below 1990 levels by 2050, and invest $150 billion over 10 years in new energy-saving technologies. He committed to start reducing emissions immediately by establishing strong annual reduction targets and promised to implement a mandate of reducing emissions to 1990 levels by 2020. He also promised to make the United States a leader in combating climate change around the world, re-engaging with the UNFCCC (United Nations Framework Convention on Climate Change) and working constructively within it, creating a new forum of largest greenhouse gas emitters, based on the G-8 plus Brazil, China, India, Mexico, and South Africa, the largest energy-consuming countries.

For non-developing countries Barack Obama pledged the creation of a technology transfer program that will export climate-friendly technologies, including green buildings, clean coal, and advanced automobiles, to developing countries to help them combat climate change.[2] This last point was considered critical for cutting the emissions of developing countries like China.

Once Barack Obama was elected, he rapidly selected his top energy and environmental advisers and designed a cap-and-trade scheme for cutting emissions. In Congress, however, many congressmen were not convinced, given the possible permit costs and the impact of this scheme on states that rely heavily on coal. The president and his supporters in Congress tried to overcome opposition by promising subsidies, fomenting renewables, and spending on green energies. Around 10 per cent of the stimulus bill – $787 billion – will be spent on energy and the environment.

Very significant rectifications started to take place. The Environmental Protection Agency (EPA) declared in March 2009 that greenhouse gas emissions posed a danger to the public's health and welfare, thus ending an era

of denial on global warming and allowing federal regulation of motor vehicle emissions. Other regulations established during the George W. Bush presidency were revised and on 18 May, Barack Obama announced nationwide automobile and mileage and emissions standards. The plan raises fuel-efficiency standards by 40 per cent from 2009 to 2016 and imposes limits on tailpipe greenhouse gas emissions from cars and light trucks.

The first concrete step adopted by Congress was the approval of the American Clean Energy and Security Act on the 26th of June, 2009. The Act will set a cap on greenhouse gas emissions. They must decline 17 per cent by 2020 and more than 80 per cent from 2005 levels by 2050. Although the Act has to be approved by the Senate, it was a significant step forward that would permit the United States to pressure other countries into emissions reduction. It was an important and quite pragmatic step, having had to satisfy diverse sectors with opposing interests, but it was not completely satisfactory. Various European states, in particular France and Germany, expressed their frustration that the United States had not committed itself to deeper emissions cuts by 2020. Other critics emphasized the fact that the cap-and-trade mechanism that was approved was going to allow polluting companies in the United States to finance emission reductions overseas, without reducing their own emissions, and thus permit emissions to rise. Although the Act still has to go through the Senate, this first approval has allowed the United States to show a new face in international discussion forums regarding emissions control and climate change.

Simultaneously, the United States has maintained a dialogue with China about emissions reduction that European states have been worried about, fearing a bilateral deal that could circumvent the UN process in Copenhagen, thus causing it to achieve less ambitious targets. However, John Holdren, Obama´s Science Advisor, has played down this perception on several occasions.

The G-8 summit in Aquila, from 8th to 10th July 2009, has served to highlight the advances and disagreements that still exist between developed and developing countries. The final G-8 official document on a sustainable future reaffirms the importance of the work of the Intergovernmental Panel on Climate Change, and recognizes in particular the following points:

- the broad scientific view that the increase in global average temperature above pre-industrial levels ought not to exceed 2ºC and the willingness to share with all the countries the goal of achieving at least 50 per cent reduction of global emissions by 2050, recognizing that this implies that global emissions need to peak as soon as possible and decline thereafter
- support a goal of developed countries reductions emissions of greenhouse gases in aggregate by 80 per cent or more by 2050 compared to 1990 or more recent years

- we will undertake robust aggregate and individual mid-term reductions, taking into account that baselines may vary and that efforts need to be comparable
- major emerging economies need to undertake quantifiable actions to collectively reduce emissions significantly below business-as-usual by a specified year.[3]

The advance was significant in accepting that average global temperatures ought not to exceed pre-industrial levels by more than 2°C, and that the goal was to achieve a global reduction of 50 per cent by 2050. However, other clearly unsatisfactory aspects exist: the 80 per cent reduction or more by 2050 by developed countries leaves the date of comparison open. A reduction with respect to 1990 would be significantly higher than with respect to 2005. Nothing was said about short-term targets, in particular for 2020. The leading developing countries were not asked to make comparable commitments either. One of the reasons for this tepid position was that the G5 group of emerging economies had previously refused to back an explicit target for developing countries to cut emissions.

Later on in the meeting of the Major Economies Forum, which contributes 80 per cent of world emissions, there were several small advances. In the final communiqué, the scientific view that temperatures should not rise by more than 2°C on pre-industrial levels was accepted as well as the global goal for substantially reducing global emissions by 2050. But there were no commitments to specific cut targets.[4] The developing countries wanted to know first what were the average targets agreed to by developed countries against the baseline of 1990, and the financial resources that were to be provided by developed countries for adaptation and mitigation.

Therefore, the respective positions are still too far apart to be able to reach a satisfactory agreement. EU objectives with regard to greenhouse gas emissions cuts and their timing are still a long way off. The results of a satisfactory or unsatisfactory agreement in the Copenhagen summit have important implications for security.

Security and climate change

In this book, the four 'conflict constellations' as a result of climate change, if serious, deep, and costly mitigation and adaptation policies are not undertaken, are emphasized. The effects of climate change on the availability of fresh water and food, on the increase of natural disasters, and its impact on environmentally induced migrations will have serious socioeconomic, political, and security implications, especially in developing countries.

These countries, exemplified in the book when dealing with the Mediterranean and Southeast Asia, are especially vulnerable to climate change, given their high population growth, their high dependence on

agriculture, their growing urbanization, and their lack of adequate infrastructure. This vulnerability also exists in developed countries, as is shown in the book when dealing with countries in the south of Europe, and the effects may also be significant. At present, the forecast effects are, nevertheless, of a different order. The general impoverishment that may be caused by climate change in developing countries, the competition for ever-scarcer natural resources, especially if access to natural resources is politicized, interacting with conflictive situations of exclusion, inequality, endemic injustice, lack of good governance, and unstable institutions, may lead to serious insecurity situations. These could exacerbate existing conflicts or fuel situations where there is strong competition and rivalry, or even provoke radicalization and riots that could cause violent conflicts, loss of capacity to manage, problems with the legitimacy of governments, and the displacement of people. This is especially likely in weak or fragile states which are very vulnerable to the effects of climate change, and where governments have a limited adaptation and response capacity.

Climate change and its effects could also be a trigger for violent conflict, or give way to strong competition for the exploitation of resources as new possibilities are opened up, such as is the case of the Arctic, which could be the origin of serious interstate security problems.

However, it is important to point out that the internal security of a country is also an important regional factor in determining whether conflicts or their consequences, such as refugee displacement, are transferred to neighbouring states. One key factor that, without doubt, can cause serious tensions between states is massive migration. Pressure on borders and increasing evacuation, rescue, and maintenance costs are already matters that put serious pressure on various states, above all in the south of Europe. Opening or closing borders to allow or foment the transfer of emigrants is a tool to put pressure on or to blackmail that could cause serious conflicts. The perception of the existence of a growing 'invasion', either fomented or simply badly managed from the exterior, could cause an overreaction that could lead to crucial bilateral and regional security problems. In Europe, and also in Asia, the question of migration is already strongly securitized. The humanitarian stance and vision is being increasingly overwhelmed.

In addition, the scarcity caused by limited resources can have implications for regional security if interstate competition for those resources is produced, especially for water and energy. In Asia as well as in the south and east of the Mediterranean there are rivers whose waters are shared by various countries and that has caused, or may cause, conflicting claims for water resources. However, the main question, when considering the climate change predictions as they are set out in this book, is how governments in different countries will allocate resources among the different sectors of the economy, in particular between agriculture and industry, or between urban and rural areas, when demand is increasing and water availability

is decreasing. The increase in temperatures also causes a fall in crop yields. Although at a global level the impact of climate change on crop productivity will not be significant until 2030, as is stated in the book, at a regional level the changes could be important. This is the case in the Mediterranean. In addition, climate change impacts on crops will be uneven between countries and regions within Asia. Moreover, climate change could modify the distribution of world agricultural production and have a strong effect on food prices. In the Mediterranean, as well as in various Asian countries, changes in availability and relative prices for major food items may result in people either changing their food basket or spending a larger percentage of their income on food. Added to this is the need to import growing quantities of food thus diverting resources and increasingly weakening the ability of governments to provide critical services, jobs, and infrastructures for development. Lack of good governance, population growth, poverty, the number of people employed in agriculture, existing discrimination and inequality will amplify the consequences of the decline of water availability and food production. The cost of adaptation will become an insurmountable barrier for different states.

Furthermore, natural disasters will intensify the lack of coping capacity of the governments in the southern Mediterranean and in some developing countries in Asia, and will contribute to increasing poverty and to fostering political crises.

Thus, as is explained in this book, in the southern Mediterranean and in some Asian countries, global warming and climate change will potentially create conditions for extremism and violent conflict and for environmentally induced migration with all the consequences mentioned for interstate relations. In Asia as well as in the southern Mediterranean, 'the institutional architecture is weak and its record of effective cooperation is unimpressive'.

On the other hand, impoverishment will be felt in the south of Europe, but the level of economic development, good governance, and the fact that these countries belong to the European Union will make climate change impacts more manageable in a context of diminishing capacities of governments, important adaptation costs, and impoverishment in relative terms. However, to think that this will not affect the balance and distribution of power, the formation and idiosyncrasy of the European Union, is a sheer illusion. The centres of power in the European Union will probably gravitate even more towards the north of Europe.

As it is explained in the book, a weakening of states that complicates their governing capacity could probably cause a strengthening of authoritarian political systems in Asia. In the southern Mediterranean, it is quite likely that a decline in the existing authoritarian regimes takes place. They can be replaced with governments linked to fundamentalist Islamic movements or parties, also deeply authoritarian.

The increasing lack of homogeneity in the world political systems, connected to strong competition for resources, the weakening of states and their incapacity to deal with serious environmental challenges in a more multipolar and competitive international system, will make militarization and competition between states more probable, which will in turn make the maintenance of post-modern approaches unfeasible.

Environmental challenges will oblige people-centred approaches to security to be taken, with a growing emphasis on conflict prevention, including coercive elements to manage possible crises and weakening of states. However, state security approaches will also gain new strength, especially in the European Union, that will have to reorient security approaches, and balance human security and state security approaches more convincingly, if it wants to continue to be an 'original international actor'.

At a global level, in terms of the role of the United Nations, once climate change is securitized there will probably be strong pressure to allow intervention in situations, and in states, where the basic needs of the population cannot be attended to. The international responsibility to protect will probably be extended to take on environmental challenges.

If the mitigation and adaptation policy decisions that have to be adopted at global level are not sufficient to tackle climate change challenges, profound modifications can be predicted in the regional and world security context, independently of the consequences that temperature rises will have in the medium term even if those policies are adopted.

These are some ideas to ponder in a context of speculative scenarios, given the amount of knowledge we already have about the magnitude of the impact of global warming and climate change, and the results of the more or less ambitious mitigation and adaptation policies that can be adopted. The book shows that considerably different approaches exist in Asia and Europe.

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Notes

1. *A Secure Europe in a Better World, European Security Strategy*, Brussels, 12 December 2003, http://www.consilium.europa.eu/uedocs/cmsUpload/78367.pdf (accessed 10 January 2009). See also A. Marquina and M. Caballero-Anthony (2008) 'Human Security: European and Asian Approaches' in A. Marquina (ed.) *Energy Security. Visions from Asia and Europe* (Houndsmills, Basingstoke, New York: Palgrave Macmillan), pp. 244–272.

2. Barack Obama and Joe Biden, *Promoting a Healthy Environment*, http://www.barackobama.com/pdf/issues/EnvironmentFactSheet.pdf (accessed 10 January 2009).
3. 'Responsible Leadership for a Sustainable Future', *The Major Economies Forum on Energy and Climate*, L'Aquila, 8–10 July 2009, p. 16, http://www.g8.utoronto.ca/summit/2009laquila/2009-declaration.pdf (accessed 12 July 2009).
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1
IPCC Assessment Reports: Challenges Presented

Ana Yábar Sterling

Introduction

The international community recognizes almost universally that climate change could potentially result in serious challenges for human security and national security this century.[1] The adequate concept of 'security' goes beyond the absence of internal state conflicts or conflicts between states. The addition of the 'human' adjective next to 'security', which served to justify several crucial activities carried out by the United Nations in the 1990s, was the final step after two decades of academic debate on the main scope of this concept, now quite far from the traditional one.

The prevention of, and attention to, conflicts that are generated in relation to the lack of satisfaction of basic human needs (water, food, health security; also livelihood and a safe place to live) are inherent aspects of human security, in its wider meaning, as the Millennium Development Goals (MDG) pointed out. Climate change impacts have to be considered among the different factors and determinant circumstances of human security and their fulfilment, but also a complex and interactive process which has to be conducted far from its conventional pattern to guarantee climate system stability for the Earth's population.

The International Panel on Climate Change (IPCC) Fourth Assessment, the Stern Review Report, more recently the Garnaut Climate Change Review[2] and most of the literature on the subject are conclusive on the huge impacts of even gradual climate-driven environmental changes, which threaten security from both perspectives.[3] In addition, military experts identify climate change as a 'threat multiplier' for instability in some of the most volatile regions of the world.[4] Accordingly, adequate conflict prevention includes consistent planning and management of environmentally driven migration, which will be critical for human security.

Climate change impacts 'will worsen resource scarcity increasing risks of conflict between nations for safe water, agricultural land or economic infrastructure'[5] and may exacerbate existing areas of political and social tension;

therefore, climate change presents several new threats and challenges to national security and to international stability. The awareness of the imminent dangers posed by climate change on security, in its more classical conception, motivated a particular session of the UN Security Council, in April 2007.[6] The foreseen deeper impact of global warming on less-developed countries' populations becomes a new challenge for inter- and intra-state relations, thus increasing the risk for geopolitical imbalance. That awareness helps to explain why climate change is being considered more and more on both domestic and international political agendas.

Considering the relevance of this issue, this chapter intends to summarize the scientific bases for climate change, following the Fourth IPCC Assessment Report main topics, to give a synthesis on the major findings on climate change impacts on subjects which can be considered as essential from a European/Asian perspective. Because socioeconomic responses to climate change impacts are predicted, the chapter further discusses the links between those and the main human concerns, which sets up new challenges for human security in terms of domestic and/or international stability. Finally, the chapter pays some attention to the subject of energy security, a big issue for non-developed countries, but also from a global human security perspective, because of their related policy implications.

Scientific bases for climate change and its major impacts

Scientific literature from the natural sciences alerted us decades ago, arguing that climate change encompasses potential global scale impacts on essential conditions for human security and human development (water, energy, health, agriculture, biodiversity and settlements/infrastructure). However, the general agreement on the anthropogenic drivers of climate change did not come so early. Likewise, the practical tools to protect the population from a radical transformation of its climate and to provide them for those essential conditions of human security have been lagging behind.

One explanation for the limited response to this big human security challenge is the uncertainty embodied in the attribution of the changes observed in the Earth's system to human activities. Strong evidence had to be collected before concluding that human activities were not negligible driving forces for those changes. This was the case and the main definition of climate change at the UNFCCC, article 1.2 (1992), which relates to its anthropogenic nature,[7] only 16 years ago, proves that the almost universal recognition of that intimate relation is quite recent.

Currently, after several decades of research and discussion, scientists have reached the conclusion that: 'No other plausible explanation for the observed warming for at least the past 50 years than human activities' (Stern Report).

If that statement from the Stern Report, based on the IPCC Third Assessment Report (2001) was definite in this respect, it's even more accurate after the IPCC-AR4 was concluded (2007). At present, new scientific evidence has been accumulated and shows a greater probability than previously thought for the sensitivity of the climate to GHGs, derived from human activities.

> Confidence in the assessment of the human contributions to recent climate change has increased considerably since the TAR, in part because of stronger signals obtained from longer records, and an expanded and improved range of observations.

The so-called *hockey stick debate* is already almost solved within the IPCC Fourth Assessment Report (AR4)–WGI findings. As the scientific understanding of the threat becomes increasingly powerful and detailed, many people naturally conclude that vigorous action is needed to tackle climate change. Besides, the emerging risks and vulnerabilities associated with climate change are the outcomes of physical processes, but also a consequence of human actions and choices.

Climate change certainly is a factor which underpins development impacts to create further risk conditions for human development. Events such as temperature extremes, droughts, floods and storms threaten lives and leave people feeling insecure. But climate shocks also wear down long-term opportunities for human development, undermining productivity and eroding human capabilities. Climate shocks already figure prominently in the lives of the poor, increasing their risks and vulnerabilities.

But, how much should be done to respond to the challenge of climate change? What is it technically possible to do? And, since the problem is global in scope, what and when can all or most of the world agree to do? What economic and social costs have to be borne and by whom?

Being clear that human activities have a powerful role in influencing the climate, climate change modelling is subject to inherent uncertainties, so the assessment on the risks and scale of climate change impacts on the future climate system. The precautionary principle invocation helps to spread the need for international action and coordination or equity concerns leads the policy response within the UNFCCC normative outcomes as well as within the UE climate change programme.

The uncertainty in the development of, and the Earth's distribution of, temperatures, precipitation, sea-level rises (the major climate system parameters) certainly exists, but it is even bigger regarding climate change impacts on natural ecosystem services, and also in terms of the new socioeconomic conditions imposed on populations by this changing climate system. Natural and social scientists are far from being able to offer definite answers to climate change impacts; it is even more difficult if socioeconomic reactions have to be foreseen and evaluated.

The IPCC plays an important role in filling the gaps in our knowledge about all these aspects, not only thanks to their four published assessment reports (1990, 1996, 2001, 2007), but also because the special reports issued on important human security outcomes, such as the one dedicated to *Climate Change and Water*, are the next to come out. For that reason, the following sections are devoted to the major scientific findings on climate change as they are exhibited by IPCC-AR4 to offer a synthesis focused on the major concerns for human security issues.

Major findings on climate change impacts within IPCC-AR4

Thanks to the IPCC Assessment Reports from 1990 to 2007, our scientific understanding on the climate change challenge turned out to be increasingly powerful and detailed. The core of the climate change problem is that the Earth's capacity to absorb carbon dioxide (CO_2) and other greenhouse gas emissions (GHG) is being overwhelmed. IPCC-AR4 includes so much evidence on the 'unequivocal' indicators of global warming attributed directly or indirectly to human activities that is difficult to find today a credible climate scientist discussing whether climate change is or is not a real and a serious problem, or if that is or is not linked to the release of CO_2.

The first sentence of the IPCC-AR4 Synthesis Report is clear in this respect:

> Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.

However, scientific consensus does not mean that debates on the causes and consequences of global warming are over. We can't forget that the science of climate change deals in probabilities, not certainties. The large areas of uncertainty over future outcomes are related to the impacts of climate change on natural (physical and biological) systems, the limits and thresholds for human development and human security. However, after AR4 we can be virtually certain on that general effect of global warming:

> Many natural systems are being affected by regional climate changes, particularly by temperature increases.

We shouldn't be surprised that scientists cannot be certain on how the Earth's ecological systems will respond to human-induced GHG. We have to remember that natural climate variability and climate change are always combined. At the same time, the volume and shape of GHG anthropogenic emissions depends on production technologies and on socioeconomic factors and conditions.

For that reason, IPCC-AR4 distinguishes likelihood levels and confidence levels to evaluate the probability of scientific findings collected on climate change impacts on climate systems, ecosystems and societies. Scientific findings come from three big, more or less well defined, research areas which correspond to three IPCC working groups.

WG I collects *available scientific information on climate change* and it has predominantly used likelihood assessments to evaluate the degree of accuracy and coincidence in those scientific results, from climatology and hard-core sciences. Using expert judgement and statistical analysis of a body of evidence (e.g., observations or model results), WG I employs the following likelihood ranges to express the assessed probability of a result's occurrence:

Virtually certain >99%;
Extremely likely >95%;
Very likely >90%;
Likely >66%;
More likely than not > 50%;
About as likely as not 33% to 66%;
Unlikely <33%; very unlikely <10%;
Extremely unlikely <5%;
Exceptionally unlikely <1%.

IPCC WG III concentrates on 'formulation of response strategies' and the scientific results collected of that kind are assessed by 'confidence levels'. At the top of the ranking, near to certainty in terms of IPCC WG I, is the 'very high confidence' used to express that the assessed chance of a finding to be correct is at least 90 per cent. The very low confidence (less than 10 per cent) is the fifth level down in that ranking where uncertainty is assessed quantitatively using expert judgement to assess the correctness of underlying statistical data, models or analyses collected.

Very high confidence at least 9 out of 10;
High confidence about 8 out of 10;
Medium confidence about 5 out of 10;
Low confidence about 2 out of 10;
Very low confidence less than 1 out of 10.

The pure qualitative evaluation within WG III-AR4 only provides a relative sense of the amount and quality of evidence (information from theory, observations or models indicating whether a belief or proposition is true or valid) and the degree of agreement (the level of concurrence in the literature

on a particular finding): high agreement, much evidence; high agreement, medium evidence; medium agreement, medium evidence.

IPCC WG II, focused on environmental and socioeconomic impacts of climate change, brings a combination of confidence and likelihood assessments to evaluate findings into play, from natural but also social scientists interested in their impact on ecosystems, economic structures, sectors of activity, shape and/or rhythm of development processes, migration patterns, etc.

From the human security point of view, climate change prospects on future ecosystems, sectors and regions are crucial, so next I'll explore some of those as they are considered by the IPCC-AR4. I'd like to concentrate mostly on projections with a *high* or *very high* level of confidence to offer an abstract of those IPCC-AR4 findings and also to focus on those established for the range of changes in the Earth's climate projected over the twenty-first century.

Impacts on systems and sectors

Ecosystems

- The resilience of many ecosystems is *likely* to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification) and other global change drivers (e.g., land-use change, pollution, fragmentation of natural systems, overexploitation of resources). *{WGII 4.1 to 4.6, SPM}*
- Over the course of this century, net carbon uptake by terrestrial ecosystems is *likely* to peak before mid-century and then weaken or even reverse, thus amplifying climate change. *{WGII 4.ES, Figure 4.2, SPM}*
- For increases in global average temperature exceeding 1.5 to 2.5°C and in concomitant atmospheric CO_2 concentrations, there are projected to be major changes in ecosystem structure and function, species' ecological interactions and shifts in species' geographical ranges, with predominantly negative consequences for biodiversity and ecosystem goods and services, for example, water and food supply. *{WGII 4.4, Box TS.6, SPM}*

Food

- Crop productivity is projected to increase slightly at mid- to high latitudes for local mean temperature increases of up to 1 to 3°C depending on the crop, and then decrease beyond that in some regions (***medium confidence***). *{WGII 5.4, SPM}*
- At lower latitudes, especially in seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increases (1 to 2°C), which would increase the risk of hunger (***medium confidence***). *{WGII 5.4, SPM}*

- Globally, the potential for food production is projected to increase with increases in local average temperature over a range of 1 to 3°C, but above this it is projected to decrease (***medium confidence***). *{WGII 5.4, 5.5, SPM}*

Coasts

- Coasts are projected to be exposed to increasing risks, including coastal erosion, due to climate change and sea-level rise. The effect will be exacerbated by increasing human-induced pressures on coastal areas (***very high confidence***). *{WGII 6.3, 6.4 SPM}*
- By the 2080s, many millions more people than today are projected to experience floods every year due to sea-level rise. The effect will be exacerbated by increasing human-induced pressures on coastal areas (***very high confidence***). *{WGII 6.3, 6.4, SPM}*
- By the 2080s, many millions more people than today are projected to experience floods every year due to sea-level rise. The numbers affected will be largest in the densely populated and low-lying megadeltas of Asia and Africa while small islands are especially vulnerable (***very high confidence***). *{WGII 6.4, 6.5, Table 6.11, SPM}*

Industry, settlements and society

- The most vulnerable industries, settlements and societies are generally those in coastal and river flood plains, those whose economies are closely linked with climate-sensitive resources and those in areas prone to extreme weather events, especially where rapid urbanization is occurring. *{WGII 7.1, 7.3, 7.4, 7.5, SPM}*
- Poor communities can be especially vulnerable, in particular those concentrated in high-risk areas. *{WGII 7.2, 7.4, 5.4, SPM}*

Health

- The health status of millions of people is projected to be affected through, for example, increases in malnutrition; increased deaths, diseases and injury due to extreme weather events; increased burden of diarrhoeal diseases; increased frequency of cardio-respiratory diseases due to higher concentrations of ground-level ozone in urban areas related to climate change; and the altered spatial distribution of some infectious diseases. *{WGI 7.4, Box 7.4; WGII 8.ES, 8.2, 8.4, SPM}.*
- Climate change is projected to bring some benefits in temperate areas, such as fewer deaths from cold exposure, and some mixed effects such as changes in range and transmission potential of malaria in Africa. Overall, it is expected that benefits will be outweighed by the negative health effects of rising temperatures, especially in developing countries. *{WGII 8.4, 8.7, 8ES, SPM}*

- Critically important will be factors that directly shape the health of populations such as education, health care, public health initiatives, and infrastructure and economic development. *{WGII 8.3, SPM}*

Water

- The current stresses on water resources from population growth and economic and land-use change, including urbanization is expected to be exacerbated by changes in precipitation and temperature due to climate change (lead by changes in run-off and water availability).
- Run-off is projected to increase by 10 to 40 per cent by mid-century at higher latitudes and in some wet tropical areas, including populous areas in east and Southeast Asia, and decrease by 10 to 30 per cent over some dry regions at mid-latitudes and dry tropics, due to decreases in rainfall and higher rates of evapotranspiration.
- Many semi-arid areas (e.g., the Mediterranean Basin, western United States, southern Africa and northeastern Brazil) will suffer a decrease in water resources due to climate change. Drought-affected areas are projected to increase in extent, with the potential for adverse impacts on multiple sectors, for example, agriculture, water supply, energy production and health. Regionally, large increases in irrigation water demand as a result of climate changes are projected. {*WGI 10.3, 11.2–11.9; WGII 3.4, 3.5*}
- The negative impacts of climate change on freshwater systems outweigh its benefits.
- Areas in which run-off is projected to decline face a reduction in the value of the services provided by water resources (***very high confidence***).
- The beneficial impacts of increased annual run-off in some areas are likely to be tempered by negative effects of increased precipitation variability and seasonal run-off shifts on water supply, water quality and flood risk. {*WGII 3.4, 3.5, TS.4.1*}
- Available research suggests a significant future increase in heavy rainfall events in many regions, including some in which the mean rainfall is projected to decrease. The resulting increased flood risk poses challenges to society, physical infrastructure and water quality.
- It is *likely* that up to 20 per cent of the world population will live in areas where river flood potential could increase by the 2080s. Increases in the frequency and severity of floods and droughts are projected to adversely affect sustainable development. Increased temperatures will further affect the physical, chemical and biological properties of freshwater lakes and rivers, with predominantly adverse impacts on many individual freshwater species, community composition and water quality. In coastal areas, sea-level rise will exacerbate water resource constraints due to increased salinization of groundwater supplies. {*WGI 11.2–11.9; WGII 3.2, 3.3, 3.4, 4.4*}

- Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the twenty-first century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g., Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives. {*WGI 4.1, 4.5; WGII 3.3, 3.4, 3.5*}
- Effects will be largest in the densely populated and low-lying megadeltas of Asia and Africa while small islands are especially vulnerable (***very high confidence***). {*WGII 6.4, 6.5, Table 6.11, SPM}*

Impacts on regions

The main interest of this book is the projected climate change impacts on Asia and Europe. So, those continents are mentioned in particular, although IPCC-AR4 offer projections also for Africa, America (South and North), Australia, polar regions and small islands due their huge vulnerabilities from this point of view.

Asia

- Asian and African megadeltas, due to large populations and high exposure to sea-level rise, storm surges and river flooding, are considered in IPCC-AR4 as especially affected by climate change. *{WGII TS.4.5}*
- By the 2050s, freshwater availability in central, south, east and Southeast Asia, particularly in large river basins, is projected to decrease. *{WGII 10.4, SPM}*
- Coastal areas, especially heavily populated megadelta regions in south, east and Southeast Asia, will be at greatest risk due to increased flooding from the sea and, in some megadeltas, flooding from the rivers. *{WGII 10.4, SPM}*
- Climate change is projected to compound the pressures on natural resources and the environment associated with rapid urbanization, industrialization and economic development. *{WGII 10.4, SPM}*
- Endemic morbidity and mortality due to diarrhoeal disease primarily associated with floods and droughts are expected to rise in east, south and Southeast Asia due to projected changes in the hydrological cycle. *{WGII 10.4, SPM}*

Europe

- Climate change is expected to magnify regional differences in Europe's natural resources and assets. Negative impacts will include increased risk of inland flash floods and more frequent coastal flooding and increased erosion (due to storminess and sea-level rise). *{WGII 12.4}*

- Mountainous areas will face glacier retreat, reduced snow cover and winter tourism, and extensive species losses (in some areas up to 60 per cent under high emissions scenarios by 2080). *{WGII 12.4}*
- In southern Europe, climate change is projected to worsen conditions (high temperatures and drought) in a region already vulnerable to climate variability, and to reduce water availability, hydropower potential, summer tourism and, in general, crop productivity. *{WGII 12.4}*
- Climate change is also projected to increase the health risks due to heat waves and the frequency of wildfires. *{WGII 12.4}*

* * *

The review so far synthesizes the major impacts of climate change foreseen by the IPCC-AR4 Report which are significant from the perspective of this chapter. Those would affect human habitats and infrastructures, would increase resource scarcity (mainly food, water and energy) and would result in mass migrations and other socioeconomic damage difficult to neglect and with enormous monetary value[8]. Also, IPCC-AR4 stresses that anthropogenic warming could lead to some abrupt or irreversible impacts, depending upon the rate and magnitude of climate change *{WGII 12.6, 19.3, 19.4},* these have not been mentioned (ocean circulation changes, metres of sea-level rise, etc.) because they involve longer time scales which go beyond the present century and are assessed with lower *confidence* levels.

Climate change and human security: How are they linked?

For the past two or three decades, researchers have been working to link environmental change and security in a variety of ways,[9] pointing out that environmental factors will interact with existing tensions, making them heavier to manage. The environmental security literature has introduced into the security studies field a set of areas that are significant for the framework of this chapter: different forms of environmental stress, lack of access to credit, confusion over property rights, poverty and inequality[10] and some others related to human security.

Environment and security has wide-ranging implications which are beyond the scope of this chapter, but there are two general areas that are worth concentrating on in relation to the human security consequences of climate change. These are potentially conflictive at the present time:

- Questions related to energy and natural resources (availability/scarcity, prices, distribution, etc.), because climate change will lead to a greater competition both within and between countries, rising conflicts in extreme cases in the absence of a new climate-oriented international strategy, and

- Migrations, due to the effects of warming and drying in some regions, the increase in extreme weather events or sea-level rise, especially within an increasing population scenario for the next decades.

Chris Abbott recently pointed out that at the national and even regional levels, competition over resources and mass migration have the potential to lead to intercommunal and interethnic conflict in some parts of the world.[11]

The author, selecting the case of Darfur as an example, concludes: Although it is a gross oversimplification to say that climate change has caused the conflict in Darfur, it is clear that the ecological crisis there has exacerbated a diverse range of social and political causes and demonstrates how climate-related factors could play an important part in triggering or prolonging conflict in the future.

The security problems engaged would be harder to cope with if climate abruptly changed or, with respect to humanitarian disasters, was climate driven.[12] Therefore, effective adaptation and mitigation measures are important to reduce the likely threats posed by climate change whose impacts would not be distributed homogeneously.

As IPCC-AR4 reminds us (especially in the volume due to WG II) the poor of this planet are ***more likely*** to suffer the worst effects of climate change:

> Poor communities can be especially vulnerable[13], in particular those concentrated in high-risk areas. They tend to have more limited adaptive capacities, and are more dependent on climate-sensitive resources such as local water and food supplies.

Therefore, arguments on the absence of scientific evidence can no longer be given for delaying measures and policies because not to take them would mean worsening the present options for coping and adapting to climate change stresses.[14] However, tackling climate change confronts governments with difficult choices.[15] Complex issues involving ethics, distributional equity across generations and countries, economics, technology and personal behaviour are at stake.

Policies for mitigating GHG emissions will require far-reaching changes in energy policy and in human behaviour. IPCC-AR4, under the head of 'International and Regional Cooperation' (WG III Report) goes into a crucial matter from a human security perspective: The achievements of the UNFCCC and its Kyoto Protocol to benefit Non-Annex B countries from a global and cooperative response to the climate change problem, specially brought about by Annex B countries.

The literature collected to make the last IPCC report provides ***high agreement*** and ***much evidence*** of many options for achieving reductions of global GHG emissions at the international level through cooperation. It also suggests that successful agreements are environmentally effective,

cost-effective, incorporate distributional considerations and equity, and are institutionally feasible *{WGIII 13.3}*. However, vulnerability to climate change is not equally distributed.[16]

IPCC-AR4 has pointed out the sharp differences in vulnerability across regions; those in the weakest economic position are often the most vulnerable to climate change and are frequently the most susceptible to climate-related damage, especially when they face multiple stresses.

There is increasing evidence of greater vulnerability of specific groups, such as the poor and elderly, not only in developing but also in developed countries. There is greater confidence in the projected regional patterns of climate change and in the projections of regional impacts, enabling better identification of particularly vulnerable systems, sectors and regions.

Moreover, there is increased evidence that low-latitude and less-developed areas generally face greater risk, for example in dry areas and megadeltas. New studies confirm that Africa is one of the most vulnerable continents because of the range of projected impacts, multiple stresses and low adaptive capacity. Substantial risks due to sea-level rise are projected particularly for Asian megadeltas and for small island communities.

Also, since IPCC-TAR more evidence on the higher level of vulnerability to extreme climate events has been accumulated in both developing and developed countries. There is now ***higher confidence*** in the projected increases in droughts, heat waves and floods, as well as their adverse impacts (water stress and wild fire frequency, adverse effects on food production, adverse health effects, increased flood risk and extreme high sea levels, and damage to infrastructure).

Across the developed world, public concern over exposure to extreme climate risks is mounting, but climate disasters are heavily concentrated in poor countries, as the OECD recently pointed out.

> High levels of poverty and low levels of human development limit the capacity of poor households to manage climate risks. When climate disasters strike, the poor are often forced to sell productive assets, with attendant implications for recovery, in order to protect consumption. And when that is not enough households cope in other ways: for example, by cutting meals, reducing spending on health and taking children out of school.

The UNDP identified five key transmission mechanisms through which climate change could delay and then reverse human development. Briefly, they are mentioned below. None of these five separate drivers will operate in isolation. They will interact with wider social, economic and ecological processes that shape opportunities for human development. However, what is certain is that dangerous climate change has the potential to deliver powerful systemic shocks to human development across a large group of countries and to increase inter- and intra-state conflicts.

Agricultural production and food security

Climate change will affect rainfall, temperature and water availability for agriculture in vulnerable areas (IPCC-AR4). For example, drought-affected areas in south Asia will experience losses in agricultural production, undermining efforts to cut rural poverty. The additional number affected by malnutrition could rise to 600 million by 2080 in those areas of Asia, Africa and Latin America.

The climate–food connection will not only affect the poor. In some industrial and industrializing nations, as climate change creates new patterns of food production, new exporting and new importing zones, access to supplies and the energy to import them may become strategic concerns and lead to international conflict.

Besides, popular discontent over livelihood security was a contributing cause for instability in Africa during 1980s and 1990s. The same pressures will cause considerable population movements and displacement both within countries and internationally. That, in turn, will increase insecurity in its hard meaning.

Water stress and water insecurity

Changed run-off patterns and glacial melt will add to ecological stress, compromising flows of water for irrigation and human settlements in the process. An additional 1.8 billion people could be living in a water scarce environment by 2080. Central Asia, northern China and the northern part of south Asia face immense vulnerabilities associated with the retreat of glaciers, at a rate of 10–15 meters a year in the Himalayas. Seven of Asia's great river systems will experience an increase in flows over the short-term, followed by a decline as glaciers melt. Climate change will be superimposed on wider pressures on water systems.

Today, around 1.4 billion people live in 'closed' river basins where water use exceeds discharge levels, creating severe ecological damage. Symptoms of water stress include the collapse of river systems in northern China, rapidly falling groundwater levels in south Asia and the Middle East, and mounting conflicts over access to water.

Rising sea levels and exposure to climate disasters

Sea levels could rise rapidly with accelerated ice sheet disintegration. Global temperature increases of 3–4°C could result in 330 million people being permanently or temporarily displaced through flooding. Over 70 million people in Bangladesh and 22 million in Vietnam could be affected. Warming seas will also fuel more intense tropical storms. Climate change is only one of the forces that will influence the profile of population risk

exposure in the decades ahead. However, climate change will reconfigure patterns of risk and vulnerability across many regions, deeply affecting countries with high population share living in coastal areas, river deltas and urban slums.

Ecosystems and biodiversity

Climate change is already transforming ecological systems. Increasing acidity in the oceans is another long-term threat to marine ecosystems. Ice-based ecologies have also suffered devastating climate change impacts, especially in the Arctic region. While some animal and plant species will adapt, for many species the pace of climate change is too rapid: climate systems are moving more rapidly than they can follow. With 3°C more, 20–30 per cent of land species could face extinction.

Human health

Rich countries are already preparing public health systems to deal with future climate shocks, such as the 2003 European heat wave and more extreme summer and winter conditions.

Many of the emerging risks for public health will be concentrated in developing countries where poor health is already a major source of human suffering and poverty, and where public health systems lack the resources (human and financial) to manage new threats. An obvious danger is that climate change under these conditions will exacerbate already extreme global inequalities in public health.

Major killer diseases could expand their coverage. For example, an additional 220–400 million people could be exposed to malaria, a disease that already claims around 1 million lives annually. Dengue fever is already in evidence at higher altitude levels than has previously been the case, especially in Latin America and parts of east Asia. Climate change could further expand the reach of the disease.

Therefore, climate change is becoming an increasingly important part of international relations. Many of the related climate change issues have the potential to cause international disputes. This is the reason why even for security reasons, international cooperation becomes necessary to tackle climate change.

Energy security and climate security. Are they pulling in different directions?

The trade-off between energy security and climate security is at the core of concerns for negotiations on climate, in the post-Kyoto period, even more after the huge volatility of energy markets just experienced.

It is a fact that national energy security may conflict with global climate security goals. In addition, we are certain that increases in energy demand will come from developing countries in the next decades to encompass growth processes and demographic trends.

Energy demand is projected to increase by half between now and 2030, with over 70 per cent of the increase coming from developing countries. To meet this demand, much of the foreseen necessary investment would be directed towards carbon-intensive infrastructures that will still be generating energy, and emitting CO_2, in the second half of the twenty-first century.

IPCC climate scenarios give us the opportunity to look through sustainable emissions pathways which are almost incompatible with the International Energy Agency (IEA) projections for fossil energy demand drivers and their energy-related CO_2 emission scenarios.

With prices for oil and natural gas set to remain at high levels, the incentives for developing low-carbon energy capacity have moved in a favourable direction. But prices for energy resources are difficult to predict, and, not many governments in the developing world are, at present, definitely engaged in programmes to reduce their 'addiction to oil' due to energy security concerns.

In the absence of a greater amount of financial resources from the developed world, it is difficult to foresee developing countries making steps for advancing programmes aimed at enhancing energy efficiency, creating incentives for the development and deployment of low-carbon technologies, and promoting greater self-reliance through renewable energy. However, within the UNFCCC it is easier to find agreement on multilateral international cooperation to finance technology transfers to support a transition to low-carbon energy sources in developing countries.

In addition, in this framework it is possible to construct a post-2012 multilateral framework to build far more ambitious targets for cutting greenhouse gas emissions. Developed countries, based on their common but differentiated responsibilities for climate change are also working on:

- Putting a price on carbon emissions through taxation and cap-and-trade systems.
- Creating a regulatory framework that enhances energy efficiency, sets standards for reducing emissions and creates market opportunities for low-carbon energy suppliers.

Those actions and approaches are central for mitigation and for adaptation to climate change. Both kinds of responses, and efficient strategies to cope with those issues, if they are internationally coordinated, benefit the Earth's security and are prerequisites to avoiding the huge threats that climate change possesses for human security in its wider sense.

Conclusions

The chapter synthesized the major climate change impacts, following the Fourth IPCC Assessment Report's main topics, leading to the conclusion that they should be observed, evaluated and considered as important factors of risk for human security for different reasons. Human-induced global warming is expected to increasingly modify patterns of extreme weather events; climate change induces rises in sea level, droughts, floods, water scarcity, soil erosion, desertification, deforestation and disease; and increases migration flows in search of better life conditions and livelihoods. Also, climate change contributes to the attainment problems of the MDG goals as a new factor of risk, increasing others already existing or acting as barriers and obstacles to evaluation, decision making and the carrying out of policies and measures that try to ensure their attention. The likely threats posed by those impacts would not be distributed homogeneously and the chapter showed them from a European/Asian perspective.

The importance of socioeconomic responses to reduce climate change impacts was stressed, particularly that of adopting effective adaptation and mitigation measures within an international/regional cooperative perspective, because climate change has the potential to deliver powerful systemic shocks to human development (particularly for a large group of Asian countries) and to increase inter- and intra-state conflicts. That review followed the UNDP five key transmission mechanisms through which climate change could delay or reverse human development: agricultural production and food security; water stress and water insecurity; rising sea levels and exposure to climate disasters; ecosystems and biodiversity; and human health.

Finally, it is important to underline the issue of energy security, since mitigating GHG emissions will require extensive changes in human behaviour and in national and regional energy policies. The conclusion in that respect shows that the UNFCCC and the 'Kyoto architecture' give us, until the end of 2012, a quite peaceful context to carry out those cost-efficient decisions and strategies to push the world onto a low-carbon trajectory. For that reason, we also are expecting a consensus by the end of the year 2009 as regards the post-Kyoto situation, which would be extended beyond the second compromise period within the UN framework. Otherwise, further disputes might be expected as ice melting opens up viable shipping routes through the Arctic, coastlines retreat due to erosion and flooding, or the evacuation of coastal zones or low-lying small island states becomes necessary.

Notes

1. See Chapter 27.
2. R. Garnaut (2008) *The Garnaut Climate Change Review, Final Report* (Cambridge: Cambridge University Press), http://www.garnautreview.org.au/pdf/Garnaut (accessed 26 December 2008).

3. A. Morton, P. Boncour and F. Laczko (2008) 'Human Security Policy Challenges' in Carolyne Pumphrey (ed.) *Global Climate Change. National Security Implications*, http://www.StrategicStudiesInstitute.army.mil/ (accessed 21 December 2008).
4. L. Schirch (2008) 'Climate Change and Conflict Prevention: Hope for the Best, Prepare for the Worst' in Carolyne Pumphrey, *op cit*.
5. John Reid, British Secretary of State for Defence, February 2004. More recently, on 24 January 2007, the UK Foreign Secretary's for Climate Change, John Ashton, said at a conference on *Climate Change: The Global Security Impact*, at the Royal United Services Institute: 'Climate change is a security issue because if we don't deal with it, people will die and states will fail'.
6. United Nations, Security Council 5663rd Meeting, S/PV.5663, 17 April 2007, http://www.un.org/News/Press/docs/2007/sc9000.doc.htm (accessed 19 October 2008). Most of the representatives in the session shared a common idea which can be expressed as: *By moving early to address climate change risks, we could do much to reduce the potential threats to human development and security.*
7. 'Climate change' means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. UNFCCC, art. 1.2.
8. *The Stern Review* published by the British Treasury at the end of 2006 concluded that inaction on climate change could cost the world economy more than 20 per cent of global GDP each year, whereas the costs of effective action could be limited to just 1 per cent of global GDP each year. N. Stern (2006) *The Stern Review: The Economics of Climate Change*, http://www.hm-treasury.gov.uk/stern_review_report.htm (accessed 10 October 2008).
9. P. Gleick (1989) 'The Implications of Global Climate Changes for International Security', *Climate Change*, Vol. 15, 303–325; S. Lonergan (1999) 'Global Environmental Change and Human Security Science Plan' in *IHDP Report 11* (Bonn, Germany: IHDP); R. Matthew, T. Gaulin and B. McDonald (2003) 'Elusive Quest: Linking Environmental Change and Conflict', *Canadian Journal of Political Science*, Vol. 36, 231–256; J. Sachs (2005) 'Climate Change and War', http://www.tompaine.com/print/climate_change_and_war.php (accessed 24 October 2008). A. Marquina (2004) 'Environmental Security and Human Security' in A. Marquina (ed.) *Environmental Challenges in the Mediterranean, 2000–2050* (Dordrecht: Kluwer Academic Publishers), pp. 5–25.
10. R. A. Matthew (2005) 'Sustainable Livelihoods, Environmental Security, and Conflict Mitigation: Four Cases in South Asia', *IUCN Poverty, Equity and Rights in Conservation,* Working Paper Series, http://www. iucn.org/themes/spg/Files/IUED/Case%20Study%20South%20Asia. Also, R. A. Matthew (2008) 'A Threat Assessment' in Carolyne Pumphrey, *op cit*.
11. C. Abbott (2008) *An Uncertain Future. Law Enforcement, National Security and Climate Change* (Oxford: Oxford Research Group), http://www.oxfordresearchgroup.org.uk (accessed 5 December 2008).
12. R. Shubert, H. J. Schellnhuber, N. Buchman, A. Epiney, R. Grieghammer, M. Kulessa, D. Messner, S. Rehmstorf and J. Schmid (2007) *Climate Change as a Security Risk*, German Advisory Council on Global Change (WBGU) Secretariat (UK and USA: Earthscan Publications), http://www.wbgu.de/wbgu_jg2007_engl.pdf. FAO (2008) *Climate Change and Disaster Risk Management*, High Level Conference on World Food Security, Background Paper HLC/08/BAK/5, ftp://ftp.fao.org/docrep/fao/meeting/013/ai786e.pdf. D. Smith and J. Vivekananda (2007) *A Climate of Conflict. The Links between Climate Change, Peace and War*,

International Alert, http://www.international-alert.org/pdf/A_Climate_Of_Conflict.pdf. United Nations Environment Programme, UNEP (2009) *From Conflict to Peacebuilding*: *The Role of Natural Resources and the Environment* (Nairobi, Kenya: UNEP).

13. Vulnerability to climate change is a function of exposure, sensitivity and adaptive capacity (IPCC-TAR) That conclusion is confirmed in its 4th Assessment Report. *{WGII 20.2, 20.7.3}*
14. IPCC and Stern Reports point out urgent action is needed also to find a cooperative and peaceful response to that global challenge, http://www.hm-treasury.gov.uk/stern_review_report.htm (accessed 10 October 2008).
15. United Nations Development Programme, UNDP (2008) *Human Development Report* (New York: UNDP).
16. The estimation of key vulnerabilities in any system, and damage implied, will depend on exposure (the rate and magnitude of climate change), sensitivity (which is determined in part and where relevant by development status) and adaptive capacity.

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Part I
Water and Food

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2
Water Availability and Policies in Asia

Maizatun Mustafa

Introduction

Water availability is becoming an increasingly crucial issue for Asia. With the rise in the region's water usage, the demand for water is also increasing substantially. Many countries in Asia are beginning to experience moderate to severe water shortages, brought on by the simultaneous effects of various factors including agricultural growth, population expansion and environmental pollution. Global phenomena such as climate change also contribute towards water availability issues.

In recent years, evidence indicates that water is becoming increasingly affected by erratic weather patterns, as has already happened to countries such as Indonesia and China, which have experienced droughts and, inevitably, food shortages. Climate change and population growth also affected water availability in south Asian countries such as India and Bangladesh. Other Asian countries, such as Singapore, face water issues in a different way, Singapore having limited availability of water resources and being highly dependent on Malaysia for its water supplies.

The current concern is that continuously diminishing and degraded available freshwater not only leads to national issues within countries in Asia, but could cause possible interstate disputes and international instability. In this chapter, issues directly concerned with water availability in Asia will be discussed together with the discussion of factors that may influence such availability. The chapter will then highlight policy reforms undertaken by Asian countries to resolve conflicts, secure access and enhance water availability.

Water availability: Defining issues

Water is central to human existence and is an essential requirement for the survival of humans and ecosystems, and a vital element for human development. Thus, water availability is an issue of major concern globally. Although

water is the most widely occurring substance on Earth, it is a well known fact that only about 2.5 per cent is freshwater while the remainder is salt water. Of the world's 2.5 per cent or 35 million square kilometres volume of freshwater, its biggest portion is locked up in glaciers and permanent snow cover, is frozen in the icecaps or lies in deep underground aquifers. Thus, in reality, only about 1 per cent of the world's freshwater is readily available and accessible for direct human use. This is the water found in lakes, rivers, reservoirs and those underground sources that are shallow enough to be extracted. The usable portion of freshwater is regularly renewed through rain or snowfall and is therefore available on a sustainable basis. Thus, in principle, the water cycle which constantly provides freshwater supplies on earth allows water to be used in a sustainable way. However, while water resources are renewable, there are huge differences in availability in different parts of the world. There are also wide variations in seasonal and annual precipitation in many places, with arid regions having evaporation that is greater than the amount of precipitation. For these reasons, the availability of water worldwide may fluctuate, causing some areas to flood while other parts suffer drought.

The quantity of freshwater on earth is limited, with no alternative to water availability on Earth. While the quantity of freshwater does not change on an absolute basis, the amount available to each individual does change, in accordance with the growth of the human population and other factors. With increasing per capita use and growing population, the percentage of appropriated water is also increasing. Together with spatial and temporal variations in available water, the consequence is that water for all uses is becoming scarce and may lead to a water crisis.

Asia: Water availability

It is widely accepted that water availability is an issue of major concern in Asia and the rest of the world. Within Asia, people, agriculture and industry are confronted with problems ranging from water shortage to conflict of uses. Freshwater resources are unequally distributed on Earth, with a sharp contrast in terms of water availability and consumption. On average, world water availability is about 7600 cubic meters per capita. However, Asia not only has the smallest continental average at 4000 cubic meters per capita, but the amount of available water keeps declining as indicated by a report carried out by the Asia Development Bank.[1]

When delineating the issue of water availability, it is necessary to identify what 'availability' is understood to mean. Generally, water availability can be referred to as the physical presence of adequate water supplies. From a broader perspective, water availability also includes issues ranging from people's ability to gain access to clean water to factors impacting on this access. In this chapter, water availability issues in Asia are examined from

this broader perspective by highlighting factors influencing water availability as well as those relating to its accessibility.

In term of volume, freshwater availability of less than 1000 cubic meters per capita per year indicates that a country is facing a water scarcity. For Asia, this problem is already happening to countries like Singapore, India and Pakistan. In India specifically, the annual quantity of freshwater available is about 2000 cubic meters per person per year and this quantity is further expected to drop in the next decade due to the increase in population and other factors. Earlier studies have shown that India will reach a state of water stress before 2025 when availability falls below 1000 cubic meters, requiring an urgent water policies' review before the problem becomes unmanageable.[2] Similarly, Pakistan is also fast turning into a water scare country as the gap between demand and supply of water increases, coupled with extended drought. It is therefore possible that future changes in climate may impact on water resources availability in Pakistan, leading to additional water stress.[3]

In Southeast Asia, Thailand has an average annual rainfall of 1700 millimetres. Based on geographical characteristics, Thailand can be divided hydrologically into 25 river basins. However, from the total volume of water from rainfall in all river basins in Thailand, 75 per cent of this water is lost through evaporation, and infiltration. With a population of over 60 million, the availability of water resources in Thailand, which is about 3000 cubic meters, is statistically adequate.[4] However, like many countries in Asia, factors such as increasing population and economic, agricultural and industrial expansion pose a threat to water quality, affecting Thailand's water availability.[5]

For Japan, in terms of water availability, this country which is located off the east Asian coast in the North Pacific Ocean has abundant precipitation due to regular monsoons. In total, Japan's available water resources per capita are about 3000 cubic meters per year. However, the spatial and temporal variation of rainfall, marked topographic differences and small river catchments have caused Japan to face frequent water shortages.[6] Similarly, Korea can also be considered as a water-stressed country with annual per capita precipitation of over 2500 cubic meters per year. There are many factors that contribute towards water availability issues in Korea. For example, in Korea, about 70 per cent of annual precipitation occurs in summer, which results in floods in summer and droughts in spring. In addition, expansion of population, a higher standard of living, urbanization and industrialization mean that the demand for water supply is becoming greater, leading to possible water shortages.[7]

As compared to many other Asian countries, Singapore faces water availability issues of a different nature. Singapore is a tiny city-state at the tip of the Malaysian Peninsula with an area of about 700 square kilometres and a population of approximately 4.4 million people. This makes it one of the

most densely populated nations in the world, with a population density of 6050 persons per square kilometre. One of the main concerns of Singapore is in providing clean water for the population, which currently consumes about 1.36 billion litres of water per day. Singapore is considered a water-scarce country not because of lack of rainfall, but because of the limited amount of land area where rainfall can be stored.

The problem faced by Singapore in dealing with its freshwater availability is in contrast to that of other south Asian countries. For these countries, water availability is driven by monsoons. Thus, even though all parts of south Asia may have surplus water, there are serious imbalances as most of this water is generated in the monsoon and flows unused to the sea. Consequently, Mirza pointed out that even during the monsoon, a large area in India and Bangladesh will suffer from water scarcity, including the regions in the Indus, Krishna and Ganges sub-basins.[8]

Even within Asia, water availability is variable. For example, freshwater is abundant in Indonesia reaching an average annual quantity of 15,500 cubic meters per capita. Nonetheless, such abundance of freshwater is not evenly distributed within different parts of this archipelago. As highlighted by Sarwar et al., while the island of Java may contain more than half of Indonesia's 206 million inhabitants, it has the lowest availability of 1500 cubic meters per capita.[9] For Indonesia, freshwater availability can further be associated with problems such as population growth, apart from industrialization, urbanization, groundwater overuse and inadequate supply in some regions. These problems have caused a decline in water quality and decreases in dependable flow, thus decreasing water availability over time, leading ultimately to water scarcity.[10]

Vietnam is also facing similar problems in relation to water availability. Considering that most of Vietnam's 332 thousand square kilometres of land consists of hills and mountains, these formations have resulted in a very complex network of rivers. Over 60 per cent of river water in Vietnam is concentrated on the Cuu Long river delta of the Mekong river basin while the remaining rivers to serve the major portion of Vietnam's population. Although Vietnam's constant rainfall allows for abundant water supply, uneven water distribution has affected water availability in different parts of this country.[11] For instance, places such as the mountainous areas may face short water supplies, especially during the dry season. Whereas areas that have numerous rivers, such as the plains, may be flooded during the rainy season. Similar to many other Asian countries, Vietnam's population growth means more demand for water resources and may inevitably result in water crisis.

As for China, water problems are perhaps the country's greatest environmental and human health threat. In terms of water supply, per capita water availability in China is only one-quarter of the world average, and the rate is lower in northern China where the per capita water availability is around 500 cubic meters per year. Similar to India, water resources in China

are extensive, with the existence of more than 50,000 rivers with a total length of 226,800 kilometres.[12] However, being a developing country with continuous population growth, China's annual water demand continues to increase and certain areas within China are facing substantial water resource shortage due to the usage of freshwater resources that have reached existing sustainable capacity limits.

Asia: Access to freshwater

As discussed earlier, water availability issues must also be seen within the context of its accessibility. In Asia, one of the questions that needs to be considered is regarding adequate access to clean and safe water for human consumption. This question relates not only to water entitlement or the recognition of water availability but also to water rights. In practice, water accessibility must also be considered from the context of the level of development of a particular country.

Thus, while the population of poorer Asian countries may be struggling to get basic access to water for their daily consumption and household chores, the population of more developed Asian countries, such as Japan and Singapore, can enjoy unlimited access to drinkable piped water. For these countries, their water systems are created out of a large-scale strategic vision.[13] But for many others, water systems are frequently created on a piecemeal basis or as a result of local considerations, and thus lack comprehensive framework and direction.

In general, Asia's record in providing a safe water supply is poor. Less-developed countries in Asia are still facing many challenges in providing their population with access to safe freshwater. These challenges are further compounded with problems arising from poor sanitary services. For example, in many south and Southeast Asian countries, water resources are being polluted by untreated sewage and household waste discharged straight into surface or groundwater. By 2025, it is estimated that half of Asia's population is expected to live in urban centres where increasing urbanization, industrialization and profligacy are likely to put severe pressure on water availability and water supply.

Factors impacting on water availability

As already mentioned, water demand and availability are created and impacted on due to a variety of driving forces. They include increases in agriculture, continuous pollution of water resources, climate change and population growth. These factors are considered below.

Agriculture

In many Asian countries, agricultural water use accounts for nearly 90 per cent of total water use.[14] While about 40 per cent of Asia's cropland is irrigated,

which helps produce about 70 per cent of its food, the underlying issue is the inefficient use of water in agriculture. Since agriculture is extremely dependent on an adequate freshwater supply, it is a concern that food production would be seriously constrained by freshwater shortages. China for example needs to maintain adequate water supply for the future considering that about 70 per cent of the additional food supply for this country during the next 20 to 30 years is expected to come from irrigated lands. For south Asian countries, their agriculture is highly irrigation intensive, thus water requirements for the agricultural sector are also the highest. In Pakistan, despite the shortage of water, Qureshi pointed out that the overuse of water in irrigation is becoming a major problem for this country and may cause an adverse impact on agriculture including reductions in crop yields.[15]

In Thailand, the present water demand for irrigable areas and other uses are forecast to increase, causing this country to face serious supply constraints. Considering that over 50 per cent of the Thai population are farmers, adequate water availability for agriculture is therefore crucial.[16] In the Philippines, agriculture has been identified as the greatest consumer of water. Irrigation takes a large portion of total water consumption by agriculture with rice farming using the biggest portion of irrigated lands. Increasing food demand, especially rice, means that the Philippines must put great effort into increasing the total irrigated area. In the Philippines, the shortage of water supply, which is due to various factors including technical and institutional deficiencies, has become an obstacle for this country, particularly in meeting the rapidly increasing demand for rice.[17]

Similarly, irrigation water is one of the most essential requirements in Korea in view of the importance of rice farming in this country. It has been reported that, as of 2000, nearly 50 per cent of the total amount of water resources in Korea was used for agriculture and the bulk of this amount goes to paddy farming. However, one of the biggest threats in ensuring adequate water availability for farming activities is water pollution. The main pollution sources for irrigation include domestic wastewater, livestock wastewater and other non-point sources such as land use, chemicals and agricultural drainage.[18]

Environmental pollution

Environmental pollution is one major factor that can influence water availability for any particular country. Ineffective control of the discharge of pollutants into water, including that of industrial effluents, may cause pollution to the water resources and consequently limit the amount of available freshwater. In many parts of Asia, having an abundant number of rivers alone does not ensure adequate freshwater especially when factors such as water pollution have put pressure on water availability.

In Thailand, the main factors contributing towards water pollution include excessive use of fertilizer and pesticides, urban sewage and industrial wastes.

Major rivers in Thailand such as the Chao Praya are being affected by pollution due to the discharge of pollutants from industrial, agricultural and populated areas.[19] In Indonesia, one of the most important river basins, the Citarum, continues to face a major threat due to pollution. This river basin territory provides water supply to millions in Jakarta, irrigates Indonesia's rice farms and is a source of water for its factories.[20] However, over the past 20 years, rapid urbanization and industrial growth have resulted in the discharge of untreated domestic sewage, solid waste and industrial effluents into the river, making it one of the most polluted rivers in Indonesia.[21] For the Philippines, although this country is endowed with abundant water resources, water contamination and pollution have reduced the amount of its available water resources. In the Philippines, pollution of water resources is due mainly to activities such as uncontrolled industrial and agricultural development as well as rapid growth of population. It has been reported that about 40 of the main rivers in this nation are polluted, with rivers within the Metro Manila area, such as the Marikina and the Pasig, are considered as biologically dead.[22] Whereas in south Asia in general, increasing water shortages and declining water quality from pollution during the past few decades are contributing factors towards water scarcity.[23]

In China, the dwindling water supply not only suffers from considerable pollutants, but is also insufficient for the country's rapidly growing economy and its massive population. Over the past 20 years, demand for water in China has been increasing in urban, domestic and industrial sectors. Turner highlighted that in China, water pollution has further intensified water scarcity, with wastewater discharge doubling between 1980 and 2003.[24] This combined effect has led to conflicts between industry and agriculture, between urban and rural areas, and between regions. A report from the Chinese Ministry of Water Resources has shown that the increasingly serious problem of water pollution in that country has directly decreased the amount of water available for productive use.[25] This problem can render the entire water resource unusable, adding to growing water shortages in China.

Pollution of water resources also puts pressure on water availability even within Asian countries that have abundant water resources, such as Malaysia at present. For this country, despite having plentiful water resources for supply purposes, pollution continues to affect water availability and inevitably affects the quantity of available fresh water. For Malaysia, the water issue has grown in magnitude and complexity compared to 20 years ago. One of the main contributing factors to water pollution is the shift of the Malaysian economy from agriculture in the 1970s to industry-based in the 1990s. In the year 2002, official data reported that from 119 river basins monitored for the whole of Malaysia, 57 rivers were found to be slightly or seriously polluted.[26] The data further identified discharges from sewage, agro-based and manufacturing industries, together with suspended

solids from earthworks and land-clearing activities to be the main pollution sources of these rivers.

Malaysia is definitely not the only country in Asia where water availability is affected by pollution. India is also facing the same problem with the quality of its water resources. In India, water resources come from rivers, reservoirs, lakes, wetlands, mangroves and ponds. However, even though various types of freshwater bodies are widely distributed across the subcontinent, the availability of drinking water suggests skewed distribution of actual supply. According to Lal, the problem is further compounded by India's high population density in the catchment areas, which has caused pollution to river basins, especially the larger ones such as the Ganges and the Brahmaputra.[27] Therefore, in India, in spite of the presence of large perennial rivers, poor quality of water in the rivers restricts options for utilizing these sources of water.

Climate change

When a given region experiences a change in the average weather, this constitutes climate change. One common example, climate change due to the enhanced greenhouse effect, is becoming one of the most pressing environmental issues at present. The global warming threat is real and the consequences of the climate change phenomena are alarming, including in terms of water availability.

Specifically in Asia, the impact of climate change in the form of higher temperatures, more variable precipitation and more extreme weather events are threatening the water supply to millions of people living near the river basins. Freshwater availability in many parts of river basins in Asia, including central, south, east and Southeast Asia is projected to decrease due to climate change. This problem, together with emerging issues of population growth and increasing demand for water, could adversely affect more than a billion people by the 2050s.

The current consensus is that climate change is likely to increase the frequency of extreme events like droughts and floods. It is pointed out by Mirza and Ahmad that even relatively small climatic changes can cause large water resource problems, particularly in the arid and semi-arid regions of India and Pakistan, and flood-vulnerable areas of India and Bangladesh.[28] In other parts of Asia, floods happen because of rapid recession of glaciers due to the rise in temperature and increase in seasonal variability in precipitation. For example, previously, glacial melt waters from the Himalayas' glaciers kept the major rivers within the Indian subcontinent perennial throughout the year. However, climate change has increased the glacial melting far more rapidly than its accumulation. This will lead to increased summer flows in some river systems for the next few decades, followed by a reduction in the flow as the glaciers disappear, ultimately affecting water availability.

For Asia, climate change can also have a serious adverse effect on agriculture. Agriculture that relies on irrigation water demand is also sensitive to climate change as it can alter the need for and timing of irrigation. Climate change that modifies rainfall and evaporation, and alters precipitation patterns may adversely affect water availability, and consequently agricultural production. Inevitably, with water resources being the most vulnerable to climate change, droughts and floods that will accompany climate change will have devastating effects on the agriculture sector, especially on food production.

For Asian regions with dry tropical or subtropical climates, their erratic precipitation, which is too limited to allow full crop yields to develop during the short wet season, causes these regions to be vulnerable to crop failures. Falkenmark has pointed out that this problem is already happening over large parts of south Asia and causes difficulties in increasing per capita crop production.[29] Specifically, rice, being a major food product in most of Asia, relies heavily on adequate water for irrigation purposes. However, as a consequent of climate change, rice crops in many parts of Asia are being affected by drought, salt-water intrusion, floods and other water stress issues. For example, in 2008, Cyclone Nargis had devastated Myanmar's Irrawaddy Delta by bringing salinity inland, causing this country to lose 6 per cent of its rice crop. Similarly, in Vietnam, the typhoon season is lasting longer and storms are stronger, submerging large areas of agricultural, inundating low-lying fields with salt water and destroying crops. Another example of an Asian country that will be significantly affected by accelerated global climatic change is Indonesia.[30] For example, in 1998, Indonesian officials asserted that the drought would result in a reduction of the country's rice-planting areas by over 4 per cent.[31]

For the developing countries of Asia, impacts of climate change on water availability are likely to be felt most severely because of resource and infrastructure constraints. As argued by Falkenmark, the global climate is changing and is creating a new level of uncertainty in water planning and management processes.[32] It would thus be possible for the competition for water between agriculture and urban as well as industrial users to become costlier, particularly when drier conditions become more extensive due to more severe heat waves.

Population growth

Extremely rapid population growth that depends on a finite amount of freshwater is another factor affecting water availability. According to McCaffrey, the gross water demand increased by almost two and a half times the rate of population growth from 1900 to 1990. By referring to this past tendency of world water withdrawals for the next 30 years, it is possible that the overall withdrawals would surpass the limit of what can be made accessible through water resources and development.[33]

Asia currently accounts for slightly over 60 per cent of the global population with south Asia among the most densely populated areas of the world.[34] For example, the population in Pakistan has already reached about 140 million and continues to increase at the rate of 2.8 per cent per year. Because of this continuous rise, water demand for all uses may increase and will reach 10 per cent of the total available water resources by the year 2025. Similarly for India, as population increases, there will also be a corresponding increase in the demand for water. According to Zerah, the demand for domestic water in India is likely to increase from the present day 6.6 per cent to 7 per cent in 2050, with the present per capita water available in New Delhi nearing the critical level.[35] Southeast Asia is less populated than south Asia, but it also has crowded areas, especially Java, part of the Philippines, and deltas of rivers like the Red, Mekong, Chao Phraya, and Irrawaddy. Biswas predicted that, during the 80-year period 1970–2050, the population in this region will grow threefold.[36]

Urbanization and the population being increasingly concentrated in urban areas can further affect water availability. While it is estimated that the Asian rural population will remain almost stationary between now and 2025, the urban population is likely to increase by 60 per cent. Biswas argued that massive urbanization, which is unprecedented in Asian history, will present new types of water-related challenges that Asian countries will have to face.[37] For the millions of urban poor in densely populated Asian cities, limited access to quantities of water, coupled with inadequate sanitation facilities, will subsequently affect them more severely than others.

Water availability in Asia: Need for changes

Increasing water demands mean that availability of water is getting more complicated. Thus, the major challenges for Asia now are to meet the current demand for water in a more efficient manner, and to ensure that the capacity of future populations in terms of water usage is not reduced. Given these challenges with respect to water availability issues, it is appropriate to ask what can and should be done. The immediate task is to focus on future challenges through possible solutions.

Unquestionably, changes need to be made at all levels to meet expectations in term of water availability. However, it is not possible to point to a single way forward, or a definite policy reform for Asia to ensure their future availability for water. Social, legal, economic, environmental, institutional and other factors dictate that there are simply no universal solutions to this issue. These differences are further compounded by rapid changes in the national, regional and global conditions affecting water preventing a time dimension to the solutions.

Nevertheless, with the possibility of water scarcity developing into a major world water crisis, the Asian countries have taken various measures to meet

the growing demands for water. Experience within Asian countries on water reform and other policy changes are deliberated here.

Water reforms: Some experiences from Asia

The recognition that there is a water crisis and that freshwater availability will be a challenge in coming decades has led to water reform initiatives in Asia. In recent years, policy reform within the water sector can already be seen in many Asian countries as a way to address diminishing per capita water availability and increasing access and use of available freshwater.[38] Increasingly, water policies have become more focused towards an integrated approach to water resource management. Emphasis is also given to factors such as demand management measures, for example, efficient water use, conservation and protection, institutional arrangements, legal and regulatory set-up.

For Asia and elsewhere, policies which focus on massive changes within the legal and institutional set-up are considered to be among the most appropriate measures towards water reform. In Japan, for example, decades of implementing advanced water resources laws have helped this country to achieve its policy target on water resources protection and water supply. As early as 1896, surface water in Japan had been administered by the River Law.[39] Towards the 1950s, several laws were introduced targeting water resources protection. They include the Waterworks Law[40] and Sewage Law[41] which were enacted to set quality standards for tap water and discharge standards. In the 1960s, more water-related laws were introduced such as the Water Resources Development Promotion Law[42] which was passed to allow for comprehensive water resources development and efficient use of water resources, particularly in response to rapid development of industry and the increase in the urban population. Subsequently, the Basic Law for Environmental Pollution Control[43] was enacted to become the core legislation for environmental regulation in Japan. This law addresses public nuisance issues, including water pollution, and provides for responsibilities and liabilities of private entities, government and individuals on environmental matters. The law also introduced the environmental standards to be complied with in order to sustain a wholesome life and environment. In 1993, the Basic Environment Law[44] was enacted to replace the Basic Law for Environmental Pollution Control of 1967. The new law was enacted to facilitate implementation of comprehensive and systematic measures to protect the environment. In addition, various laws were also enacted for ensuring adequate water supply and to cope with its deteriorating quality. One of which is the Law to Take Special Measures for the Protection of Water Quality in Headwater Areas for the Purpose of Preventing Specific Trouble in the Drinking Water Supply 1994. This law authorizes the government to determine the basic policy for the preservation of water quality in headwater

areas in relation to the drinking water supply. At present, almost 100 per cent of the population in Japan is connected to safe drinking water supplies with an annual consumption of freshwater of about 17 billion cubic meters per capita.[45]

While Japan's long-term policy on water supply resources protection and water supply have been implemented effectively through legal and other measures, other Asian countries have also started to re-examine their water policy for the purpose of efficiency. One example is Malaysia. Although legislation on water supply is already available, problems such as uncoordinated provision and enforcement due to decentralized water management have resulted in inefficient water supply services throughout Malaysia. It was on realizing that a centralized administration is the way forward to ensure effective water supply services that Malaysia took a bold step to reform the whole of its water services structure. For this reason, the Federal Constitution[46] was amended in 2005 to transfer the powers of water supply treatment, distribution and billing to the federal government as a central body. At present, jurisdiction pertaining to water supply services for Malaysia is under the jurisdiction of the Ministry of Energy, Water and Communication Malaysia, and regulated by a single piece of legislation, namely the Water Services Industrial Act 2006.[47]

For certain Asian countries, national policy relating to water resource management would include having a strict law on water pollution. Singapore is a good example where an anti-pollution law has been applied effectively on matters relating to water resources and water supply. In the space of 40 years, from the time of self-government, Singapore has transformed itself from a poor Crown colony with polluted river basins and squatter colonies to a thriving metropolis with the second highest GDP in Asia after Japan. According to Lye, all this has been achieved through an efficient administrative and legal system, a 'clean' government, effective land-use planning and investments in a comprehensive environmental infrastructure.[48] Singapore's enforcement of environmental laws by the relevant agencies is highly centralized and relatively quick and stringent.[49] This is made possible due to the unique circumstances of Singapore, where the small size of the city-state means is not hampered by provincial authorities or sectoral interests.

Another country that relies on legal provision in dealing with water availability issues is Korea. As already pointed out, in Korea one main source of water pollution is the discharge of a non-point type of pollutant which is a result of growing economic activities and land use. Korea is facing difficulty in the formulation of measures for quantitative management on the non-point pollution considering that this type of pollution does not originate from a single source, and therefore is not easy to control or detect. For this reason, Korea carried out a major reform through the amendment of the Water Quality Conservation Act 1990.[50] This act was wholly amended

in 2005 in order to present the basic ideology and direction of policies for the preservation of water quality and to enhance the status of the act as the framework law on the conservation of water quality. It also establishes a legal basis for the protection of water resources through the control of non-point pollution sources. For these reasons, the amended act provides for, among other things, the shared responsibility of both central and local government authorities for non-point source pollution management; a mandatory establishment of facilities to reduce non-point source pollution; and the incorporation of the clauses on the management of non-point source pollution into other legislation.

Apart from engaging legal provisions to deal with water pollution, the law is also being relied upon by Korea as a means of implementing its sustainable water circulation policy of the reusing of wastewater, and treatment of sewerage water, while reducing reliance on natural water resources. In Korea, treated sewerage water is considered to be one of the best alternative water resources. To facilitate the reuse of treated sewerage water, the Sewerage Act was revised in March 2001[51] to incorporate the strategy for reusing treated sewerage water. In 2006, the act was wholly amended[52] to include provision on the mandatory reuse of a certain proportion of treated sewerage water when building a new sewerage treatment facility.[53] According to the report by the Ministry of Environment, Republic of Korea, the percentage of the reuse of treated sewerage water is on the increase, from the total amount of over 6 billion tonnes of treated water, nearly 500 million tonnes were reused in 2006.[54]

In Asia, policy directives to ensure availability of water can come in many forms. One of which involves water rights. Arguably, as water availability becomes more limited and access more often contested, it is imperative that better rules are required for coordinating water use and settling conflicts. Lack of well-defined and secure water rights have already raised issues apart from increasing the vulnerability of poor, politically and economically weaker, water users. Thus, for parts of Asia, water rights have been seen as an important policy not only in securing access to water, but also in ensuring more effective management of water supply. From the holistic point of view, there are several aspects that can be derived from water rights. They include the property right of water resources, the human right to water and the environmental right to water. Experiences from Asia have shown that rights to water are upheld in various forms, and implemented through various means.

In the context of human rights, it is relevant to look at how water rights principles are taking shape within some Asian countries. Generally, the right to clean water may be considered a human right which is taken by some societies to be vital for human life and must therefore be secured by the highest law of the country. However, not all countries would secure such rights within their constitutions, as is evident in Malaysia where

environmental rights, including rights to clean water, are not clearly outlined within its constitution. A clear comparison can be made to the Indian Constitution that makes a direct attempt to protect the right to clean water. The Indian Constitution is amongst a few in the world that contain specific provisions on the matter. Judicial interpretation has further strengthened India's constitutional mandate through the recognition of the right to a wholesome environment as being implicit in the fundamental right to life. For example, the Indian courts, through judicial interpretation, have expanded the meaning of article 21 of the Indian Constitution on fundamental rights to life and personal liberty to include environmental protection. While the constitution does not specifically recognize a fundamental right to water, court decisions deemed such a right to be implied in article 21 on the right to life. Subsequently, this provision has been interpreted to include the fundamental right of every individual to the enjoyment of pollution free water and air as decided in the case of *Subhash Kumar v. Bihar*[55]. Later, in the case of *Narmada Bachao Andolan v. Union of India*[56], the Supreme Court went further and directly derived the right to water. In this case, the court stated that water is the basic need for the survival of human beings and is part of the right of life and human rights as enshrined in article 21 of the Constitution of India.

In addition to that, the Indian Constitution further provides for a fundamental duty towards the environment as provided under articles 48A and 51A (g) . Both articles emphasize the duty of state, as well as individual, to protect and improve the environment. These two provisions make it imperative for the state to do everything it can to protect and improve the environment. Thus, in a case where any public authority is neglecting a constitutional duty or a statutory duty resulting in the pollution of water, a writ of petitions would be competent against such public authorities. Incidentally, these constitutional provisions also greatly facilitate the judges' tasks on matters relating to procedural requirements of litigation. Rosencranz explained that the Indian Supreme Court and High Courts frequently treat letters written to individual judges in court as writ petitions.[57] For India, this legal development is an outcome of the extensive policy reform within the last two decades which allow for legislative, administrative and judicial initiatives on environmental protection. Through such reform, the existing regulatory system has been transformed with new laws introduced, including that containing provisions on citizen suits.

It is also worth mentioning that India is a good example for its advance in protecting public rights to water in term of access to litigation. India's environmental legislation is one of a few in the world that grant users rights to water, namely through the Water (Prevention and Control of Pollution) Act 1974[58]. Prior to its amendment in 1988, enforcement under the act was achieved only through criminal prosecution initiated by central boards, as well as through applications to courts for injunctions. However, its

amendment brought about significant changes where a person can now launch a prosecution against the polluter after giving 60 days' notice to the board; and can demand for the relevant reports from the board. In addition, other Indian legislation, such as the Environmental (Protection) Act 1986[59], also allows its citizens to prosecute an offender by complaining directly to a magistrate. Under section 19 of the act, the court is allowed to take cognizance of any offence under the act on a complaint made by any person of the offence to the authority. Thus, similar to the Water Act, the Environmental (Protection) Act 1986 also gives the public significant powers to enforce the act while allowing an aggrieved person to directly prosecute a polluter. Arguably, India has proven that the interests of society in the preservation and improvement of water resources can be clearly proclaimed through legal mandates. Inevitably these legal and institutional reforms have helped, directly or otherwise, towards water resource protection and in securing rights to water.

While countries like India rely on their constitutional mandate to secure water rights, policy reforms of other Asian countries indicate the application of water rights through other means. For some of these countries, water rights are considered to be part of market-based mechanisms for securing water availability and are enforced through the law and other means. Indeed, the current debate has already put much emphasis on the need to see water as an economic good and to use water for the most worthwhile uses by forceful demand management. Countries like China and Indonesia have passed another milestone in their water reform through the implementation of practical and systematic approaches towards water rights in the form of the water rights system.[60]

In China, water availability is dictated by factors such as geography, topography, and monsoon-influenced climate. Thus, distribution of water resources does not necessarily match population, cultivated land and economic distribution. Consequently, the levels of water resource development differ significantly. This uneven spatial and temporal distribution of water resources across China has caused conflicts over the supply and demand of water resources. The water availability issue in China is further compounded by the fact that water resource management regards water usage as an open commons access, where the cost for the usage of water is almost none. Over a long period, China has been following a mode of inefficient production and consumption, having low efficiency of water use, which is not in harmony with China's national situation as regards water resource shortage. Liu argued that the major implications of this system towards water availability are the injudicious development and overuse of water, causing rivers to dry up, ecosystem degradation and environmental deterioration.[61] With deepening economic reforms in China, water sector managers and administrators now recognize the need for market mechanisms in water resource management. Recent developments show that there appears to be

an understanding in China that in order to develop a sustainable water resource management system, it is necessary to reform water management and incorporate a water rights system substantively. To this end, China has started to upgrade its water management system based on the theories of water rights with a special quota system to be set up to clarify the water rights of different regions and sectors.

Measures relating to water rights were subsequently incorporated by virtue of the Water Law 2002[62] which is the principal law relating to water resource management in China and the key legislation dealing with water rights.[63] This law provides a comprehensive framework for water planning and for the allocation of water rights. It covers matters on water resources ownership, rights of collectives to use water, water abstraction rights, water resource planning, water resource development and utilization, the conservation of water resources, water resource allocation, water use and savings, dispute settlement and administrative responsibilities. Indeed, for China, the decision to evolve a comprehensive water rights system should not be underestimated. Nevertheless, considering that water rights as a property right is a complicated issue, the evolution of a form of China's property rights in terms of water will be a long-term process.

Apart from China, Indonesia is another country that recently incorporated water rights provisions within its water law. Similar to China, in the past, Indonesia's water resource development strategies tended to emphasize the supply side. Thus, the current strategy for the development and management of water resources reverses this emphasis by focusing on the demand side by way of establishing a water use rights system. It is argued by Sarwan et al. that such allocation must be implemented to achieve national objectives, as guided by clear principles of rights and priorities, of which the water use rights system is of central importance.[64]

Indonesia's attempts at a paradigm shift in water resource management can be found through the enactment of the Water Law 2004.[65] This new law which replaces the law of 1974 was formulated to develop and implement comprehensive management principles as part of the reform in water resources policy.[66] Arguably, the creation of water use rights allows rights-holders to fulfil all basic needs with respect to water and help avoid conflicts related to water use. This is on the basis that each rights-holder acquires an understanding on limits to his rights and in turn should also understand the demarcation of these rights so that he will make efficient use of water, making more water available for use by others. Sarwan et al. argues that water use rights would provide the community and individual with a degree of certainty concerning the availability of water resources.[67] These rights serve as a basis for resource accounting which is necessary both for long-term planning and for real-time water allocation decision-making in the basin. Water rights now play an important role in Indonesia's water resources policy reforms.

Arguably, in the context of water availability, more developed Asian countries may be used as a reference for more advanced legal and institutional structures on water resource management. While it may not be fair or possible to compare one country's achievement with another's, it is still relevant to highlight the experience of countries such as Singapore on this matter. Singapore is a good example of water supply, wastewater management and overall catchment management. Singapore, unlike its neighbouring countries, such as Malaysia and Indonesia, is small in size with high urban density, sparing it of the environmental problems commonly associated with larger countries with natural resource extraction activities. However, with water in short supply,[68] Singapore's dependence on imports of water from Malaysia makes water an issue of national security for this republic. Due to this unresolved water issue and in order to reduce its dependence on external sources, Singapore has developed and implemented a new policy plan.[69] This plan seeks to ensure increasing water security and self-sufficiency and efficient demand and supply management practices. The plan includes the formulation and implementation of new water-related policies, heavy investments in desalination and extensive reuse of wastewater, and catchment management and other similar actions.[70] In 2001, in order to provide centralized management and a holistic water policy, responsibilities over sewerage and drainage were transferred to the Public Utilities Board Singapore.[71] According to Tortajada, through this holistic water policy, Singapore has successfully managed to find the right balance between the necessary elements of the water sector.[72]

For Singapore, the right balance constitutes that of water quantity and water quality considerations; water supply and water demand management; public sector and private sector participation; efficiency and equity considerations; strategic national interest and economic efficiency; and strengthening internal capacities and reliance on external sources. Other factors that stand out within Singapore's effective water management are the creation of an enabling environment, strong political will, effective legal and regulatory frameworks, and an experienced and motivated workforce.[73] As a whole, Tortajada summarized Singapore's formula in reaching a level of holistic water management, namely by ensuring efficient use of its limited water resources through economic instruments, adopting the latest technological developments to produce 'new' sources of water, enhancing storage capacities by proper catchment management, practicing water conservation measures, and ensuring concurrent consideration of social, economic and environmental factors.[74]

While individual Asian countries may have taken various national initiatives to deal with water availability issues, it is also relevant to mention efforts made by some of these countries at regional level, notably that of ASEAN. The Association of South East Asia Nations or ASEAN consists of a number of member states from Southeast Asia. The region generally shares similar

environmental and water issues (perhaps with the exception of Singapore).[75] This has led to the growth of ASEAN environmental instruments to meet the growing demands for good quality water and to protect water resources which come in the form of mutual agreement and cooperation.

The ASEAN Strategic Plan of Action on the Environment has several strategies. Among them are a regional framework on biological diversity conservation and sustainable use of its components; promotion of protection and management of coastal zones and marine resources; and promotion of environmentally sound management of toxic chemicals and hazardous wastes and control of transboundary movement of hazardous wastes.[76] While there has been debate and criticism on the effectiveness of ASEAN's environmental instruments in dealing with environmental issues, it is worth highlighting some of its efforts in water resource management.[77] The vision for water resources in ASEAN was initially defined in the ASEAN Long Term Strategic Plan for Water Resources initiated by the ASEAN Working Group on Water Resource Management. This Working Group was established in 2002 and provides for areas for cooperation which include networking and collaborative action on integrated water resource management; exchange of relevant information, expertise, technology and know-how on water management; and training, education and awareness-raising. It is generally recognized that there is a need for ASEAN to integrate the management of water sectors and issues, including water supply, and that increasing variability is due to human intervention and climate change.[78] There is still a long way to go for ASEAN before these efforts deliver real outcomes, but it is important that the ASEAN countries, which share many common issues and principles regarding water resource management, continue to establish regional goals and strategies that would lead to the intended outcomes.

Conclusion

This concluding analysis on water availability and policies in Asia conveys significant messages. It is universally recognized that water is vital to human needs, it is relied on for various uses. Thus, freshwater shortages can potentially have broad and far-reaching security implications, possibly beyond that of local or national borders. It is thus vital for Asia to meet these challenges of meeting the current demand for water in a more efficient manner while ensuring that the capability of future populations in terms of water usage is not reduced.

Over the past couple of decades, Asian countries have made changes in their policies on water management. Many Asian countries have seen a more coordinated effort at changing legal, institutional and policy frameworks to face future challenges. However, in reality, it is an acceptable notion that water availability depends on many other factors beyond policy reform. For instance, having legal and institutional frameworks for water alone may

not be sufficient to ensure objectives set can be achieved. The study has shown that factors such as low environmental priority and weak enforcement of the law can seriously undermine efforts put in to water resource management. Thus, for any water policy reform to be successful, it must be sustained by, among other things, a strong institutional set-up and must be backed by stringent and strictly enforced laws.

In addition, it is also very important for Asia to take into consideration the factor of climate change when considering its water reform. For many countries in Asia, especially those with limited resources and infrastructure, impacts of climate change on these countries are likely to be more severe than others. It is thus pertinent for Asia to incorporate sustainable development policies with climate change in mind to reduce its vulnerability in the context of water availability. This includes taking into consideration climate change in planning and implementing water resource strategies and activities. Apart from that, Asia's future solutions of current and emerging water problems also need to span across disciplines and stakeholders. At the regional and international level, Asian countries, especially those that are sharing international watercourses, are facing more complex water availability issues. It is therefore important for these countries to continue engaging in international cooperation and coordination on related matters, and to involve all the stakeholders.

Finally, the ongoing water reforms in Asia must also be supported by serious tasks of promoting more effective conservation efforts and greater environmental awareness, while recognizing people's basic need for, and right to, water. However, the chapter cautions that a water strategy which is successfully implemented in one country may not be suitable for another. For an Asian country, any intended water reform needs to take into consideration its constitutional, legal, social, economic and environmental factors. Matters such as financial standing, existing technological know-how and available expertise should also be taken into consideration when providing solutions for Asia. Nevertheless, they should not be regarded as definite obstacles towards water reform. Indeed, each Asian country has a particular strength, and this strength should be identified and used effectively to strive towards the creation of more sustainable water use now and on into the future.

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3

Effects of Climate Change on Hydrological Resources in Europe: The Case of Spain

Teodoro Estrela Monreal and Elisa Vargas Amelin

Introduction

Water resources are strategic for economic, social and environmental development, but water scarcity and droughts are current challenges that could be worsened by climate change.

During the past 30 years, drought episodes have increased in the European Union. The number of areas and people affected increased by 20 per cent and there were also impact-associated costs: the annual mean cost has multiplied by four in this period, and the total cost adds up to 100,000 million Euros. At least 11 per cent of the European population and 17 per cent of its territory has been affected by water scarcity to date, and demand has increased for available resources under sustainable conditions.[1]

According to scenarios forecast by Member States, and their preliminary assessment, some climate change effects related to water will include: increase of frequency and severity of hydrological droughts, general decrease of water resources, increase and severity of floods, diminishment of water quality, and decrease of aquifer levels with the consequence of associated saline intrusion. For instance, in Spain, the decrease of water inputs could reach 50 per cent in arid and semiarid regions of the country (30 per cent of the national territory).[2]

The Water Scarcity and Droughts Expert Network, within the Common Implementation Strategy of the European Water Framework Directive (WFD),[3] led by France, Italy and Spain, is working to find adequate measures to minimize water scarcity and drought impacts. In addition to the technical work, in 2007, in response to political concern, the Communication from the European Commission to the European Parliament and Council 'Addressing the challenge of water scarcity and droughts in the European Union'[4] was issued to present how to address these issues.

In Spain, a National Climate Change Adaptation Plan has been developed.[5] This plan establishes a general reference framework to evaluate climate change impacts, vulnerability and adaptation, and aims at achieving the established agreements between Spain and the United Nations and the European Union.

More precisely, within the water resources sector of the National Climate Change Adaptation Plan, the main strategic lines focus on water resources under natural regimes, water demands (irrigation, public supply and industry), water management systems and the ecological status of water bodies. These studies are being developed by the Directorate General for Water of the Spanish Ministry of Environment and Rural and Marine Affairs, with the support of the Centre for Hydrological Studies (CEDEX). This work has been supported through policy tools, such as the Royal Decree on Hydrological Planning Act (RD 907/2007) and its Technical Guidance.

The developing studies will allow the integration of possible climate change impacts into Spanish hydrological planning; consequently adapting river basin management plans' measures. These experiences will in turn be useful for the European Strategy linked to the Water Scarcity and Droughts EC Communication.

Water scarcity

Water scarcity, which means that water demands exceed the available water resources under sustainable conditions, is currently affecting many European countries. At least 11 per cent of the population and 17 per cent of the land of Europe are affected by water scarcity at this time (EC, 2007a). Malta and Cyprus, followed by Spain and Italy, show the lowest water availability per capita, when comparing their water exploitation index from 1992 to 2003.[6] This index, for a country, is the mean annual total demand for freshwater divided by the long-term average of freshwater resources. It illustrates to what extent the total water demand puts pressure on water resources.

According to the European Environmental Agency, and its 2005 water reports, water availability per country in Europe is very diverse, as shown in Figure 3.1.

Taking into account the agency's predictions for the water exploitation index (available water resources for different uses), the results are worrying. According to these predictions, as shown in Figure 3.2, many countries, and not only Mediterranean ones, will face medium to severe water stress by the year 2030.

In the specific case of Spain, there is a clear imbalance in water availability between northern, central and southeastern areas. The main area of the country falls under the lowest amounts of water availability (between

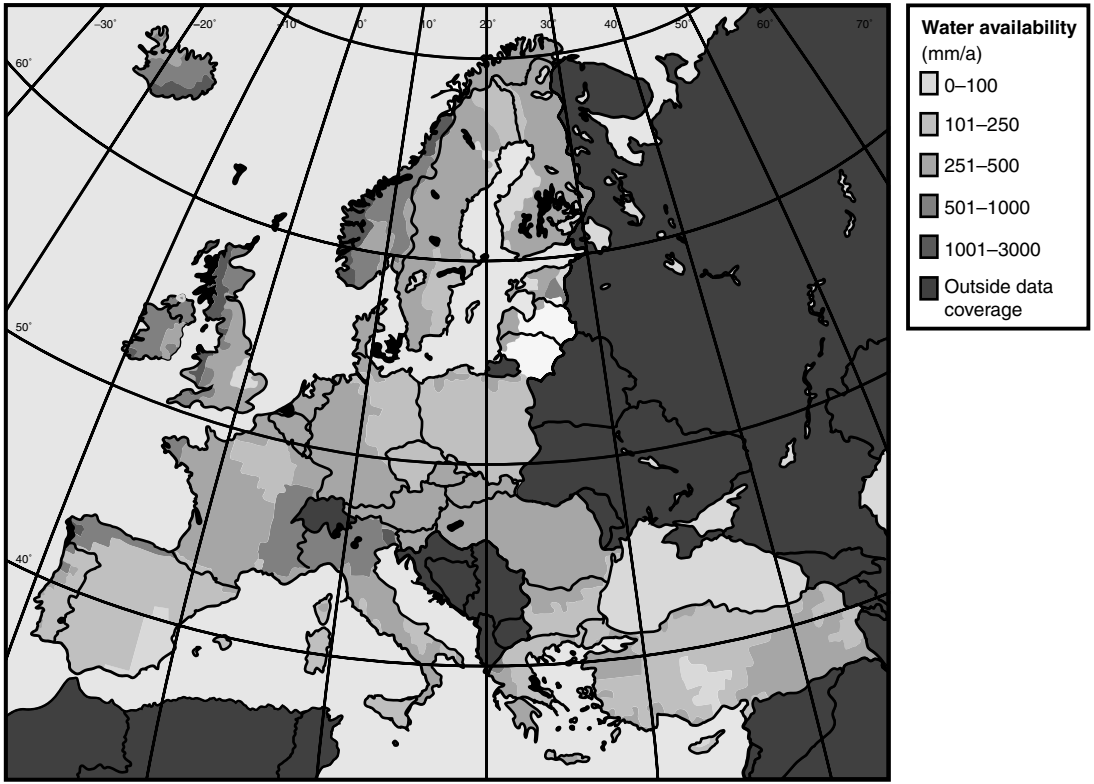


Figure 3.1 Water availability in Europe

Source: EEA, 2005.

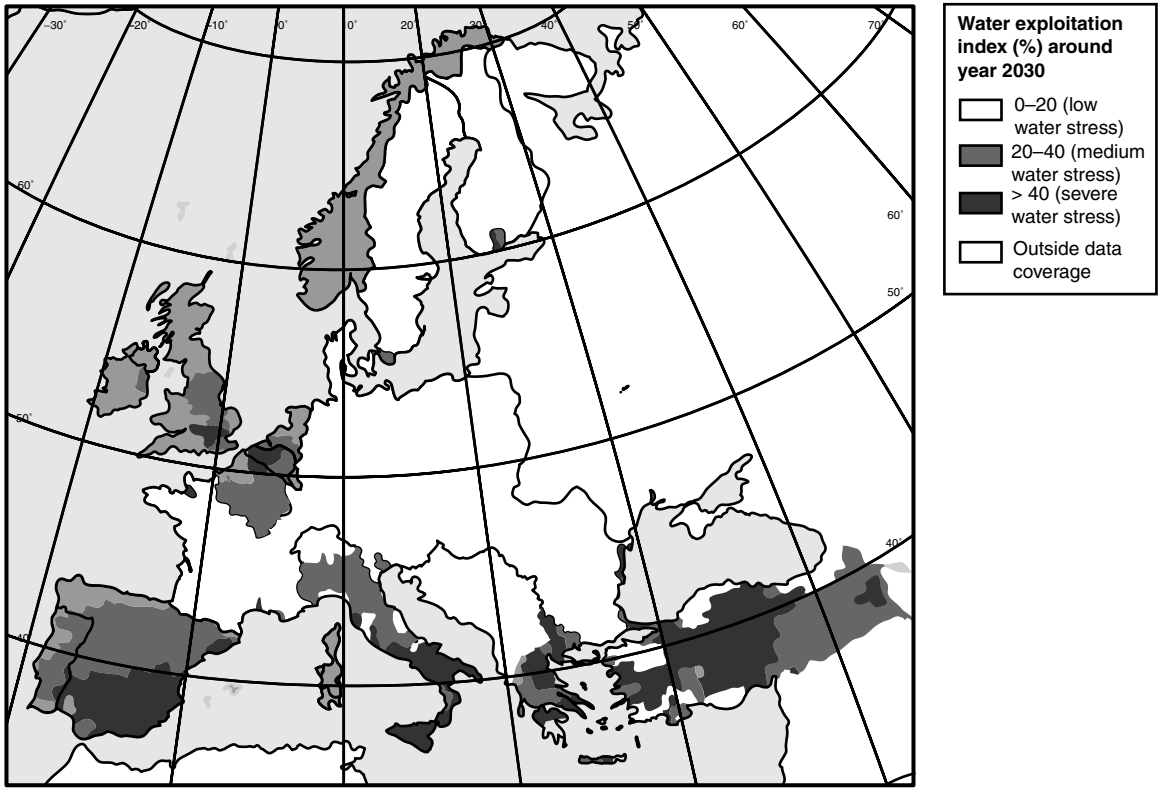


Figure 3.2 Water exploitation index estimation for 2030

Source: EEA, 2005.

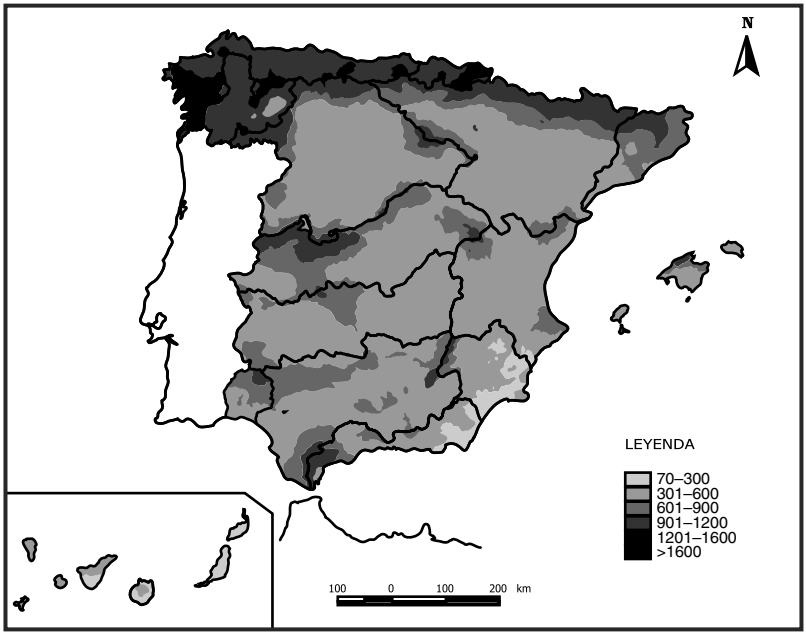


Figure 3.3 Mean annual precipitation in Spain (mm)
Source: MIMAM, 2000.

0 and 100 mm per year). Precipitation ranges from close to 2000 mm per year in northwestern areas, to less than 200 mm in Almeria (southeast), see Figure 3.3. Similarly, runoff means values range from thresholds as different as 1–50 mm in southeastern and central areas, to over 800 mm/year, see Figure 3.4.

This high water irregularity in time and space is provoking numerous conflicts related to water demand and uses.

Different measures are being applied at the national level to decrease water scarcity impacts. For instance, new water supply infrastructures have been constructed or existing ones modernized to ensure adequate public supply. Metering programmes, for both surface and groundwater, are being used to control water use. Saving water and water-efficient technologies are being promoted. These include public awareness campaigns led by municipalities and supply entities. In addition, joint management of surface and groundwater is carried out by the River Basin Authorities in charge of water management. Lastly, there has been an important increase in recent years in non-conventional water resources, such as wastewater reuse and desalination.

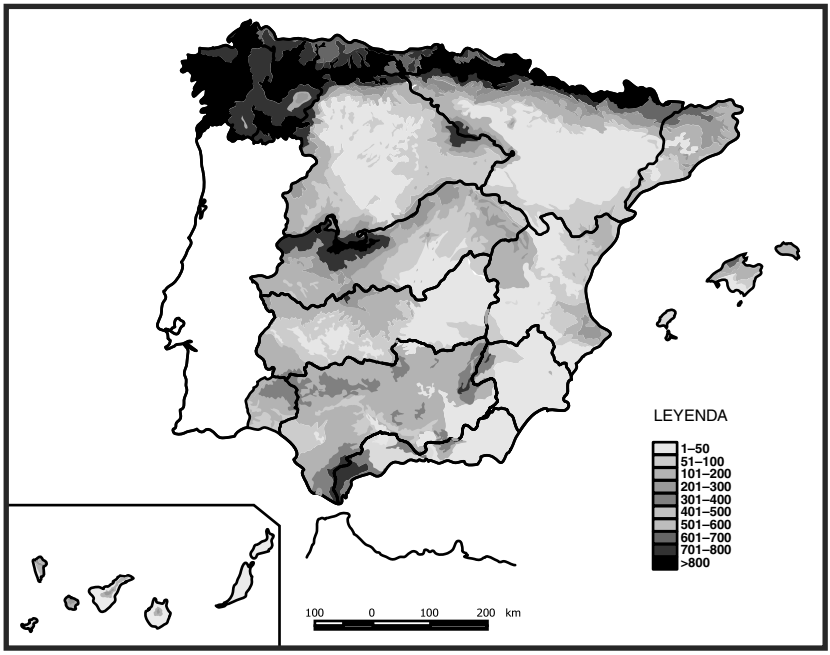


Figure 3.4 Mean annual runoff in Spain (mm)
Source: MIMAM, 2000.

Droughts

Drought means a temporary decrease in water availability due, for instance, to rainfall deficiency. It can occur anywhere in Europe, by definition in both high and low rainfall areas and in any season. The impact produced by droughts can be exacerbated when occurring in regions already presenting low water resources levels, with mismanagement of water resources and with imbalances between water demands and the available water resources.

The Council of Ministers of the EU launched a policy request to assess the gravity of water scarcity and droughts in Europe in March 2006 (led by Spain and Portugal). This political interest resulted in a first interim report assessing the situation presented by the DG Environment of the EC. Furthermore, a specific working group was created within the Common Implementation Strategy of the Water Framework Directive in 2007. This group was made up of a Stakeholder Forum with a more political level and mainly led by the EC and an Expert Network to deal with technical aspects, led by France, Spain, Italy and the EC. This network is the technical core

of the Water Scarcity and Droughts' Working Group, approved by EU Water Directors in December 2006, and it is composed of technical experts officially nominated by Member States.

After the drafting and discussion process within the Stakeholder Forum, and an interim report on the situation, the Communication of the EC to the Council and European Parliament 'Addressing the challenge of water scarcity and droughts in the European Union' was issued on 17 July 2007 (EC, 2007b). This Communication establishes the need for a European Strategy based on national and EU measures. It recognizes the importance of both problems, and the need for undertaking European action to use, to reform, whenever necessary, the existing tools (Common Agricultural Policy, Water Framework Directive, financing mechanisms and emergency assistance). The Communication underlines that saving water must become the priority, that all possibilities to improve water efficiency must be explored, and that policymaking should be based on a clear water hierarchy. The Communication lists possible measures to cope with water scarcity and droughts (management measures mainly), recommends the development of Drought Management Plans, supports establishing a European Strategy, and considers using European funds when suffering prolonged droughts, and proposes establishing a European Drought Observatory. In summary, it presents a range of possible orientations for managing the problems of

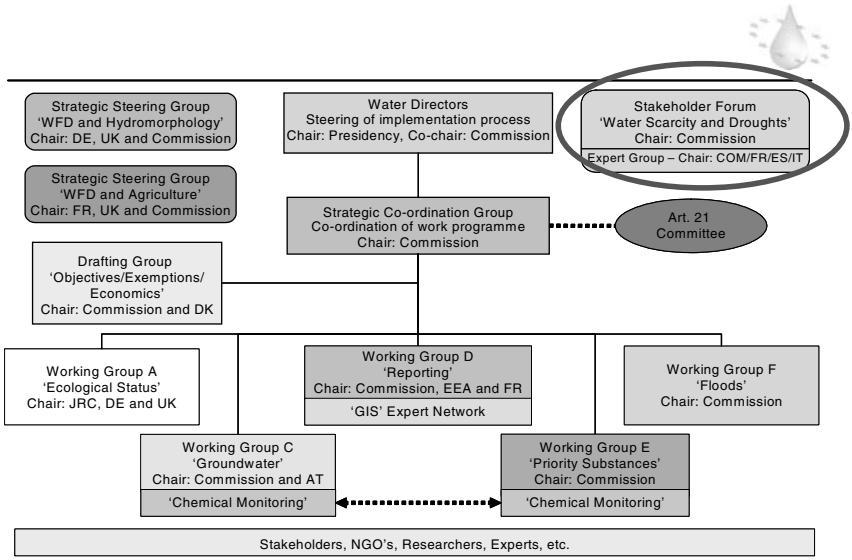


Figure 3.5 Scheme of the common implementation strategy of the Water Framework Directive, for the period 2007–2009

water resource scarcity and drought, and quotes a certain number of good practices existing in various countries, see Figure 3.5.

Regarding the technical results of the Expert Network, one of the main products has been the 'Drought Management Plan Report, including agricultural, drought indicators, and climate change aspects'.[7] This report includes a plan framework and classification and description of measures, and sections on exemptions and prolonged drought, agriculture and groundwater, and on climate change and transboundary management. Its main objective is to serve as a useful tool to elaborate Drought Management Plans (DMPs), supplementing River Basin Management Plans (RBMP) according to the WFD article 13.5. This technical report can help Member States, and other countries, to mitigate and prevent drought effects thus minimizing socioeconomic and environmental impacts. It provides technical recommendations to establish useful indicator systems to declare drought status. In addition, it establishes measures, in accordance with indicators' status, consistent with RBMP. Lastly, it relates direct issues clearly affected by droughts (agriculture and groundwater) and considers consequences of climate change.

Drought planning and management in Spain

Historically, Spain has suffered important dry periods that have caused severe impacts, and have made the water management process to satisfy basic needs difficult, such as public water supply and irrigation. Traditionally, droughts were managed as emergency situations, but this approach has shifted towards a planning one. Water restrictions and saving water awareness campaigns have become common practices, transmitting the need of legal and technical tools to promote planned drought management.

To minimize environmental, economic and social impacts caused by drought situations, the Water Act on the National Hydrologic Plan established that the Ministry of Environment had to achieve, for river basins dependent on the Ministry, a hydrologic indicator system that would allow the forecasting of droughts. This indicator system would become a general reference for the River Basin Authorities to formally declare, in a homogeneous way, possible drought and emergency situations.

An indicator based on different parameters (precipitation, reservoir levels, groundwater levels, etc.) was determined, as well as the status and associated colours of drought phases, see Figure 3.6.

The Water Act established that Drought Management Plans (DMPs) had to come into force, and be developed by the River Basin Authorities (RBAs). The eight RBAs developed their plans, which were approved in March 2007 by the Ministry of Environment and their publication on the Official Spanish Bulletin was made through Ministerial Order MMA/698/2007.

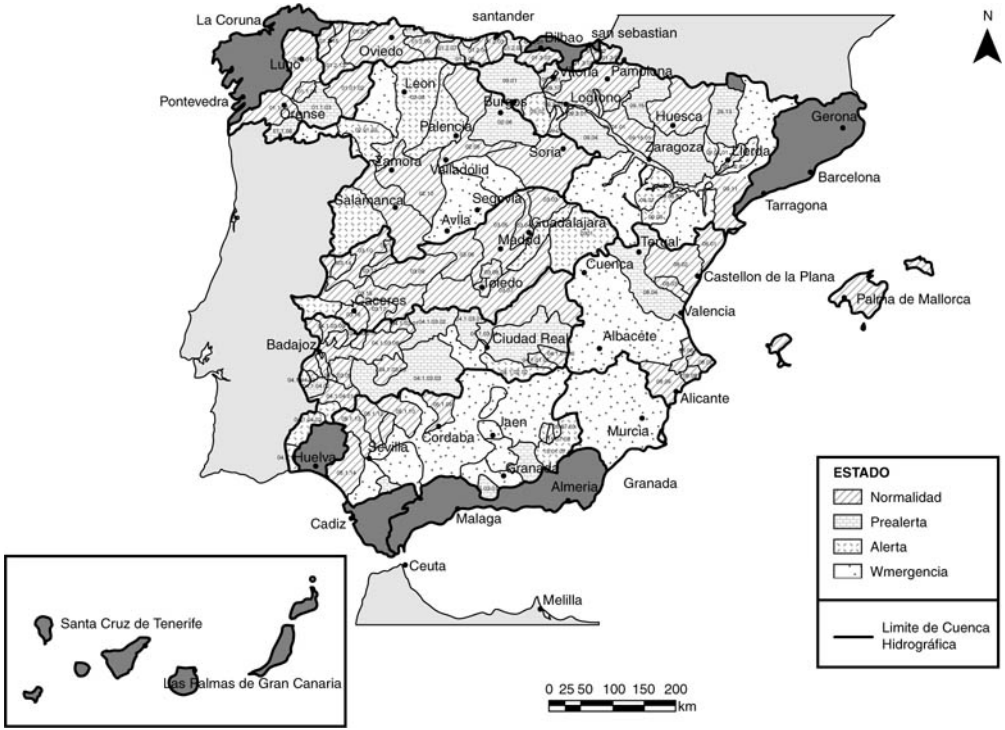


Figure 3.6 Drought status map of Spain, April and May 2008

Source: Spanish Ministry of Environment

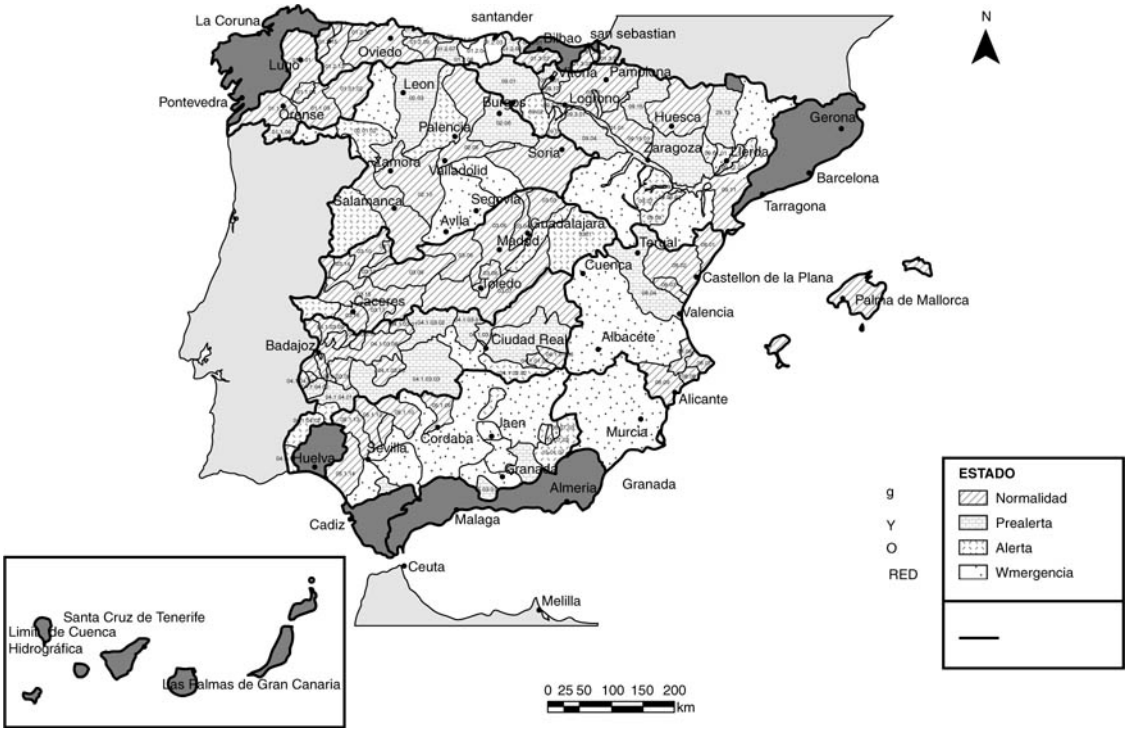


Figure 3.6 Continued

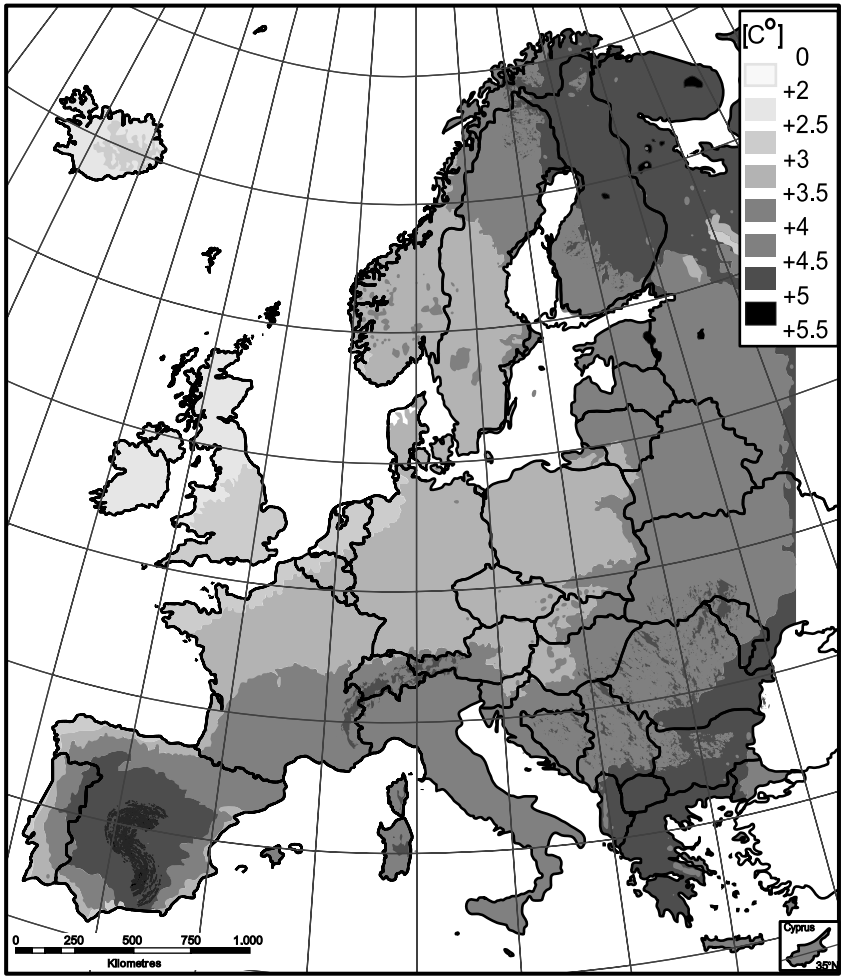


Figure 3.7 Change in mean annual temperature (Co)
Source: EC, 2007d.

These plans or DMPs are reference documents and are useful and efficient tools to manage water resources under drought episodes. Their action methods and established measures must be applied once they have been previously agreed by the interested parties: social society, administration, scientific community, NGOs, etc.

The specific objectives of the DMPs are as follows:

- Guarantee water availability required to sustain population life and health.

- Avoid or minimize negative drought effects on the ecological status of water bodies, especially on the ecological water flows, avoiding in any case, any permanent negative effects.
- Minimize negative effects on public water supply.
- Minimize negative effects on economic activities, according to the prioritization of uses established by water policies and river basin management plans.

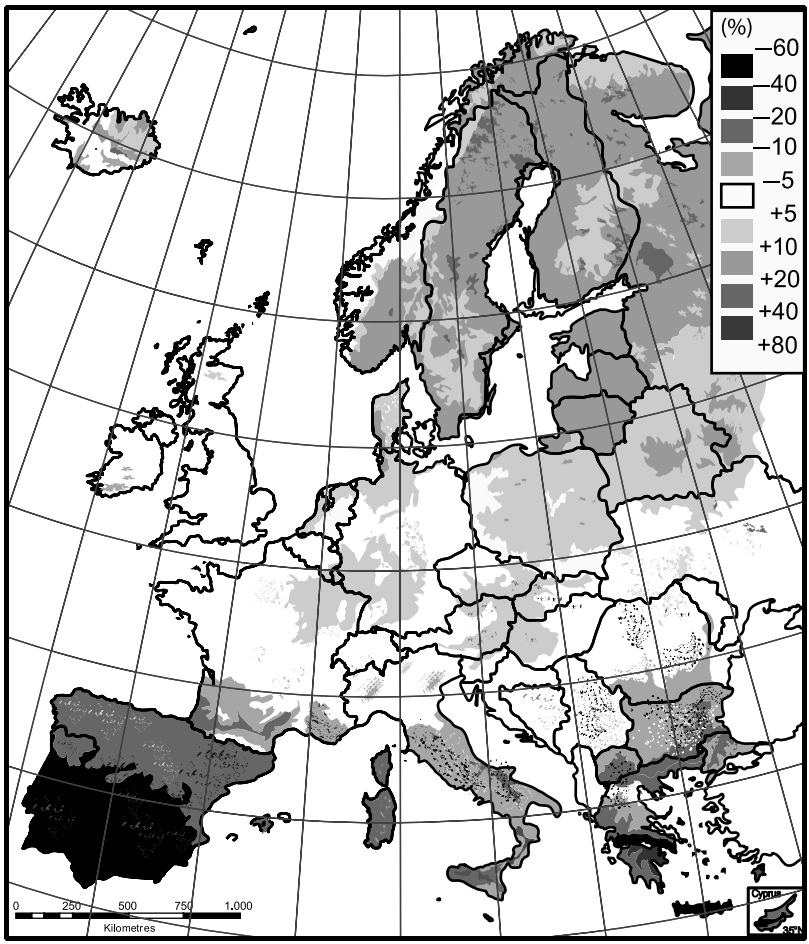


Figure 3.8 Change in annual precipitation (%)
Source: EC, 2007d.

To achieve these objectives, the DMPs identify the most adequate mitigation measures, adapted to the different established drought thresholds and phases. Drought status and follow-up maps reflecting this information are published monthly. During a normal phase, the measures derive from regular management practices. As the drought progresses, and a more critical situation is arrived at, measures go from control and information to conservation and restriction types.

DMPs include a drought diagnosis, a program of measures, in addition to a follow-up and management system. The drought diagnosis includes the identification and characterization of land and environmental elements. This part of the DMP analyses and characterizes historical droughts as well as learnt lessons through those episodes. It includes also one of the most relevant elements of the plans, which are the indicators, thresholds and drought phases definitions.

The indicators system allows the adoption of the different mitigation measures in the water resources management systems and the application of them in public domain water use. Basic indicators are selected in each case, taking into account the specificities of each river basin, and include: reservoir levels, groundwater levels, flow inputs and precipitation.

Another key part of the DMPs is the programme of measures, which defines and describes the different types of measures that can be applied in each area, according to the drought phase, as was shown in Figure 3.6.

Lastly, the DMPs include a management and follow-up system that allows the implementation of measures to be analysed, using corrective measures in case the established objectives are not met. This part of the plan describes the methodology to develop follow-up reports, and analyses each drought period as it occurs.

Impacts of climate change in Europe

According to the EC Green Paper on climate change,[8] and following the A2 scenarios, the changes in mean annual temperature and precipitation could be on a great scale.

Figures 3.7 and 3.8, from this report, show the climatic changes forecast for 2071–2100 for these two variables.

The previously mentioned Communication of the EC to the Council and European Parliament states that impacts of climate change and economic development are expected. Furthermore, the proportion of severe water stress in EU river basins is likely to increase from 19 per cent today to 35 per cent by 2070 according to predictions. The areas affected by droughts will more than likely increase, and if temperatures rise by 2 to 3°C, water scarcity would affect 1.1 to 3.2 billion people.

The European Commission is preparing a White Paper on adaptation to climate change, as a follow-up to the first elaborated policy document or

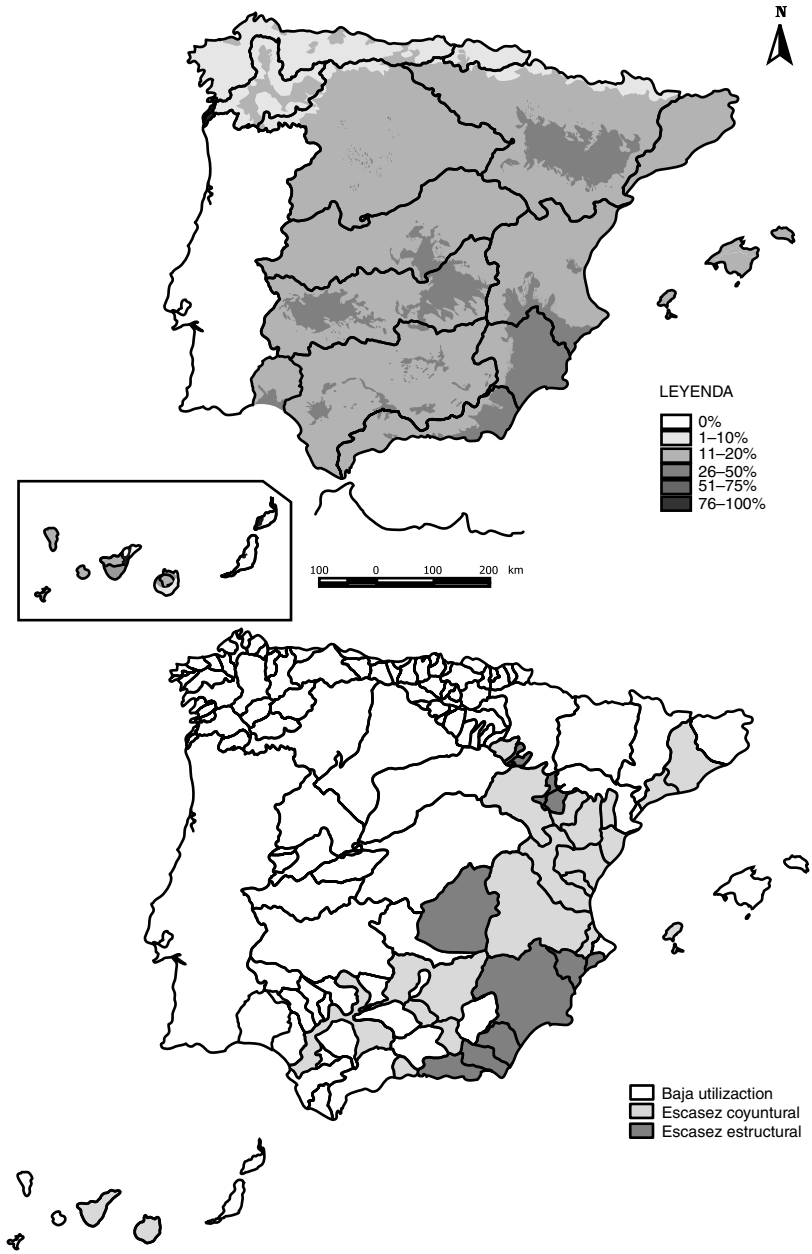


Figure 3.9 Impact on runoff reduction for a decrease of 5 per cent in mean annual precipitation and an increase of 1ºC in mean annual temperature (for the year 2030) on the top map. Greater values of expected runoff, match areas already presenting water scarcity above

Source: CEDEX, 2008; MIMAM, 2000.

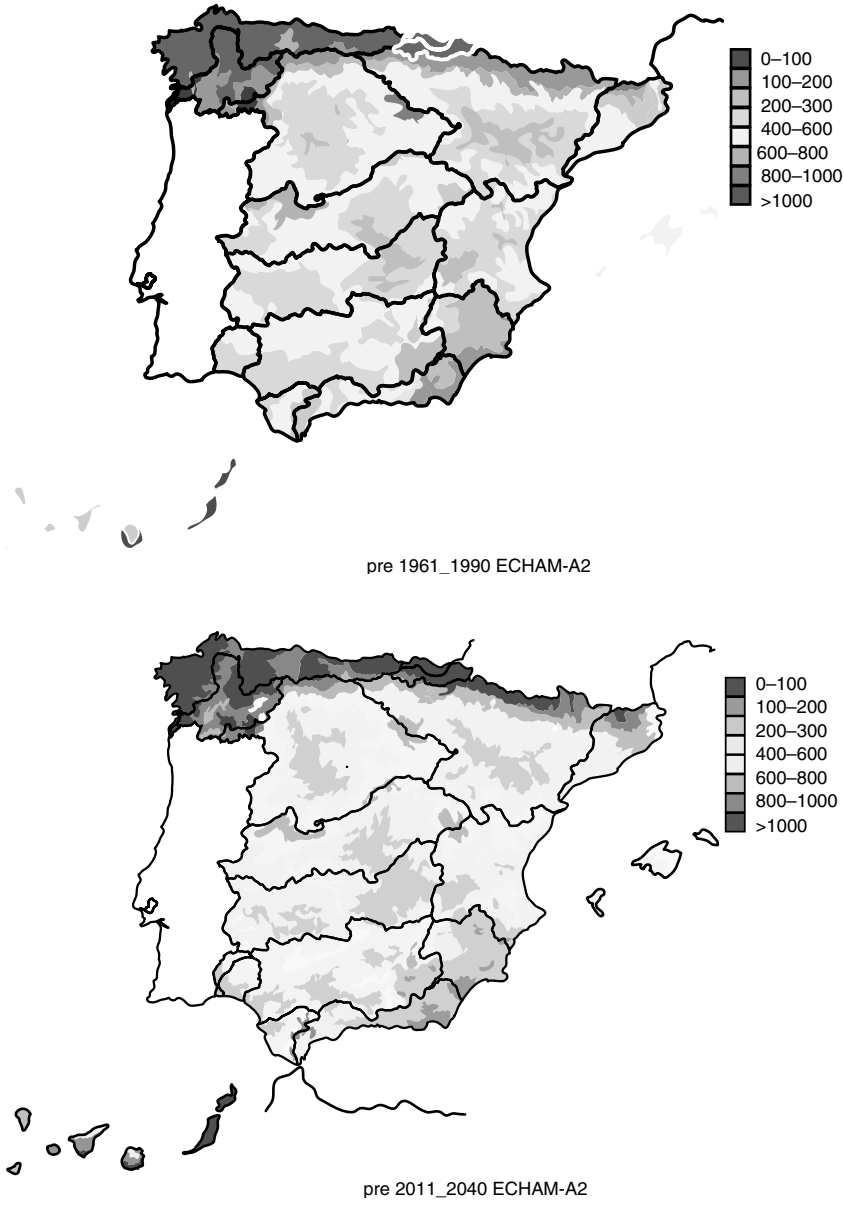
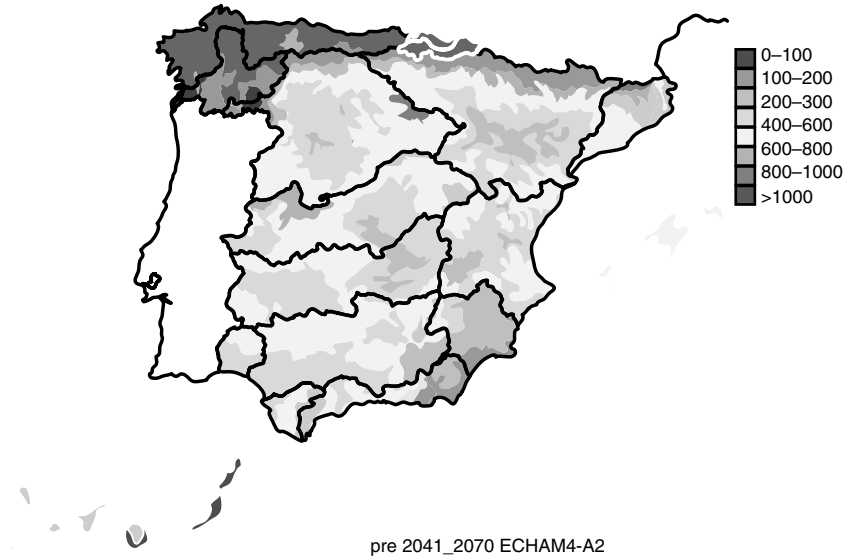


Figure 3.10 ECHAM4 Model. Scenario A2. Precipitation maps for years 1961–1990, 2011–2040, 2041–2070, 2071–2100

Source: CEDEX, 2008.



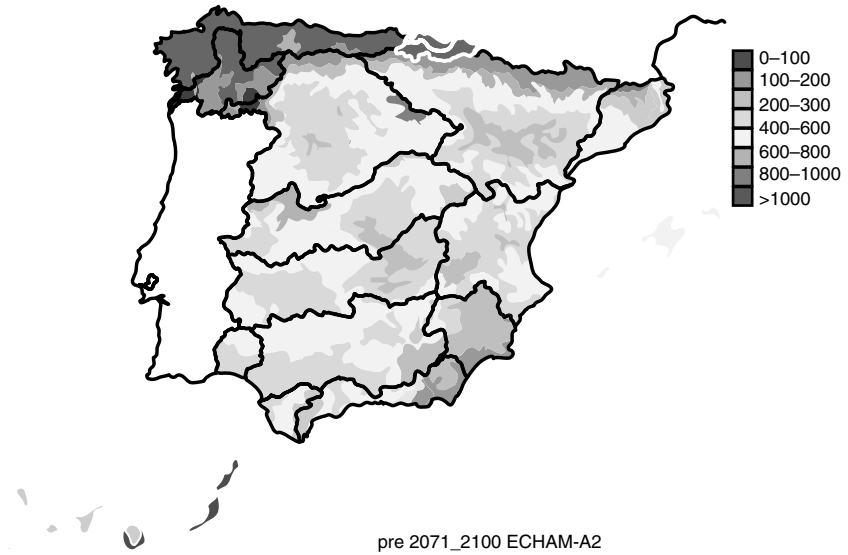


Figure 3.10 Continued

Green Paper on adaptation to climate change, which was adopted in June 2007. A wide stakeholder consultation took place in order to prepare this first document and had overwhelming support for future action on adaptation. This report presents the need to establish a framework to reduce the vulnerability of social and economic structures, and ecosystems, to the impacts of climate change. However, stakeholders have identified some areas which need to be strengthened and new topics that needed to be addressed.

It concludes that adaptation actions and strategies will need to be taken to face predicted impacts. There is a need to consider climatic change in hydrological planning strategies and assess its direct effects on demands, available water resources and the ecological status of water bodies.

Climate change is expected to influence the baseline of present drought issues, with potential impacts on water quantity and quality. A link between DMPs and climate change and their associated adaptation strategies should be integrated into the implementation of the WFD as much as possible, including the aspects already dealt with in the EC Green Paper on adaptation to climate change in Europe.

Climate change in Spain

Preliminary assessment reports on climate change impacts in Spain show a clear decrease in water resources mean values. For a decrease of 5 per cent in mean annual precipitation and an increase of 1ºC in mean annual temperature, a decrease of between 9 and 25 per cent in runoff is expected depending on the affected river basin districts (CEDEX, 2008). In addition, an increase in water resource variability is expected. The most critical Spanish areas are arid and semiarid ones where water scarcity and drought problems are greater. Impact on water resources and vulnerability in these areas of Spain are likely to worsen, affecting areas already suffering water scarcity even more (see Figure 3.9).

As previously mentioned, to cope with climate change effects a National Climate Change Adaptation Plan has been developed (MMA, 2006). Its aim is to integrate adaptation to climate change into the planning strategy of the different socioeconomic sectors in Spain. Specifically, for the water resources sector, it includes an assessment of impacts on natural resources, water demands, available resources and ecological status.

Different models have been assessed and compared using different water-related variables, precipitation, potential evapotranspiration and runoff, with similar results (see Figure 3.10).

Regarding policy and plans regulation in Spain, during the first river basin planning cycle (plans to be ready during 2009), a Climate-Check for the Programme of Measures, similar to what has been proposed in different technical reports for all EU Member States, will be carried out. The Spanish Royal Decree, RD 907/2007, regarding River Basin Management

Plan Regulations was approved in July 2007, and it states that it is mandatory to consider the effects of climate change on water resources in the development of the plans.

Conclusions

Europe is a very diverse continent, in which most countries have been recently affected by drought episodes and water scarcity. Climate change is likely to have an impact on water availability, and thus on all affected socioeconomic sectors.

Spain presents a high irregularity in time and space concerning precipitation and runoff. There is water scarcity in many regions, in addition to strong and prolonged drought episodes. Drought has been traditionally managed as a crisis situation, applying measures once the impact had already affected areas and river basins. This approach has shifted towards a planned one, with effective management tools such as drought plans.

The DMPs are being applied by the Spanish River Basin Authorities. They serve as reference documents to manage drought episodes and minimize the associated social, environmental and economic impacts. The acquired experience in drought management and DMPs development has been shared at the European and international level, and has resulted in an EU report to promote their use and application. The political interest in this area at the EU level has likewise led to a Communication and a European Strategy to combat water scarcity and drought impacts.

In the specific case of Spain, Drought Management Plans are allowing planned drought management coordinated by River Basin Authorities, and as their main achievement, they have avoided applying restrictions in urban areas throughout the current drought period. They are powerful tools, which, through agreed bases among stakeholders, prioritize uses and protect water ecosystems under stressed situations. Predicted climatic change effects in Europe, related to hydrological issues, include increase in severity and intensity of flooding, increasing sea levels, extreme precipitation events, and most severely, frequent and prolonged droughts.

In particular and regarding factors directly related to drought and its management, hydrological stress is expected to increase in central and southern Europe, increasing the affected populations living under water stress conditions. River flows are likely to decrease, challenging the maintenance or improvement of water quality. Adaptation action will need to be taken into account to minimize impacts. Potential climatic change effects will need to be considered in water resources in natural regions, water demands (irrigation, urban supply and industry), available water resources in management systems, and the ecological status of water bodies.

In Spain, climate change impacts are likely to decrease water availability. Recent studies using different models show a decrease in precipitation

values and an increase of runoff, especially in areas already facing water scarcity. A National Climate Change Adaptation Plan is being developed. This plan established a general reference framework to evaluate climate change impacts, vulnerability and adaptation. In addition, adaptation measures are being taken into account in water policy and in the upcoming River Basin Management Plans.

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4

Climate Change: Implications on Agriculture and Food Security in the Short-Medium Term

Tomás Lindemann and Daniela Morra

Introduction

This chapter focuses on the implications of climate change in agriculture and, thus, food security, in particular for Asia. This area has been continuously considered to be at risk due to its vulnerability to the predicted impacts of climate change. At the same time, the region is heavily populated, especially in areas that present food security and poverty issues. This chapter will analyse what are considered the four pillars of food security, followed by an overview of the possible implications of climate change on freshwater supplies and predicted food requirements. Finally, the chapter will conclude by briefly analysing the pro-active adaptation and mitigation responses to cope with the potentially devastating effects that climate change is to bring about.

In the coming decades, global agriculture will face two major challenges. On the one hand, the prospect of a changing climate and its implications for ecosystems, induced by the increasing concentration of greenhouse gases.[1] On the other, the challenge of feeding the world's population, projected to double its present level of five billion by about the year 2060.[2] This growing population has dramatically increased the energy and food demands, met by both the burning of fossil fuels and intensive agriculture.

Forecasting the exact magnitude of impacts caused by climate change is proving a difficult task; however, it is an established fact that climate change does have the potential to permanently alter ecosystems through a progressive unpredictability and variability of climate, affecting all *weather–sensitive* activities, in particular agriculture, forestry and fisheries with negative implications for food security in general. Figure 4.1 illustrates the range of historical temperature rises since the 1850s.

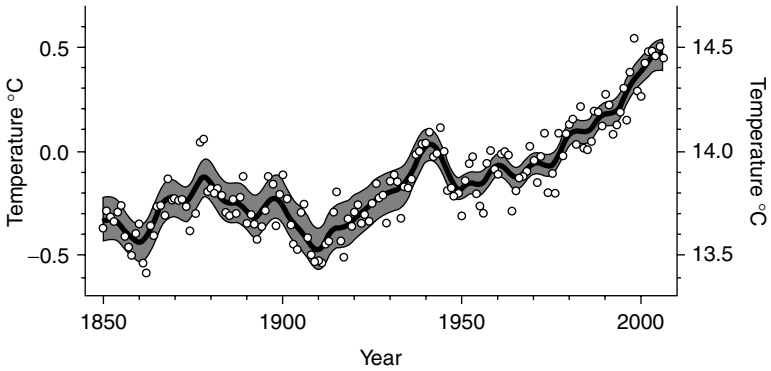

Figure 4.1 Global average surface temperature

Source: R. K. Pachauri and A. Reisinger (eds) (Core Writing Team) *IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Geneva, Switzerland: IPCC).

Effects on food security

Currently, it is estimated that roughly 50 per cent of the world's population lives in urban areas (as opposed to 1950, where the percentage was around 30 per cent).[3] Therefore, climate change's influence on human and physical capital (including roads, storage and marketing infrastructure, houses and others) are at least as important as direct effects on agriculture, challenging thus the human capacity to guarantee the stability of food systems in both urban and rural areas.[4]

In 2006, the World Food Summit defined a state of food security when

> all people at all times have physical or economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.[5]

This encompasses activities in the food system from the beginning, which is food production, to the end, food consumption. The outcomes of these activities constitute the four pillars of food security; that is, food availability, food accessibility, food utilization and food system stability.[6]

Pillars of food security[7]

Food availability. Some 50 per cent of total crop production comes from forest and mountain ecosystems, while crops cultivated on open, arable flat land account for only 13 per cent of annual global crop production.[8]

Although impacts of mean temperature increase will be experienced differently depending on location, moderate warming (increases of 1–3 °C in mean temperature) is expected to benefit crop and pasture yields in temperate regions, while in tropical and seasonally dry regions it is likely to have negative impacts, particularly for cereal crops. The main grain production regions have a largely continental climate, with dry or at least cold weather conditions during harvest time, which allows for storage of harvested grain without special infrastructure or the need for immediate treatment. However, a change in climatic conditions would require special infrastructure or treatment in order to avoid crop loss due to contamination from microorganisms.

Crop yields in Southeast Asia could increase by up to 20 per cent, while they could decrease by up to 30 per cent in central and south Asia by the mid-twenty-first century.[9] Overall, climate change's impact on crop production will not be significant until 2030. Beyond that, widespread declines in cropland productivity are expected, with some of the severest impacts likely to be felt in the already vulnerable areas, those with scarce adaptation abilities.

Food access. Some factors, such as generating capacity, the amount of remuneration received for products and goods sold or labour and services rendered determine whether people have or don't have access to sufficient food through exchange mechanisms, such as market or trade. It would be misleading to consider effects of climate change on agriculture by countries, since currently most food is acquired through buying, trading and borrowing. Changes in availability and relative prices for major food items may result in people either changing their food basket or spending a larger percentage of their income on food.

Food supply stability. Maintaining the continuity of food supply when production is seasonal is challenging, given that many crops have annual cycles. Droughts and floods are a particular threat to food stability since they are expected to become more frequent, more intense and less predictable. In rural areas that depend on rainfed agriculture for their local food supply, changes in rainfall cycles are very likely to aggravate the precariousness of local food systems.

Some regions are able to produce grain reserves which are then used in emergency-prone areas to compensate for crop losses and support food relief programmes for displaced people and refugees. However, higher temperatures and humidity may render those areas unfit to store grain, limiting countries' ability to maintain reserves to respond to large-scale disasters.

Food utilization. Declines in the availability of wild foods, and limits on small-scale horticultural production due to scarcity of water are likely to

affect nutritional status. Furthermore, climate change is expected to cause new patterns of pests and diseases, affecting plants, animals and humans and posing new risks for food security, food safety and human health.

Increased incidence of waterborne diseases in flood-prone areas, changes in vectors for climate-responsive pests and diseases, and the emergence of new diseases could affect both the food chain and people's physiological capacity to obtain necessary nutrients from the foods consumed. Decreased water availability also has implications for food processing and preparation practices, particularly in those areas where consumption of raw food is common.

Effects on freshwater supplies

Water is involved in all components of the climate system (atmosphere, hydrosphere, cryosphere, land surface and biosphere). Moreover, the hydrological cycle is intimately linked to changes in atmospheric temperature and radiation balance, affecting it through a number of mechanisms.[10]

There is a growing concern for water availability due to an increase in temperatures and evaporation, a rise in sea levels and variations in rainfall patterns, thus altering the hydrological balance of many ecosystems, as well as a certainty of its negative impacts on animal and plant subsistence and of unleashing conflicts over water resources. Freshwater availability in central, south, east and Southeast Asia, particularly in large river basins, will affect more than a billion people by the 2050s.[11]

Precipitation

Prolonged and repeated droughts can cause loss of crop/animal production undermining the sustainability of livelihood systems, especially of those based on rainfed agriculture. Figure 4.2 provides a landscape on the vulnerability of freshwater resources around the world.

The land precipitation trend has shown an increase over the twentieth century between 30°N and 85°N; however, prominent decreases have occurred in the past 40 years.[12]

Changes in precipitation, evaporation of water from the soil and transpiration (water vapour given off by plants) are expected to increase runoff by 2060 in some parts of northern China, east Africa and India. Runoff is important to replenish the water of rivers and lakes and therefore also irrigation and maintaining ecosystem services. Across south Asia (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka), large populations depend on semi-subsistence agriculture for their livelihoods. Rainfall in the semi-arid and sub-humid regions of south Asia is highly variable and unreliable and influences agricultural productivity.[13]

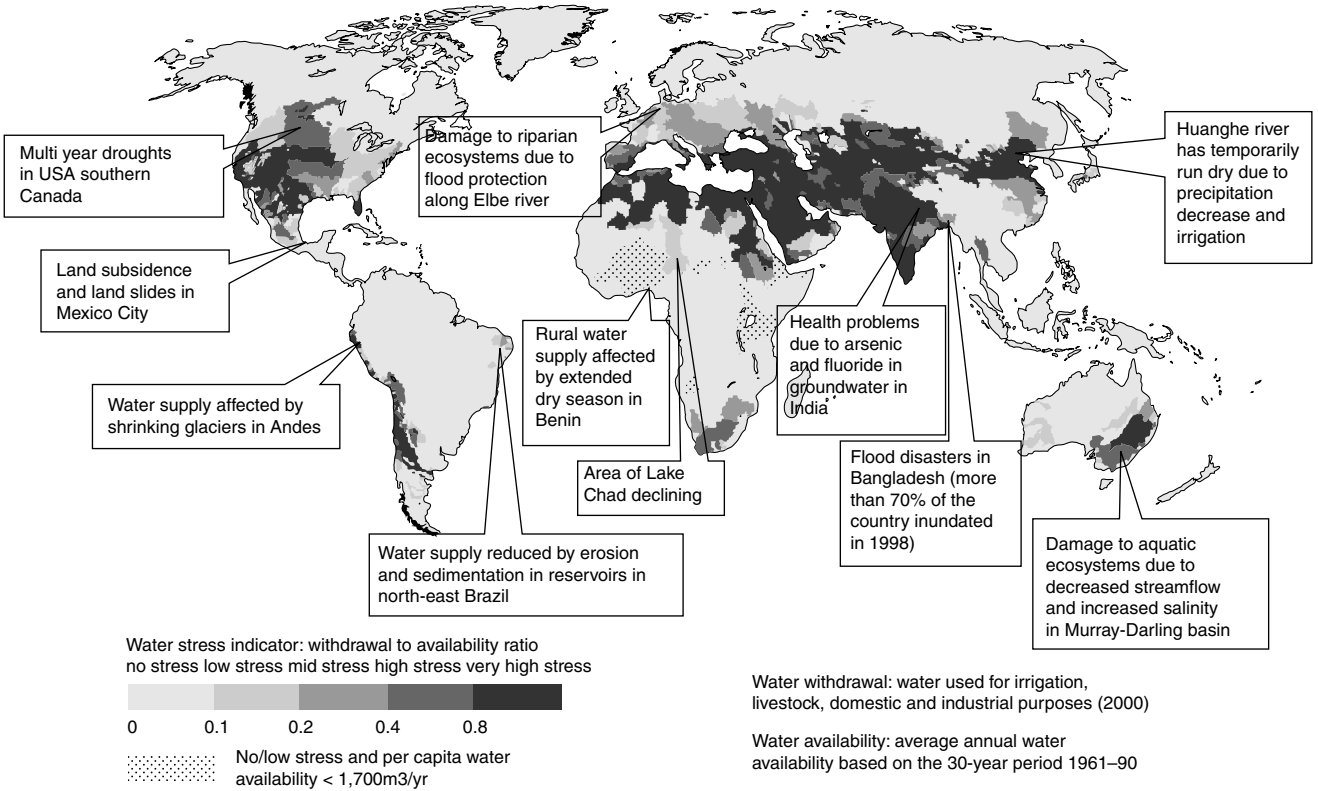

Figure 4.2 Examples of current vulnerabilities of freshwater resources

Source: B. C. Bates, Z. W. Kundzewicz, S. Wu and J. P. Palutikof (eds) (2008) *Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change* (Geneva: Secretariat IPCC).

Glaciers

The greatest asset of altitudes of more than 3500 metres is the drinking water reserves that exist in the form of glaciers. These in addition, play a buffer role in case of drought, releasing their quota of water every year to compensate for water losses in times of drought. With global warming, however, this role glaciers play is being lost, with dramatic consequences for both communities located at the highest altitudes and urban complexes located at lower altitudes.[14]

The enhanced melting, as well as the increased length of the melt season of glaciers lead, at first, to increased river runoff and discharge peaks, while in a longer timeframe, the runoff is expected to decrease. The formation of lakes is occurring as glaciers retreat in several steep mountain ranges, constituting a danger for glacial lake outburst floods.

Sea-level rise

Coastal ecosystems and settlements are particularly vulnerable to the phenomenon of sea-level rise. In fact, during the last century, sea levels rose 5 to 6 inches more than the global average along the mid-Atlantic and gulf coasts, because coastal lands there are subsiding.[15] The IPCC estimated that the global average sea level will rise between 0.6 and 2 feet (0.18 to 0.59 meters) in the next century.[16]

Evidence demonstrates that sea levels are not rising uniformly around the world, but depending on the region, sea levels have risen either above or below the global mean level. However, heavily populated coastal areas in megadelta regions of south, east and Southeast Asia will be at the greatest risk due to increased flooding,[17] also salt marshes and mangroves are particularly vulnerable to rising sea levels, as well as wetlands, where outer boundaries are expected to erode and new wetlands form inland as previously dry areas are flooded by higher water levels. The IPCC suggests that by 2080, sea level rises could convert as much as 33 per cent of the world's coastal wetlands to open water.[18]

Projected changes in food requirements in the medium-term due to climate change

According to Figure 4.3, by 2080 (assuming a 4.4°C increase in temperature and a 2.9 per cent increase in precipitation) global agricultural output potential is likely to decrease by about 6 per cent or 16 per cent without carbon fertilization.[19] As climate change increases, projections have been made that by 2080 agricultural output potential may be reduced by up to 60 per cent for several African countries, with an average 16–27 per cent.

Assuming no climate change effects, it is estimated world cereal production will be 3286 million metric tons (mmt) in 2060 (cf. 1795 mmt in 1990). Per capita cereal production in developed countries will increase

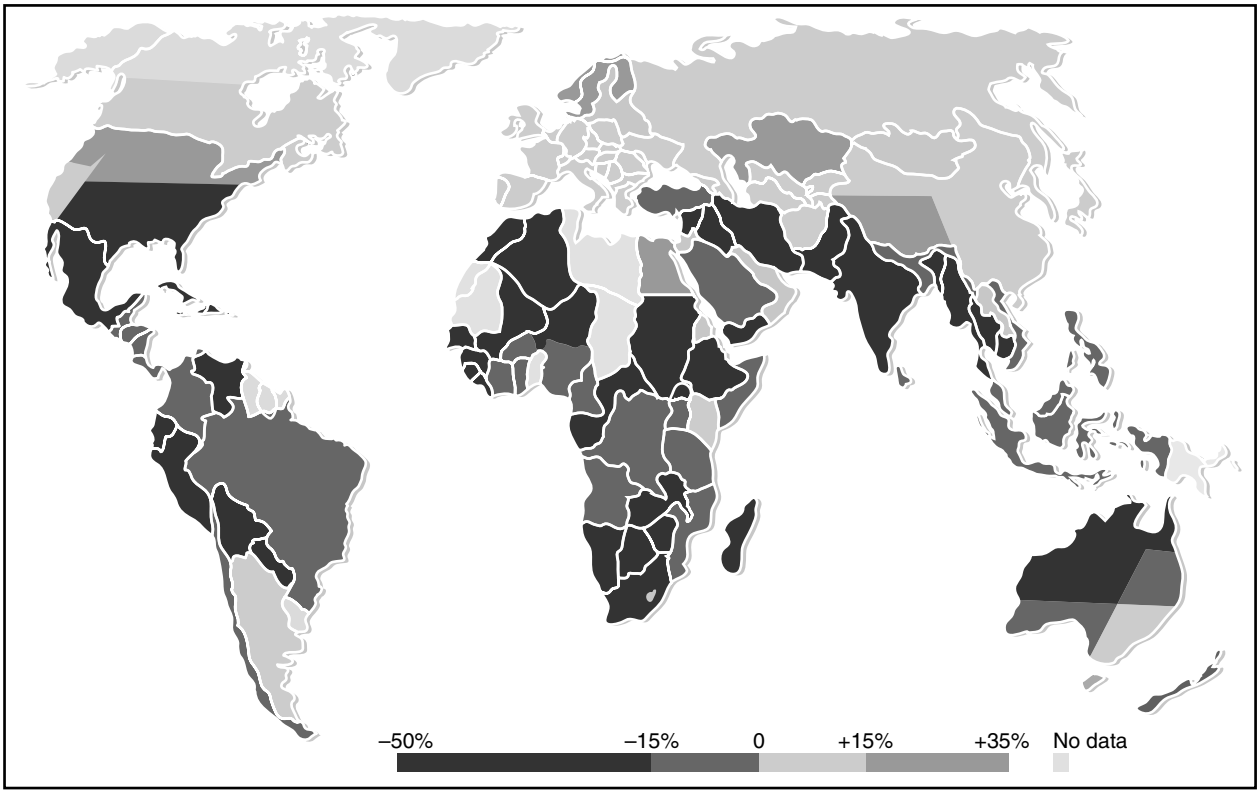

Figure 4.3 Projected losses in food production due to climate change by 2080

Source: GRID-Arendal, Hugo Ahlenius (ed.) (2007) *Environmental Knowledge for Change. Projected Losses in Food Production due to Climate Change by 2080,* http://maps.grida.no/go/ graphic/projected-losses-in-food-production-due-to-climate-change-by-2080 (accessed 3 March 2009).

from 690 kg/cap in 1980 to 984 kg/cap in 2060. In developing countries (excluding China) cereal production will increase from 179 to 282 kg/cap. It is estimated the number of hungry people will be about 640 million or about 6 per cent of total population in 2060 (cf. 530m in 1990, about 10 per cent of total current population).[20] Regarding prices, the estimated number of hungry people will increase approximately 1 per cent for each 2–2.5 per cent increase in prices. It is estimated the number of people at risk of hunger will increase by 10 per cent to almost 60 per cent, resulting in an estimated increase of between 60 and 350 million people in this condition by 2060.[21]

According to the Fourth Assessment Report of the IPCC, south Asia is very likely to warm during this century, putting pressure on some of the prime productive land and reducing agricultural output, biodiversity and the natural ability of ecosystems to recover. It is expected that climate change impacts will be uneven between countries and regions within Asia: China with 140 million undernourished people should gain 100 million tonnes in cereal production; India in turn with 200 million undernourished is expected to lose 30 million tonnes.[22]

Response through adaptation and mitigation

The IPCC defines *adaptation* as

> the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities and **mitigation** as the technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce GHG emissions and enhance sinks.[23]

The capacity to adapt and mitigate is dynamic and is heavily influenced by a society's productive base, including natural and man-made capital assets, social networks and entitlements, human capital and institutions, governance, national income, health and technology among others.

The agricultural sector, including crops, livestock, fisheries, forestry, and land and water management, is both a bearer and a contributor of global climate change. Specific options for both climate change mitigation and adaptation are necessary. If widely adopted, these measures could have substantial potential to counterbalance negative impacts from climate change. To cope with climate change more effectively in Asia and the rest of the world, it is necessary to identify integrated adaptation and mitigation options enabling a favourable policy environment that allows for prompt action.

Some of the main mitigation strategies are:

(a) *Improving the quality of information and its use.* Information is a crucial tool in decision-making, particularly in matters where there is considerable uncertainty, as is the case with climate change. The type of information, its source(s), to whom it is targeted, and how it is to be used are important elements which can make the difference between resilience and collapse for a community. Rural areas are particularly vulnerable, thus useful information generation and dissemination are key in influencing decision-making among farmers. It is important to encourage participatory approaches. Climate predictions have become a popular way to elicit farmers' understanding of climate and climate information and for determining how to improve the relation between these perspectives and scientific forecasts.
(b) *Monitoring weather and improving scientific understanding of climate change.* Part of the scientific work in response to climate change includes the development of tools and technologies for improved monitoring of weather and climate, early warning systems and observation and modelling of climate impacts on rural livelihoods.

Figure 4.4 depicts the short-, medium- and long-term functions of a Food Security Information and Early Warning System (FSIEWS) that covers the information needs of all components of the food system and addresses all aspects of food security. Typically, these systems have focused on monitoring current weather and use this information, together with other socio-economic data, to forecast the adequacy of food supplies and assess food aid needs in developing countries with high risk of drought.

Time series data generated by FSIEWS are increasingly used to support longer-term policy and planning work. The main challenge for these information systems is to reach directly with useful information those communities that need the information to act accordingly.

(c) *Managing agricultural water more efficiently.* Water is not accessible to everyone: today, one in three people face water shortages. Unsustainable use is putting additional pressure on available supplies.

Increasing water scarcity and changes in the geographic distribution of available water resulting from climate change pose serious risks for both rainfed and irrigated agricultural production globally.

(d) *Managing land sustainably.* Production risks can be buffered by land management practices and technologies, such as the enhancement of residual soil moisture through land conservation techniques, or buffer

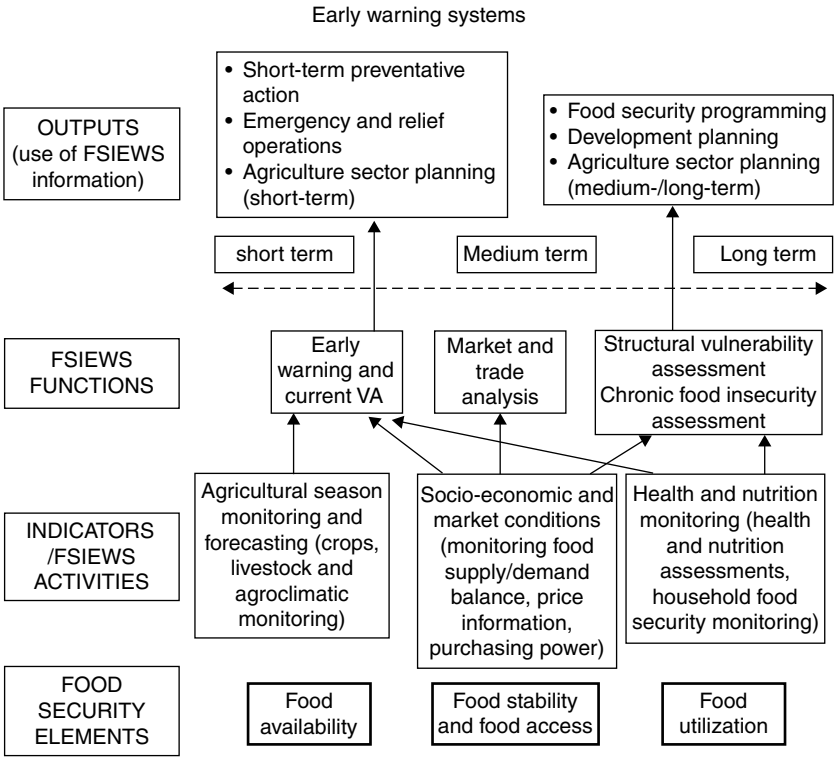

Figure 4.4 Providing timely weather information for all actors in the food system

Source: FAO IDWG (2008) *Climate Change and Food Security: A Framework Document* (Rome: Ed FAO Publishing Management Service).

strips, mulching and zero-tillage, which mitigate soil erosion risk in areas with increasing rainfall intensity.

Conservation agriculture is an option for adaptation as well as for mitigation because the increase in organic soil matter reduces vulnerability to both excessive rainfall and drought.

(e) *Maintaining biodiversity*. Promoting agro biodiversity is crucial for local adaptation and resilience. Biodiversity increases resilience to changing environmental conditions and stresses, because genetically diverse populations and species-rich ecosystems have greater potential to adapt to climate change.

An example of this is rice, which is both affected by and has an affect on climate. Because climate change is expected to have a significant impact

on rice productivity, and thus on the nutrition and livelihood of millions of people, rice systems (especially in south and east Asia) are under increasing pressure due to the high water needs. This crop is currently the staple food for more than half the world's population. Around 2 billion people obtain 60 per cent to 70 per cent of their calories from rice and its products. Furthermore, about 80 per cent of the world's rice is grown by small-scale farmers in low-income and developing countries. While rice is a highly adaptable staple, tolerant to desert, hot, humid, flooded, dry and cool conditions and able to grow in saline, alkaline and acidic soils, currently only two of the 23 rice species are cultivated. Improved technologies would enable farmers to grow more rice on limited land with less water, labour and pesticides, thus reducing damage to the environment. In addition, improved plant breeding, weed and pest control, water management and nutrient-use efficiency can increase productivity, reduce costs and improve the quality of the products of rice-based production systems.[24]

(f) *Improving livestock management.* Approximately 70 per cent of the world's agricultural land is used by the livestock sector, including grazing land and cropland for feed production.[25] Current prices of land, water and feed do not reflect true scarcities, leading to the overuse of resources and causing major inefficiency in the livestock sector.

At present, overgrazing is the greatest cause of grassland degradation, an important contributor to deforestation and the overriding human-influenced factor in determining soil carbon levels of grasslands. In many systems, improved grazing management, such as optimized stock numbers and rotational grazing, will therefore result in substantial increases in carbon pools.

(g) *Improving fisheries management.* Worldwide, some 200 million people and their families, most of them in developing countries, live from fishing and aquaculture. Fish is an important source of cash income for many poor households and is a widely traded food commodity. As well as stimulating local market economies, fish constitutes an important source of foreign exchange.
(h) *Understanding linkages among climate change, energy security and food security.* The IPCC estimates that by 2030, liquid biofuels could supply 3 per cent of the transport sector's energy needs, rising to 5 per cent to 10 per cent if second-generation biofuels take off.[26] Biofuels can be considered to contribute to climate change mitigation only if their use produces fewer emissions of GHG at the end of the production process than the average emissions from fossil fuel use.

Emergent poor farmers with sufficient skills and assets to become successful commercial farmers can take advantage of the emerging liquid biofuel

market, provided they live in locations where growing conditions are suitable and the appropriate infrastructure is present.[27] If domestic markets are functioning efficiently, higher prices can benefit the farmers producing cash crops. However, higher prices for staple cereals such as maize will increase food insecurity for poor farming households that are net buyers of the staple concerned, as is often the case.[28]

(i) *Increasing energy efficiency*. The energy demand has been growing because of the rising cost of petroleum, the concern about dependence on fossil fuel imports, the climate change mitigation benefits of reducing reliance on fossil fuels, and the increase in demand for fuelwood and charcoal for expanding populations in many parts of the developing world. It is important to consider energy saving and efficient use for reducing the demand for energy, including bioenergy, and the potential role of sustainably managed forests and trees as a source of energy at the national and household levels.
(j) *Exploiting forests sustainably*. Sustainable forest management is a dynamic and evolving concept. The aim is to maintain and enhance the economic, social and environmental values of all types of forests for the benefit of present and future generations.[29] Forest management includes all administrative, legal, technical, economic, social and environmental aspects of conservation and use of forests.

In general, developing countries do not count on adequate funding or the skills/human resources for the preparation, implementation and monitoring of forest management plans.

(k) *Improving household energy security and food security simultaneously*: To meet the energy demand of both rural and urban poor people, bioenergy has become the dominant source for about half of the world's population. At the household level, manure, twigs and low-grade biomass is utilized for cooking and heating, and only human force in their productive activities. As people become less poor and move up the economic ladder, they switch to fuelwood, progressing through charcoal, kerosene and gas to electricity, integrating animals and simple tools into production processes. At a certain level of development, people will integrate some level of mechanization, irrigation and fertilization, moving on – if successful – to mechanized equipment such as tractors and harvesters, which imply a switch to fossil fuels.[30]

Among the main mitigation measures, it is possible to find:

(a) *Reducing agricultural and forestry emissions of carbon dioxide*. Intentional land conversion and deforestation, also referred to as anthropogenic

land-use change, currently accounts for an important share of greenhouse gas emissions. Moreover, the reduction in global forested area caused by land clearing and unsustainable logging (in which cut trees are not replaced with new plantings) has reduced the capacity of the world's forests to store carbon. The UNFCCC and the Kyoto Protocol recognize the potential role of forests in providing a variety of adaptive ecosystem services in addition to mitigating climate change through carbon sequestration. These services include biodiversity preservation, watershed protection on mountain slopes, control of desertification and maintenance of the environmental integrity of fragile coastal zones.

Forests' capacity to play their natural role in maintaining climatic stability is closely linked to the response of food systems to the challenge of climate change. To slow down and eventually reverse the still largely uncontrolled deforestation process, forest clearing, grazing in forested areas, cutting down trees for fuelwood and commercial logging must all become planned activities, based on trade-offs between benefits and costs on different spatial and temporal scales.

Action is needed on several fronts, especially by creating economic alternatives to reduce the incentive for clearing forests or using forest resources unsustainably, promoting second-generation biofuels to avoid land clearing for biofuel crops, and enforcing more strictly the regulations that discourage potential investors from starting wildfires to clear land for commercial development.

(b) *Reducing agricultural emissions of methane and nitrous oxide.* Worldwide, ruminant livestock are the largest source of methane from human-related activities, especially in intensive production units, where large numbers of animals are concentrated in relatively small spaces.[31] Through the process of enteric fermentation, which is unique to ruminant animals such as cattle, sheep and goats, unused carbon is released in the form of methane during the digestion of fibrous materials in the diet, as well as from manure. These two sources account for 60 per cent of agricultural emissions of methane and about 30 per cent of total anthropogenic methane emissions. Methane emissions per animal and per unit of livestock product are high when the animals' diet is poor.[32] Better grazing management and dietary supplementation have been identified as the most effective ways of reducing emissions from this sector because they improve animal nutrition and reproductive efficiency. Technically, these diets are relatively easy to improve using feed additives or supplements. However, such techniques are often beyond the reach of smallholder livestock producers, who lack the capital, and sometimes the knowledge, to implement changes.

Relying more on non-ruminant sources of animal protein (pigs, poultry, fish) in the diet can mitigate emissions from enteric fermentation and contribute to food security by improving the livelihoods of livestock-dependent households and adding diversity to the diet. Most of the increase in demand for animal protein to 2030 and beyond is projected to occur in emerging developing countries in Asia, where pig and poultry meat is preferred, so the relative share of beef in total animal protein consumption is likely to decline over time.

Although nitrous oxide is a relatively less important greenhouse gas in terms of share, it is highly potent, and derives almost entirely from manure, cultivated soils that have been fertilized with organic matter or inorganic compounds containing nitrogen and nitrogen-fixing legumes. If manure is managed as a liquid substance, it decays and forms methane.[33] In the wild, animal manure is spread over a wide area and decomposes aerobically in the oxygen in the natural environment; however, intensive livestock rearing methods cause high concentrations of manure to build up in relatively small areas, leading to a predominance of anaerobic (oxygen-free) decomposition of the manure, which produces methane. Methane is not released when manure is managed as a solid substance through composting and drying, or is applied and worked into the fields without being left to stand. Moving away from intensive rearing methods to increased grazing time for animals, so greater dispersal of their manure, also increases aerobic rather than anaerobic decomposition and reduces the rate of methane production.

The other main source of agricultural methane is rice, accounting for almost 40 per cent of agricultural methane emissions and about 20 per cent of all human-caused methane emissions. The warm soil of rice paddies provides ideal conditions for methanogenesis and although some of the methane produced is usually oxidized by methanotrophs in the shallow overlying water, the vast majority is released into the atmosphere. Substantial reductions are possible by growing, under much drier conditions, other rice species with large reductions in methane emissions without any loss in yield.

(c) *Reforestation and afforestation*. Sustainable forest management requires a new tree to be planted for every tree cut down by logging, fuelwood gathering or land-clearing activities. At the global level, however, meaningful carbon sequestration through reforestation and afforestation would require more new trees to be planted each year than were lost to deforestation in the previous year.

Areas that have been intentionally converted from forest to other land uses need to be transformed into stable agricultural areas as quickly as possible, so they are not left in the vulnerable transition period for too long. Cleared

land is at high risk of erosion and loss of soil moisture, so fast-growing cover crops should be planted as soon as possible after clearing, even if they are subsequently replaced by something else. In addition to reducing the risk of erosion, these crops will absorb some CO_2 and can later be ploughed under to enhance the fertility and water-retention capacity of the soil.

Increasing the extent of protected areas and natural parks is another way of augmenting carbon stores. Preserving forests is therefore a vital part of any strategy to mitigate climate change.

(d) *Rehabilitating degraded grasslands*. Grasslands cover about 25 per cent of the world's surface and contribute to the livelihoods of more than 800 million people, including many poor smallholders and pastoralists. Particularly adapted for grazing livestock and pastoral farming systems, especially in more arid parts, mixed farming systems are also important in grasslands. However, factors such as overgrazing, reduction of fallow, water scarcity and cutting down trees for fuel and timber are degrading the land, creating energy scarcities with negative impacts for many rural people.

With better management, these grasslands can produce feedstocks for manufacturing biofuel for local markets, give their inhabitants more secure and sustainable livelihoods that will be resilient in variable and uncertain weather conditions. Dry soils are less likely to lose carbon than wet soils, as lack of water limits soil mineralization and therefore the flux of carbon into the atmosphere. As a result, carbon's residence time in dryland soils is long, sometimes even longer than it is in forest soils. Improved grassland management through the incorporation of trees, improved species, fertilization and other measures can reverse carbon losses, lead to net sequestration and yield additional benefits, particularly by preserving/restoring biodiversity. In 1991, up to 71 per cent of the world's grasslands were reported to be degraded to some extent.[34]

Overgrazing is the greatest cause of degradation in grasslands, and the overriding human-influenced factor in determining their soil carbon levels. In many systems, improved grazing management practices, such as optimizing stock numbers and rotational grazing, will therefore result in substantial increases in carbon pools. Among the many other technical options are fire management, protection of land and set-asides, and enhancement of grassland production, such as through fertilization and the introduction of deep-rooted/legume species.

(e) *Rehabilitating cultivated soils*. There is great potential for net sequestration of carbon in cultivated soils: the carbon sink capacity of the world's agricultural and degraded soils is 50 per cent to 66 per cent of the total carbon loss since 1850.

Under conventional cultivation practices, the conversion of natural systems to cultivated agriculture results in soil organic carbon losses of up to 50 per cent compared with pre-cultivation stocks in the surface metre.[35] Non-conventional cultivation practices allow soil quality to improve and organic soil carbon levels to increase.

(f) *Promoting conservation agriculture*. Conservation agriculture is based on enhancing natural biological processes above and below ground. As well as reducing tillage, the farmers who adopt conservation agriculture also keep a protective soil cover of leaves, stems and stalks from the previous crop, which shields the soil surface from heat, wind and rain, keeps soils cooler and reduces moisture losses by evaporation. Less tillage also means lower fuel and labour costs, and farmers need to spend less on heavy machinery. In zero-tillage agriculture, the soil is never turned over, and soil quality is maintained entirely by the continuous presence of a cover crop. Crop rotation over several seasons is essential to minimize the outbreak of pests and diseases.[36]

The benefits of conservation agriculture include increases in soil organic matter, in turn increasing the amount of carbon stored in the soil. Under conventional tillage, this carbon is metabolized by soil microorganisms into CO2. Experience with conservation agriculture so far show that the increase in organic soil matter continues for about 30 years, before levelling out to a new equilibrium, which generally corresponds to the organic matter content of the virgin soil, before it was cultivated.

Conclusions

The rapid increase in world population in the past decades and the ensuing pressure on the existing natural resources are posing major challenges for the sustainability of ecosystems, which are vital to guarantee the supply of food and drinking water for urban and rural areas indistinctly. It is crucial to implement more sustainable practices that respect ecosystems' carrying capacity.

Asia represents a particularly vulnerable region, given that it is both heavily populated and prone to natural disasters, posing a constant challenge for the food security of millions. In fact, the food requirements predicted for the following century are much higher, in contrast with the estimated decreased water availability for the same region.

Although climate change remains an uncertain science in terms of the magnitude of its implications predicted for the coming decades, recognizing the existence of a changing climate is inducing a change of attitude towards the environment. Mitigation and adaptation measures must be included at all levels, from the household up to national and international political agendas.

Although adaptation and mitigation aim at the same goal, they are still considered and managed differently, reducing the potential that coordinated action with integrated adaptation and mitigation measures could have.[37]

Despite the fact that climate change is seen as a threat to humanity, it is possible to also view it as an opportunity. Due to the impacts it will have on all sectors of society, rich and poor have a stake in preventing climate change from becoming a serious threat to their livelihoods. In fact, climate change potentially represents a driver of change at all levels.[38] It is important that development programs identify such drivers that bring advantages for both rich and poor, so that potential changes have global appeal and transform into action, benefiting present and future generations.

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Part II
Natural Disasters

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5

A European Mechanism to Address Natural Disasters: Working Alone Is Not an Option

Kostas Ifantis

Introduction

The world is witnessing a rapidly increasing impact of disasters caused by the combination of natural hazards and vulnerability, which constantly threatens people's lives and livelihoods. Human-induced climate change is modifying patterns of extreme weather, including floods, cyclones, droughts and wildfires. In many cases, climate change is making these hazards more intense, more frequent, less predictable and longer lasting. This magnifies the risk of disasters everywhere, but especially in those parts of the world where there are already high levels of human vulnerability.

The need to systematically reduce the increased impact of natural disasters is gaining recognition and commitment among governments worldwide, especially after the December 2004 Indian Ocean tsunami disaster. However, disaster risk reduction is a cross-cutting and complex development issue. It requires political and legal commitment, public understanding, scientific knowledge, careful development planning, responsible implementation and enforcement of policies and legislation, people-centred early warning systems and effective disaster preparedness and response mechanisms.[1]

This chapter discusses the drive for effective public policy response at the European level. It examines the developments towards strengthening the existing structures for cooperation between EU Member States as well as setting up a European mechanism to provide for a more 'European' prevention and response to natural disasters. In the background of the discussion are the destructive forest fires of the summer of 2007 in Greece. Because of this, a Greek proposal, inspired by the Barnier Report of 2006, was submitted to the EU Council of Ministers in October 2007, a few weeks after the wildfire mayhem that ravaged most of central and southern parts of the country. The devastating wildfire experience has been one more clear indication that the need for a closer, more institutionalized, and strengthened

European policy on addressing natural disasters is not an option but an imperative.

Prevention and response in the EU

Between 1990 and 2007, the European Union witnessed a marked increase in the number and severity of both natural and man-made disasters, with a particularly significant increase in the former. The loss of human life, the destruction of economic and social infrastructure and the degradation of already fragile ecosystems is expected to worsen as climate change increases the frequency and magnitude of extreme meteorological events, such as heat waves, storms and heavy rains. Analyses carried out by the UN and other international organizations have highlighted a growing vulnerability to disasters, partly as a consequence of increasingly intensive land use, industrial development, urban expansion and infrastructure construction.

In this context, the EU has already developed a set of instruments to address various aspects of disaster preparedness, response and recovery. There are also a number of sector-specific initiatives covering floods, technological disasters, and oil spills which deal with elements of disaster prevention. It could be argued that EU cooperation in the field of civil protection aims to better protect people, their environment, property and cultural heritage in the event of major natural or man-made disasters occurring both inside and outside the EU. The international role that European countries are playing in the provision of civil protection assistance is increasing one emergency after another. Both past, but especially recent disasters such as the 2004 south Asia tsunami, the 2005 US hurricanes, the 2005 Pakistan earthquake, and the various emergencies within the EU, bear witness to this. EU institutions and EU Member States have increased over time their reliance on cooperation for the provision of civil protection assistance in order to be as effective as possible at the site of a disaster. There is clear added value in working together. Such cooperation allows for the pooling of resources, maximizing the collective European effort on site. The management of natural disasters is a clear example of the value of action at EU level, where national responsibility for dealing directly with disasters remains unchallenged but is facilitated and assisted through sheer collective effort. There is, however, no strategic approach, at the EU level, for disaster prevention – at least until very recently.

Civil protection as an area for cooperation within the European Community was brought up at a ministerial meeting in Rome in May 1985. Between 1985 and 1994, several resolutions established operational instruments dealing with the preparedness of those involved in civil protection and the response in the event of a disaster, based on the subsidiarity principle laid down in the Maastricht Treaty. While there is no special title in the treaties on civil protection, it is mentioned in Article 3 in the Rome Treaty

(the reason why it belongs to the first pillar). At the same time, all activities and decisions have to be made under Article 308 in the Amsterdam Treaty, which means that all decisions are taken in consensus. PROCIV, the Council Working Party on Civil Protection, is a legislative Working Party, which takes the important decisions, and it is within this working party that negotiations on proposals from the Commission on civil protection take place.[2]

The fundamental approach to an effective civil protection operation relies on three key modes of action: Prevention, preparedness and response. The European Commission is responsible for supporting and supplementing efforts at national, regional and local levels with regard to disaster prevention, the preparedness of those responsible for civil protection and intervention in the event of disaster. At the international level, the Commission aims to enhance coherence, especially in the context of cooperation with candidate countries in view of enlargement and with partners in the Mediterranean region. In a more general context, the Commission is also working on prevention matters in the development of its environmental policy for climate change.

Information is key to successful cooperation in civil protection matters. The players at stake are not only civil protection authorities but also the public at large, which at any given moment could fall victim to a disaster. Contributing to raising awareness in view of increasing the level of self-protection of European citizens is therefore part of the whole cooperation strategy adopted by the EU and Member States. However, proper distribution of information during emergencies is also a necessity. Without information-sharing the whole cooperation structure would simply collapse. It is in this light that the Commission collects and disseminates validated emergency information and that Member States undertake to pool information on national civil protection capabilities, military and medical resources. Community cooperation also calls for the rapid mobilization of intervention teams, experts and other resources on request in the event of major emergencies in order to alleviate the effects of a disaster during the first days. The Commission is entrusted to facilitate this as well as to offer technical support, including satellite images if these are required.

Over the years, the EU has developed two major tools through which all the above-mentioned policy objectives in the field of civil protection may be achieved.[3] First, the Community Action Programme supports major projects, workshops and training courses in the field of prevention, preparedness and response to natural disasters, both at land and at sea. The Programme was established in 1999. It intends to support and supplement Member States' efforts at national, regional and local levels by implementing action in the event of natural and technological disasters.[4]

Second, and most important, the Community Mechanism for Civil Protection, which involves the participation of 30 European states which pool

their civil protection resources that can be made available to disaster-stricken countries. The Mechanism, which was established on 23 October 2001, increased the activity in the civil protection area and presently PROCIV has meetings more than once a month, whereas in the beginning of the 1990s there were only a couple of meetings a year.[5] The main role of the Community Mechanism for Civil Protection is to facilitate cooperation in civil protection assistance interventions in the event of major emergencies which may require urgent response actions. This applies also to situations where there may be an imminent threat of such major emergencies. It is therefore a tool that enhances community cooperation in civil protection matters. In accordance with the principle of subsidiarity, it can provide added value to European civil protection assistance by making support available on the request of the affected country.

The Monitoring and Information Centre (MIC) is the operational heart of the Mechanism. It is operated by DG Environment of the European Commission and is accessible 24 hours a day. It gives countries access to a platform, to a one-stop shop of civil protection means available amongst all the participating states. Any country inside or outside the Union affected by a major disaster can make an appeal for assistance through the MIC. It acts as a communication hub at headquarters level between participating states, the affected country and dispatched field experts. It also provides useful and updated information on the actual status of an ongoing emergency. Last but not least, the MIC plays a coordination role by matching offers of assistance put forward by participating states to the needs of the disaster-stricken country. Examples of when the mechanism has been used are the Prestige accident (2002); earthquakes in Algeria (2003), Iran (2003/4/5), Morocco (2004) and Pakistan (2005). It was also used in the tsunami in south Asia (2004/2005), in the forest fires in Portugal (2003/2004/2005), in floods in Romania and Bulgaria (2005), in the Hurricanes Katrina and Rita in the United States (2005) and in the forest fires in Greece and southeastern Europe (2007).[6] Especially, the 2004–2005 tsunami in south Asia was instrumental for the debate on strengthening European civil protection capabilities to start afresh in Brussels.

The Barnier Report

Already in early 2006, the Commission had come up with a series of proposals to improve the response of the EU's Civil Protection Mechanism to natural and man-made disasters. The measures proposed would allow the Commission to better address any shortage of transport and equipment needed at the site of a disaster. Moreover, additional measures would contribute to the development of early warning systems, improve coordination and provide logistical support. At the same time, the Commission launched an online disaster monitoring alert service called 'MIC Daily',

designed to monitor emerging and ongoing disasters around the globe. It aimed at enhancing awareness and information-sharing between national crisis centres to maximize the effectiveness of response. The proposals aimed to strengthen the already existing legislative framework governing civil protection cooperation at EU level and to contribute to a more effective and better-coordinated response to major disasters occurring inside or outside the Union. Proposed improvements concerned the areas of transport, equipment, early warning and third-country disasters.[7] At the same time, in January 2006, former Commissioner and former French Minister for Foreign Affairs, Michel Barnier, was asked by the Austrian presidency of the Council and the President of the Commission Jose Manuel Barroso to draw up a report on the EU's response to major cross-border emergencies. The report was published in May 2006, ready for the June 2006 European Council.[8]

The report makes 12 recommendations for a strengthening of European civilian crisis management capacities. Amongst them are proposals for the setting up of a Civil Security Council and a greater role for the General Affairs and External Relations Council; a one-stop shop for the EU's humanitarian response; an integrated European approach to crisis anticipation; the setting up of six EU regional delegations specialized in crisis management in Africa, Asia and Latin America; the establishment of a clear information system for EU citizens travelling outside the Union; the pooling of EU consular resources; the creation of consular flying squads; the setting up of 'European consulates' on an experimental basis in the Caribbean, the Balkans, the Indian Ocean and West Africa; the establishment of a European consular code; the creation or specialization of laboratories to deal with bioterrorism and victim identification. However, the most interesting proposals are those related to the creation of a common, uniformed but civilian protection force suited to act in a number of different scenarios, ranging from natural to man-made disasters (including terrorism) and both inside and outside of the EU.

The report indicates that the EU needs to pool existing national resources. In the absence of overall organization of the European response, with scenarios, protocols and identified resources, the cost of non-Europe is being felt in the effectiveness of the response and in economic terms. For Barnier, only preventive organization and a pooling of existing resources can bring about the emergence of a European civil protection force. Such a European force would be governed by five principles. First, dual subsidiarity, in relation to the Member States and in relation to the United Nations: European crisis capacity must respect the national, regional and local organization of each Member State. Units of this European civil protection force would be made available in line with national and regional powers. The European force's resources of people and equipment would be managed and maintained by the Member States at national or regional level. There would be

no centralization of resources in Brussels. The force would also respect the coordinating role of the United Nations, which sees clear added value in a European pole with the capacity to act, as compared with a multitude of national operations working alongside one another.

Second, voluntary membership and a 'bottom-up' approach. The initiative would come from the Member State wishing to take part in the force. Third, European solidarity. In the event of a crisis inside or outside Europe, the resources making up the force would be devoted as a matter of priority to a European response. If the crisis was in a Member State, and the resources were not needed by Europe, they would be used by the Member State that maintained them. Fourth, specialization. Member States would specialize in the handling of one or more threats, corresponding to the various civil protection scenarios (fires, floods, earthquakes, etc.) that had been precisely identified and mapped to the resources needed to tackle them.[9] Finally, openness. The European force would be open to the non-EU countries that already participate in the European Civil Protection Mechanism and to the Union's other neighbours.

The European force would call on the existing resources of Member States.[10] It should also be able to acquire additional resources, which would be entrusted to volunteering Member States to manage on a delegated basis. At the same time, the EU itself would acquire equipment of this kind under a multiannual programme – in particular, field hospitals, heavy-duty pumps, transport planes and medical material – and these would be entrusted to the interested Member States on a delegated management basis.

The focal points of the European force would be an Operations Centre and a Training Institute for Civil Protection and Humanitarian Aid. Setting up the Operations Centre would not require a transfer of powers. The Centre would be made up of the present MIC teams, with the addition of seconded national experts, who could give it the benefit of their own specialized knowledge. The Operations Centre would draw up the scenarios and protocols in close cooperation with the crisis centres in the Member States, and with the Civil-Military Cell, in order to take account of the strategic transport facilities that might be available to provide logistical support for the civil protection force and for humanitarian aid. One department of the Operations Centre would be responsible for the monitoring and use of satellite capacity in the areas of navigation, communication and observation.

The Training Institute for Civil Protection and Humanitarian Aid would provide training for staff and for the national and regional teams making up the European force and for the evaluation experts working for the EU. It would also be open to NGOs, and on certain conditions to volunteers from among the public who possessed expertise that would be useful in assistance and rescue operations.

While the report's proposals elicited some immediate criticism on the grounds that it promotes centralization of the civil protection agencies

in Brussels, the overall 'Europe Aid' idea was welcomed. The European Parliament reacted especially positively to the proposals.[11] However, at the June 2006 European Council the Member States did not really engage themselves in really giving a policy boost to the proposals. It is worth noting that in the relevant Presidency report for the European Council, there was just a single reference to the Barnier Report.[12] But the forest fires of the summer of 2007 in Greece and elsewhere in southeastern Europe and the Mediterranean proved critical. For it was then that a real quantum leap was made towards a more daring and comprehensive approach on reinforcing the Union's disaster prevention and response capacity.

The 2007 wildfire experience in Greece: A milestone?

Natural disasters are defined as such in terms of how much damage – typically to lives and property – they cause. According to European Forest Fire Information System data, in 2007 almost 270,000 hectares were burnt in Greece, while the annual burnt area since 1980 has been around 100,000 hectares on average. Also, according to data released on August 29, 2007 by the European Space Agency, Greece experienced more wildfire activity that August than any other European country has over the last decade. August 2007 was also the worst month for fires in Greece in the past ten years by a factor of four,[13] killing 76 people and injuring numerous others. A lengthy heat wave in June and unusually strong, dry winds in August exacerbated the country's risk of wildfire. During August, Greek authorities faced an average of up to 85 fire starts and 200 active blazes per day across the country. From 23 August to 31 August, more than 130 fires broke out in the Peloponnese alone, including 82 blazes between 23 and 25 August.

In June and July, wildfires ravaged more than 30,000 hectares of wild land in the north of Greece, on the Island of Crete, and around Athens, including on Mount Parnis and Mount Pendeli. These blazes killed ten people, including two Greek firefighters and two Hellenic Air Force pilots flying fire-fighting aircraft, three part-time firefighters in Crete, and three civilians in Egio Prefecture, in the northwestern Peloponnese. In late August, fires in the Peloponnese and Evia regions killed an additional 66 people and burned across more than 240,000 hectares of land. The fires spread rapidly across the dry terrain, overwhelming the response capacity of the Hellenic Fire Brigade. Estimates of the number of homes and buildings destroyed by the fires range from 1700 to approximately 4000. Homes in more than 100 villages were gutted. Thousands of livestock also perished in the flames. By some estimates, the fires caused 5 billion euro worth of damage.[14]

There are many causes for what happened. Fire essentially is the same the world over, but the wildfires in Greece are unique, characterized by a brew of biophysical, political, social, and cultural factors – some of which are not being thoroughly reported in mainstream media. Ecology and climate

are two biophysical forces that drive wildfires in Greece as part of a natural process. From Turkey to Spain, pyro-landscapes dominate large areas of the northern Mediterranean.[15] Also, meteorological and climatological patterns in the region contribute to varying degrees of fire risk from one season to another and from one year to another.[16] But, fire risk is also fuelled by social and economic processes. Over the course of the twentieth century, poverty, war and economic policies removed many of the very people who knew best how to manage the fire-prone land from the landscape, people who were rooted in the land, and who had an intimate knowledge of how to navigate the often rugged and precipitous terrain.[17]

Economic interests are to be blamed as well. Greek officials have said that at least some of the fires, which came on the heels of deadly blazes in June and July, could be the work of arsonists. Emerging evidence suggests that a mixture of negligence and destructive intent may be to blame.[18] The truth is that potential arsonists have strong economic incentives. Rising incomes have fuelled a construction boom. In Greece, as in other Mediterranean countries, demand is particularly high for land near the sea to build second homes. Although Greek law states that builders cannot put up homes on former forested areas, developers are practiced at getting around such regulations. One reason is that Greece, unlike other European states, lacks a comprehensive register of forests and land ownership. Actually, the process of acquiring such a register has been underway since early 2008 but is moving slowly. It is then easy to have burned forest land reclassified as former farmland, which can then be sold for development. Although such problems are known to plague other fire-prone parts of Europe, nowhere is the problem more acute than Greece.

It will take years for Greece to recover from this summer's record wildfire season – and it may not happen at all if officials don't take steps to protect burnt land during the renewal process – warns the Greek chapter of WWF. The group has assessed in detail how years of poor forest management combined with high temperatures and dry weather created this year's unprecedented tinderbox situation.[19] Environmentalists and academics warn that Greek forests face additional hazards unless the government acts quickly and decisively. Without plants to anchor the soil, for instance, burn zones are ripe for heavy erosion, flooding and landslides if heavy rains douse the areas in the next few years. This is particularly true in the higher elevation burned zones. Precisely how Greek authorities plan to manage the deforested lands remains to be seen. The government has announced plans to replant in the burn zones. Because towns have sprung up amidst the ashes of forests burned in the past, there is good reason for pessimism. Fire always forces land-use changes. After every fire, a certain proportion of the burned area is always developed.[20]

However, the major problem is that the natural balance of fire and renewal in Greece could be upset in the near future. Climate models indicate that

the area is likely to transform into an even hotter and drier landscape during the twenty-first century. Key species in the current forest stands, which are adapted to the present climate, may not be able to recover from fire, propagate and thrive under the anticipated climatic conditions. Research has already indicated that forest stands that have burned repeatedly over relatively few years do not regenerate.[21]

Greece civil protection capabilities and emergency services struggled to contain the fires. Nearly 1000 soldiers, backed by military helicopters, reinforced firefighters who were stretched to the limit.[22] By sea and by land, the authorities evacuated hundreds of people trapped by flames in villages, hotels and resorts. In such a situation, Greece requested assistance to help combat the fires through the European Civil Protection Mechanism. The request triggered a rapid response from the Monitoring and Information Centre (MIC) of the European Commission. The MIC immediately alerted the civil authorities of the 30 countries participating in the Community Civil Protection Mechanism.[23] At least 12 countries sent reinforcements, and six water-dropping planes from France and Italy joined operations. The EU and some third countries – such as Russia – sent a total of 31 fire-fighting aircraft.

At almost the same time, the MIC received requests for assistance from Bulgaria, Italy, Cyprus and the former Yugoslav Republic of Macedonia. It seems that the MIC reacted quickly and relatively effectively to facilitate and support the mobilization of Member States' assistance. However, the MIC's experience also underlined the importance of further developing the Community Civil Protection Mechanism and strengthening the MIC by giving it an autonomous capacity to mobilize additional fire-fighting resources. The conclusion was that a more robust European system is needed to deal with the increase in natural disasters across Europe and that brought the ideas found in the 2006 Barnier Report to the forefront again.

Reinvigorating the debate: A Greek initiative

In the framework of the October 2007 EU GAERC, Greece submitted a proposal for enhancing European cooperation for the prevention of and response to natural disasters and emergencies. It was an initiative that stemmed from a discussion which took place in Paris on 30 July 2007 between the French president, Nikolas Sarkozy, and the Greek prime minister, Costas Karamanlis, with the fires ravaging Greece and southern Europe still untamed. At that time, Sarkozy and Karamanlis called for closer cooperation in the field of prevention and response that would go beyond the traditional voluntary pooling of national resources.[24] The essence of the Greek proposals was the reinvigoration of the Barnier Report, focusing on the creation of a cohesive mechanism of European civil protection. It would embody the principle of European solidarity through concrete and effective

collective action and with the aim of achieving more timely coordination between national civil protection structures and improved interoperability within the European civil protection system; increased effectiveness, resulting from the availability and/or acquisition of common (European) means, the use of European know-how and technologies (e.g., satellite surveillance) as well as from the sharing of experiences and of national best practices; and increased cost-effectiveness, since the cost of prevention and preparedness is substantially smaller than that of reconstruction ex post facto.[25] The strategic objective of the Greek initiative was to comprehensively develop further, as soon as possible, the existing European mechanism, in order to be able to respond efficiently to emergencies and to any kind of disaster. To this end, the following were proposed:

I Reinforcement of existing tools

- Expediting the implementation of decisions already adopted regarding the coordinating role of the MIC and the enhancement of the Civil Protection Mechanism (i.e., modules, common training and exchanges of experts).
- Reinforcing resources available to the MIC, mainly through the exchanges of Member States experts, so that it can become a genuine operations centre capable of taking an active role in improving the common EU response.
- The simplification of procedures for EU co-financing of transport.
- The enhancement of the EFFIS (European Forest Fire Information System) initiative, provided it proves its added value in forest fires mitigation.

II Enhancing EU capacity

- To simplify the procedures for the transfer of aerial means since this would increase their operational capability, as soon as they arrive in the affected MS.
- To establish civil protection modules in each MS, according to specific national needs.
- To examine all funding possibilities for additional means and equipment for forest fires and floods and disaster mitigation (such as planes, helicopters, etc.), according to actual needs, especially when disasters strike more than one country simultaneously.

III Creation of a pool of forces

Apart from the above, the EU should establish a system that will add to national resources in time of need. The creation of a European pool of forces is suggested, based on the existing Civil Protection Mechanism community structures. Member States will contribute civil protection modules,

equipment and other resources to the pool, according to their national capacity. The planning and coordination will be on a community level, in order to cover all needs. In this framework, the coordinating role of the MIC should be reinforced and inter alia, by endowing it with operational functions; in this way the MIC will be in a position to activate the necessary structures of the pool, and coordinate prompt and quasi 'automatic' intervention, along with the national resources of the affected MS. More specifically, the community mechanism will be responsible, inter alia, for:

- Scenarios and gap analyses;
- Collecting operational, real-time information for immediate use by the national civil protection structures (e.g., satellite images, meteorological forecasts, etc.);
- Establishing commonly accepted methods and procedures, including relevant indicators for prevention in disaster response (e.g., European index for forest fires risk, according to which preventive measures will be intensified, aerial means will be transferred, etc.);
- Providing access to additional common means and resources.

Following the submission of the Greek proposals, the discussion acquired a momentum of its own. After GAERC, Germany proposed '*strengthening EU prevention and preparedness for natural disasters*', sustaining exchange of good practice among Member States and the establishment of a European engagement at the prevention and preparedness level. At the Meeting of Directors-General for Civil Protection, held on 25 October 2007, the Commission presented several ideas for the future, including the implementation of a European Institute specializing in Civil Protection, reinforcing the MIC and developing additional capabilities at European level (applicable to fire-fighting aircraft in a first stage). The Conclusions of the Euro-Mediterranean Ministers of Foreign Affairs Meeting, held in Lisbon on 5 and 6 November 2007, signalled that efforts should be made to establish a Euro-Mediterranean civil protection system, starting with a network of permanent national correspondents. The EU Council adopted the recast of the Community Civil Protection Mechanism on 8 November 2007. The Community Civil Protection Mechanism called for creating modules to enable faster and more targeted response to the specific need in the event of future disasters. Six Member States (Austria, Finland, Germany, Netherlands, Sweden, United Kingdom) submitted a joint paper entitled 'Natural Disasters: Strengthening Prevention and Preparedness in the EU' in order to make additional proposals in the field of prevention and preparedness.[26] Also, on 14 December 2007 the Commission published a Staff Working Document on strengthening early warning systems in Europe[27] and, most importantly, on 5 March 2008 it published its Communication on 'Reinforcing the Union's Disaster Response Capacity'.[28]

The purpose of this Communication was to make proposals to reinforce the EU's disaster response capacity, building on what had already been achieved. According to the Commission, these proposals are a first step on the road to a comprehensive and integrated EU response and are aimed at reinforcing and creating synergies between existing instruments, and at strengthening coordination between them. The Commission uses the notion 'disaster' in a broad sense to cover not only natural or man-made disasters but also conflict-related complex emergencies, taking place within and/or outside the EU. In addition, a specific annex on forest fires is attached to illustrate how further prevention, preparedness, response and recovery measures could be combined to deal with a disaster of the magnitude of the one that struck Greece and Southeastern Europe.

What is being indicated very forcefully is that greater coherence, effectiveness and visibility are needed to achieve the objective of a more integrated EU disaster response capacity. At the core of the Commission's proposals is the need for existing resources to be pooled more efficiently between EU level and Member States instruments, and between EU/Community instruments.[29] There is also a need for improvement in the 'vertical' coordination between the EU level and Member States. What is important, however, is that the improvements introduced by the Commission draw notably on suggestions from the Barnier Report: The development of the Monitoring and Information Centre into an Operations Centre for European civil protection intervention; the identification of gaps in disaster response resources and where gaps exist the presentation of proposals for improving the European civil protection response capacity based on two components: a voluntary pool of key standby civil protection modules to be available for deployment at any time, and additional reserve capacities designed to complement national responses to major disasters such as forest fires and flooding.[30]

The proposal met with criticism, especially by the humanitarian community. Their criticism stems from their concern that military actors were encroaching on humanitarian space. However, military assets have been an integral part of the international community's response to many major natural disasters and it is true that the combination of military and civilian components in such a force could ensure a smoother transition between the surge phase (when military assets tend to be utilized) and the relief and recovery phases (when civilian assets have a distinct advantage). In principle, such a force will streamline and provide a more coherent framework for provision and use of military and civilian assets for disaster and humanitarian response and avoid the bilateral channelling of assets that has come to dominate the disaster relief scene. In addition, it could mean an enhanced level of international cooperation between the UN and the EU.

The financial resources required to create the force are a matter of consideration, particularly since the proposal calls for a standing capacity. In

general, military assets are expensive to deploy compared with civilian assets. This has often led to heated debates concerning whether the deployment of military assets impinges on humanitarian aid budgets. The 2007 Civil Protection Financial Instrument could be mandated to finance the cost of the ECPF. The plan for the funding to be partly drawn from ECHO's budget for external action draws strong objections from the humanitarian quarter. Unless the force receives an adequate level of financing and is drawn from one pot of funding, rather than a multitude of financial instruments, its capacity for rapid response may suffer.[31]

In June 2008, the Council adopted conclusions highlighting the requirement for an integrated approach to disaster management, encompassing prevention, preparedness, response and recovery. The Council also stressed the need for a coordinated approach, inviting the Commission and the Member States to take this work forward rapidly.[32] Then, in November 2008, the Council also adopted conclusions which called for the setting up of European Disaster Management Training Arrangements. These aim at the development of two strands of activities: to promote consistency amongst national training programmes in support of disaster management, on the one hand, and to ensure a wider range of training opportunities at Community level for disaster management experts and intervention personnel, on the other.[33]

Towards an EU approach

After many years of inaction, indifference, and mounting costs of recovery from natural disasters, there are clear signs that an EU approach to disaster prevention is developing. In its February 2009 Communication the Commission for the first time attempts to map out a comprehensive policy programme on disaster prevention. It is a programme that unfolds along four key elements:[34] First, the creation of the conditions necessary for the development of knowledge-based disaster prevention policies at all levels of government. These would include creating an inventory of information on disasters, spreading best practices, developing guidelines on hazard/risk mapping, and encouraging research activities with the aim of improving coordination of Community-financed research in the area of early warning systems and on interoperability of information and monitoring systems, etc. Second, linking the actors and policies throughout the disaster management cycle. A range of Community and national policies can be managed in a way that supports the disaster management cycle – prevention, preparedness, response, recovery. This requires linking the actors involved in developing and implementing measures that can have a significant impact on disaster prevention, such as extending the lessons learnt from exercises as well as training and awareness-raising in the area of disaster prevention, and reinforcing early warning tools. Third, making existing

instruments perform better for disaster prevention by more efficient targeting of Community funding, and by taking account of disaster prevention in existing Community legislation. Finally, reinforcing international cooperation with Candidate Countries and potential Candidate Countries, within the European Neighbourhood Policy, by reinforcing the disaster prevention chapters in existing agreements, through the programme for prevention, preparedness and response to natural and man-made disasters. This would be in the framework of the Euro-Mediterranean Partnership, and with Eastern ENP partners on prevention to natural and man-made disasters. Although the communication focuses on prevention, it is stated rather explicitly that the EU should take an integrated approach, addressing all types of disasters and the whole disaster cycle, encompassing not only prevention but also preparedness, response and recovery.[35]

Conclusion

Today's disasters are often of a cross-border nature and require multilateral and coordinated responses. At the same time, boundaries between internal and external disasters are increasingly blurred. The Indian Ocean tsunami affected European tourists as well as the local populations, floods and fires affect both EU Member States and neighbouring countries, and epidemics can spread from one continent to another, European citizens need to be evacuated from crisis areas, etc. Often the same instruments – in particular civil protection assets – are deployed by the Community and Member States to respond to the same needs within the Union and beyond EU borders, either as a stand-alone disaster response contribution or as a complement to humanitarian aid. Any EU response to a given disaster has to make use of the most appropriate components available based on needs. In addition, aspects such as speed, effectiveness and cost-efficiency need to be taken into account.

The complexity and scope of these multidimensional challenges require a comprehensive approach by the EU to the continuum of disaster risk assessment, forecast, prevention, preparedness and mitigation (pre and post-disaster), bringing together the different policies, instruments and services available to the Community and Member States working as a team. This helps to balance national responsibility and European solidarity. The existing links between civil protection and environmental policies should be reinforced in order to take full advantage of the preventive measures included in environmental legislation and ensure an integrated EU approach to disaster prevention and mitigation. In addition, cost-effectiveness concerns and resource constraints call for a managed, coordinated and integrated response. When providing assistance to people affected by disasters outside its borders, the EU response should be an integrated part of the overall international response.

By the time this chapter was being finalized, a Community strategy on disaster prevention was being proposed by the Commission. For some this might seem a very modest and perhaps disappointing development, especially against the reality of the dramatic increase in the frequency and severity of natural disasters both within and outside the EU. But undoubtedly such a strategy would reduce the disparities within the EU regarding the protection of people, the economy and environment from the effects of disasters, increase the general level of awareness amongst decision makers and the public, promote best practice, and thereby increase the resilience of the EU and its economy to the increasing threat of natural and man-made disasters. In the short term, specific actions contributing to the development of knowledge, better linking of actors and policies, and an improvement in the effectiveness of existing policy instruments with regard to disaster prevention could provide a flexible option for Community action that could adjust to the different needs and resources of Member States, simultaneously ensuring EU-wide coordination and consistency. It would have the potential for delivering relatively low cost results, would enhance the understanding of disaster prevention issues at all levels and provide the basis for a much-needed strategic approach in reinforcing the Union's disaster response capacity.

Notes

1. See United Nations (2007) *International Strategy for Disaster Reduction: Guidelines, National Platforms for Disaster Risk Reduction* (Geneva: United Nations International Strategy for Disaster Reduction Secretariat, UNISDR), pp. 1–2.
2. M. Britz 'Translating EU Civil Protection in the Nordic States – Towards a Theoretical Understanding of European Crisis management Capacities', paper prepared for the European Union Association's Tenth Biennial International Conference, Montreal, Canada, 17–19 May 2007, p. 3.
3. There are also tools that have been specifically designed to deal with major industrial chemical accidents and combating marine pollution.
4. See www.europa.eu.int/comm/environment/civil/index.html.
5. M. Britz 'Translating EU Civil Protection in the Nordic States – Towards a Theoretical Understanding of European Crisis Management Capacities', paper prepared for the European Union Association's Tenth Biennial International Conference, Montreal, Canada, 17–19 May 2007, p. 3.
6. The Mechanism can also be used as a part of the ESDP, although that has not happened yet.
7. Notably, the following improvements were proposed: Transport – The national civil protection authorities are responsible for transporting their own civil protection personnel and equipment to the site of a disaster. However not all of them have aerial means – or the cost of an airlift might outweigh the financial value of the assistance provided. The Commission therefore proposed that when national transport is not available, insufficient or not viable, the Commission will have the right to hire the necessary transport means; equipment – In case of simultaneous or large-scale disasters, some equipment, such as high capacity pumps might

not be readily available. In cases such as this, the Commission will be allowed to mobilise additional equipment including basic logistical equipment, in particular communications material; early warning – The Commission will be in a position to play a more important role in developing early warning systems, allowing for more timely intervention. It will be better able to assess and upgrade where necessary existing early warning systems; improve the link between detection systems and alert mechanisms; and make them more accessible to decision makers; third-country disasters – coordination is essential to a successful assistance operation. Through the proposal, coordination will be reinforced, whether European intervention is autonomous or led by an international organisation. In addition, the Commission at that time launched on its Internet web site a daily bulletin called 'MIC Daily' which monitors emerging and ongoing natural and man-made disasters around the globe. It aims to inform decision makers and crises centres in Europe and abroad. The 'MIC Daily' is connected to more than 50 early warning and real-time alert services and hundreds of news sources around the world. It provides a concise overview of the main disasters (earthquakes, floods, forest fires), complete with hyperlinks to detail reports, maps, satellite imagery and analyses. It is also accessible by the public. See 'Civil Protection: Commission Proposes to Strengthen the EU Civil Protection Mechanism', IP/06/89, 27 January 2006.

8. Michel Barnier (2006) *For a European Civil Protection Force: Europe Aid*, http://ec.europa.eu/commission_barroso/president/pdf/rapport_barnier_20060508_en.pdf (accessed on 20 January 2008).
9. According to the report, Member States could join together to establish a group of countries specialised in the management of a particular threat, setting up units big enough to be operational. A recent example of specialisation of this kind is provided by five countries in the south of the EU which have joined to fight the danger of fires (Fire Five). In the future, the coastal countries of the EU might also pool their resources to set up a European coastguard.
10. The report clearly indicates that the European resources must in any event be upgraded: to support humanitarian aid, four or five Airbus A 400Ms (replacing the Hercules C-130s) and some Casa aircraft should be bought. These would be deployed at one or more multimodal bases. There would have to be close collaboration between the Member States, the General Secretariat of the Council, the future Operations Centre and the European Defence Agency.
11. 'MEP's Hear Barnier's Plan for a European Civil Protection Force', http://www.europarl.europa.eu/news/expert/infopress_page/059–11290-275–10-40–910-2 (accessed 6 September 2007).
12. 'The Presidency Has Expressed Its Gratitude to Michel Barnier for His Report, Which Considers a Useful Input for Our Work'. See Council of the European Union, *Draft Presidency Report on Reinforcing the European Union's Emergency and Crisis Response Capacities*, 9630/1/06, Brussels, 2 June 2006.
13. *The New York Times*, 29 August 2007.
14. *The Economist*, 1 September 2007.
15. The trees growing on these lands have adapted over time to periodic burning. Fine fuels, such as grasses, emerge every winter during the rainy season only to dry quite rapidly once the summer season arrives. Frequent, low-intensity fires serve to clear out these fuels, provide the necessary heat to release pine tree seeds, and restore nutrients to the soil. For centuries, the grazing of sheep and goats, as well as the burning practices of shepherds that improved pasture conditions, also served to control fuel loads.

16. In summer 2007, three searing heat waves struck the area in relatively rapid succession. The heat, combined with the drying effects of strong winds that buffet Greece every summer, extracted whatever residual moisture remained in the vegetation and soil.
17. Massive and repeated waves of migration depopulated much of the Greek countryside. Young people from the villages abandoned rural landscapes, including pastures, olive groves, and orchards, for better prospects abroad and in Greek cities. In some depopulated areas, forests have expanded; in many others, although olive oil production remains high in Greece, there are many untended groves and orchards that have become derelict and increasingly fire-prone.
18. A recent map of fire locations displays a distinctive pattern of fires near Athens and in seaside areas – as well as in the Taygetos Mountain in southern Peloponnese – that at least hints at destructive intent because almost all the fires have ignited in or near important tourist areas.
19. Some swaths of Greek forest are fire-dependent and will regenerate quickly. Evergreen strawberry trees, along with mastic and other common shrubs, resprout following fire. These lowland plants may start regeneration within two to three years. And short-statured Aleppo pines release their seeds when they are exposed to fire. But much of the damaged land will need far longer to recover. One unusual feature of the fires this year is that they reached unusually high elevations – up to 4900 feet (1500 meters). Upland forests in Greece are not accustomed to fire and could take 50 years or longer to renew. This is not typical Mediterranean forest, and it is not easy to regenerate. One place this is critically important is Mount Parnis National Park near Athens, which lost more than one-third of its trees. This forest has been contributing greatly to the climate of Athens, smoothing high-temperature peaks, acting as a filter of pollution, and being a source of oxygen. On another front, it may be impossible to restore the acres of olive groves grown for agricultural purposes on the Peloponnese Peninsula. Many groves contained trees that were more than a hundred years old. The flames also hit seven Natura 2000 sites, burning 74,000 acres (30,000 hectares). This included the lands surrounding Lake Kaiafa, where most of the human fire fatalities lived. The burned areas include habitats for several animal species, including the endangered golden jackal and red deer and several lizard and turtle species. See also, Hope Hamashige 'Greek Wildfire Recovery Could Take Decades', *National Geographic News*, 3 October 2007.
20. Wildfires (along with floods and earthquakes) constitute the most devastating natural disasters in the Euro-Mediterranean Basin. Greek forest fires have been occurring with catastrophic frequencies for the last 50 years, in a fire-prone and vulnerable natural environment in terms of vegetation, topography, climate and human geography. In adverse climatic conditions, predicted over the next decades, the wildfire problem of Greece will potentially intensify due to unorthodox and truly irrational land use planning and inherent lag in technological know-how adaptation. See, Martha Henderson, Kostas Kalabokidis, Emmanuel Marmaras, Pavlos Konstantinidis and Manussos Marangudakis (2005) 'Fire and Society: A Comparative Analysis of Wildfire in Greece and the United States', *Human Ecology Review*, vol. 12, no. 2, 172.
21. Evidence of this is readily apparent in places like the island of Chios, where large areas are virtually denuded of all but thorn scrub vegetation.
22. Although, on paper civil protection in Greece is organized in a quite rational way and according to European and international standards, in reality the state's civil protection system is being undermined to the point of paralysis by the

lack of coordination between different authorities, inefficient use of human resources and underqualified regional officials. Greece ranks 114th out of 262 countries in terms of its 'susceptibility to natural disasters'. This laggard rate is blamed on the fact that responsibilities for the prevention and containment of natural disasters are scattered across ministries, local authorities and security forces and that there is no clear strategy for cooperation among these groups. According to a report commissioned by the Interior Ministry, there is 'confusion on every level and structural paralysis, the onerous consequences of which were proven dramatically in the 2007 forest fires'. For the prevention of natural disasters such as fires and earthquakes some 45 organizations are involved in nine areas of competence. Eleven state services and 14 organizations are involved in containment. 'Much of the dysfunctionalism reported during natural disasters is due to the confused involvement of so many organizations'. Many of the aforementioned services, including the fire brigade, are understaffed. Moreover, more than half of local authority officials employed for civil protection have only been educated to high school level. This hardly qualifies them for 'studying and analysing risks based on scientific criteria', as called for by the Civil Protection Authority. The report contrasts the chaotic system in Greece against the implementation in other countries of an Integrated Emergency Management System, a central, unified service which coordinates all bodies involved in the prevention and containment of natural disasters as well as reconstruction. See 'State Unequipped for Disasters', *The Kathimerini*, 17 June 2008.

23. 'Natural Disasters: Update on EU Civil Protection Activities', IP/07/1166, Brussels, 24 July 2007.
24. 'Dimas Welcomes Barnier Idea on Rapid Reaction Force on Forest Fires', IP/07/1200, Brussels, 31 July 2007.
25. 'Greek Initiative for Enhancing European Cooperation for the Prevention of and Response to Natural Disasters and Emergencies', Non Paper submitted by Greece to the GAERC, 8 October 2007.
26. Future Group (2007) *Civil Protection*, http://www.statewatch.org/news/2008/jul/eu-futures-dec-civil-protection-2007.pdf (accessed on 20 January 2008).
27. Commission of the European Communities, Commission Staff Working Document, *Towards Better Protecting Citizens against Disaster Risks: Strengthening Early Warning Systems in Europe*, SEC (2007) 1721, Brussels, 14 December 2007.
28. Commission of the European Communities, Communication from the Commission to the European Parliament and the Council, *Reinforcing the Union's Disaster Response Capacity*, COM (2008) 130 final, Brussels, 5 March 2008.
29. *Ibid*., p. 6.
30. *Ibid*., p.10.
31. S. Wiharta (2008) 'European Civil Protection Force: A Step towards a More Effective Disaster and Humanitarian Response?', *ISIS Europe – European Security Review*, no. 42, December, 3.
32. Council of the European Union, *Draft Council Conclusions on Reinforcing the Union's Disaster Response Capacity – Towards an Integrated Approach to Managing Disasters – Adoption*, 10128/08, Brussels, 29 May 2008.
33. Council of the European Union, Presidency Report, *Reinforcing the European Union's Capacities to Prevent and Respond to Disasters*, 15933/08, Brussels, 18 November 2008.
34. Commission of the European Communities, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *A Community Approach*

on the Prevention of Natural and Man-made Disasters, COM (2009) 82 final, Brussels, 23 February 2009.

35. See Commission of the European Communities, Commission Staff Working Document, *A Community Approach on the Prevention of Natural and Man-made Disasters – Impact Assessment*, SEC (2009) 202, Brussels, 23 February 2009, p. 6.

6
Natural Disasters in Japan

Haruo Hayashi

Introduction

Japan is a disaster-prone country which suffers from many kinds of natural disasters because of its geographical, topographical and meteorological conditions. As indicated in Figure 6.1, the number of dead or missing as a result of natural disasters exceeded 1000 almost every year because of successive big typhoons and earthquakes from the end of the Second World War to the 1959 Ise-wan typhoon, which caused the greatest flood damage with over 5000 dead or missing. This event made holistic disaster management one of the top priority policies in Japan. The impact of natural disasters in terms of mortality decreased because of various kinds of flood mitigation measures over the years to the extent that there would be no more disasters in Japan with 1000 or more fatalities until the 1995 Kobe earthquake occurred. It was found that Japanese disaster management was not well prepared for devastating damage due to near field earthquakes when the 1995 Kobe earthquake disasters killed more than 6000 people. More recently, we are facing two new challenges. One is the preparation for the expected mega damage due to a series of gigantic inter-plate earthquakes and tsunamis in the first half of this century. The other is the preparation for the so-called guerrilla flood, which is an acute micro-flood, due to extreme rainfalls which could occur at anywhere and anytime. In this chapter, the progress and remaining issues in natural disaster management in post-war Japan for the last 50 years will be reviewed.

Natural disasters and disaster management in Japan by mortality

The characteristics of natural disasters and disaster management in Japan after WWII can be summarized, as shown in Figure 6.1, in terms of the number of people killed or missing due to natural disasters for each year between 1945 and 2000. First, it is clear that Japan suffers from both geo-hazard

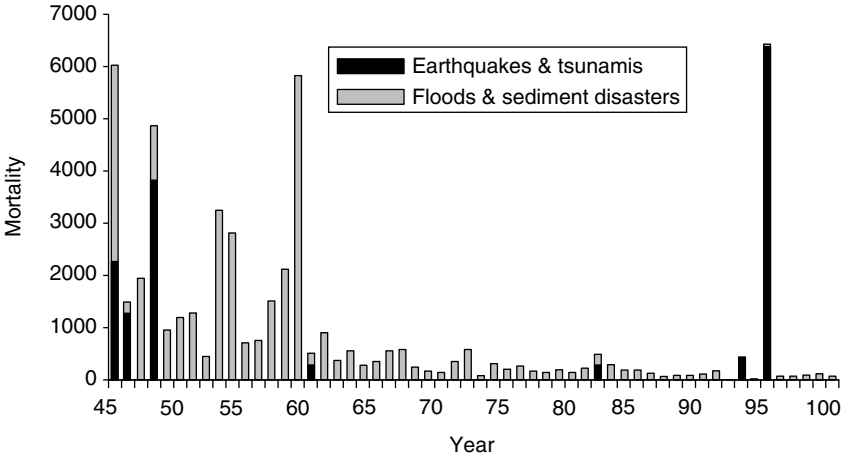


Figure 6.1 Japanese natural disasters by mortality between 1945 and 2000

Source: Adopted from Cabinet Office, Government of Japan, 'White Paper on Disaster Management' (in Japanese).

disasters and weather-related disasters. Geo-hazard disasters are small in number but devastating in damage. Weather-related disasters are more frequent in number but casualties are kept minimal. In terms of disaster management, there were two notable events during this period: the 1959 Ise-wan Typhoon flood disaster, and the 1995 Kobe earthquake disaster. Following each event, disaster management systems and practice in Japan have gone through major modifications to improve their effectiveness. Thus, in this chapter it is proposed that Japanese disaster management can be divided into three phases: 1945–1960, 1961–1995, and 1996–present.

Geo-hazard disasters in Japan

The Japanese archipelago is located in the Circum-Pacific 'Ring of Fire' where seismic and volcanic activities occur constantly. Although the country covers only 0.25 per cent of the land area on the planet, about 10 per cent of seismic energy will be released in this region so that the number of earthquakes and distribution of active volcanoes is quite high in comparison with other parts of the planet. However, only 17 earthquake disasters and eight volcanic eruptions occurred between 1945 and 2000. There were only seven earthquake and tsunami disasters which killed more than 100 people during this period. Figure 6.2 shows the epicentres of these seven major earthquake disasters. These earthquakes can be classified into two groups based on the mechanism of why earthquakes occur: inter-plate earthquakes and intra-plate earthquakes.

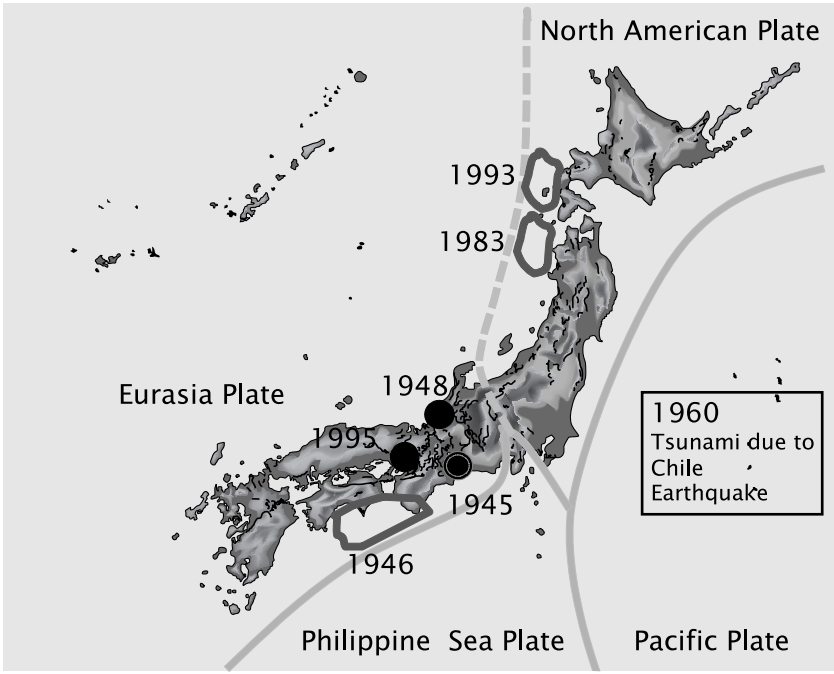


Figure 6.2 Major earthquakes and tsunami disasters with 100 or more mortality between 1945 and 2000

Source: Compiled based on 2005 Chronological Scientific Tables, Maruzen, Japan.

Inter-plate earthquakes occur at the boundaries of two plates whose magnitude tends to exceed 8.0 with short return periods of hundreds of years. There were four inter-plate earthquakes between 1945 and 2000: the 1946 Nankai earthquake, the1960 Tsunami disaster due to the Chile earthquake, the 1983 Nihonkai Chubu earthquake, and the 1993 Hokkaido Nansei-oki earthquake. As shown in Figure 6.2, the epicentres of these events were under the sea so they were accompanied by devastating tsunami that intensified the damage. The number of mortalities was as follows: the 1946 Nankai earthquake, 1330; the 1960 Chile earthquake tsunami, 142; the 1983 Nihonkai Chubu earthquake, 104; and the 1993 Hokkaido Nansei-oki earthquake, 230. In reality, victims were mainly killed by flooding due to tsunami attacks rather than strong ground motion itself. This is why tsunami became the prime target for disaster reduction in Japan.

The Nankai earthquake is the most frequently recorded earthquake in the world, nine times in the last 1300 years. It is known that the average return period of this earthquake is about 100 years and it creates a seismically active period and quiescent period alternately in the Western Japan region.

The active period usually lasts for several decades before the event and the first 10 years after the event. During the seismically active period it also tends to increase the occurrence of devastating intra-plate earthquakes.

Intra-plate earthquakes occur when active faults rupture. They are small in size and less frequent in comparison with inter-plate earthquakes, with an average magnitude of 7.0 and a return period of thousands of years. There were three intra-plate earthquakes between 1945 and 2000: the 1945 Mikawa earthquake, the 1948 Fukui earthquake, and the 1995 Kobe earthquake. These three earthquakes caused devastating life loss: the 1945 Mikawa earthquake, 2306 dead; the 1948 Fukui earthquake, 3769; the 1995 Kobe earthquake, 6435. It was because the epicentres of these earthquakes were very close to the places where many people live that very strong ground motion caused building collapses.

After the 1948 Fukui earthquake, there was a period of seismic quiescence for about half a century until the 1995 Kobe earthquake occurred. During this period, Japan achieved great economic development, which helped to create most of the current Japanese houses and infrastructure. In that sense, the majority of Japanese houses and infrastructure have not been tested by major earthquakes. The 1995 Kobe earthquake is believed to be the first event of a new seismically active period before the twenty-first century Nankai earthquake occurs, which may happen sometime between the 2020s and 2040s. According to the estimate by the national government of Japan, devastating damage is expected, a total of 21,000 people would be killed with a total cost of 840 billion USD. Damaging intra-plate earthquakes are also expected more often during the seismically active period. In reality, a series of moderate-sized intra-plate earthquakes occurred at various places in Japan in 2000, 2001, 2003, 2004, 2007 and 2008.

Weather-related disasters in Japan

The Japanese archipelago, which extends over 2000 km from north to south and is predominantly mountainous, lies in the northeast end of the Asian Monsoon Zone whose weather is generally mild and humid with considerable climatic variations from region to region. Figure 6.3 summarizes the annual pattern of temperature and precipitation in major cities in Japan. The average annual precipitation in Japan is about 1600 mm, which is almost double the world average. Northern Japan on the Japan Sea side has heavy snow during winter. Almost all Japan has 'Tsuyu' (a rainy season) in June and July. Southern Japan will have typhoons in September and October.

Given the Japanese topographical and meteorological conditions mentioned above, Japanese rivers share the following common characteristics: they are prone to flooding because they flow rapidly, due to the steepness of slopes along their basins and their relative shortness. The ratio of peak flow discharge to basin area is relatively large, ranging from 10 times to as

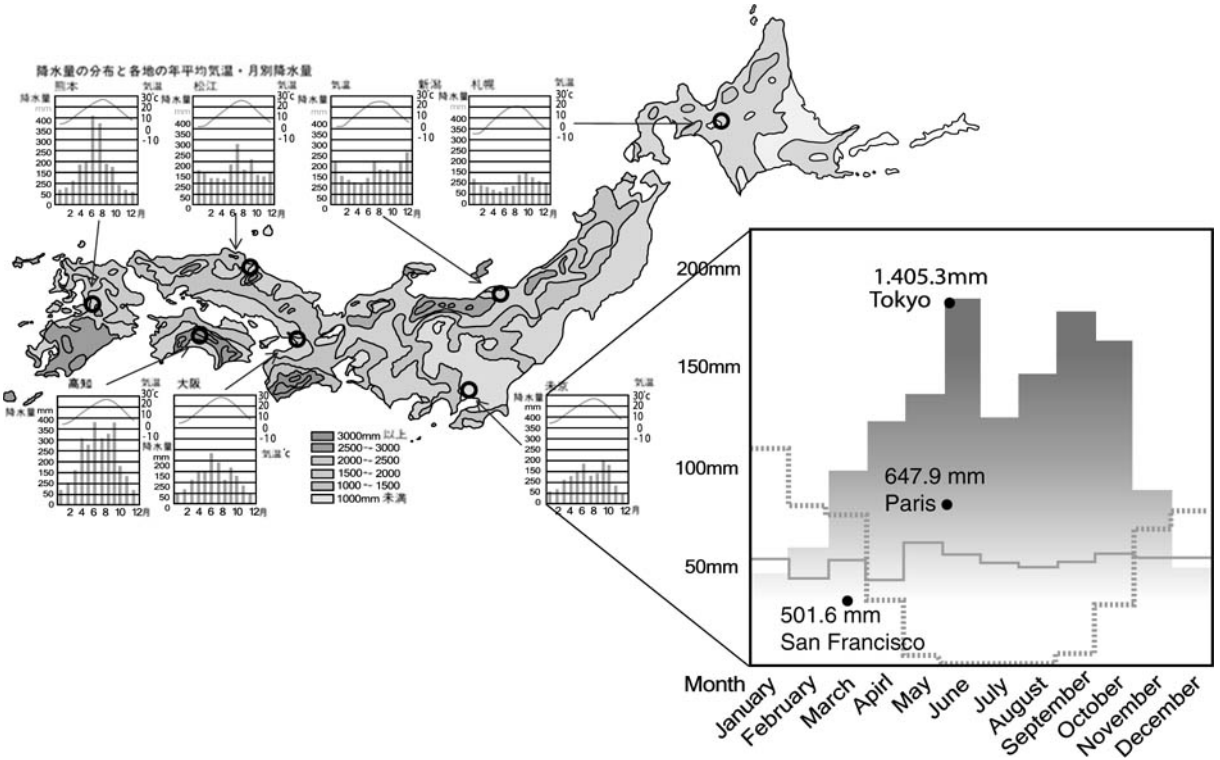


Figure 6.3 Japanese weather

Source: http://suido-ishizue.jp/daichi/part1/01/05_1.html (accessed 14 October 2008).

much as 1000 times that of major rivers of other countries. The water level rises and falls very quickly. The ratio of the maximum discharge to the minimum discharge (river regime coefficient) is between 200 and 400, which is 10 times larger than that of continental rivers on the planet. The volume of sediment runoff is also large. As a result, flood and sediment disaster mitigation has always been one the top priority policies since the enactment of the River Law in 1896, which was the first disaster mitigation law in Japan (see Figure 6.4).

Investment for flood mitigation measures had been neglected between 1930 and 1945 because of war, so Japan suffered from many severe natural disasters with more than one thousand dead or missing almost every year, mainly over the years from the end of the Second World War to 1959.

In 1959, a huge typhoon hit the central part of Japan, named the Ise-wan Typhoon, which resulted in 5098 people killed or missing due to flooding cause by storm surges. Unprecedented devastation due to this disaster led Japan to intensively re-examine its disaster management system. As a result, the Disaster Countermeasures Basic Act was enacted in 1961 as the basic framework of the current Japanese disaster management system with multi-hazards orientation and a holistic disaster management system. The River Law was amended in 1964 to integrate both more effective flood control and stable water use.

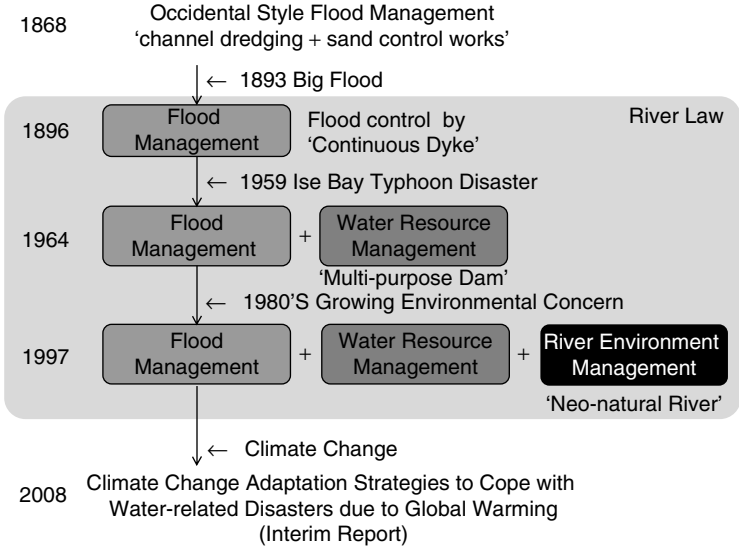


Figure 6.4 Enactment and amendments of River Law in Japan

Source: Compiled from http://www.mlit.go.jp/river/basic_info/english/pdf/riversinjapan.pdf (accessed 8 August 2008).

Flood and sediment disasters remain a potential cause of catastrophic damage in Japan, even after many years of flood control efforts which has always been a high priority policy in Japan. Figure 6.4 compares the Japanese level of river improvement with other industrialized countries. Unfortunately, the level of safety secured by structural flood control measures is still lower in Japan. In European countries like the Netherlands, the United Kingdom, and France, most river improvement work has already been completed with a high safety level, such as a return period of at least more than one hundred years. Even in the United States, 90 per cent of the Mississippi River improvement had been completed. In contrast, the safety level of Japanese river improvement is as low as 1/30 to 1/40 years for major rivers and 1/5 to 1/10 years for smaller rivers, which is an achievement rate at present as low as 60 per cent. These numbers suggest that it will take a long time for Japan to complete river improvement work (see Figure 6.5).

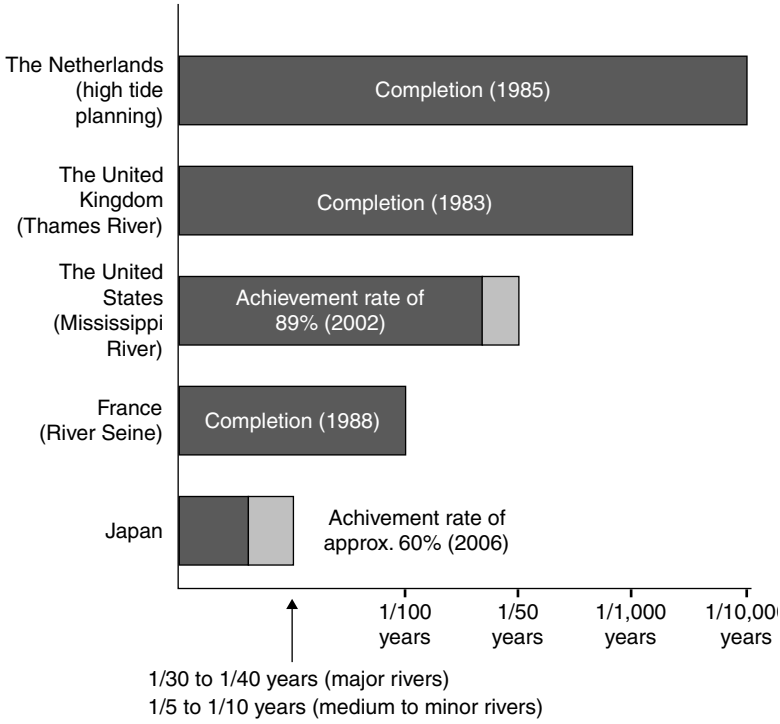
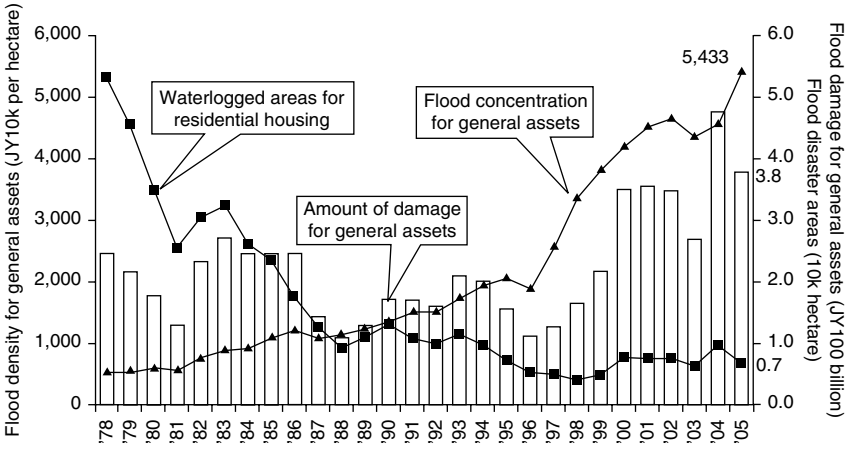


Figure 6.5 Comparison of flood protection work among industrialized countries

Source: http://www.mlit.go.jp/river/basic_info/english/pdf/RiverAdministrationInJapan(e).pdf (accessed 8 August 2008).

Since then, annual mortality due to weather-related disasters in Japan has steadily decreased over the years. Is this a proof of success – does it mean that no major weather-related disasters from a life safety point of view will occur in Japan anymore? Figure 6.6 summarizes the recent statistics in flood disasters in Japan between 1978 and 2005. The flooded areas as indicated by waterlogged area for residential housing have indeed decreased remarkably from 5.6k hectares in 1978 to 0.7k hectares in 2005 because of flood control efforts. However, the amount of economic losses in flooded areas did not show any significant decrease during this period.

On the contrary, the vulnerability to flood disasters has sharply increased mainly due to increasing accumulation of population and assets in flood prone areas due to the rapid urbanization of Japan in the last 50 years. Currently, about 75 per cent of property and about 50 per cent of population is concentrated on alluvial plains below flood level, which accounts for only 10 per cent of total land area in Japan. As the economic and social conditions have changed in these years, the conditions surrounding the river administration system have changed dramatically. Today, projects are expected not only to perform flood control and water use functions but



(1) Amount of damage (JY10k)/waterlogged areas (hectare) (costs as of 2000)
(2) Figures represent average for past five years.
(3) Non-operation losses for businesses are included in the amount of damage for general assets, as well as the concentration of waterlogged areas.
(4) Figures were derived from "Flood Statistics" issued by the River Bureau of the Ministry of Land, Infracture and Transport.

Figure 6.6 Decreased flooded area but increased flood vulnerability in Japan recently

Source: http://www.mlit.go.jp/river/basic_info/english/pdf/RiverAdministrationInJapan(e).pdf (accessed 8 August 2008).

also to provide an attractive waterside space and habitat for diverse plants and animals. There is also a growing demand for creative efforts to make excellent use of rivers as an important component of the regional climate, landscape and culture.

Japanese disaster management system

The immense flooding damage caused by the Ise-wan Typhoon in 1959 was a turning point for disaster management in Japan, giving rise to a movement to plan and prepare a comprehensive disaster management system so that the Disaster Countermeasures Basic Act was enacted as the basis for disaster management in Japan in 1961. Thereafter, the disaster management system has been improved and strengthened following the occurrence of large natural disasters and accidents.

This act takes a multi-hazards approach which covers both natural disasters and accidents. Under natural disasters, earthquakes, storm and flood, volcano and snow are identifies as hazards. Under accidents, the following eight hazards are listed: marine disaster, aviation disaster, railroad disaster, road disaster, nuclear disaster, hazardous materials disaster, large-scale fire disaster and forest fire disaster.

The act also prescribes the roles and responsibility of the national government of Japan, prefectural and municipal governments, and public municipal governments are prescribed to have prime responsibility for disaster management. If the resources of impacted municipal governments are overwhelmed, the resources of prefecture government will be mobilized. If the magnitude of the disaster exceeds pre-designated levels, the national government declares the disaster-impacted area to be its jurisdiction so that the resources of national government will be mobilized.

At all levels of government, as shown in Figure 6.7, the 'Disaster Management Council' is formed as the highest authoritative body for disaster planning and execution, which consists of all departments of government and designated public organizations. Designated Public Organizations include NHK (Nippon Broadcasting Service), the Japanese Red Cross, NTT (Nippon Telephone and Telecommunication) and JR (Japan Railway). Each of the organizations involved in the Disaster Management Council are required to have their own management plan and to revise it annually.

The Basic Disaster Management Plan is the master plan prepared by the Central Disaster Management Council for Japanese disaster management, which sets forth the basic activities for each type of disaster management plan. This plan clarifies the duties assigned to the national government, public corporations and local government in implementing measures. The plan also describes the sequence of disaster countermeasures, such as disaster mitigation and preparedness before the event, emergency response right after the event, and long-term recovery/reconstruction according to the type of disaster.

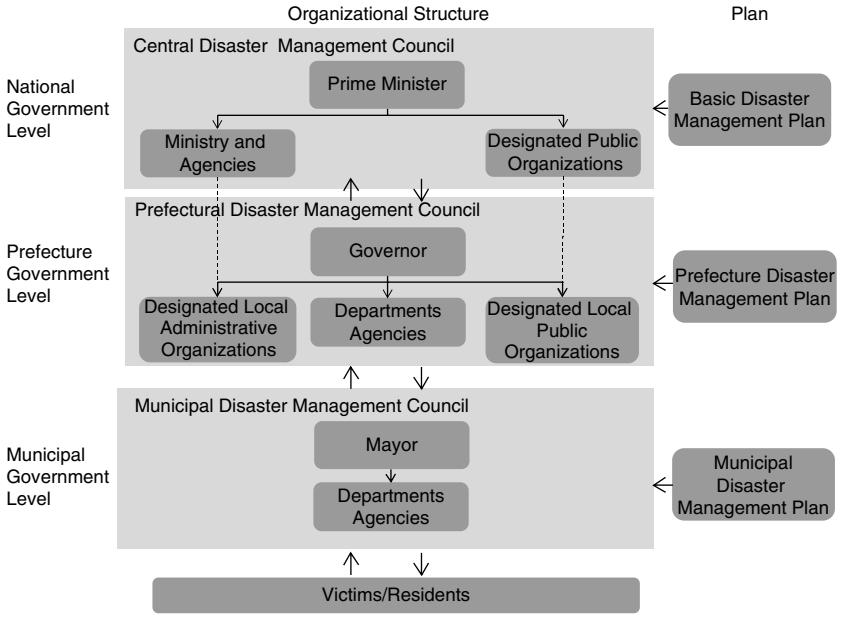


Figure 6.7 Japanese disaster management system

Source: Compiled from http://www.bousai.go.jp/panf/saigaipanf.pdf (accessed 15 September 2008).

The Disaster Management Operation Plan is a plan made by the respective ministries and agencies of national government and Designated Public Corporations for their disaster management measures according to the Basic Disaster Management Plan. The Local Disaster Management Plan is a plan made by respective prefectural and municipal disaster management councils according to local circumstances and the Basic Disaster Management Plan.

According to the Basic Disaster Management Plan, the following measures were recommended for adoption as the major options to improve disaster mitigation and preparedness: (1) Improvement and upgrading of disaster response capacities and facilities, (2) Promotion of national land conservation, (3) Increasing disaster awareness and disseminating disaster management knowledge, (4) Regular implementation of disaster response drill, and (5) Establishment of local voluntary disaster management organizations and facilitation. To facilitate the implementation of these measures, the national government allocates approximately 5 per cent of the total amount of the budget for general accounts annually. This percentage stays the same for the long term, which indicates the high commitment of national government to disaster reduction. The budgetary appropriation for disaster management is classified into four categories: (1) Research and development (2) Disaster

mitigation and preparedness (3) National land conservation, and (4) Disaster recovery and reconstruction.

In order to carry out disaster response and recovery smoothly, collecting, processing, analysing and transmitting information of the disaster quickly and accurately is a prerequisite. In Japan, in addition to collecting and analysing information about disasters via meteorological disaster management information, river/basin information or road disaster information systems, exclusive disaster management communications networks such as the Central Disaster Management Radio Communications System, which connects national organizations, the fire disaster management radio network, which connects fire fighting organizations, and the prefectural and municipal government disaster management radio communications networks, which connect not only disaster management organizations of the local government but also the local residents, have been established.

Current practice of storm and flood disaster management

Storm and flood disasters may not be fatal anymore in Japan, but they are getting more and more costly so various kinds of measures have been taken to reduce potential damage in the following four aspects: (1) Improvements in meteorological observation and forecast and warning systems, (2) Promotion of comprehensive flood control measures, (3) Promotion of comprehensive sediment disaster countermeasures and (4) Promotion of coastline conservation.

Improvements in meteorological observation and forecast and warning systems

Meteorological conditions, including typhoons, low-pressure areas and front activities, must be known accurately to prevent and/or reduce storm or flood damage by precise weather forecast and quick information dissemination. The Japan Meteorological Agency conducts meteorological observations utilizing radar, satellites and observation instruments located throughout the country, and makes forecasts and warnings based upon this data. The information for river water level and rainfall amount in basins is provided by a comprehensive river/basin information system and is used extensively.

Promotion of comprehensive flood control measures

1. River Flood Control Measures: river flood control projects are well coordinated under the 9th Seven-Year Flood Control Project Plan introduced in 1997 by the Ministry of Land, Infrastructure, and Transportation. Flood control programs emphasize the development of a safe social infrastructure, risk management for waters that exceed the designed flood stage level, etc.

2. Promotion of Flood Control and Storm Surge Countermeasures: given the recent increase in the flooding of small and medium-sized rivers and the occurrence of urban flooding which may be caused by global warming, the Flood Control Act was revised in 2001. The objective of the revised act is to expand and improve flood forecasting for rivers, designate and announce areas where inundation is expected and prepare flood warning and communications systems that will guide smooth and swift evacuation from the danger of flooding. An underground shopping district and basements were heavily damaged during flood disasters in 1999 and a storm surge hazard was experienced at the time of a typhoon in Kumamoto Prefecture in 1999 too. Also heavy rain in 2000 caused urban flooding in Tokai region in which utilities were damaged and forced approximately 61,000 residents to evacuate their homes. These disasters led Japanese disaster management to focus more on emergency response for extreme weather which may be a result of global warming.

Promotion of comprehensive sediment disaster countermeasures

Since Japan is predominantly mountainous, it is subject to debris flow, landslides, slope failure and other sediment disasters. The Outline for Promoting Sediment Disaster Countermeasures was introduced in March 1988 with the objective of promoting comprehensive countermeasures, including national land conservation projects, and improving forecasting, warning and evacuation systems. In April 2001, the Sediment Disaster Management Countermeasures for Sediment Disaster Prone Areas Act was also enacted for the purpose of clarifying areas considered prone to landslide disaster, preparing evacuation warning systems, limiting development, regulating building construction and promoting structure transfers.

Promotion of coastline conservation

Since Japan is an island nation, it has a long coastline. In order to prevent storm surge disasters caused by waves and erosion on coastal shores, improvements of coastline conservation facilities and the surrounding environment are being systematically carried out in accordance with the 6th Seven-Year Plan for Coastline Projects, which was introduced in 1996.

Japan's international cooperation in disaster relief

Japan has suffered many natural disasters in the past. Based on ample disaster experience, Japan has developed many innovative disaster countermeasures which mean Japan works hard in the promotion of international cooperation in the field of disaster management. Currently the Japanese government has the following four areas of activities to promote international cooperation: (1) technical cooperation, such as providing training courses for specialists from other disaster-prone countries and the dispatch

of specialists to such countries; (2) Granting of funds; (3) Providing loans; and (4) Multilateral cooperation through United Nations organizations (ISDR, UNCRD etc.). In 1987, the Japan Disaster Relief Team Dispatch Law was enacted to allow and promote comprehensive international emergency disaster relief activities (e.g., providing relief goods). Non-governmental organizations in Japan, such as the Japan Red Cross Society, are also active in terms of emergency disaster relief assistance. To promote multilateral disaster management cooperation in the Asian region, where disasters occur frequently, was especially emphasized at the ministerial-level Asian Natural Disaster Reduction Conference held in Kobe City in 1995, attended by delegates from 28 countries in Asia and other regions. Consequently, the Asian Disaster Reduction Center (ADRC), located in Kobe, started its activities in 1998 to promote multilateral cooperation for disaster management in the Asian region. Under close ties with 24 participating countries, ADRC gathers and provides disaster-related information, promotes studies and research into disaster management cooperation, collects information for multilateral emergency disaster relief activities, and carries out disaster management training and education programs and other activities.

New threats due to global warming

Recent devastating flood disasters in both the United States, in 2005, and the United Kingdom, in 2007, may be treated as evidence for global warming. It may be too early to conclude that all of these examples are evidence for global warming, though it is sure that Japanese weather is getting more violent and extreme in term of its variability. As an example, as indicated in Figure 6.8, the variability of annual precipitation during the twentieth century became greater each year, although the average stayed relatively stable during this period. Greater fluctuation in annual precipitation suggests a greater risk of both flooding disaster and drought disaster in the future, which will mean current infrastructure may not be as safe as previously.

As indicated earlier, the number of urban floods or 'guerrilla floods' increased recently as the number of heavy rainfalls which exceed 50 mm/hour or 100 mm/hour increased. It is because most urban infrastructure, such as sewage and dykes for middle and small rivers in Japan, have 50mm/hour rainfalls as a designated acceptable risk level. The fact that the number of heavily concentrated rainfalls, exceeding 50 mm/hour or even 100 mm per hour, has been increasing recently resulted in the increase in urban flooding or 'guerrilla floods', which could happen at anywhere and anytime, and which is a totally new threat for Japanese disaster management.

In 2007, the Intergovernmental Panel on Climate Change (IPCC) published its fourth report, which suggests that it is as important to promote 'adaptation' to the impacts of global warming as to promote 'mitigation',

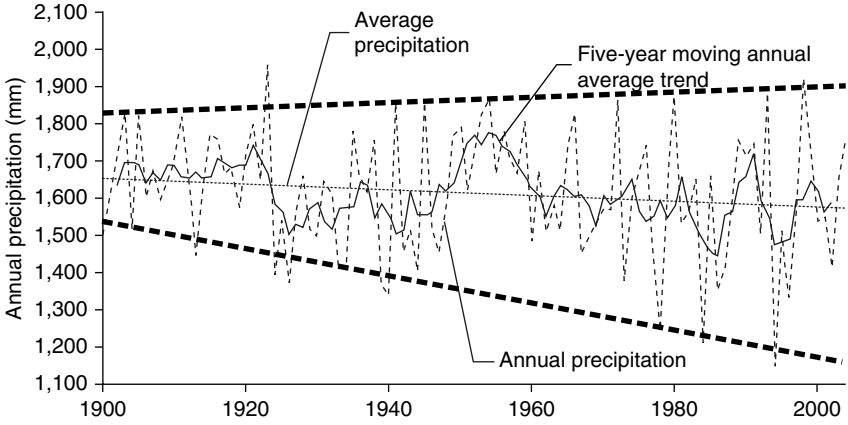


Figure 6.8 Recent trends in average annual precipitation in Japan

Source: http://www.mlit.go.jp/river/basic_info/english/pdf/RiverAdministrationInJapan(e).pdf (accessed 8 August 2008).

since global warming 'mitigation' cantered around the reduction of greenhouse gases has limitations, and global warming impacts would continue over centuries even when 'mitigation' is implemented. The Japanese government has accepted this recognition seriously as far as the subcommittee on climate change adaptation for flood control, which was originally under the auspices of the Ministry of Land, Infrastructure and Transportation, undertook to investigate and implement adaptation measures in 2007, including preventive structural measures, to cope with climate change based on a long-term vision. This subcommittee adopted the following three basic adaptation strategies:

1. **Adaptation strategies with emphasis on the revision and regulation of land use in basic basin communities**
    1. Revising land use and ways of living based on changes in social conditions
    2. Developing communities to adapt to inundation
2. **Adaptation strategies with emphasis on crisis management**
    1. Developing systems for responding to large-scale disasters
    2. Promoting non-structural measures based on new scenarios
3. **Adaptation strategies with emphasis on structures**
    1. Maintaining the reliability of structures against changes in external forces
    2. Full utilization of existing structures and prolonging their service life
    3. Constructing new structures

Conclusion

Recent climate change may force us to review the current framework of Japanese disaster management in general and weather-related disaster management in particular. It may not be a viable strategy to depend mainly on structural mitigation by public sector investment, such as in levees, dykes and dams to prevent flooding and sediment disasters. It may be time for us to start a more participatory approach which involves both public and private sectors and a more adaptive and resilient strategy to live with floods and sediment disasters.

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7

China and Natural Disasters: Prospects and Policies

Luo Tianhong

Introduction

In the past 30 years, China has been engaged in developing a modern disaster relief system and policy in line with international practice, emphasizing the standardized procedure, regularization and legalisation of the mitigating measures, the primacy of protecting human life, careful advance preparation and capacity development. The leading role of the state and the approach of political mobilization in responding to devastating disasters remains the salient feature, while non-governmental organizations have emerged as an increasingly important part of the system. In terms of international cooperation, the Chinese government has also adopted a more positive attitude and plays a much more active role. The notion of human security has been integrated into the governmental policy discourse, and many efforts have been made to promote international collaboration and contribution. Both progress and underdevelopment, achievement and weakness in disaster relief system and policy are related to the great transformation in China in the last 30 years.

Natural disasters in China

China is among the few nations that are affected by natural disasters the most seriously. More than 70 per cent of cities and more than half of the population are located in the areas where meteorological, geological and marine disasters are active. During the last 15 years, there have been 0.3 billion people afflicted by natural disasters per year, 3 million houses destroyed, 7 million people moved away from the disaster area, and the total economic loss is nearly 200 billion Chinese Yuan, approximately 29 billion U.S. dollars.[1]

Natural disasters in China can be divided into four types: (1) Disasters in aerosphere and hydrosphere, such as flood, drought, typhoon, storm, thunder and lightning, heat wave, sandstorm, storm surge, billow, tsunami,

red tide, sea ice and coast erosion. The affected area by flooding is more than 10 million hectares and the disaster area is more than 5 million hectares per year; the area affected by drought is more than 20 million hectares, and the disaster area is more than 10 million hectares per year; the average number of land typhoons in China is about seven per year; and storm surge is the most threatening marine disaster, in the past it once killed more than 10 thousand people.[2] (2) Geological and earthquake disasters, including earthquake, collapse, landslide, mud-rock flow, surface subsidence, ground settling, desertification and so on. Earthquakes occur frequently in China. In 1976, the Tangshan earthquake, of magnitude 7.8, resulted in 242 thousand people dead, and 164 thousand people hurt and disabled.[3] By the end of the 1990s, the desertification area in China was 2.62 million square kilometres; desert encroachment is expanding at a speed of 2460 square kilometres.[4] This year, the '5.12' earthquake was responsible for over 69 thousand lives lost and over 17 thousand people missing, it had a magnitude of 8.0.[5] (3) Biosphere disasters. There are more than 1400 kinds of plant diseases, insect pests and plagues of rats in China, causing a loss of grain of about 50 million tons per year and a loss of cotton of over 1 million tons.[6] (4) Forest and grassland fires. From 1950 to 1998, there were about 160 thousand forest fires each year. The grassland hit by fires frequently covers nearly 0.1 billion hectares.[7]

The research on the implication of global warming predicts that the distribution and germination of natural disasters in China will be influenced greatly by the global warning effect and the situation will tend to be aggravated. Typhoons will be activated, torrential rain and the possibility of flooding in drainage areas will be increased. There will be more geological disasters of landslide and mud-rock flow caused by local heavy rains. In northern China, the probability of extreme low temperatures and catastrophic snow will be increased, seasonal distribution of precipitation will be more uneven; prolonged drought will be exacerbated in the north, while high temperatures and heat waves will probably hit the south more. The probability of forest fire and grassland fire will be higher; desertification of the north will be aggravated; the scope of plant disease and insect pests will be extended; the likelihood of storm surge and red wave will be greater.[8] Considering the situation in the last three years, it is very clear that China has experienced much more extreme weather, and disaster conditions have gone beyond the historical record.[9]

The evolution of policies and the transition of the disaster reduction system

The Chinese government is always the key actor in natural disaster alleviation. In an agricultural country, the legitimacy of the government depends heavily on its ability to build and run irrigation work in order to protect its

subjects from flooding and drought. In contemporary China, for the ruling party CCP (Chinese Communist Party), the significance of managing natural disasters is highly political. It can be summed up as embodying the purpose of 'Serve the people' (为人民服务), 'Be in power for the people' (执政为民) and 'Take people as the foremost' (以人为本). In the policy domain, disaster prevention and reduction is regarded as an important guarantee to achieve the overall objective of sustainable development, and the guiding line of disaster alleviation is to improve the comprehensive capacity of disaster reduction and risk management by administrative, legal, scientific, technological and market means, shifting from the focus of reducing disaster losses to the orientation of reducing disaster risk.[10]

The past 30 years have witnessed the transition of China's disaster-reduction system – which is part of political, economic and social arrangements. With the establishment of a market structure and social development, the demand for disaster management changed greatly. In 2003, the SARS (Severe Acute Respiratory Syndrome) incident was another strong impetus for the transition process.

This transition and progress lie in the following aspects:[11]

1. A set of governmental institutions were built, rebuilt and restructured to form an integrated system and working mechanism for disaster relief; a series of laws, administrative regulations and emergency response plans were issued to stipulate the rules and detailed procedures for disaster relief. In April 2005, the China Commission for IDDR was renamed as National Commission for Disaster Reduction, together with the creation of a Board of Experts. The moves signify that an integrated system and operational platform have taken shape at the national level, so has the system of policy counselling and technical support for disaster reduction. That has been followed by the establishment of local disaster reduction networks, with competent departments up and running in 23 provinces presently. In 1998, the first national plan for disaster reduction was disclosed.[12] In 2007, a new version of the national plan for disaster reduction, Comprehensive National Disaster Reduction '11th Five-Year' Plan, was announced.[13] The two other important documents were the National Emergency Plan on Natural Disaster Relief,[14] announced by the State Council in January 2006 and the People's Republic of China Law for Emergency Response,[15] adopted by the Standing Committee of National People's Congress in August 2007. In addition, there were over 30 specified laws and regulations on preparedness and prevention against certain kinds of natural disaster issued and adopted. Therefore, the command and management of disaster relief has been on the track of institutionalization and standardization, rather than depending on the experience of the individual; and disaster relief has been an integral part of the overall economic and social development plan.

2. The goal and focus of disaster relief have shifted from stressing the reduction of economic losses under the planned economy and the value of 'collective property the first', to centring on the safety of human life; emergency response and relief has been attached greater importance and the relief standard for the living victims from disaster has been raised.

   During the '5.12' earthquake relief work this summer, saving and protecting lives were definitely of prime importance, whereas during the Tangshan earthquake relief process in 1976, the most typical moving and publicized story was about how soldiers and civilians rescued national and collective property at the cost of their own lives. Another contrasting aspect is the living standard of the sufferers after their survival. When the country was very poor, the relief work tried to achieve protecting victims from freezing and starving to death. Now the goal is to ensure that the affected citizens are able to get food, water, clothing, shelter, medical care and the children can go to school, which is getting closer to the international standard.

   The new developments in 2008 also included: individuals stranded because of the effect of the disaster on railways and highways were incorporated into the category of disaster relief work for the first time; a new project of comforting the suffering families who had lost family members was adopted, and the pension for each victim was 5000 Yuan; assistance measures for the transition period were implemented for the first time, including temporary living assistance, follow-up assistance and the assistance and placement for solitary individuals.[16]
3. The organizing process of disaster relief has turned from closed to open and transparent. Some information about disasters, especially the data of death tolls, had been regarded as a secret for the sake of so-called 'social stability'. In 2003, the public administrative sector got serious lessons on the necessity of publicizing the facts of a disaster. In 2005, the State Secrecy Bureau and the Ministry of Civil Affairs made a decision on decrypting the information on the death toll in disasters.[17] This year, during the relief work after the '5.12' earthquake, the seriousness and rigorousness in data statistics, plus the transparency and punctuality in releasing information, was unprecedented.
4. More high-tech means have been used in disaster relief instead of the traditional way that was dependent on human power and human hands. In 2003, the state council approved the project of building the Small Satellite Constellation for environment and disaster monitoring and forecasting. In the relief work combating the '5.12' earthquake, unmanned aircraft and the Beidou Navigation System were used for the first time in order to get aerial images and real-time locations. In September 2008, the Small Satellite Constellation for environmental and disaster monitoring and forecasting was launched, indicating that the all-weather, all-time and large-scale monitoring and evaluating level has been raised to a new level.[18]

China and international and regional cooperation in natural disasters

The stance on international cooperation for disaster monitoring and response has been transformed from alert and narrow towards active and open. China had been over-vigilant in refusing international aid. The typical case was the refusal of any international assistance during the Tangshan earthquake in 1976. But at the same time, during the Mao era, being internationalism-oriented, China could be enthusiastic and generous in providing aid to some developing countries. Along with the process of opening and reform, the policies on providing and receiving aid and the policies on joint action for disaster relief have become both more active and pragmatic.

The China International Search and Rescue Team (CISAR) was founded on 27 April 2001 and began to participate in international and domestic rescue missions in 2003. After the Indian Ocean tsunami in December 2004, the Chinese government and non-governmental organizations got vigorously involved in the relief operations. The total amount of the donation was about 1.3 billion Yuan by September 2005.[19] Beijing also held a discussion forum with ASEAN on tsunami early warning; invited the officials from 11 disaster-stricken countries to a workshop on disaster relief; and took the initiative of establishing regional major disaster monitoring, prevention and evaluation mechanisms in international society. The Asian Conference on Disaster Reduction was held during 27–29 September 2005 in Beijing, which was the first ministerial conference on disaster reduction in Asia, co-sponsored by UNDP (United Nations Development Program), ISDR (United Nations International Strategy for Disaster Reduction), UNESCAP (United Nations Asia-Pacific Economic and Social Council), WMO (World Meteorological Organization) and ADPC (Asian Disaster Preparedness Center). The final document 'Asia's Disaster Risk Reduction Beijing Plan of Action' was adopted.

The major international framework under which China participates for disaster reduction is at the regional level, including the Shanghai Cooperation Organization, APEC, China and ASEAN, the Asia-Europe Summit, China and Japan, China and South Korea, US-China-Japan, and so on. Although China normally puts more emphasis on protecting national sovereignty and autonomy rather than the significance of international intervention, China has adopted a very positive attitude on international cooperation and joint action in disaster reduction, and the notion 'human security' has been accepted and used by the Chinese government since the start of the new century. At the same time, China sticks to its own guiding principles in developing and participating in international cooperation regimes: the leading role and coordination function of the UN, the key role of the existing framework, full consultation among member states, practical measures, and the importance of strengthening the response capability of developing countries.

Issues under discussion

The powerful national government and its leading role in natural disaster reduction, military force as the main force for disaster emergency response, the underdevelopment of non-governmental organizations and the insurance sector and its minor role in disaster relief, all these characterize the natural disaster reduction system of China. Moreover, these define the Chinese approach to natural disaster relief, which is described by some scholars and observers as the 'political mobilization model' or the 'nationwide mobilization model'. Largely it can be said that this model or approach is effective and successful due to the powerful mobilization of nationwide resources by government authority. But the weakness of this approach has been clearly exposed as well. Besides the discussion on how to improve the disaster relief system, another topic under debate is about the advantages and disadvantages of building large-scale water control engineering projects.

The leading role of the government and the functioning of the emergency response system

The leading role of the government is not only the political duty of the ruling party and state authority, but also the legal responsibility provided by national laws and administrative regulations. For instance, in the national flood control bill, it is said that the heads of governments at all levels take personal charge in flood control, and the heads of relevant departments take the job responsibility.[20] Actually, there are three kinds of governmental organizations playing roles: (1) central government (2) regional and local governments and (3) government departments based on specific business functions. And there are tensions between them. On the one hand, the government's strong leadership and effective response to natural disasters is very impressive; on the other hand, there are often complaints that in practice the complex government system can not operate efficiently due to the tensions between different levels and departments, and the efficiency and unified leadership of the government is not achieved in a modernized way.

A recent case under discussion and criticism was the management of the heavy snow in the south in January and February 2008, and the dysfunction of the newly established emergency response system.[21] According to the national plans and relevant arrangements, disaster reduction and relief are accomplished under the unified leadership and deployment of the government; while they are managed at different levels and by different departments, the local government should be the main body in charge. At the same time, coordination centres and command centres are formed for emergency response and comprehensive disaster reduction. The former, being in charge of regular coordination, lack the authority to organize and command. The

latter, being the real authority in an emergency, is established only in emergencies. As the standing coordinating body is weak, it is difficult for the institutionalized emergency response system to function.[22] Therefore, the established working system and procedures for emergency response and disaster relief could not do as well as had been expected.

But the later case of the '5.12' earthquake showed how successful the imperfect system could be. By contrast, the mature disaster-reduction system in the United States was not satisfactory in managing Hurricane Katrina in 2005. So it might be concluded that in dealing with an unexpected devastating disaster, the role of the people, including the correct response of some VIP figures and the cohesion of the ordinary people, are at least as important as, or even more important than, the role of well-designed systems and institutions. Further questions are: (1) Can the cohesion of the nation be kept in the future? (2) Can the positive combination, unity and coordination among different levels and departments, military services and the civilian sector be lasting and institutionalized?

The military as the main force for disaster relief and its impact

China's military is actually composed of three parts: the Chinese People's Liberation Army (PLA), which is in charge of defence against external invasion, the Chinese People's Armed Police Force, which is in charge of guarding internal security and the militia as the reserve service. Distinguished from the arrangements of the military forces as the force for keeping social order, Chinese soldiers are the ones who get deeply involved in rescuing the victims and they do an excellent job. That is why soldiers are always regarded as the most beloved ones in disaster areas and the most reliable rescuing force by the whole nation. In this way, disaster relief activities have greatly strengthened the emotional linkage between the military and the people. Besides the political benefit, the unique role of the military also suggests other advantages and potential:

1. The development of the military in rescue missions can be an economic and viable way for developing countries to have a well-organized and disciplined force at hand to be used in disaster relief. Of course, in order to accomplish the rescue task, special training and equipment are necessary. In this regard, taken as a whole, China's military is still poorly trained and equipped.
2. The deep development of large numbers of soldiers in rescue missions is a result of using the military for non-traditional security purposes,[23] and it helps redefine the function of the military, adding and strengthening the humanitarian aspect of it. It is correct to argue that non-traditional security threats cannot be solved only by military means. But

a further argument should be made at the same time that it is necessary and significant to use the military in non-traditional security missions in a non-traditional way. The transition of the military from the means of waging war into a purely protective force for social stability and security might be a utopia for the time being, but change can be made gradually. Peacekeeping missions are a striking example. International military cooperation in rescue operations is a good opportunity to build confidence between the militaries of different nations. In the '5.12' earthquake rescue process, although the original plan of sending relief supplies by Japanese military aircrafts was refused, at least quite a few foreign defence departments and military forces took part in the process by providing material assistance.[24]

3. Deploying troops for disaster relief can be a drill for the soldiers and a test for the national defence mobilization system.[25] Although this seems contradictory to the point I have just mentioned, it is very true now that the primary responsibility of the military is the traditional one. In any case, testing the functioning and effectiveness of defence mobilization systems through disaster relief is just a by-product.

Although using the military as an emergency response and disaster relief force is both convenient and effective, some critical views have been voiced. The most challenging view was about the disadvantage of the fire service being part of the armed police force.[26] And the broader issues of the necessity and advantage of having standing professional civilian rescue forces and the weakness of sending troops for disaster relief was raised.[27]

Civil society and disaster relief

The government being strong and the military having the key role, civil society is still in its initial growth stage and cannot have its due role in disaster reduction and relief. In the '5.12' earthquake relief process, volunteers and non-governmental organizations were in a embarrassing situation to some extent, as the government had not been used to working with them, and some NGOs were not trusted. The worst outcome that the underdevelopment of social forces has brought was the weakening of self-help and mutual help in disaster, which has been recognized as the most useful and effective way for disaster relief. So the significance of social forces and strong civil society was learned from bloody lessons. On the other hand, going through many difficulties, NGOs and volunteers made great contributions in the '5.12' earthquake relief and won respect and admiration at last. So the '5.12' earthquake could be a new starting point, from which social forces and civil society could develop further, and the democratization process be promoted.

Guiding principles for natural disaster reduction

Prevention has long been the primary guiding principle in disaster reduction, and high priority was attached to large-scale water control engineering projects. But in recent years, a lot of questioning and criticism has been heard and become louder. The famous example is the debate and questioning on the Three Gorges Water Control Project for its long-term damage to the ecological environment and the possibility of bringing new disasters. China is facing a challenge: whether the country can go beyond the old-fashioned disaster prevention method given that developed countries have already found problems with the water control engineering projects, and how to go about it. At this stage of development, it seems that abandoning the water control project is impossible. Another question related to prevention is the poor awareness of disaster and the lack of sense of preparation and risk avoidance.

The depth of international cooperation

Although China has adopted a positive policy stance toward international cooperation in disaster mitigation, there are suspicions from other countries about how much China wants to do in terms of implementation, especially in developing institutionalized and joint measures. During the discussions of the US-China-Japan working group on Confidence and Security-Building Measures (CSBMs) and joint humanitarian and natural disaster monitoring and response in 2007, some participants wondered whether China would be willing to share information given concerns over secrecy, and how China can participate in joint response outside its borders.[28] During the '5.12' earthquake relief process, some international observers criticized the Chinese government for not allowing international rescue teams to go to the disaster area in time and missing the precious first 72 hours in victim-rescue.

Conclusion

China has achieved great progress in disaster reduction during the past 30 years. Along with the progress in modern administrative system construction in China, the preliminary disaster-reduction system has been set up and is moving along the track of rationalization, the preparation and prevention for disaster relief has been greatly strengthened. In terms of life- and asset-loss reduction from natural disasters, the quantitative goal has been set, and the data in recent years shows that the goal has been achieved in the average year. As to the effectiveness of the reduction system and policy, the cases of the 1998 flood and the '5.12' earthquake have demonstrated that the strong will and great mobilization capability of the government can achieve great success in fighting devastating disaster even if the reduction

system remains to be improved. There are obvious indications of the overall good performance in confronting natural disasters in China – the satisfaction and pride of Chinese people for the overall achievements in the '5.12' earthquake relief operations and the positive impression and comments of external observers and international media[29] on China's response to the '5.12' earthquake. On the international stage, the Chinese government has adopted the notion of human security and become actively involved in regional and international cooperation in disaster monitoring and relief.

The progress and achievements in system construction, policy reorientation, capacity strengthening and effectiveness improving in confronting natural disasters in China is an integral part of China's historical transformation. Without the fundamental political, economic and social transition, all the changes in the domain of disaster relief cannot be imagined.

The problems and shortcomings with the system and policy in dealing with natural disasters cannot be neglected, including the problems with the system and its weaknesses, the negative stories related to the performance of government due to bureaucracy and corruption, the transparency in releasing information and its thoroughness and sustainability, problems with underdevelopment of civil society and its impact, the assertions coming from the effective management of the devastating earthquake and its potential leading to excessive nationalistic sentiment, and so on. Actually, the suspicion and criticism of China has raised further questions: is the progress in China deep-rooted true achievement, or is it just contingent due to the tricks of the ruling party? Is the Chinese way of dealing with disasters a different and useful model, or is the only correct way the Western one? If you have confidence about the fundamental transition in China, or you believe China's model can be a different and useful one, the changes in China will be regarded as meaningful and the future will be optimistic. If the judgment is that the Western social and political model is the only correct one, and the ruling party in China is hopeless, the so-called progress and achievements in China will be regarded as marginal and questionable.

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8
India and Natural Disasters

P. R. Chari

Introduction

India, South Asia and much of the developing world are seen as disaster prone. Why? The reasons derive from geographical factors, but also overpopulation. A considerable percentage of the deaths in Asia due to natural disasters occur in India, due to its size, population and vulnerability.[1] Some 60 per cent of India is vulnerable to earthquakes, and around 40 million hectares are susceptible to floods. Two-thirds of its 7500-kilometer coastline is exposed to cyclones, and 68 per cent of its area is prone to droughts.[2] Where the next natural disaster will occur cannot be predicted, but vulnerable areas can be identified, contingency measures planned and preparatory action taken. Empirical evidence shows that floods and droughts occur in one or another part of the country every year. Less predictably, India's coastal states are vulnerable to cyclones in particular months. The major tsunami disaster in December 2004 had its origins off northern Sumatra, but severely affected India's island territories and five coastal states.[3] Given its densely populated area, high poverty level (a considerable percentage of the population was below the poverty line in 2004–05),[4] and high illiteracy levels (some 35 per cent of its population is illiterate according to the 2001 national census),[5] taking preventive and ameliorative measures presents a challenge.

There are no reliable statistics to compute the loss suffered by India due to natural disasters, but estimates of lives lost and damage to property/infrastructure are published in the Annual Reports laid before Parliament by the Ministries of Agriculture and the Ministry of Home Affairs. To compute the ultimate bill for ameliorative programs remains difficult. As does the computation of intangible costs like loss of livelihood, physical injuries to people affected and so on. But the loss of lives and the amount spent on providing immediate relief or undertaking longer term rehabilitation measures have been computed with some success. For instance, an assessment report made by the United Nations to assess the recovery work after

the major tsunami disaster of December 2004 noticed that the death toll in the worst affected state of India (Tamilnadu) was 8009, and that the population affected was 897,000. Total financial assistance provided until the end of 2007 amounted to Rs 2381.70 crores (around $480 million), mostly spent on fisheries, housing, sanitation and infrastructure and livelihood assistance.[6]

The most common natural disasters are droughts, leading to food scarcity and malnutrition. This situation arises because agriculture engages some 60 to 65 per cent of India's population, accounting for around 20 to 25 per cent of its GDP. India's heavy dependence on the monsoons continues, since 60 per cent of Indian farmlands are unirrigated;[7] hence, a failure of the monsoons has serious consequences for the economy and population. Better roads and rail-links now permit food to be moved from one part of the country to another, but their earlier absence caused devastating famines. For instance, the Bengal Famine in 1943 resulted in the loss of some two million lives. The British colonial power appreciated the need to mitigate droughts and avoid civil unrest, and promulgated the Famine Code in the late nineteenth century. A sink fund was established into which contributions were made by the provinces and federal government for scarcity operations. The Scarcity Manual, written in the last years of the nineteenth century, still guides the management of drought situations in India.

The chapter initially enunciates some broad principles to address the generic questions underlying disaster management in India. Then, the organizational arrangements for dealing with disasters – natural and manmade – are described, emphasizing the role of the armed forces. Two disasters, of which the author has personal knowledge, are presented as case studies. A critical examination is then made of policies and plans to deal with these calamities, especially with regard to the tsunami disaster in December 2004. The cooperation existing or contemplated between India and its neighbours is then described. Finally, conclusions are presented placing these findings within a larger conceptual framework.

Three broad principles

Three general observations can be made that are relevant for natural disaster management in India:

- First, a distinction between natural and manmade disasters is invidious. Clearly, floods and earthquakes are natural disasters; and a dam burst or dangerous pathogens escaping from a biotechnology laboratory are manmade disasters. Nevertheless, the measures for their mitigation are the same. Hence, the Disaster Management Act (2005) in India defines disaster as 'a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence

which results in substantial loss of life or damage to, or destruction of property, or damage to, or destruction of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community in the affected area.'[8]

- Second, natural disasters are interlinked to environmental issues; so are measures for their mitigation. Weather patterns become unpredictable and lead to floods and droughts. In India, the uncontrolled felling of trees has led to a serious depletion of forest cover. A change in monsoon patterns has occurred over the intervening years, aggravated by global climate change, leading to erratic rainfall, increased flooding and droughts. The remedy to arrest this vicious cycle lies in accelerating forestation programs. Currently, 20.6 per cent of India's land surface is under forest cover,[9] but the national goal is to raise forest or tree cover to 33 per cent.[10]
- Third, the Indian experience reveals that natural disasters have their particularities, which must be appreciated when devising remedial measures. The immediacy of relief is of great consequence. Drought relief, which is an elaborate effort, permits some delay in gearing up a scarcity relief program. However, disaster relief after floods, earthquakes and cyclones must be provided within the first 24 and, at most, 72 hours, to save lives.

Organizational arrangements in India

The primary responsibility for disaster management in India lies with the state governments, but the central government supplements these efforts when severe or widespread disasters occur by providing logistical and financial support, which includes deploying the armed and paramilitary forces under its control.[11] The use of uniformed services for disaster relief is an established tradition in India, traceable to colonial times when the Indian armed forces were required to serve British imperial interests abroad and maintain internal security in the country. The latter function envisages maintaining law and order, but also performing 'aid to civil' duties that include maintaining essential services and assisting the civil administration to handle disasters. The uniformed forces provide the core of the government's response capabilities, but they function under the control of the civil authorities, who decide what tasks they should perform, where they should be deployed, and also when they should be withdrawn, which is a unique aspect of civil–military relations in India.

The Disaster Management portfolio was transferred from the Ministry of Agriculture to the Ministry of Home Affairs in 2002,[12] but drought relief continues with the Ministry of Agriculture. In 2005, the Government of India undertook a structuring of the organizational arrangements for disaster management. A Disaster Management Act (2005) was passed, envisaging a three-tier structure at the national, state and district level under the

leadership of the Prime Minister, Chief Ministers and District Magistrates, and a role for rural and urban local bodies. Allocations for disaster relief are made every five years by the Finance Commission, which estimates national revenues, and recommends how they should be distributed between the central and state governments. Funds are allocated by the Finance Commissions to the Calamity Relief Fund (CRF) – current provision is Rs 21,333 crores, roughly $45 billion, for the 2005–10 period, and the National Calamity Contingency Fund (NCCF) – current corpus Rs 500 crores, roughly $1.1 billion, which is replenished from contingent duties. Each state has its own CRF with allocations being provided by the central and respective state government in a 3:1 ratio.[13] The NCCF operates in severe calamities, when the expenditure exceeds the capacity of the state government.

The standard procedure requires the disaster affected state to submit a financial memorandum to central government. Norms are laid down for the various items of expenditure involved. They include ex-gratia payment in the case of death or disability, fully or partially damaged dwelling houses, and agricultural input subsidy. An Inter-Ministerial Central team makes a spot assessment of the damage and justification for the funds requested, which is adjudicated by a group of Secretaries in New Delhi, and finally allocated by a group of Central Ministers. Both the CRF and NCCF schemes are meant to provide immediate financing of disaster relief operations. Long-term expenditure for restoring damaged infrastructure is met from regular plan funds allocated by the central government. This elaborate procedure is necessitated to avoid leakage of funds; but also because disaster relief is a highly politicized issue in India.[14]

Coming to administrative measures, a National Institute of Disaster Management was created in 2003 under the control of the NDMA. Over the years, the National Institute has been training administrators and trainers, and conducting disaster management courses on its premises, and in the state capitals. The National Civil Defence College was established in 2002 by upgrading the Central Emergency Relief Training Institute, founded in 1957 to conduct training courses in search and rescue, fire fighting, medical emergencies and so on. This institution functions as the nodal training centre in India for WMD-related disasters. There is some apprehension in India regarding a likely bioterrorist attack; hence, a biological incident, first-response training programme has also been evolved.

The NDMA has facilitated the training and equipment of a National Disaster Response Force (NDRF), constituted with eight paramilitary battalions – two each from the Border Security Force (BSF), Indo-Tibetan Border Police Force (ITBP), Central Industrial Security Force (CISF) and Central Reserve Police Force (CRPF). Similar response teams are planned for the states. Apart from the Ministry of Home Affairs, the Public Health Ministry and the National Institute of Communicable Diseases (NICD)

play an important role in disaster management. The danger of epidemics is especially acute after a disaster, since large, displaced populations have to live in makeshift shelters, without access to potable water, hygienically prepared food and sanitary arrangements. Besides, the functional ministries are involved in moving food grains, petroleum products and other essential supplies into the affected areas. Incidentally, an unusual outbreak of plague in Surat (1994), and again in Himachal Pradesh (2002), raised suspicions that a bio-attack had been launched, leading Indian public health authorities to coordinate their activities with the World Health Organization and the Centre for Disease Control in the United States.[15]

Two case studies

The foregoing presents the official view of what is being done or is envisaged for the future. What actually occurs on the ground is of greater significance. A discussion of two disasters based on first-hand experience is proposed: the first a natural disaster, a severe drought and resulting famine conditions (1967–68), and the second a manmade disaster, arising from the Bhopal Gas Tragedy (1984).

Drought and famine (1967–68)

The experience here relates to the district of Surguja in central India, which then was one of the largest districts in India (around 8500 square miles in area) with a tribal population of 1.2 million. Almost wholly dependent on rain-fed agriculture, any failure of the monsoons spelt widespread distress. The problem in 1967–68 arose because two successive monsoons in 1965 and 1966 had failed, the seed had been consumed and plough-cattle had starved to death. Further, an acute scarcity of food grains in India created a dependence on imports. A literal ship-to-mouth situation was occurring. Surguja also lacked metal roads – there were no rail links – hence, stocking of food grains in the interior had to be completed before the first rains (around the end of May) when the district was converted into islands, isolated from each other.

A four-pronged scarcity relief operation was launched:

- First, the stocking of food grains across the district was undertaken on a priority basis, using the limited private transportation available. Food grains were brought from the Mumbai port by rail to the nearest railhead and then moved into the district. Warehouses (public or private), and schools and other public buildings were requisitioned to undertake stocking before the monsoons started.
- Second, free feeding centres were established throughout the district, which provided one 800-calorie meal (cornmeal and soya) to prevent the population from starving to death, children being particularly vulnerable. Food supplies were provided from stocking centres, and arrangements

made for cooking under the supervision of school teachers. At its peak level some 500,000 people were being fed in this manner.
- Third, scarcity works were started to provide employment for the population to earn minimum wages. At peak levels some 1200 scarcity works, mostly construction of roads or tanks or minor irrigation works, were initiated and a large number were completed before the monsoons set in. The work done had to be measured and weekly payments made.
- Fourth, the population, weakened by lack of nutrition, especially women and children, were vulnerable to disease. The distribution of multivitamin and iron tablets was undertaken on a war footing, and medical personnel deployed to inoculate the population against cholera and gastroenteritis, besides providing oral rehydration salts to those suffering from diarrhoea.

These major scarcity operations drew world attention and a flood of media people and political personages. The important visitors included Prime Minister Indira Gandhi and a host of personnel from concerned UN agencies. These visitations were unavoidable, but led to consequent disruption in relief operations, pointing to the need for systemic procedures to ensure that the routine was not affected. Two other lessons were learnt:

- First, the need for improvization. Elaborate plans do not work as designed in emergency situations, requiring pragmatic decisions on the spot to achieve the ultimate objective, rather than adhering to rules and precedents. For instance, roadworks get washed away in the monsoons. Emphasis was therefore laid on constructing small tanks to provide drinking water and irrigation, which also raised the water table in the district (mainly a plateau area). Some 800 tanks were completed in this manner; several have been deepened over the years to become sizeable water reservoirs.
- Second, the maintenance of law and order and prevention of crime had to be ensured. Riotous situations near food stocking and free feeding centres required counselling and improving administrative arrangements wherever found deficient. An special problem was hill tribes killing the cattle of plains farmers for food, which had to be dealt with strictly. A system of informers was devised to unearth hoarded food stocks by grain merchants hoping to profiteer by selling them at high prices. This scheme succeeded, while offending powerful political interests in league with the profiteers.

The Bhopal gas tragedy (1984)

Briefly, the US-based Union Carbide company had set up a plant in Bhopal to manufacture carbaryl, an agricultural pesticide, which included manufacturing 'methyl isocyanate' (MIC) – a lethal poison stored in liquid form in metal containers. How water got into one container on the night of the

accident was never identified, but it set off an exothermic reaction with the MIC, turning into a gaseous form. The water sprinklers – a safety feature – failed to operate, and the gaseous MIC escaped into the city. Being heavier than air, it sank to the ground, affecting eyesight and breathing. People running in panic ingested more gas, leading to more casualties. Several died in the resulting stampede.

The total number of deaths remains unknown, with estimates ranging from 3000 to 8000, since many bodies remained unidentified. The number of injured people runs into hundreds of thousands, depending on the severity and permanence of the damage. The presence of Army establishments in Bhopal led to their assistance being sought, and there were several instances where they performed heroic tasks to rescue people, despite great personal risks. In fact, the commander of this effort, Brigadier Maini, died prematurely some years later of pulmonary complications contracted during these operations.

Some lessons learnt from this manmade disaster can be mentioned:

- The addition of the highly poisonous chemical, MIC, to the inventory held by Union Carbide without providing multiple-redundancy safety measures was most reprehensible. The people were ignorant about its consequences, which raises the issue of creating public awareness about the effects of likely accidents in industrial plants. Would this help mitigate possible disasters, or create a nation of people living in fear? Significantly, the medical community was unaware of the physiological effects of MIC or how it should be treated, and could only provide symptomatic treatment. The question, therefore, of creating awareness has a larger remit that requires greater consideration.
- Second, arrangements for the treatment of victims in large numbers need attention. A moral dilemma before doctors and nurses is whether they should treat everyone or weed out those unlikely to survive. A triage principle is adopted during wartime to select the wounded for treatment. Should these principles apply in peacetime to treatment of victims of manmade and natural disasters? Another question arises about the disposal of dead bodies. Under Indian law, a post-mortem has to be conducted to ascertain the cause of death in any case having a medico-legal dimension. This is impracticable in large-scale accidents. Riots have occurred in hospitals with relatives being unwilling to permit further mutilation of the bodies to serve legal niceties.[16] Greater thought needs to be given to these moral and legal dilemmas.

There are other lessons of equal significance:

- For instance, how should the population be isolated in an epidemic and prevented from carrying the infection further into the countryside by

fleeing in panic? This happened when a suspected outbreak of plague occurred in Gujarat in 1994, when immigrant workers fled to their native towns and villages in different parts of India.

- In addition, in the Indian experience, the immediate first aid and life-saving work in natural and manmade disasters is invariably undertaken by the local population from their own minimal resources. Indeed, the resilience of the local population has been favourably noticed in examining past cases of disaster management.[17] Ironically, the first responders and first victims are also the same; hence the imperative need for training them to deal with disasters.
- The government must take responsibility for preventive action to avert disasters and mitigate their effects, which includes enforcement of building norms in earthquake prone zones; insistence on fire safety precautions being incorporated into high-rise structures; establishing early warning systems to inform people of impending floods and cyclones; repairing drainage systems in cities to evacuate flood waters and so on. The responsibility of the state must also include providing funds for undertaking preventive measures. Experience shows that governments are unwilling to spend money on prevention, but spend much more on relief measures when disasters occur.
- Finally, the need to simplify procedures for dispensing relief cannot be overemphasized. A common complaint in executing relief works or rehabilitation schemes is that money does not reach the beneficiaries in a timely manner. Allegations are sometimes made that political and religious considerations guide assistance to disaster victims. Complaints of malfeasance are also received. Full transparency in relief and rehabilitation efforts is the best antidote.

Policies and plans relating to natural disasters

A paradigm policy shift in dealing with natural calamities was affected in 2002 in line with the Yokohama Strategy enunciated in 1994 during the international decade for natural disaster reduction. Emphasis was laid in this strategy on disaster prevention, mitigation and preparedness to reduce vulnerability, instead of disaster response. Disaster response only yields temporary results at high cost; prevention and mitigation contribute to lasting improvement in safety and are central to integrated disaster management.[18] The main thrust in disaster management was changed from a relief-centric approach to cover the entire cycle of disaster management, encompassing, 'prevention, mitigation, preparedness response, relief and rehabilitation. The approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process'.[19] The disaster management policy then evolved from 'post disaster response to mitigation and preparedness',[20] and

'management of damage against conventional weapons [but] also threat perceptions against Nuclear weapons, Biological and Chemical warfare and Environmental disasters'.[21]

A National Disaster Management Authority (NDMA) was constituted in 2006. It has drafted the National Policy on Disaster Management, and is formulating guidelines to prevent, prepare for, and mitigate, natural and man-made disasters through a consultative and participatory process involving the major stakeholders in government, academic and scientific institutions, the corporate sector and the wider community. Guidelines for managing earthquakes, chemical (industrial) disasters, preparing state disaster management plans, medical preparedness and mass casualty management have been issued. Guidelines on nuclear disasters, biological hazards, cyclones, landslides, urban flooding, river erosion, micro-finance and insurance are under preparation.[22]

Reverting to our example of the tsunami disaster in December 2004, an important policy decision was taken by the Government of India to extend the management of its coastal zones to include, not merely the coastline, but also the adjoining sea surface to prevent pollution, erosion and salt water intrusion and face the challenge of sea-level rise due to global warming. Not only are its island territories (Andaman and Nicobar islands in the Bay of Bengal, and the Lakshdweep islands in the Arabian Sea) at risk, but its metropolitan cities of Mumbai, Chennai and Kolkata are also vulnerable. Significantly, some 250 million people in India live within 50 kilometres of the coastline.[23] The creation of bio-shields by planting mangroves along vulnerable coastlines is now being undertaken; they would serve as speed breakers to reduce the impact of tsunamis and cyclones. Further, a coastal farming system involving mangrove plantation and aquaculture is proving popular, which will also improve carbon sequestration and reduce global warming.[24]

Earthquakes have also caused extensive damage in India. Model building by-laws have been framed by the NDMA for high-rise buildings to incorporate and retrofit disaster-resistant features; capacity enhancing courses have been arranged for building engineers and architects; retrofitting of pilot buildings undertaken, and disaster risk management programs launched in vulnerable districts involving preparation of disaster management plans down to the village level. These include plans for operating relief camps, evacuation of affected population; and ensuring availability of food grains and essential commodities.

As a general measure to guide relief operations a multi-mode, multi-channel communications system, based on satellites, is envisioned to establish continuous contact with the affected areas. An incident command system is also envisaged to professionalize emergency response management by immediately deploying designated coordination officers, with the backup assistance of incident management teams having specialists in logistics, planning,

safety, media relations and so on. Awareness programs to heighten risk perception, preparedness and self-reliance in the context of disasters like earthquakes and cyclones have been launched, and mock drills held to review the adequacy of state and district disaster management plans, and identify gaps in resources and implementation.[25] Taken together all these measures are designed to build capacity among those who shall be involved in disaster management at the planning, supervisory and executive levels.

Regional cooperation

Natural disasters are linked to climate change. Scientific opinion is divided on whether global warming and climate change arise from evolutionary or manmade causes, but 'there is clearly a strong correlation between the steady rise in ocean temperatures attributable to anthropogenic greenhouse-gas emissions and the demonstrable increase in storm frequency and intensity'.[26] India recognizes that, 'The frequency of extreme weather events leading to natural disasters may increase. We may face multiple risks resulting from rise in sea-levels, problems with water availability, recession of Himalayan glaciers, food security and public health ... we have set up a Council on Climate Change chaired by the Prime Minister himself.'[27] India's policy towards climate change was incorporated in the SAARC Declaration on Climate Change in December 2007, envisaging, '[provision of] adequate resources to tackle climate change without detracting from development funds; funding assistance for the transfer of environment-friendly technologies and their adaptation; binding CHG emission reduction commitments by developed countries with effective timeframes; and equitable burden-sharing'.[28]

Natural disasters can trigger security related problems. India is vulnerable to immigration due to environmental refugees flooding into the country. The loss of agricultural land due to flooding and coastal erosion in Bangladesh had led to its desperate people illegally entering India in search of employment and a better quality of life. A similar problem arises from rising sea levels which threaten to submerge the Maldives. A natural antipathy against these poor migrants is evoked since they compete for employment with Indian citizens, which often flares up into law-and-order problems. These migrations could be better managed if they occurred in an orderly fashion, but that would be naïve to expect.

The experience in south Asia shows that natural and manmade disasters do not respect national boundaries, and can affect more than one country, as is apparent during floods and cyclones, and was dramatized by the tsunami disaster in 2004. Quite obviously, regional and international cooperation is required to meet the challenge. Arrangements exist to provide advance warnings of floods between India and Pakistan, and India and Bangladesh where India is the upper riparian state, and between India and Nepal where India is the lower riparian state. The Indian air force has

routinely provided its helicopters for air-dropping food and emergency supplies to people marooned during floods and cyclones in Bangladesh. In the post-tsunami (December 2004) relief operations the Indian Navy played a crucial role in south and Southeast Asia by providing humanitarian assistance promptly to Sri Lanka, the Maldives and Indonesia, apart from India's Andaman and Nicobar islands. As a matter of policy, however, India does not make requests or appeals to the international community in the event of natural disasters, but assistance offered suo motu is accepted.

Disaster management has figured on the agenda of SAARC. The SAARC Declaration issued after its last Summit Meeting in Colombo notes that: the heads of state or government present 'expressed concern at the human life suffered through natural disasters in the region and stressed the need for the timely provision of relief in humanitarian emergencies ... they directed that a Natural Disaster Response Mechanism be created to adopt a coordinated and planned approach to meet such emergencies ...'[29] Until a regional response mechanism is established, however, the bilateral modality is available. The present cooperative arrangements for regional cooperation, however, remain modest. A SAARC Disaster Management Centre was established alongside the NIDM in India in 2006. Its mission is to provide 'policy advice and facilitate capacity building services including strategic learning, research, training, system development, expertise promotion and exchange of information for effective disaster risk reduction and management'.[30]

Conclusions

It seems inevitable that an increasing deployment of the armed forces to deal with natural and manmade disasters will be the future norm. In recognition of this reality, India has appointed a former Chief of the Army Staff as the first Vice Chairman of the National Disaster Management Authority, who is the chief executive of the organization. A former Director General of the Armed Forces Medical Services heads its medical wing. A specialized body has also been established within the Armed Forces Medical School to train service personnel in handling WMD-related disasters. Currently some eight battalions of paramilitary forces have been trained and equipped to deal with natural and manmade disasters. They are deployed in strategic locations around the country to respond quickly in emergencies. In time, the Indian armed forces could establish dedicated units for handling natural disasters, equipped for this purpose. They would need to be integrated into disaster management plans, as they would form the core of quick reaction teams to fly into disaster affected areas for coordinating relief operations.

A lack of appreciation of the problem means that the costs of inaction can geometrically escalate when disasters strike in the Indian situation, partly because these costs are difficult to compute. But, the greater difficulty arises in convincing legislators and finance officers to find the budget to adopt

preventive measures like protective earthworks to prevent floods, although much more money would be spent when floods occur. Perhaps legislators and finance officials should be familiarized through a general program relating to disaster management with worst-case scenarios. No doubt, there is greater policy emphasis now on planning and preventive measures to anticipate and deal with natural and manmade disasters. However, a shadow falls between the policies and plans envisaged and their implementation, which is evident from the continuing building collapses, fires in high-rise buildings, the breach of canals and so on, highlighting poor supervision. It needs further reiteration that the preparation of disaster risk management programs is not enough. They must be constantly rehearsed through simulation exercises, which are not being adequately undertaken, leading to tragic errors in executing relief programs when the need actually arises.

Relief and rehabilitation measures, especially after major disasters like the tsunami (2004) and earthquake in Kashmir (2005) require long-term efforts and large outlays to ensure that the affected population regain their livelihoods and return to their normal lives. The need for multi-disciplinary teams with specialists in credit management, civil engineering, public health, education and so on is an innovation worth establishing. They need to be deployed soon after the disaster, since the first responders often become the first victims.

Notes

1. Government of India, Ministry of Home Affairs (2004) *Disaster Management in India: A Status Report* (Hereafter: Status Report), p. 61.
2. Government of India, Ministry of Home Affairs (2008) *Annual Report 2007–2008* (Hereafter: Annual Report, 2007–2008), p. 89.
3. *Ibid*.
4. India's Planning Commission uses a Head Count Ratio to estimate the poor population based on dietary adequacy norms of 2400 and 2100 kilocalories being consumed daily in rural and urban areas. Government of India, Ministry of Finance (2008) *Poverty and Inclusive Growth*, http://indiabudget.nic.in/es2007–08/chap103.pdf (accessed 12 August 2008).
5. A person aged seven and above who can both read and write with understanding in any language is deemed literate. Government of India, Ministry of Information and Broadcasting, Publications Division (2008) *India 2008: A Reference Annual*, p. 6.
6. Ramya Kannan, 'An Occasion to Assess Progress of Tsunami Rehabilitation Works', *The Hindu*, 26 December 2008.
7. Government of India, Ministry of Information and Broadcasting, Publications Division (2008) *India 2008: A Reference Annual*, p. 60.
8. Government of India, Ministry of Home Affairs (2005) *The Disaster Management Act, 2005*, Act No. 53 of 2005, Section 2 (d), http://www.mha.nic.in (accessed 23 December 2005).
9. Government of India, Ministry of Environment and Forests (2005) S*tate of Forests Report 2005*, p. 11, http://www.fsi.nic.in/sfr2005/SFR2005.pdf (accessed 8 August 2008).

10. Government of India, Ministry of Environment and Forests, *National Forestry Action-Programme, India*, http://envfor.nic.in/nfap/detailed-policy-1.html (accessed 9 August 2008).
11. Government of India, Ministry of Home Affairs (2008) *Annual Report 2007–2008* (Hereafter: Annual Report, 2007–2008), p. 89.
12. Within the Business Rules framed under the Indian Constitution each Ministry in the Government of India is prescribed a specific charter of duties that cannot be infringed upon or extended except by enabling orders of the Central Cabinet, which then needs to inform Parliament, since this embodies the subordinate legislation delegated to the executive.
13. Government of India, Ministry of Home Affairs (2008) *Annual Report 2007–2008* (Hereafter: Annual Report, 2007–2008), p. 91.
14. *Ibid*.
15. Animesh Roul (2003) 'Plague Outbreaks in India: Surat and Himachal Pradesh' in P. R. Chari and Arpit Rajain (eds) *Biological Weapons: Issues and Threats* (New Delhi: India Research Press).
16. These problems are discussed in James Manor (1993) *Power Poverty and Poison: Disaster and Response in an Indian City* (New Delhi: SAGE Publications), esp. chapter 5 on 'The Medical Services', pp. 81–100, which relates to large-scale deaths due to people drinking illicit liquor laced with methyl alcohol.
17. In a study on the resilience phenomenon in the American setting, four factors are highlighted for being optimized. Robustness, or the ability to keep operating after a disaster. Resourcefulness, which is technology-based, but is also people-dependent. Rapid recovery to normalize the situation. And, having the absorptive capacity to learn new lessons. Stephen E. Flynn (2008) 'America the Resilient', *Foreign Affairs*, vol. 87, no. 2, 5. These factors are of universal applicability.
18. Government of India, Ministry of Home Affairs, National Disaster Management Division (2004) *Disaster Management in India – A Status Report*, p. 14.
19. Government of India, Ministry of Home Affairs (2008) *Annual Report 2007–2008* (Hereafter: Annual Report, 2007–2008), p. 89.
20. Government of India, Ministry of Home Affairs, *Annual Report, 2002–03*, pp. 43–45.
21. Government of India, Ministry of Home Affairs, *Annual Report, 2004–05*, p. 125.
22. Government of India, Ministry of Home Affairs (2008) *Annual Report 2007–2008* (Hereafter: Annual Report, 2007–2008), p. 90.
23. M. S. Swaminathan, 'The Tsunami and a New Chapter', *The Hindu*, 26 December 2008.
24. *Ibid*.
25. Government of India, Ministry of Home Affairs (2008) *Annual Report 2007–2008* (Hereafter: Annual Report, 2007–2008), p. 90.
26. Alan Dupont (2008) 'The Strategic Implications of Climate Change', *Survival*, vol. 50, no. 3, 39.
27. Address by Mr Kapil Sibal, Minister of Science and Technology and Earth Sciences, at the *13th Conference of Parties of the United Nations Framework Convention on Climate Change*, Bali, 12 December 2007, http://meaindia.nic.in/speech/2007/12/12ss01.htm (accessed 9 August 2008).
28. Inaugural Address by External Affairs Minister Mr Pranab Mukherjee at the Sustainability Summit: Asia 2007, 11 December 2007, http://meaindia.nic.in/speech/2007/12/11ss01.htm (accessed 9 August 2008).

29. Permanent Delegation of Sir Lanka to the United Nations in New York, 'Colombo Declaration of 15th SAARC Summit', 8 August 2008, http://www.slmission.com/statements/88-ministry-statements/109-colombo-declaration-of- (accessed 19 January 2009).
30. Cf. Mission Statement of the SAARC Disaster Management Centre, http://saarc-sdmc.nic.in/sdmc_vision.asp (accessed 19 January 2009).

9

Natural Disasters and Policies to Confront: A Case Study of Vietnam

Luan Thuy Duong

Introduction

Lying in a tropical monsoon area, as well as in the typhoon centre of Asia-Pacific – one of the world's five storm centres, Vietnam faces various kinds of natural disasters. The country is among ten countries worldwide to suffer the highest frequency of natural disasters, including storms, floods, flash floods, landslides and drought. Yet, Vietnam is widely known as a country that has performed well in responding to natural disasters. It has reduced the number of deaths and casualties occurring as a result of natural disasters preparedness since 1999. This chapter will examine the impacts of climate change on Vietnam, in terms of economic infrastructures, developments and human resources. It will also consider the responses and policies of the Vietnamese government on the issues.

Global warming, climate change and consequences

As shown in a recent World Bank study, Vietnam is among the countries most heavily affected by the consequences of global warming and climate change: of the 84 coastal developing countries investigated in terms of sea-level rise, Vietnam ranks first in terms of impact on population, GDP, urban extent, and wetland areas, and ranks second in terms of impact on land area (behind the Bahamas) and agriculture (behind Egypt). Vietnam is also highly vulnerable to climate change: Vietnam ranks fourth behind China, India, and Bangladesh in terms of the absolute number of people living in vulnerable, low-elevation coastal zones, defined as the contiguous area along the coast that is less than 10 meters above sea level. About 43 million Vietnamese are living in those LECZ, which is about 55 per cent of the country's population (38 per cent of Vietnam's urban population). This is the highest percentage of all countries worldwide.

A study by Vietnam Institute of Meteorology, Hydrology and Environment says that Vietnam is now already suffering from climate change with annual average temperature increase and a rise in sea levels.

Between 1900 and 2000, annual average temperatures increased by 0.1°C per decade. Summers are becoming hotter with average summer temperatures increasing by 0.1°C to 0.3°C per decade. It is expected that, compared to 1990, temperatures will increase in the range 1.4–1.5°C by 2050 and 2.5–2.8°C by 2100[1] – and the highest temperature increases will be inland. Changes in rainfall patterns are complex and season and region specific. Monthly rainfall is already decreasing in most of the country in July and August and increasing in September, October and November, and rainfall intensity is increasing considerably. Compared to 1990, annual total rainfall is expected to increase in the range of 2.5 per cent to 4.8 per cent by 2050 and by 4.7 per cent to 8.8 per cent by 2100. The increase will be largest in the north of Vietnam and smallest in the southern plains. It is expected that rainfall will be concentrated, even more than now, in the rainy season months, leading to an exacerbation of drought problems in the dry season. Climate change, then, is set to make precipitation more uneven and variable over time and space. Even before future climate change is factored in, Vietnam is at risk from extreme weather events. In 1996, more than 2000 km^2 of the country's coastal zones were estimated to be at risk from annual flooding, with the Mekong River delta accounting for 75 per cent of this total and the Red River delta a further 10 per cent. In some areas, such as the central provinces and the Mekong River delta, floods appear to be increasing in intensity compared with those in the first half of the twentieth century, though whether this simply reflects increased human settlement, cultivation, and infrastructure development is unclear. Flood damage is expected to be aggravated by an increase in daily rainfall of 12–19 per cent by 2070 in some areas, affecting both flood peak discharges and the return period of floods. Drought problems will intensify through increased variation in rainfall and increased evaporation (3 per cent in coastal zones and 8 per cent in inland areas by 2070) triggered by rising temperatures.

The number of typhoons that Vietnam experienced increased between the 1950s and the 1980s but subsequently decreased in the 1990s. The peak month of typhoon landfalls has shifted from August in the 1950s to November in the 1990s, and considerable uncertainty exists about the expected frequency of typhoons in the coming century. The trajectory of typhoons appears to have moved southwards in recent years,[2] though it is widely expected that due to a rise in temperatures the north will become more subject to typhoon activity and the intensity of storms will increase, resulting in higher peak wind speeds and more intense precipitation. Coastal zones will suffer from more intense typhoons, posing higher threats to people's lives, livelihoods, infrastructure and agricultural production.

Upland communities will be faced with increasing risk of flash floods and landslides from heavy rainfall. An estimated 80–90 per cent of Vietnam's population is potentially directly affected by typhoons.[3]

Several studies have reported sea-level rises in Vietnam. According to UNEP (1993) sea levels around Vietnam increased by 5cm between the 1960s and 1990s and the Hydro-meteorological General Department estimates that the seawater level is rising at an average rate of 2mm per year. Coastal erosion has also been reported, such as in the Cau Mau area where more than 600 hectares of land have been eroded, with 200m wide strips of land lost in some locations. Predictions for the extent of sea-level rise in the future differ, with national publications asserting a rise of up to 1m by 2100.[4]

The IPCC[5] estimates that the global average sea level rose between 1900 and 2000 by about 15 cm, and predicts that with different greenhouse gas emission scenarios this will at least double in the period 2000 to 2100, that is, a rise of 28–58 cm (3–6 mm/yr) This is lower than previously expected but many uncertainties still exist and a 1m rise cannot be ruled out. Sea-level rises will overwhelmingly impact on the low-lying Mekong River delta, which could be almost completely inundated for some periods of the year.

The sea-level rise in Vietnam would lead to flooding of up to 20,000 km^2 of the Mekong River delta and 5000 km^2 of the Red River delta. In the Mekong River delta alone, more than 1 million people would be directly affected. A 1 metre rise in the sea level would affect approximately 5 per cent of Vietnam's land area, affect 11 per cent of the population, impact on 7 per cent of agriculture, and reduce GDP by 10 per cent.[6] The 3 and 5 metre sea-level rise scenarios for Vietnam are described as 'potentially catastrophic'.

Natural disasters and impacts

Vietnam has a long history of coping with natural disasters and mitigating their effects in many ways. Natural disasters affect particularly the coastal regions but also include flash floods in upland areas, for example following landfall of typhoons associated with heavy rainfall. The Institute of Meteorology, Hydrology and Environment says heavy rainfall hits the country more frequently in some areas, causing severe floods, while rainfall has decreased in almost all areas in the country, creating drought conditions. In addition, storms occur more frequently in the central and southern regions.

Vietnam is located in the northwest of the Pacific Ocean, one of the storm-prone areas with a vast and violent number of typhoons and the trend shows they are increasing, especially in the last three decades. Typhoons are one of the major and most dangerous types of natural disasters in Vietnam. In more than 50 years (1954–2006), there were 380 typhoons and tropical

depressions in Vietnam in total, of which 31 per cent hit the north, 36 per cent in the northern central and middle central part, and 33 per cent in the south central and the south. A typhoon's landfalls are usually accompanied by high tides and heavy rain, thus resulting in heavy and long rains and floods. It is estimated that up to 80–90 per cent of Vietnam's population are affected by typhoons.

Floods in northern river systems normally occur from May to September, and there are about 3 to 5 floods annually, each of them may last from 8 to 15 days. The progress of floods in the Mekong River delta in the south of Vietnam last for a period of 4 to 5 months annually, causing inundation in almost all areas of the Mekong River delta.

Following typhoons and floods, drought causes the third greatest losses in Vietnam. Drought control is difficult due to water shortage and depleted upstream reservoirs. Whirlwinds and cyclones are common phenomena in Vietnam and their frequency has increased in recent years.

Landslides on hill and mountain slopes have been caused by heavy rains and brought impacts like mountain destruction for roads, forest destruction, etc. Landslides often come with mud floods and cause serious damage to human life and assets. Earthquakes have happened in Vietnam though they have had limited strength. Tsunamis have not yet happened in Vietnam but many coastal areas of Vietnam have been affected by tsunamis in some neighbouring countries.

Vietnam has more than 80 per cent of its population living at risk of direct impacts of natural disasters. According to figures released by the Ministry of Agriculture and Rural Development, natural disasters have left close to 750 dead and missing each year over the past decade, and caused estimated losses of nearly 1.5 per cent of the country's GDP. Vietnam loses US$375 million per year because of natural calamities.

Between 1991 and 2000 more than 8000 people were killed by natural disasters (storms, floods, flash floods, land slides). In addition, an estimated 9000 boats were sunk and 6 million houses were destroyed. The total economic value of losses for this period was estimated at US$2.8 billion.

In the last 5 years (2002–2006), natural disasters have killed 1700 people and caused estimated assets losses of US$4.6 billion.

The Chanchu typhoon in the central region in 2006 caused 19,249/1 – fishing boats sunk in the East Sea. The Xangsane typhoon in the central region in 2006 caused 72, 4/532 – 349,348 houses collapsed and damaged; 5236 classrooms damaged; 21,548 ha of rice fields flooded and damaged; 3974 ha of fish and shrimp ponds damaged; 494 tons of fish and shrimps destroyed; and 951 ships and boats sunk.

In 2007 alone, storms and floods caused huge human and property losses. In recent days, high tides have destroyed many dyke sections in Ho Chi Minh City, damaging many farms, aquaculture areas and houses. Thousands of people in the areas hit by floods and storms are facing a very difficult life.

Based on global climate change and the losses caused by natural disasters in Vietnam, international experts warned that as many as 22 million Vietnamese people, especially those living in the central and southern regions, could be displaced if the sea level rises by an additional 1m.

A rise in seawater level will worsen saline water intrusion in coastal zones too, which is already a problem in some areas due to fresh water extraction for irrigation and drinking water and the construction of canals in the deltas and upstream dams. The Mekong River delta will be the most affected region with 1.77 million ha of salinized land, accounting for 45 per cent of the land. A sea-level rise of 30 centimetres (a scenario for 2050) would increase the salinity of the main tributaries of the Mekong River as far as 10 kilometres inland. Inundation and the resulting loss of land, and saline water intrusion in the Mekong delta and parts of the Red River delta, the country's most important agricultural areas, will pose serious threats to farmers as well as agricultural exports, such as rice (of which Vietnam is the second largest exporter in the world), and possibly to national food security.

Besides inundation, more frequent flooding, saline water intrusion, drought, and typhoons, both agriculture and natural ecosystems will suffer from increased minimum temperatures, a decreasing number of days with temperatures under 20°C (0–50 days by 2070) and an increasing number of days with temperatures above 25°C (0–80 days by 2070).

This will affect growing periods, crop calendars and crop distribution, increase pest and virus activity and cause migration of tropical trees and crops northwards by 100–200 kilometres and to higher altitudes in the mountains by 100–550 meters where they will replace subtropical species. In addition, some species may become extinct as a result of changing climatic conditions, and it is predicted that yields of summer rice will decrease by 3 to 6 per cent by 2070, compared to the 1960–1998 period. The impact on spring rice may be more serious, especially in the north where yields are expected to decrease by 17 per cent by 2070, compared with the south of the country where yield will decrease by 8 per cent.[7]

Climate change is expected to have a considerable impact on Vietnam's fishery and aquaculture sectors, which accounted for 3.9 per cent of GDP in 2005. The numbers of tropical fish with a low commercial value (except for tuna) will increase and the numbers of subtropical fish with a higher commercial value will decrease. Coral reefs are expected to degenerate and fish living in these habitats are expected to disappear.

Moreover, sharp decreases in plankton will lead to migration of fish and reductions in fish body mass. As a result, it is estimated that the economic sea production capacity of Vietnam will be reduced by at least one-third. Due to a rise in the seawater level, aquaculture farms will have to be relocated and saline water intrusion and reduction of the mangrove area will create loss of habitat for fresh water creatures.

Speaking at the launch of the UNDP Human Development Report 2007/2008, Natural Resources and Environment Deputy Minister Nguyen Cong Thanh said that climate change and natural disaster is not only an environmental issue but also a development issue.

Responses

Climate change and natural disasters are becoming global issues that should be addressed urgently by all countries and Vietnam has taken a number of measures.

There are several laws in Vietnam in the 'disasters' area, including the Law on Water Resources, the Ordinance on Emergencies, the Ordinance on Storm and Flood control and the Ordinance on Dykes. Forest fires and droughts are mentioned in other laws.[8]

Being aware of the serious impact of climate change, Vietnam signed the United Nations Framework Convention on Climate Change in June 1992 and ratified it on 16 November 1994, and ratified the Kyoto Protocol on 25 September 2002.

The Ministry of Natural Resources and Environment has carried out many projects on how to mitigate and adapt to climate change. Currently, it is studying climate change scenarios and building a national strategy to address the phenomenon.

The weather forecasting system has been upgraded, bringing about positive results as the recent storms were correctly forecast, helping localities carry out necessary control plans and reduce losses.

Vietnam already has an extensive long-standing institutional response system for natural disasters such as floods and typhoons, reflecting the country's vulnerability to these events. Disaster risk management activities are coordinated primarily by the Central Committee for Flood and Storm Control (CCFSC, founded in 1955), chaired by the Minister of Agriculture and Rural Development. Other members of the CCFSC include relevant line ministries, the Department of Floods and Storm Control and Dyke Management, the Disaster Management Centre, the Hydro-meteorological Service, and the Vietnam Red Cross (VNRC).

The Natural Disaster Mitigation Partnership (NDM-P) is made up of government, NGOs and donors to promote dialogue and common ways of working, and support coordination for implementation of the Second National Strategy and Action Plan for Disaster Mitigation and Management (discussed below). The CCFSC is responsible for gathering data, monitoring flood and storm events, issuing official warnings and coordinating disaster response and mitigation measures. The authorities in all localities and each sector's ministry also have committees for flood and storm control (CFSCs).

Local CFSCs at the provincial, district and commune levels are responsible for coordination of flood and storm measures: organizing dyke

protection, flood and storm preparedness and mitigation; and flood recovery and rehabilitation. Sector committees support with technical assistance, materials and equipment. The system of CFSCs is important for sharing information on damage and relief needs, communicating early warning information, damage assessments, coordinating rescue during floods, and protecting dykes and other infrastructure. Vietnam's mass organizations are also crucial in disaster response, with the Fatherland Front raising and dispersing considerable relief funds and supplies, for example during the 2000 and 2001 floods in the Mekong delta.

The VNRC is operating throughout the country from national to commune level and works on awareness raising, disaster preparedness, response and prevention.

Policies to confront

The National Strategy on Natural Disaster Prevention and Mitigation to 2020

Vietnam's policy for disaster management was formalized in July 2007 when Prime Minister Nguyen Tan Dung ratified the National Strategy on Natural Disaster Prevention and Mitigation to 2020. Accordingly, natural disaster prevention and mitigation will be carried out by the state and the people. The strategy aims to mobilize all resources to effectively prevent and mitigate natural disasters from now to 2020, to ensure sustainable development, national defence and security.

Specifically, the strategy will centre on upgrading the nation's ability to forecast storms, floods, droughts, earthquakes, tsunamis and other dangerous natural phenomena, especially increasing the forecast time to 72 hours before the onset of disasters. The strategy includes nine groups of general missions and solutions and five groups of missions and solutions to prevent and mitigate natural disasters in each region. The top mission is building and completing the legal system and policies on natural disaster prevention and mitigation; issuing policies on disaster relief and policies to encourage sci-tech, investment and international cooperation in, and mobilizing resources for, natural disaster prevention and mitigation.

The state encourages the application of advanced sci-tech to improve forecast, warning and communication ability, the country's ability to research changes in the earth and nature in Vietnam and in the region.

The strategy states that Vietnam will develop sciences on natural disasters, such as natural disaster control, sustainable development, disaster health, production and environmental recovery after disasters, etc.

The Ministry of Agriculture and Rural Development and the National Steering Board for Flood and Storm Control will implement the strategy.

The Second National Strategy and Action Plan for Disaster Mitigation and Management 2001–2020

Vietnam's policy for disaster management was also set in the Second National Strategy and Action Plan for Disaster Mitigation and Management 2001–2020. This strategy prioritizes increased awareness raising and participation, minimizing loss of life and assets, and stresses the importance of co-existence with floods in situations which demand it. Other key initiatives of the Second National Strategy include: establishment of disaster forecast centres in the north, centre and south of the country (for different disasters); construction of flood corridors and flood retention areas in southern Vietnam; the use of advanced information and communication technology; strengthening the role of schools and the media in awareness raising; maintaining and upgrading equipment for local Flood and Storm Control Committees; and a proposal for a national disaster fund for projects on disaster mitigation and preparedness, and setting up a disaster insurance company.

The Second National Strategy is still, however, designed principally to address short-term climate extremes rather than to respond to future climate change, and focuses on emergency response and reconstruction, rather than risk prevention and adaptation. There is also a marked lack of integration between disaster risk reduction policies and wider policies for rural development and poverty reduction, with little cross-sector integration or coordination, either in policy, or practice. A recent study into institutional arrangements for climate change response concludes that: 'Integration of institutions engaged in disaster management, climate risk and development remains a weakness in Vietnam, but there are positive examples of coordination to build upon, including the multi-scale framework provided by the CFSC system and the NDM partnership for Central Vietnam'.[9] There is limited government ownership yet of an adaptive approach to future climate-related risks, and limited financing available for climate change adaptation.

Disaster warning and preparedness is a key policy of Vietnam's response to climate-related threats and disasters. The UNDP has long supported Vietnam in improving early warning for disasters, gathering and reporting damage data, and in connecting Vietnam's hydro-meteorological data services and the CCFSC to the national media in order to make information more readily and more widely available. The government is continually upgrading capacity in this regard and satellite data is expected to be available in 2008 from Vietnam's own satellite, Vinasat. Real-time meteorological information is also available from China and Japan's meteorological agencies, but improvements in information collection and communication are especially needed to prevent the large loss of life through sinking of boats as occurred in the East Sea in 2006 during typhoon Chanchu (see annex). The national typhoon warning system

delivers a 48-hour warning, broadcast through the media and locally via loudspeakers, and during the typhoon season dykes are monitored 24 hours a day. The CCFSC also disseminates reports by electronic mail. However, despite recent improvements the system is still in need of further improvement.

The policy slogan during and after this time was 'living with the floods', which reflects a realization that ever higher dykes in the Mekong delta are not the answer to seasonal floods, that fields and forests must store flood water instead, and that people's livelihoods must adapt. Government has subsequently launched a programme of safe settlement areas for home relocation and the raising of homes above flood levels so that evacuation will no longer be necessary. However, there have been delays with this large-scale construction and relocation programme, and some resistance to move, especially because the settlements limit people's access to canals and their fields, in non-flood times as well as during floods, whilst fishing is a critical survival and livelihood strategy.

International cooperation

Vietnam gives high priority to enhancing international cooperation to cope with natural disasters.

The effectiveness of disaster response depends on the quality of preparedness. Emergency preparedness and responsiveness is therefore a programme thrust of ASEAN. In July 2005, the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) was signed, which provides a comprehensive regional platform to strengthen preventive, monitoring and mitigation measures to reduce disaster losses in the region. The Agreement indicates as one of its principles that ASEAN shall, to the furthest possible extent, mainstream disaster risk reduction efforts into sustainable development policies, planning and programming at all levels.[10]

As a member of ASEAN, Vietnam has begun to implement many of the provisions of the Agreement. Vietnam and other ASEAN member countries have started formulating standard operating procedures for the development of regional standby arrangements, mobilization of military and civilian personnel and assets, and coordination of joint disaster relief and emergency response operations. Vietnam is cooperating with other ASEAN countries to set up a network of disaster relief across borders. Vietnam is also committed to conducting regional simulation exercises regularly to enhance preparedness and maintain the applicability of standard operating procedures.

As a member of APEC, in Hanoi, on 24 April 2008, Vietnam held an APEC meeting on natural disaster control. Measures to cope with natural disasters topped the agenda of a two-day seminar. The seminar, officially named 'Dialogues among APEC member economies, enterprise circles and

international partners to confront emergency cases', aims to work towards reducing the effects of natural disasters in the region.

The Vietnamese Deputy Minister of Foreign Affairs, Vu Dung, said the seminar would create a momentum for the region to boost cooperation in this issue. For the host, Vietnam, Mr Dung said the event provided concerned agencies, and in particular, the central provinces, which suffer natural calamities most frequently, with an opportunity to share information and look for international cooperation on this issue.[11]

In addition, Vietnam holds the view that environmental protection efforts are an important contribution to natural disaster control. Therefore, bilateral government links have been developed and promoted between Vietnam and Sweden, Canada, Australia, Denmark, Holland, Japan, France etc., to put into effect the commitments of the government of Vietnam and its counterparts to environmental protection, providing the country with the necessary financial assistance and technical experience.

So far, the disaster relief is still carried out by the army, therefore, while fostering friendship among the armies Vietnam has put the cooperation on disaster relief on the agenda. During the visit by Senior Lieut. Gen. Liu Yong Zhi, deputy director of the General Political Department of China's People's Liberation Army, to Vietnam on 3 November 2008, Lieut. Gen. Nguyen Tuan Dung, deputy director of the General Politics Department of the Vietnam People's Army, discussed the issues with him. Vietnam and China shared experiences in search and rescue and discussed the army's activities in helping natural disaster-hit people restore their normal lives.[12]

The armies of Vietnam and India have not achieved joint activities yet to relieve disasters, but cooperation at governmental level gained some progress. The Prime Minister of the Socialist Republic of Vietnam, H.E. Mr Nguyen Tan Dung, paid a state visit to India from 4 to 6 July 2007 at the invitation of the Prime Minister of the Republic of India, H.E. Dr. Manmohan Singh. During the visit, Vietnam and India issued a Joint Declaration on Strategic Partnership[13] in New Delhi on July 6, following the talks between Prime Minister Nguyen Tan Dung and Prime Minister Manmohan Singh.

The two leaders shared the view that in addition to opportunities for development, the ongoing process of globalization has posed a wide range of non-traditional security issues such as drug trafficking, natural calamities, climate change, energy security, HIV/AIDS, avian influenza and other epidemics that could be effectively tackled by international cooperation. Along these lines, they resolved to strengthen bilateral cooperation in dealing with these issues through sharing experience, expertise and information.

Vietnamese President Nguyen Minh Triet and Japanese Prime Minister Yasuo Fukuda signed a Joint Statement on deepening relations between

Japan and Vietnam in Tokyo on November 27 during President Triet's state visit to Japan. In the Joint Statement, the two sides mentioned cooperation confronting climate change.

Bearing in mind that climate change has become an imminent challenge for the world as a whole, the Vietnamese side appreciates the Japanese proposal 'Cool Earth 50' to achieve the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC), and the two sides share the need to cut global emissions by half of the current level by 2050. Vietnam and Japan will take part in the establishment of an effective framework for addressing climate change beyond 2012 in which all major emitting countries participate. The two sides will further promote cooperation to address climate change and to promote the improvement of energy efficiency and the use of clean energy, including nuclear energy, and to promote the measures for natural disaster risks raised by climate change. The two countries concur to promote a co-beneficial approach, which address domestic environmental pollution and climate change simultaneously. The two governments will continue cooperating to promoting the use of the Clean Development Mechanism (CDM).

Conclusion

Global warming, climate change and natural disaster is a very real threat to Vietnam's continued socioeconomic development. Natural disasters, increasingly erratic and variable rainfall, higher temperatures, more intense extreme weather events like typhoons, droughts and heavy rainfall causing floods, and the rising seawater level will all have significant impacts across sectors, regions and income groups, and particularly on livelihood security of the poorest rural people.

The threat of global warming and climate change and its link to natural disasters is beginning to be acknowledged but information and awareness remains at a low level. Vietnam does not yet have national or local climate change adaptation strategies, and national and local capacity building is urgently needed to ensure that policy responses are adequate and effective. Coordination between line ministries also needs to be urgently improved, and cooperation with international agencies and NGOs enhanced so that climate change can be addressed in an integrated way with long-term socioeconomic and poverty-reduction efforts.

Crucially, those most at risk from climate change, the rural poor living in provinces most affected by climate change and natural disasters, have limited information or financial and technical support to adapt to their changing world, despite some local successes. Their direct experience of climate change impacts should be incorporated into future responses, and solutions sought that build upon existing local adaptation practices, where appropriate. The 'at risk' poor should also be key participants in the planning and

implementation of future climate change adaptation measures, particularly where these require relocation or significant dislocation of existing livelihood practices.

To improve this and for the sake of human security, Vietnam needs comprehensive research on the possible impacts of climate change on the Vietnamese economy and key development goals, particularly poverty reduction. The potential social and economic implications of, for example, sea-level rise on settlements and agriculture, should be studied. Research is also needed on the most effective long-term adaptation measures and strategies to ensure human well-being and continued economic growth and poverty reduction.

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10

Cooperation for Natural Disasters and Special Units: The Emergency Military Unit (UME)

José Miguel González Requena

Introduction

Disasters, either technological or natural, are a reality all over the world in current times. As time goes by, it looks as though natural disasters have become more violent than ever. Leaving aside the reasons for this, one might accept that vulnerability is still significantly on the increase and thus, the risk increases accordingly.

Natural disasters – drought, floods, earthquakes, hurricanes, volcanic eruptions etc. – stall economic growth and development prospects in the affected regions. Donors have traditionally responded with post-shock humanitarian and reconstruction assistance, but they would also welcome a broader strategic approach on emergency planning, through prior risk management strategies and through investment in prevention and in quick response to emergencies.

Disaster risk reduction activities are to be integrated within the planning process for projects in countries that might be vulnerable to the effects of natural hazards. These activities include actions that seeks both to reduce vulnerability and to enhance resilience of populations, structures, institutions and services at risk throughout every aspect of the disaster management cycle: among others, those undertaken during the disaster event, comprising an emergency response in the immediate aftermath of it. It is in these domains that the European Union and NATO organizations are taking a more proactive role within civil protection.

NATO concerns regarding natural disasters

At the NATO level, efforts have been made to assist countries affected by natural disasters. As an example, Russia got the right not only to engage in consultations, but also to take part in the decision-making process

on some specific issues, in order to counter the consequences of natural disasters.

Perhaps the most significant step NATO has taken towards developing better capabilities has been the creation of the NATO Response Force (NRF). Agreed in November 2002 at the NATO Prague summit, it was intended to fill the gap in NATO's expeditionary capabilities by providing a joint multinational force that is technologically advanced and maintained at high readiness. The NRF has already been deployed to provide security for the Afghan elections and for disaster relief after the 2005 Pakistan earthquake (a very good and recent example of NATO's commitment to cope with natural disasters). The NRF is expected to reach up to 21,000 troops, drawn from national forces.

NATO has adopted several significant steps and policies for dealing with natural disasters: the NATO Parliamentary Assembly, in its Resolution 360/2007 on 'NATO's Role in Civil Protection'[1], stressed the policies to be developed with regards to natural disasters, among others, the creation of the NATO Civil Emergency and Crisis Management expert group. In some NATO missions like Kosovo, special attention was made to overcome the effects of natural disasters. The Individual Partnership Action Plan, subscribed to by countries like Armenia, Georgia, Azerbaiyan, Armenia, Kazakhstan, Bosnia and Herzegovina and Montenegro, includes civil emergency planning as one of its objectives, to be able to cope with natural disasters, among other objectives covered into the general categories of political and security issues. The Euro-Atlantic Partnership Council (EAPC) Policy on 'Enhanced Practical Cooperation in the Field of International Disaster Relief', approved by EAPC Ministers of Foreign Affairs on 29 May 1998, was built upon an original proposal by the Russian Federation, supported by the NATO Policy on Cooperation for Disaster Assistance in Peacetime. Because of it, the Euro-Atlantic Disaster Response Coordination Centre (EADRCC)[2] was established at NATO Headquarters, headed by the Director of Civil Emergency Planning. The EADRCC is a '24/7' focal point for coordinating disaster relief efforts among NATO members and partner countries. The Euro-Atlantic Disaster Response Unit (EADRU) is a non-standing, multinational mix of national civil and military elements (qualified personnel from rescue, medical and other units, equipment and materials, assets and transport) volunteered by EAPC countries. The EADRU could be deployed in case of a major natural – or technological – disaster either inside or outside the EAPC boundaries upon request (in the latter case, political guidance should be obtained before any response is implemented). The composition and size of the multinational EADRU is to be determined based on an international assessment of each particular disaster.

During the Bucharest Summit on 3 April 2008, some conclusions were reached: the EADRCC's successes over the past ten years in coordinating

NATO and partner countries' contributions to disaster relief were validated. NATO and the EU are working, and will continue to work, side by side in key crisis management operations, including civil emergency planning.

NATO and Russia: An interesting approach to cooperation in natural disaster relief

In Paris, on 27 May 1997, the Founding Act on Mutual Relations, Cooperation and Security between NATO and the Russian Federation was signed. In Chapter III, Areas for Consultation and Cooperation, the following is stated: 'In building their relationship, NATO and Russia will focus on specific areas of mutual interest. They will consult and strive to cooperate to the broadest possible degree' among other issues 'in conducting joint initiatives and exercises in civil emergency preparedness and disaster relief'. So, from the very beginning, the assistance between NATO and Russia in natural disaster relief is pointed out.

The establishment of the NATO–Russia Council (NRC) at the Rome Summit in May 2002 was a fundamental step in the building of a new Europe. There is now an unprecedented level of cooperation and transparency, both in emergency response and in the military field. The programmes jointly implemented by Moscow and NATO have been drafted to incorporate the interests of all partners. They involve issues such as military reform, anti-terrorist efforts and crisis management. The latter includes liquidating the aftermath of natural disasters, fighting weapons of mass destruction (WMD) and missile technology proliferation, illegal migration, shipwreck rescue and much more. The NRC shall boost its important cooperation in civil emergency planning to increase its preparedness and protection against natural disasters, among other issues.

Russian personnel participated, along with some 1000 people from 25 different NATO and partner countries, in a deployment to assist the Finnish authorities in a 5-day disaster response field exercise, UUSIMAA 2008, held in Finland from 1st to 5th June. This exercise was organized by the EADRCC, being the first one to be hosted by Finland as part of its contribution to the Partnership for Peace programme. The aim was twofold: testing procedures and practising capabilities for coordinating disaster response operations among different organizations and agencies. Urban search and rescue teams located and rescued casualties. Medical teams provided first aid and field hospitals were deployed to provide the necessary follow-on medical care. Several Chemical, Biological, Radiological and Nuclear (CBRN) response teams dealt with the consequences of secondary damage to energy facilities and chemical installations, which had led to several leaks in gas and chemical pipelines.

Further developments need to be implemented in civil emergency protection in order to enhance the common ability to manage the consequences

of attacks with WMD and natural disasters. The preparation for this task included two field exercises in Russia in 2003 and 2004, which proved the ability of the civil response teams to work together. A third exercise was conducted in Italy in 2006.

Efforts have also been made to assist countries affected by natural disasters. For example, Russia got the right not only to engage in consultations, but also to take part in the decision-making process on some specific issues, in order to counter the consequences of natural disasters.

EU concerns regarding natural disasters

Civil protection is currently a responsibility that lies with every Member State (MS) of the European Union (EU). A few examples include: at the EU level and as early as the 1980s, more precisely at the Council Regulation of 1981 on financial and technical aid, a broad frame of objectives and tools was set out. The aid was to be aimed not only mainly at improving food production and rural environment, but also at coping with disasters (art. 3). Between 1985 and 1994, five resolutions were adopted to ameliorate the operational instruments of response to disasters.

As a significant step, an EU Action Plan for 1999 to 2006 was put in place with a budget of €7.5 million per year.[3] Simultaneously, the Humanitarian Aid department of the European Commission (ECHO) has been operating a disaster preparedness programme since 1996, the DIPECHO (Disaster Preparation ECHO).[4] The European Commission on its part has committed itself to supporting disaster risk reduction. Several steps and policies can be mentioned: the 2003 Global Monitoring for Environment and Security, the reinforcing of EU disaster and crisis response in third countries in 2005 and the 2005 European consensus on development.

Due to recent natural disasters, such as the 2005 tsunami, EU civil protection was reviewed. Therefore, in 2005 and within the 9th European Development Fund, the Commission launched the African Caribbean Pacific – EU Natural Disaster Facility. In 2007, an improved EU Mechanism of Civil Protection,[5] to ease cooperation of Member States in response to disasters, was established (the former created 23 October 2001).

The Barcelona Declaration adopted at the 1st Euro-Mediterranean conference (27 and 28 November, 1995) remarked for the first time, as an issue of multilateral assistance among different Mediterranean countries, medical cooperation in the case of natural disasters.

At the EU level, efforts have been increased since then with reference to prevention, mitigation and management of natural disasters. As an example, in 2007 financial support of €4.4 million was allocated to the Euro-Mediterranean partnership for these purposes.

The joint declaration of the Paris Summit for the Mediterranean (July 2008) stated that the establishment of a Joint Civil Protection programme

on prevention, preparation and response to disasters was one of the priorities in civil protection, linking the region more closely to the EU civil protection mechanism.

Finally, the 5+5 Dialogue for the Mediterranean, as an open forum of informal discussion created in 1990 and expanded later to include five EU (Spain, Italy, France, Portugal and Malta) and five Maghreb (Morocco, Algeria, Tunis, Mauritania and Libya) countries, can also be mentioned. The first issues of cooperation were in the economic area. Currently, there are also informal meetings at the internal affairs level, whereas cooperation in case of natural disasters is a must.

To summarize, a great effort has been made by these two organizations, the EU and NATO, to be able to assist their Member States to cope with any emergency that may arise. Next, we examine the current situation in several European countries and the Spanish civil protection system. Also discussed are the effects of the creation of the Emergency Military Unit.

Other European countries' approaches to disaster response management

France

France has had special military units to be deployed as disaster response elements for more than 30 years. These units, called 'USIIC' (Intervention and Security Units) are able to face every contingency. They have been a clear example for the Spanish Emergency Military Unit in organization, procedures and readiness. Nevertheless, unlike the UME, they belong to the Ministry of Internal Affairs and not to the Ministry of Defence, as the UME does.

Switzerland

Switzerland also has a special Disaster Response Engineer Battalion within their Armed Forces. The UME had the outstanding opportunity not only to visit it, but also to participate as observers in their largest emergency exercise, RHEINTAL 06, which involved many participants from three different countries, and that actually mobilized the reinforcements of the battalion, showing the advantages and shortfalls of the system.

Norway

Norway thinks it is especially important to increase the common ability to meet the new threats. In view of the multi-faceted security challenges we have to face, it is particularly important to develop an ability to respond with more than military means. With that in mind, Norway has been a proponent of developing the non-military aspects of cooperation in the NATO–Russia Council. Protecting our civilian populations is particularly important in that regard.

Spain

Spain, with regard to civil protection, has some bilateral agreements signed a long time ago, mainly with neighbouring countries such as Portugal, France and Morocco, which could be included in the Mediterranean area of interest, and also with Argentina and Russia. Moreover, since the EU mechanism for cooperation, MIC (Monitoring and Information Centre), was established on 23 October 2001, Spain has also responded to any request coming from it. Several projects from the EU are on the way to being implemented: this is the case for FIRE 5, together with France, Portugal, Italy and Greece, which has the aim of establishing intervention modules against wildfires and earthquake disasters, to be put at the MIC's disposal for a quick reaction, regardless of location. As well, the NARPIMED project, jointly with Italy, Greece, Morocco and Algeria, is trying to elaborate a manual for prevention with reference to natural risks, especially focused on seismic risks. In addition to these projects, where UME members have participated to some extent, the UME is currently on the way to signing an agreement with France to set the basis for further cooperation in future with their 'UIISC' (Civil Protection Training and Intervention Unit).

The Spanish civil protection model

The National Concept of Civil Protection integrates all public and private organizations and institutions, as well as citizens, who have to participate in all civil protection activities. This definition reveals who and what constitutes the civil protection system; however, the real purpose of civil protection in Spain is: the sum of activities orientated to the study and prevention of high-risk situations, catastrophes or public calamity, and to the protection and assistance of people and property in case these events take place.

This is only a definition. We have not yet defined the civil protection functions. When a risk situation is detected, different protection functions are established for the case. All the steps taken until the last moment are oriented to the functions previously established.

First there is prediction, then prevention, afterwards activation of the appropriate emergency plan (depending on the different levels of risk, the autonomous community where the situation occurs, etc.), the early warning systems and finally ending with the protective and assistance measures. In addition, in case they should be required, there are rehabilitation and reconstruction programs.

In Spain, the central government has delegated many of their obligations or responsibilities to the Autonomous Communities (17+2 Autonomous Cities). Therefore, most of the regulations and actions, in case of an emergency, are under the umbrella of responsibility of the Autonomous Community Authorities. If, and only if, they don't have the necessary resources central government will eventually take the lead. Moreover, in

some special cases, which will be discussed later, central government might take the lead anyway.

Broadly speaking, there are three different kinds of plans: Self-protection Plans, Special Plans, and Basic Plans. Central government controls only the third type, referred to as the Basic Plans. The other two above-mentioned types are left for local or the Autonomous levels of responsibility.

If potentially threatening emergency situations arise and the local or the Autonomous Community Authorities don't have enough resources to cope with these situations, they ask for help: either from other Autonomous Communities or from central government authorities. In these situations, the central government becomes the lead institution.

In summary, Spain belongs to the European Union, thus Spain must follow EU regulations. Besides this, as a Member State, Spain may create its own laws. Moreover, Spain has two additional power levels with the capacity of creating and developing their own regulations, the local and the Autonomous Community Authorities.

Another system of classification, comprising four levels, is the following:

- Social Level — Self-protection Plans
- Local Level — Territorial Plans, Special Plans
- Autonomous Level — Territorial Plans, Special Plans
- Central Government — Government Plans, Basic Plans

Now, let's summarize the previously explained concepts.

Overall, we have the way in which the Spanish government activates these plans: who is able to produce them; who the managing authority for each plan is; and finally which resources are allocated to every plan. Also included at this stage is the concept of support: who is supported, by whom and what for.

Starting from the bottom, local administrations activate the plans that they manage, Autonomous Communities, activating their plans should have the capacity to assist and support their local administrations, if need be. The Autonomous Community could eventually manage the local plan, only in the case of a real interest.

The delegate of central government in every Autonomous Community is in charge, by order of the Ministry of Internal Affairs, to manage the Autonomous Community Plan in the case of national interest due to the current emergency. There are under-delegates of central government at the provincial level with similar responsibilities to the delegates, at their respective level. Central plans could be managed by the Ministry of Internal Affairs (normally by the Civil Protection & Emergencies General Director), who could assist and support the Autonomous Communities central government delegations. Above this, the Spanish central government needs to be able to manage the basic laws of civil protection, and of course, to cope with the situation regardless of the plan activated (see Figure 10.1).

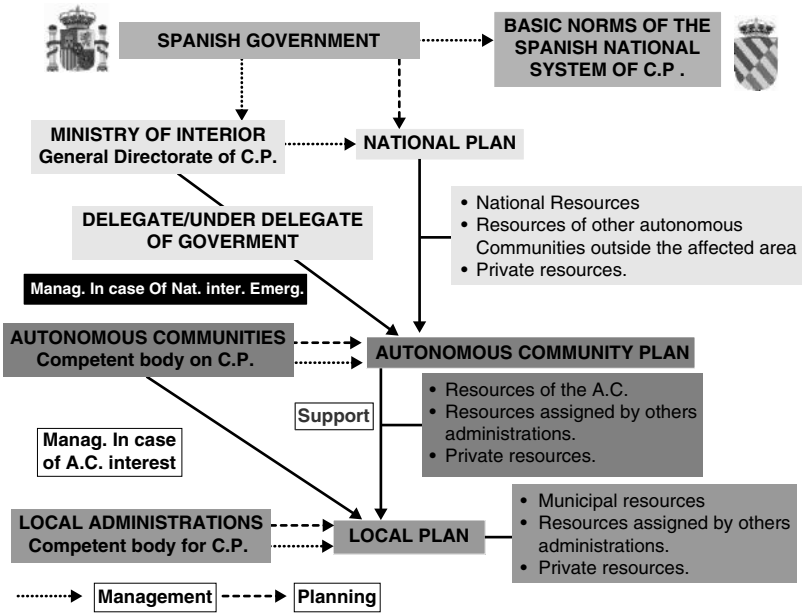

Figure 10.1 Civil protection in Spain

Civil protection teams work under the responsibility of a local, autonomous or central authority. They are normally managed by the Autonomous Community Authorities, though they work shoulder to shoulder with the rest of the teams depending directly on each level: local, autonomous, or central.

Only two years ago, should the local authorities have requested assistance from the Autonomous Community and in the event that this request should have been transferred to the Spanish central government, there wouldn't have been a force, either military or civilian, able to respond. This was one of the reasons why the Emergency Military Unit (UME) was created in 2006; in doing so, the UME covers this gap, being a standing-ready, well-organized and perfectly fitted force to support and even manage and control any emergency situation.

The Emergency Military Unit[6]

In 2004 the Spanish National Defense Directive, in addition to other main goals, stated

> the Armed Forces have to **collaborate** with the Civil Protection in order to preserve the security and well-being of the citizens in the assumptions of serious risk, catastrophe, calamity or other public needs...

In the new National Defence Law (2005), in article number 15, states, 'the Armed Forces, together with the State Institutions and Public Administrations, **must** preserve the security and well-being of the citizens in the assumptions of serious risk, catastrophe, calamity or other public needs'. In accordance with this law, the government decided to create the Emergency Military Unit on 20 January 2006.

The above-mentioned National Defence Law (2005) pointed out for the first time the role of the military in case of catastrophe – cooperation with our allies and the non-combatant extraction operations (NEO). Relief efforts had never before been considered a primary mission for the military and have sometimes conflicted with preparation for war. From now on, it is mandatory for the military to get involved in the case of serious disasters.

The Armed Forces had already been dealing with all kinds of relief operations, such as floods, wildfire and earthquakes either within Spain or abroad. Nevertheless, the scope has now changed, the military no longer has only a supporting role, on the contrary, it has, with the Emergency Military Unit, achieved the capability to be employed in the front line in the case of any emergency.

Despite what is commonly thought, this type of unit is not new in the Spanish Armed Forces. As early as the eighteenth century (1797), Manuel Godoy created a unit based on the Mobile Artillery Brigade (a mounted unit) to attend the population in the case of any catastrophe, among other tasks. Later on in 1971, a special Air Squadron was created to attack forest fires, and it has been operating successfully for more than 35 years.

Let's start with the basic issues. Where and for what purpose does the unit act? 'The UME mission is to intervene in any place of the national territory to contribute to preserve the security and well-being of the citizens, in the assumptions of serious risk, catastrophe, calamity or other public needs'. Who is entitled to give orders to the unit? It is the Minister of Defence (MoD) under the request of the Minister of Internal Affairs (MoI), as opposed to the French model where their UIISC units belong to their MoI.

The UME is the primary force taking responsibility for the mission assigned to the Armed Forces in article 15.3, National Defence Law 05/2005. Nevertheless, bear in mind that all the rest of the 'traditional' capacities of the Armed Forces could be deployed and used against the emergency, if required. Should this happen, they would be under operational control of the UME. Sea emergencies are explicitly excluded from the situations where the UME is supposed to act and, eventually, take over.

As regards the UME's main features, it is a Military Permanent Joint Unit. The UME encompasses all the necessary means to fulfil its mission. The UME operates within the MoD structure (not within that of the MoI). The UME emphasizes all Armed Forces skill and capabilities, such as its ability to mobilize large numbers of people, move large amounts of material and equipment, and provide logistic support.

In order to establish the layout of the unit and to get knowledge of similar military structures, the UME maintains contact with other nations, especially with France and Switzerland. France has been one of the UME's main references, offering great help in developing doctrine, mimicking organization and providing UME personnel with information with regard to the wildfire campaign. Thinking in advance, the UME also developed an agreement in order to normalize this relationship. Switzerland also invited the UME to visit their units, and to attend its greatest disaster exercise RHEINTAL 06, which was very helpful, as mentioned previously.

The general structure of the unit is: a Headquarters (HQ); an Air Task Force; five Battalions; one Emergency Support Regiment; and liaison officers to be detached. In reference to the basic units and starting with the Battalion, it is mandatory to stress that the five Battalions do not have the same organization; their differences depending on the area of deployment and attending to general and specific requirements. Basically their structure is as follows: Support Company (Coy); Engineering Coy, which includes a 80-ton class bridge; Natural Emergency Coy, with intervention in all kinds of natural disasters; Technological Emergency Coy (only present at I and IV Battalions).

The Regiment includes all those capacities required to cope with the management of an emergency that are not contained in the Battalions. For instance, encampment for up to 5000 people including: cooks, store facilities, tents, showers, toilets, etc. The Regiment provides the Battalions with an extra transport capacity, heavier, cross-country, medevac, among others. The last leg is maintenance and recovery: heavy cranes, deployable workshops, etc.

Finally the Air Task Force is mainly organized into two groups (water bomber amphibious aircrafts and helicopters) with 24 amphibious aircrafts (Canadair type) and 19 multi-role helicopters (TBD). These units remain in their Services, the Air Force and the Army respectively, with regard to administrative issues, such as discipline, personnel and logistics. However, these units operate under the command of the UME commanding officer.

The deployment of the UME is the following: most of the forces are concentrated in Madrid (Command, HQ, Regiment, Air Task Force and I Battalion). The rest of the Battalions are in Seville, Valencia, Zaragoza and Leon. There are two Operational Detachments from Seville in Las Palmas, and in Tenerife. The total strength of the unit is 3967 people.

According to the most probable risk during the year, these campaigns are organized and an alert element is available to respond in one hour to:

- Wildfires
- Floods
- Winter storms

Depending upon the campaign currently established, the units are structured in different task organizations. They have enough flexibility though

to change from one task organization to another, in case needed (emergencies do not fit exactly to the UME's forecasts). These alert elements, once activated, trigger the constitution of subsequent elements that are deployed in a staggered way in a few hours until the necessary means are put in place to fight the emergency.

Right now, the UME counts on more than 3600 troops. The recruitment process, both internal from the Armed Forces and directly from Spanish society, did not create problems.

The critical guidelines were with regard to recruitment, training, infrastructure and equipment. The UME shall likely achieve its objectives regarding personnel recruitment and training, but unfortunately infrastructure and equipment will continue to arrive or be finished over 2009. For instance, the UME shall receive helicopters later than December 2009.

One of the main problems during creation of the unit was to train the personnel. The UME trained with civilian organizations, experts with well-known experience in the different domains. The philosophy applied was to carry out training by levels, depending on the rank achieved and the post fulfilled. These different training levels are:

- Basic level
- Intermediate level
- High level

With regard to command, control, communication and information systems this could be considered a key point. We are talking about cutting-edge technology. The UME created a revolutionary system that fully integrates the civilian and military communications and networks. This system will provide the UME with a single emergency picture. The UME's aim is to implement a national system constituting the basis of a very good command and control capacity, to ease coordination with all involved agencies and to enhance leadership. In the case of the most demanding scenario, there could be a deployment area with the advanced command post within a vast emergency zone, two battalions, air elements and also specific elements of the support regiment operating.

The Emergency Military Unit has to work in a civilian environment. Knowledge, coordination and integration with civilian authorities is paramount. Therefore, the UME held a series of meetings, visits, etc., leading to the establishment of agreements at both the national level and regional level. Spain has 17 different regions and two autonomous cities (Ceuta and Melilla). As the UME often works at the regional level, shoulder to shoulder with its regional counterparts, the UME scheduled several visits to the regions and even detached observers, starting in summer 2006. As a result of the visits, written and verbal agreements were reached. The process is still ongoing, but the attitude and cooperation shown by the Autonomous regions is promising.

As a summary of summer actions, from 15th June 2007 the unit was ready to act against wildfires. This summer was the first time the UME participated in real operations, UME interventions were very well accepted by the different regions. The UME took part in several forest fires, gathering a huge amount of personnel and means. In most of them, units from different battalions joined the ranks of the one leading the operation.

In the winter of 2007–08, UME also participated in some operations despite not yet being certified to act in such emergencies. Notwithstanding, in order to become a useful public service, its principal aim, the UME accepted the challenge, reacted and deployed to assist the affected areas. The first one was in El Vergel, where the UME required the support of the Army Engineer Regiment 11, located in Salamanca, to lay down a bridge (at that time the UME did not have its own bridges yet). In addition, UME organized an operation to assist people in Utrera, a town in the south of Spain, because of the floods that originated after heavy rains.

Since the beginning of the year 2008, the UME worked against forest fires in La Gomera, Zuera, Honrubia and Tarifa. Besides those there were some lesser fires in which the UME collaborated with the fire-fighting services of the different Autonomous regions. In the beginning of 2009 the UME acted against winter storms, clearing some routes, for example, at Madrid Barajas International Airport, and allowing the reestablishment of some affected communication lines around Madrid.

Conclusion

During the last years of the twentieth century and in the beginning of the twenty-first, the approach to civil protection and natural disasters has evolved. The western world is looking at some natural disasters, like the 2005 Indonesia tsunami for example, which took thousands of lives. Europe and NATO cannot afford such a catastrophe. That is the reason why relief operations and multinational assistance is paramount and why countries are willing to reach cooperation agreements in the civil protection field. Natural disasters will no longer be something related solely to an isolated country. On the contrary, it will be a matter of concern for international organizations such as the European Union and NATO, whose main purpose lie in security issues.

The increasing importance of natural disaster relief operations is a fact: the Barcelona Process, the NATO–Russia Council, the Euro-Mediterranean Dialogue, the Paris Summit for the Mediterranean, the 5+5 Dialogue, etc., point out the natural risks they are likely to face. They developed some tools: NATO, the NRF, the EU, the Mechanism for Cooperation in Civil Protection. These tools show the increasing interest of these organizations in facilitating international cooperation and enhancing mutual assistance. However, only a few countries have specialized units able to cope with an emergency: France, Switzerland and since very recently, Spain with the Emergency Military Unit.

Let us summarize some aspects of this brand new unit. The Spanish Armed Forces have a new mission, for this purpose the UME has been created. It is a specialized unit and, in the case of emergency it is the first intervention unit within the Armed Forces. When the support of the rest of the units in the Armed Forces has been required, the UME carried it out with success, mainly because there is an agile procedure in place.

The implementation process is still ongoing. The UME is currently 75 per cent of the way. This unit enhances the Spanish civil protection system, complementing the emergency agencies already existing in Spain. UME responds to a social demand, following the western trend of regarding the military as a very valuable institution, not only in its war-fighting role, but also as a public service participating in disaster relief operations.

The UME had a proper response concerning reaction time. In normal situations the unit tries to monitor the emergency from the very beginning and once the unit receives the order to act, it responds quickly. The unit has not yet had valuable experience in these kinds of missions and still has much to learn. Notwithstanding, the actual operations carried out have shown that it is going in the right direction in training activities.

The Spanish military has just got started in the field of emergencies; however, in spite of some minor problems, the equipment acquired is good enough to accomplish the allocated tasks.

During actual operations, the unit had to deploy companies in a different battalion's area of responsibility, as far as the Canary Islands. In order to do so, units had to be projected, that is to say, to perform some airlifts of heavy water engines, communication vehicles and personnel from the peninsula to the islands and back to the peninsula by sea transport, once the mission was accomplished.

The UME maintains close and constant cooperation with the General Directorate of Civil Protection and Emergencies, as well as with regional organizations from the Autonomous Communities. These links provide it with real and updated knowledge of the situation and allows it the capacity to give an appropriate response both in the engaged assets and in the reaction times.

Notes

1. See http://www.naa.be/default.asp?SHORTCUT=1311 (accessed 4 March 2009).
2. See http://www.nato.int/eadrcc/index.html (accessed 4 March 2009).
3. http://ec.europa.eu/environment/civil/prote/cp14_en.htm (accessed 4 March 2009).
4. http://ec.europa.eu/echo/aid/dipecho_en.htm (accessed 4 March 2009).
5. http://ec.europa.eu/environment/civil/prote/mechanism.htm (accessed 4 March 2009).
6. http://www.mde.es/ume/ (accessed 4 March 2009).

Part III

Environmentally Induced Migration

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11

From a Socioeconomic Approach to Migration to the Inclusion of Environmentally Induced Migration in the Mediterranean

Antonio Marquina

Introduction

In this chapter I will try to show the main environmental causes that can induce migration in North Africa. I use the term forced migration or environmentally induced migration, not environmental refugees or other terms, for describing the people displaced by environmental factors.

The chapter explains first the migration policies of the European Union and the late awareness of the importance of the environmental causes of migration. Later I explain the importance of global warming and climate change as a significant driver for migration in the Mediterranean and I present some nuances and some conclusions regarding migration flows.

The south-north migration flows in the Mediterranean

In the Mediterranean there is a tradition of south-north migration. Illegal sea crossings by North Africans have been a persistent phenomenon since Italy and Spain introduced visa requirements in the early 1990s. Most of these migration flows come from the Maghreb countries (Morocco, Algeria, Tunisia and Libya). Egypt, Syria and Lebanon migration flows have traditionally gone to the Arab countries of the Gulf and to neighbouring countries. Israel is a reception country for Jewish emigrants. Finally, Turkey has been a sending country since the beginning of the 1960s. The majority of the flows have been directed to the European Union and in particular to Germany.

These flows were substantially labour migrant people. The root causes of these persistent and increasing migration flows were largely attributable to high demographic disparities between Europe and Africa, to poverty (the

high income gap), and political instability in the countries of origin. Given these differentiations in destinations of migration flows from North African and Middle Eastern countries, in this chapter I will only deal with the North African countries.

Another factor to take into consideration is that, in the decade starting from 2000, sub-Saharan African migrants have joined the North African migration flows and now they form the largest illegal amount of boat people that try to reach Europe via the Atlantic to the Canary Islands and by crossing the Mediterranean.

The majority of West Africans enter Europe legally and overstay their visas. In recent years, a yearly increase of 100,000 registered West African people in the EU is estimated, plus 25,000 to 35,000 irregular crossings by sub-Saharan Africans per year. Comparing the estimated figures of registered migrants in the EU, around 800,000 registered West African migrants in the main European receiving countries and 2,600,000 North Africans, it can be said that West African migration to Europe is still quite modest in comparison with the annual migration coming from North Africa.[1] The principal destinations for West African migrants are Italy and Spain. Another point to be mentioned is that the Maghreb countries have become transit countries. It is estimated that 65,000 to 120,000 sub-Saharan Africans enter the Maghreb yearly overland, but only 20 to 38 per cent enter Europe.[2] The majority of these West African flows are labour migrant people and are relatively well-off. That is also the conclusion of one of our programs on migration flows coming to the Canary Islands that was finished in 2008.[3]

For these flows there are several migration routes: air migration routes, the most expensive, using transit airports; maritime routes, with different fares to be paid to small boats and even cargo ships for crossing the Atlantic and the Mediterranean and where the main arrival areas are located in the Canary Islands, the south of Spain, Malta, Sicily, Lampedusa and Pantelleria, Cyprus and numerous islands in the Aegean; and land routes to reach the Mediterranean and Atlantic coasts.

The principal land routes are the following:

1. The West African coastal route: destination Canary Islands via northern Mauritania, western Sahara or southern Morocco.
2. The western Sahara route: destination Canary Islands via northern Mauritania, western Sahara or southern Morocco.
3. The central Sahara route: destination Canary Islands via northern Mauritania, western Sahara or southern Morocco, or the Spanish mainland via northern Morocco.
4. The eastern Sahara routes: destinations Lampedusa, Sicily and Malta.
5. Horn of Africa to Libya: destinations Lampedusa, Sicily and Malta.
6. The Asian routes: destinations Turkey and Greece; Yemen and the Gulf area.[4] (See Figure 11.1.)

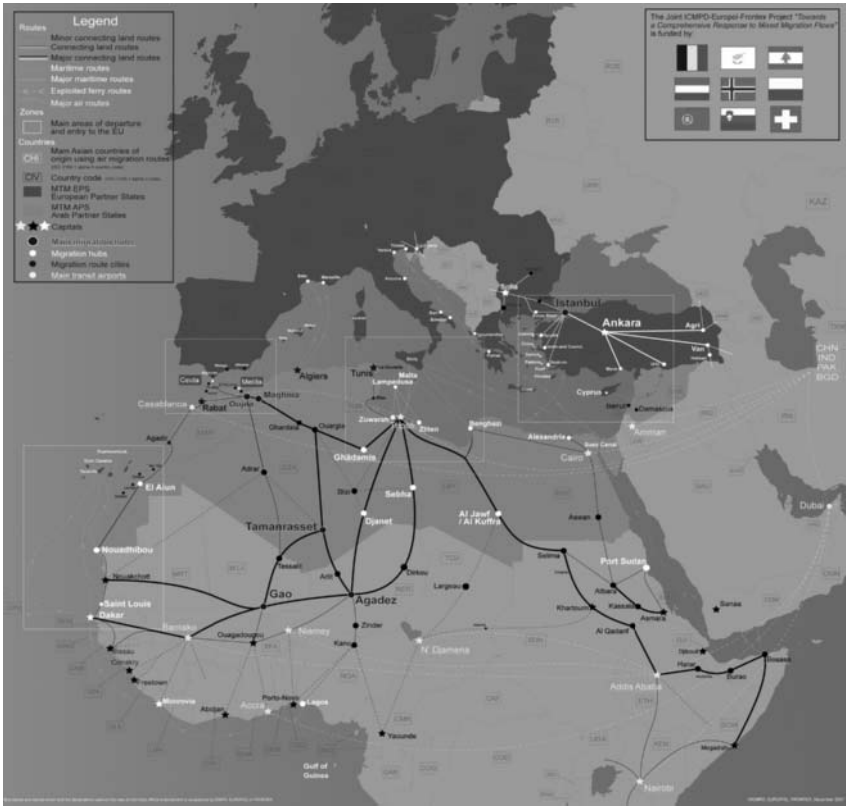

Figure 11.1 Mediterranean and African irregular migration routes
Source: ICMPD, MTM Map.

As mentioned, a significant question to be underlined here is that the North African countries and even eastern Mediterranean countries that traditionally were sending countries now have become migrant receivers.

In this panorama, apparently the question of environmentally induced migration cannot be considered very relevant. At present in North Africa there is not general evidence that emigration is triggered by desertification. For instance in Morocco, the traditional sources of migration are related to lack of life horizons for a growing population in closed environments with limited resources, rather than to environmental factors. In 1998, a poll carried out by the consulting company Léger and Léger concluded that 72 per cent of the Moroccans polled wanted to leave the country. The figure was even higher, 82 per cent, for people less than 30 years of age.[5] These figures reflect the excess of labour force growth over employment

growth, the lack of opportunities in the labour market, the social and political conditions and the low economic performance of the kingdom. The public authorities in the kingdom have encouraged migration to Europe on political and economic grounds. In 2003, remittances represented 8.16 per cent of gross domestic product (GDP), 25.6 per cent of imports value and 41.56 per cent of exports value.[6] It can be said that in Morocco, and in the Maghreb in general, there is a structural dependence on remittances; migration has become a safety valve for the stability of some political regimes.

Significant and recent studies on migration flows in the Mediterranean reinforce the importance of demographic, socio-political and economic factors as migration interlinked triggers. However, only very recently the idea of global warming and climate change, as one crucial cause for future migration flows, has been posited for North Africa and the Middle East.

The European and Euro-Mediterranean approaches to root causes of migration in the Mediterranean (1995–2008)

After the Cold War, migration was considered a relevant topic on the new European security agenda, in particular in the Mediterranean. The European Union developed the common foreign and security policy towards the Mediterranean, and started the Barcelona process in November 1995. Migration was included as a field for cooperation in the Barcelona declaration, adopted at the Euro-Mediterranean Conference, but the salience of the topic was not remarkable, even taking into consideration that migration and the importance of dealing with the projections of increasing North African migration flows was one of the reasons for looking to the Mediterranean in order to fix it.

It was stated in the third part of the declaration, dealing with the partnership on social, cultural and human affairs, that the Euro-Mediterranean partners 'acknowledge the importance of the role played by migration in their relationships. They agree to strengthen their cooperation to reduce migratory pressures, among other things through vocational training programmes and programmes of assistance for job creation. They undertake to guarantee protection of all the rights recognized under existing legislation of migrants legally resident in their respective territories'. The approach was mainly a socioeconomic approach and from the beginning was quite securitized.

But the situation was deteriorating, given the increase of migratory flows affecting in particular the southern European Mediterranean countries that were non-traditional recipients of emigrants. The Valencia Action Plan, approved in the fifth Euro-Mediterranean Conference of Ministers for Foreign Affairs on 23–24 April 2002, contained a paragraph welcoming the realization of a Ministerial Conference on Migration and

Social Integration, including aspects such as cooperation with the countries of origin, social integration of migrant workers and management of migration flows. The approach was security oriented. Two months later, on 20–21 June 2002, the European Council in Seville agreed to the integration of immigration policies into the Union's relations with third countries. Later on, during the Italian presidency of the European Union in the second semester of 2003, this cooperation was extended to cover the root causes of migration, which were considered to be essentially socioeconomic.

A new step took place in the second semester of 2004 during the Netherlands presidency. Cooperation with Maghreb countries was needed to address not only the root causes of emigration but also the negative effects of transit migration. Illegal migration was now considered a common problem affecting Europe and the Maghreb countries. In 2005, a global approach to migration was adopted by the European Council with the aim of formulating comprehensive and coherent policies addressing the different migration-related issues and policy areas: development, social affairs and employment, external relations and justice and home affairs. Given the fact that not only short-term actions, but longer-term actions were contemplated for dealing with the root causes of migration, considered to be socioeconomic and political, linking of migration and environmental degradation was now a more or less open possibility.

But in the working programme established on the 10th anniversary of the Barcelona declaration, although the importance of migration in Euro-Mediterranean cooperation increased, the mainly socioeconomic approach was maintained. The 2005 report on Mediterranean migration financed by the European Commission had only focused on the traditional aspects of migration, addressing issues pertaining to both emigration and immigration. The environmental factors were not contemplated.

In November 2006, the first Euro-Mediterranean Ministerial Conference on the Environment took place in Cairo. Water, desertification and pollution were the main topics of discussion. Nothing was prepared for linking environment and migration. This was turning out to be curious since in this year migratory avalanches from western Africa to the Canary Islands had taken place and two important regional conferences on migratory topics, the first one in Rabat on July 10–11, 2006 and the second one in Tripoli on November 22–23, 2006 were celebrated. But the approach was the traditional approach, emphasizing the socioeconomic dimension and the promotion of development plus the addition of conflict as a root cause of forced migration was included in the Tripoli conference.

Even in 2007, after the United Nations published the new IPCC reports, in the first Euro-Mediterranean meeting on migration that took place in the Algarve (Portugal) on the 18–19 November 2007, only poverty, unemployment and the development gap were the root causes of migration mentioned

in the conclusions, in the context of an increased European securitized approach to migration.

It was not until March 2008 that the European Union accepted the importance of the linkages between environment and migration flows. In the Paper from the High Representative and the European Commission to the European Council, entitled 'Climate Change and International Security', the predictions of the UN of millions of environmental migrants by 2020 were accepted, considering climate change as one of the most important drivers of this phenomenon. Regarding the European neighbourhood, the paper underlined that in North Africa and the Sahel, increasing drought, water scarcity and land overuse will degrade soils and could lead to a loss of 75 per cent of arable, rain-fed land. In the Middle East, the existing tensions over access to water will be intensified leading to further political instability with detrimental implications for Europe's energy security and other interests. The paper was clear and conclusive: since the EU's neighbours include these two regions, some of the most vulnerable regions to climate change, migratory pressure at the European Union's borders and political instability and conflicts could increase in the future. Consequently, Europe must expect substantially increased migratory pressure. The paper recommended the Council to 'consider environmentally triggered additional migratory stress in the further development of a comprehensive European migration policy, in liaison with all relevant international bodies'.[7]

A nexus between climate change and migration not based on empirical studies

This notable delay in the acceptance of the importance of environmentally induced migration is not very surprising; the figures estimated by a few researchers were not sufficiently convincing and the linkages between environmental changes and increasing migration flows started to be developed in academia quite late, in the 1970s.

Lester Brown introduced the concept of environmental refugees in the 1970s. Later on, El-Hinnawi expanded the use of the term in his 1985 report for the United Nations Environment Program, entitled Environmental Refugees. A decade later, in 1995, Norman Myers with Jennifer Kent published the results of a project entitled 'Environmental Exodus. An Emergent Crisis in the Global Arena'.[8] In this study the authors concluded that there were 25 million environmental refugees, mainly located in sub-Saharan Africa, the Indian sub-continent, China, Mexico and Central America, and these numbers would be likely to grow if the predictions of global warming materialized and 'could eventually cause as many as 200 million people to be put at risk of displacement'. This estimation was qualified as conservative. For two time horizons, the years 2010 and the year 2025, they explained

the implications of the shortfalls in food production, water shortages, deforestation, desertification, population growth, urbanization and mega-cities, unemployment, poverty and extreme weather events. Considering the prospects for sub-Saharan Africa, a region they considered accounted for half of all the environmental refugees, they emphasized the implications of population growth, severe desertification, chronic or acute water shortages in ten countries, food deficit and inability to compete in the global grain market. All this would affect hundreds of millions of people in Africa, resulting in the forceful displacement of many of them. For Myers and Kent the environment is an important driver of migration but it is connected with other drivers such as population growth, low incomes and poverty and food deficit. Environment is not a mono-causal driver of migration flows.[9]

These ideas were repeated in articles and presentations[10] years later. For our purposes it is important to underline the continuous emphasis on Africa as 'the prime locus of environmental refugees' and on the African Sahel saying that 'of the 25 million environmental refugees in 1995, there were roughly five million in the African Sahel, where a full ten million people had fled from recent droughts, only half returning home'.[11]

These estimates were quoted by different researchers, including the Stern Review in 2006. Although they were criticized because they were not rigorously tested, the estimated data was not dismissed. The principal reason, as Stern recognizes, is that these estimates were not in contradiction with the projections presented in different reports and studies on the consequences of global warming and climate change.[12]

In October 2005, the UNU's Institute for Environmental and Human Security, in a statement to mark the UN day for disaster reduction, reiterated that rising sea levels, desertification and catastrophic weather-induced flooding will create up to 50 million environmental refugees by the end of the decade, and could eventually displace hundreds of millions.[13]

Christian Aid, for its part, believes that the growing number of disasters and conflicts linked to future climate change will displace a total of one billion people between 2007 and 2050.[14]

The Dutch government's paper on migration and development published in June 2008 was less alarming, putting the figure between 25–200 million.[15] The range makes this figure only slightly relevant.

However, the publication of the IPCC reports in 2007 had the most significant impact on the debate; nevertheless, in these reports a substantial deficiency of data regarding the Mediterranean exists. The reports deal with the different continents and thus the Mediterranean region is not contemplated.

I will explain, using different sources, what can be said regarding environmentally induced migration south–north in the Mediterranean, explaining also the difficulties for a rigorous approximation to the topic.

Global warming and climate change as a significant driver for migration in the Mediterranean

The north of Africa and the Mediterranean are considered to be among the most vulnerable zones to climate change. The question is how to measure with certainty the consequences of global warming and climate change in environmentally induced migration from North African countries to the European Union. There are very few empirical studies on this subject and conclusive results cannot be presented.

I will select what I consider the principal environmental push factors that might lead to increasing migration flows in a context of increasing population growth (projections of an increase by 40.4 per cent up to 2025 and by 68.9 per cent up to 2050[16]), and later I will explain the possible implications and the difficulties we have for the estimation of their consequences.

These are:

1. Increasing desertification
2. Water availability, drought and food production
3. Impact of natural disasters
4. Sea-level rises

I will use different sources. Let me explain first that the data we have is insufficient. As I said, at the official level, the process of admission of the importance of environment in the explanation of migration flows took some time and at the research level the situation was not very promising. One of the reasons is that EuroMesco, the network of research institutes dealing with international relations created after the 1995 Barcelona Conference, supported by the European Commission, did not pay attention to environmental problems and the approach to the migration flows in the Mediterranean was merely socioeconomic. Other networks and institutions like CARIM suffered the same short sightedness. STRADEMED, another network of Euro-Mediterranean institutes, however, paid attention to environmental challenges affecting the Mediterranean, but its focus was not only on research but also on training officials and decision-making officers.[17] These studies and data in particular can be useful for this explanation.

Modelling global warming and precipitation in the Mediterranean

The models I will use for the Mediterranean were prepared in 2003 and were published in 2004[18] According to these models, if no stabilization measures are taken, temperatures in the Mediterranean will progressively increase in

this century reaching above 6ºC in A2 scenario and above 5ºC in B2 scenario in summertime. In the winter season, the projected temperature rise is in general 1–2ºC less intense than in summer.

Regarding precipitation, the amount of winter precipitation is projected to increase in the western and northern Mediterranean zones both in A2 and B2 scenarios, while a decrease in precipitation will take place in the southern and eastern Mediterranean. For all other seasons a uniform decrease all over the Mediterranean is expected, being very remarkable in summertime. In B2, the decrease in precipitation is less intense. The change of precipitation at the end of the century is projected to be around –5 to –20 per cent. In North Africa, it is projected to be around –10 to –20 per cent. To this, the changes in seasonal precipitation have to be added, affecting crop yields negatively.

Today the authors of these models consider that they are optimistic models if business as usual is maintained by the governments of the world.

Increasing desertification

As previously explained, in North Africa there is not general evidence that emigration is triggered by environmental factors. In Morocco, Algeria, Tunisia, Libya and Egypt the traditional sources of migration are related to lack of life horizons for an increasing population in closed environments with limited resources rather than to drought, loss of land, land degradation, desertification and natural disasters.

However, important data is available for making some clarifications. In Morocco some 22,000 hectares of arable land disappear under desert every year, according to official figures, Tunisia loses around 8000 hectares and Algeria loses 40,000 hectares.[19] This data has to be seen in relation to the advance of the desert. Increasing urbanization has to be added to this. From 1970 to 2000, densities in Mediterranean coastal areas increased by 49 per cent.

In Tunisia 40 per cent of the surface area of the territory is occupied by the Sahara desert and 75 per cent of the territory is threatened by land degradation (overgrazing, deforestation, soil degradation, agricultural practices). In Algeria, 90 per cent of the territory is desert (more than 2 million square metres), and is at risk of further desertification. In Morocco, almost 93 per cent of the territory is affected by aridity. According to geographer Bouazza Zahir: 'For every 1,000 square kilometres, Morocco has 700 square kilometres of arid land' and 'the average annual population increase in the arid regions is 3.5 per cent' overusing the land.[20]

In Libya, more than 90 per cent of the country is desert or semi-desert. In Egypt, 96 per cent of Egypt's surface area is desert and it is estimated that 80 per cent of the rangelands in Egypt and Libya are degraded.[21]

According to the UNEP report, 'Africa Environmental Outlook 2', in Northern Africa in the last 50 years the traditional systems of cultivation and conservation have broken down and productivity has declined as soil erosion from overcultivation and overgrazed lands has reduced soil fertility. More than 57 per cent of the total land area of Northern Africa is threatened by desertification.[22] The labour force occupation in agriculture represents 44.6 per cent in Morocco, 14 per cent in Algeria, 55 per cent in Tunisia, 17 per cent in Libya and 32 per cent in Egypt. Thus, people living in rural areas in countries like Morocco, Tunisia and Egypt may be the most affected in the years to come if the predictions on global warming and climate change are realized.

Water availability and food production

Regarding water availability, according to the projections of the Blue Plan baseline scenario, water demand may increase by a further 43 km3 by 2025, essentially in the southern and eastern countries of the Mediterranean. In numerous Mediterranean countries water use is approaching the limit level of available resources. The Blue Plan emphasizes that the number of water-poor Mediterranean populations, living in countries with less than 1000 m^3/capita per year, reaches 180 million inhabitants, 60 million of whom face shortage conditions with less than 500 m^3/capita per year. Twenty million Mediterranean people are still deprived of access to drinking water, particularly in the south and east.

These trends are further aggravated by the projected changes in temperature and precipitation. The Blue Plan considers that by 2025, 80 million Mediterranean people will face shortage conditions (less than 500 m^3/capita per year). By 2050, taking into consideration the high demographic growth, the population of North Africa and the eastern Mediterranean would face water shortages affecting 290 million people.[23] Our projections and the IPCC projections related to drought include a significant decrease in precipitation in North Africa and the Sahel.[24]

The average diminution of run-off in North African rivers is also alarming. In Morocco, a recent study shows that the average run off countrywide has been reduced by as much as 35 per cent from a comparison between the run off series of 1945–1970 and 1970–2000.[25]

In this context, food production and food security is likely to be adversely affected as rainfall declines and land degradation and desertification expands. Given the low average crop yield and high population growth in North Africa, the imports needed for basic foods will continue to grow,[26] depending on the vicissitudes of the world market and the import capacity of the North African countries. That is a major challenge.[27] (See Table 11.1.)

Table 11.1 Imports of food by North African countries

Countries	Net cereal imports and food aid as a percentage of total consumption	Average crop yield (kg per ha) (world 3.096)
Morocco	54.1%	670
Algeria	76.1%	929
Tunisia	56.9%	1,109
Libya	89.2%	637
Egypt	33.7%	7,238

Source: World Resources Institute, Earth Trends, country profiles.

Impact of natural disasters and sea-level rises

Natural disasters are a source of concern. According to different studies, more and more people around the world have been affected in recent decades by natural disasters. One of the critical characteristics of these developments is that the overwhelming majority of people affected live in developing countries. Deep poverty and rapid economic growth increase vulnerability to natural disasters.[28] They are placing further stress on already over-stretched coping mechanisms and trapping people in downward spirals of deprivation.

According to the United Nations, between 2000 and 2004 an average of 326 climate disasters was reported each year, affecting 262 million people annually. This figure more than doubles the level of the first half of the 1980s. 'For the period 2000–2004, on an average annual basis one in 19 people living in the developing world was affected by a climate disaster. The comparable figure for OECD countries was one in 1,500 affected – a risk differential of 79'.[29] It can be underlined also that natural disasters tend to increase health risks in the population.

According to OXFAM the number of climate-related disasters, particularly floods and storms, is rising far faster than the number of geological disasters, such as earthquakes. Between 1980 and 2006, the number of floods and cyclones quadrupled from 60 to 240 a year while the number of earthquakes remained approximately the same, at around 20 a year.[30]

It is estimated that by 2015, on average 375 million people per year are likely to be affected by natural disasters. This figure is over 50 per cent higher than the average figures provided for the present decade.[31]

In North Africa, the number of natural disasters is not very high in comparison with other regions and continents. Climatological and hydrological disasters are the most relevant natural disasters in this decade (see Tables 11.2 and 11.3). None of the most important disasters by victims and damage have taken place in North Africa in this decade.

Table 11.2 North Africa: Occurrence and Impacts by Major Disasters Group

2000–2006 (average)	Occurrence	Number of Victims	Damage (US$´000)
Geophysical	1	32,531	861,045.1
Climatological	0.6	22.9	138.2
Hydrological	5.1	149,252.6	114,146
Meteorological	0.9	18.7	7.5
Total 2000–2006	7.6	181,825.1	975,336.8
Total in 2007	10	573,396	343,061

Source: CRED Annual Disasters Statistical Review 2007.

Table 11.3 Natural Disasters: Occurrence and Impacts by Continent

2000–2006 (average) (2007 in brackets)	North Africa	Africa	America	Asia	Europe
Total Occurrence	7.6 (10)	59.7 (85)	92.9 (102)	160.4 (153)	64.7 (65)
Number of Victims	181,825.1 (573,396)	13,056,460.1 (9,598,158)	5,172,569.3 (8,940,362)	214,771,857.9 (190,863,162)	1,055,514.9 (1,642,878)
Damage (US$'000)	975,336.8 (343,061)	1,297,211.4 (755,341)	45,809,019.2 (17,617,126)	29,307,371.2 (34,245,932)	13,053,541.1 (20,529,206)

Source: CRED Annual Disasters Statistical Review 2007.

But at the same time, the Mediterranean region is the most vulnerable region in Europe to climate change because of its sensitivity to drought and rising temperatures. Forest fires are a recurrent phenomenon in the Mediterranean.

Our projections and the IPCC projections related to drought include a significant decrease in precipitation in North Africa and the Sahel.[32] It is considered likely that drought will become more frequent, severe and protracted in the Mediterranean.[33] Climatological disasters are the most probable disasters in this region.

Sea-level rise

On sea-level rise, it is estimated that the rate of global average sea-level rise has increased from 1.8mm/year to 3.1mm/year from 1961 to 1993. The sea-level rise has been due to thermal expansion, melting glaciers and ice caps and the polar ice sheets.

For the IPCC 2007, the projected sea-level rise at the end of the twenty-first century will be 0.18–0.59 m. It will imply an increase in the number of people suffering floods in coastal areas from 13 to 94 million.

However, there are significant differences among the researchers. John Church, from the Centre for Australian Weather and Climate Research,

explained in March 2009 that, according to his research, sea levels could be 1 metre or more above the present level.[34] In May 2009, another study was made public. Jonathan L. Bamber from the Bristol Glaciological Centre maintained that sea-level rises in this century could be 3 metres above the present level.[35]

Regarding the Mediterranean, the Instituto Español de Oceanografía in a recent study maintained that sea levels could rise as much as 0.5 m in the next 50 years.[36] More recent studies reinforce this conclusion. In 2009, a Spanish-British research project using global models from the IPCC came out with three scenarios for the effects of climate change on the Mediterranean over the next 90 years. The conclusion on sea-level rise was that the Mediterranean could rise over 0.6 m in this century.[37]

The implications of sea-level rises between 0.5 m and 1 m will be extremely severe for Egypt. The projections are daunting. The present population density of 73 per sq km will reach 104 per sq km in 2030. Given that 95 per cent of the country is desert and the population is concentrated in 5 per cent of the territory, the real population density is 2080 per sq km.[38] In the Nile delta, the UNEP estimates a population density of up to 1600 inhabitants per sq km.[39]

A sea-level rise of 1 m will impact on an area of 24,654 sq km, affecting in particular the Nile delta. From Cairo to the Mediterranean, the Nile delta is approximately 160 km in length. From west to east, from Alexandria to Suez, it covers some 240 kilometres of coastline. It embraces an area of 25,000 sq km. Over one third of Egypt's 76 million people live in the Nile delta region. The projections are so severe that on 9 March 2008 the Egypt Minister of Environment, George Maged, warned that rising sea levels will threaten 15 per cent of the Nile delta by 2020.[40]

Professor El Raey, for his part, had presented in 1997 a survey on the vulnerability of the Nile delta coast. According to this survey, for over 2 million people living in the cities of Alexandria, Rosetta and Port-Said, a rise of 0.5 m could imply the abandonment of their homes, the loss of 214,000 jobs and over $35.0 billion in land value, property and tourism.[41]

UNEP for its part projects a displacement of 3.8 million people and damage to 1800 sq km in the delta for a sea-level rise of 0.5 m.

With a rise of 1 m the consequences will be more catastrophic in a region marked by high levels of poverty in rural areas, with people living below the poverty line. It will imply the possible displacement of 6 million people and the flooding of 4500 sq km of farmland. For a sea-level rise of 2 m, 33,864 sq km of land will be affected. And for a sea-level rise of 3 m, 43,727 sq km of land will be affected. In both cases, the Nile delta will disappear.[42] Other cities at risk, according to the UN-HABITAT Global Urban Observatory 2008, are Casablanca, Algiers and Tunis.[43]

For North Africa and the Middle East, the World Bank estimates that a sea-level rise of 1 m will impact on an area of 24,654 sq km, affecting

8,307,472 people, an urban area of 3679 sq km, an agricultural extent of 4086 sq km, and a GDP loss of 20,870 million US dollars (1.49 per cent). UNEP follows these projections.

In conclusion, the impact on the population of North African countries of a sea-level rise of 1 m is severe for Egypt, with more than 8 million people affected, Tunisia, with less than 5 million people affected, Libya, with less than 3 million affected and Morocco, with more than 1 million affected.[44]

Prospects for environmentally induced migration in North Africa

Several fundamental environmental aspects that may influence migration can now be underlined, given their impacts: the high population growth, a likely temperature rise of 2°C by 2040[45], a sea-level rise of between 0.4–1m, increasing desertification, land degradation and loss of cultivable land, and increasing water scarcity will substantially diminish the crop yields and force the North African people living in rural areas to leave. A study by researchers at the Lawrence Livermore National Labs and Stanford University compared yields for the world's six main staple crops – wheat, rice, corn, soybeans, barley and sorghum – and found a 3 per cent to 5 per cent decline for every one degree of temperature increase.[46] This will imply, according to the emissions' scenarios I am using, that in 20–30 years time the crop yields of the principal crops of cereals, such as corn, oats, wheat, barley and rice, will diminish a minimum of between 6 to 10 per cent, given that the average crop yields are at their limits and that seasonal precipitation changes predicted imply a different distribution of rain during the year. The North African countries will be obliged to import significant quantities of food in an economic environment where food prices will become increasingly high. That is a major problem to be solved by these developing countries and will further impoverish them. Water shortage will affect also to millions of people. The socio-political consequences of water and food scarcity in all these authoritarian countries are quite obvious.

Natural disasters, in particular climatological disasters, will trap thousands of people in a spiral of deprivation. And a sea-level rise in the Mediterranean of between 0.4 to 1 m, according to the figures previously presented, will flood thousands of sq km, precisely in the area where the North African people are concentrated. All this, added to the high rate of unemployment and poverty, lack of efficient adaptation policies, and positive attitudes of North African communities to migration, will push millions of people to leave for other regions and to other countries if they can find the way and can pay the full package for leaving the country, legally or illegally.

Nevertheless, it is important to make some observations. Firstly, the information and data we have is not as homogeneous as it should be, given that it depends on projections of different models. Depending on the models

on greenhouse gas emissions and the projections of models on temperature rise and decreasing precipitation, the results and implications are of major or minor importance. This last point has been recently underlined by Oli Brown who has presented only 'three *highly speculative* scenarios' for future environmentally induced migration.[47] And it is also necessary to emphasize that the results differ substantially depending on the zone of the Mediterranean we study. The impacts of the temperature rise and change in the rainfall patterns plus the changes in seasonal precipitation are not homogeneous for all the North African territory. The wide ranges presented in the possible effects in different studies are also a factor of scepticism.

Finally, it is necessary to emphasize the lack of effective adaptation policies in the different countries in North Africa, the diversity of policies worldwide, as well as the different capacities and the colossal adaptation costs for dealing with these challenges. The awareness on the critical importance of these challenges and the clarification at government level of all these aspects is fundamental, but is not clear in the North African case. Given that the effects of global warming and climate change are gradual and non-linear, the process of awareness and critical decision-making will take some more time. In Morocco, for example, the cereal crop yield in 2009 will reach a record of 10.2 million tons, given the increase in precipitation of 69 per cent. In 2007 and 2008, the crop yields were limited and unsatisfactory.

Algeria and Libya, given their oil and gas resources, are the countries that in theory can adopt some effective adaptation policies for dealing with the challenges they have to face. In Morocco, Tunisia and Egypt the situation is more complicated given the importance of agriculture to their GNP and the number of people occupied in agriculture, which represents 44.6 per cent in Morocco, 55 per cent in Tunisia, and 32 per cent in Egypt (more than 47 million people in the three countries).

The empirical studies carried out in North African countries do not allow for a high rate of optimism regarding definite results in the short term for linking migration with environmental problems. Migration is almost a fact of life in North African countries. EACH FOR (Environmental Change and Forced Migration Scenarios) has presented recently some preliminary findings in case studies for the following countries: Morocco, Egypt and the western Sahara. For Morocco the preliminary findings are general, nothing unknown: 'there are clear but complex linkages between the environment and migration', 'migration has become one of the standard possibilities available for earning a living and improving one's situation', 'migration from the villages where research was conducted is primarily internal, especially to the main Moroccan cities'.[48]

On Egypt the preliminary findings are a little bit more relevant for our purposes: 'most of the emigrants interviewed did not mention environmental problems explicitly as a cause for their migration; there are many other factors that intervene', 'there are considerable pull factors that support

migration decisions of people who are affected by environmental degradation. For example, the style of life in Cairo, the higher living standards and income in the Gulf countries', 'people would leave their home and move to another place only when there are absolutely no more livelihood possibilities for them', 'the migrants who leave their villages/regions/the whole country can only do that if they have the financial means to do so. In many cases it is not possible for people to leave since environmental degradation has had a negative impact on their income', 'does not really play an important role when moving from one place to the other, as long as it is within the country'.[49]

All this will be substantially increased given the growing sub-Saharan migrant flows arriving to North African countries. The present numbers are in the tens of thousands. These flows will increase in the coming years, taking into consideration not only socioeconomic factors, but environmental factors as well.[50]

The experience of the migratory processes in North Africa shows us that the orientation of rural migration flows has essentially been directed to the cities in the Maghreb. This has been verified in the last 40 years. A part of these flows tries to arrive legally to Europe using visas, or illegally via Spain and Italy. The illegal emigration routes change depending on police alertness and the agreements among governments. Opening or closing an exit route has turned into a way of pressurizing European states that some governments of North Africa have used to obtain benefits and rewards.

In North and West Africa the decision to emigrate is not complex, it is necessary to possess means. Money can be obtained either from family savings or from the sale of lands. From the results of field studies carried out in Senegal and from the testimonies of emigrants that arrived to the Canary Islands in 2006,[51] we can foresee that the migratory flows will tend to be more internal among sub-Saharan countries than directed to the European countries – providing that North African states consider cooperation with European states profitable. The cost of legal and illegal movements to Europe is a fundamental barrier. Nevertheless, it is necessary to gain perspective and evaluate the rapid relative changes that organized crime groups are making, and the technological advances. Years ago the arrival of 31,541 illegal sub-Saharan migrants to the Canary Islands in only one year, using small boats (cayucos) to cross 910 miles was unthinkable.

Conclusion

In spite of all these nuances, what it is important to underline here is that environmental factors, notwithstanding the scepticism of some researchers, will constitute a fundamental factor in the growing migratory flows in the Mediterranean. It is also reasonable to predict that intra- and

inter-state conflicts will increase in the Mediterranean, given the magnitude of the problems to be resolved, the lack of existing capacities in several North African countries and the possible use of migration flows for getting rewards. Environmental factors will act as triggers and multipliers of conflict, given the impact of population growth, the reliance of North African countries on agriculture and/or on the imports of food from foreign countries, the authoritarian system of governance in all North African countries, the unequal distribution of wealth and poverty affecting large parts of the population, the increasing sub-Saharan migration flows in North African countries and the rise of Islamic fundamentalism challenging the present political regimes.

The policies implemented or to be implemented by European states and the European Union are still clearly insufficient.[52] Nevertheless, the awareness on the importance of climate change in international security and the possible impacts of environmentally induced migration has been realized at the official level.[53]

Notes

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12

Global Warming and Climate Change: Prospects for Forced Migration in Southeast Asia

Carolina G. Hernández

Introduction

Global warming and climate change as non-traditional security challenges and their attendant human security implications have increasingly received the attention they deserve.[1] The alarm bells signalling their entry into the agenda of human collectives at various levels are not of recent vintage. It will be recalled that environmental destruction has led to earlier major global initiatives to mitigate its effects on humankind, including the Climate Change Convention and its Kyoto Protocol. Al Gore's documentary 'An Inconvenient Truth' on global warming and climate change was preceded by his own advocacy at home and abroad. Leaders responded in different and opposite ways, citing conflicting scientific studies as their basis. Others simply reacted to the fact that environmental destruction, including global warming and climate change, are slow processes that easily escape the attention of policy makers whose priority concerns are about their own perceptions about imminent challenges that immediately impact on regime survival.

Thus, when the United Nations takes notice, as it did when the issue of climate change was taken up through the initiative of the United Kingdom (UK), and when regional organizations such as the European Union (EU) and the Association of Southeast Asian Nations (ASEAN) and its partners (such as in the ASEAN+3, consisting of the ten member states of ASEAN and their three neighbours in northeast Asia – China, Japan and South Korea) adopted this issue as a regional concern,[2] it is met with relief and hopeful expectation among advocates of redressing climate change. These 13 east Asian nations had also previously signed with the EU-25 and the President of the European Commission the ASEM6 Declaration on Climate Change in Helsinki on 10–11 November 2006.

It is generally known that climate change is caused by global warming and is linked to resource scarcities, including food, water, and energy which could create new, and fuel existing, conflicts, particularly in the domestic context. Global warming refers to the heating up of the Earth's surface,

including the oceans. It results in the melting of the polar caps, raising the sea level, and submerging populations and economic production facilities, particularly in the globe's environmental flashpoints. It is also believed to result in an alteration of weather patterns as well as increasing severity and unpredictability of natural disasters. These lead to serious human security challenges and humanitarian crises in affected areas. Although the effects of global warming and climate change might be concentrated in specific domestic and regional locations their effects cross national borders, and exacerbated by global interdependence and increasing integration can truly be felt on a global scale.

This chapter seeks to analyse the human security implications of global warming and climate change in East Asia broadly speaking and focuses on the prospects of forced migration in this region, particularly in Southeast Asia and neighbouring South Pacific. It highlights regional responses and provides suggestions for both intra-regional (within the broader East Asia and Southeast Asia) and inter-regional (between Europe and East Asia) cooperation to meet this imminent challenge to human security.

Global warming and climate change: The East Asian context

East Asia, Southeast Asia, and their neighbours in the South Pacific are vulnerable to the effects of global warming and climate change. Climate change results from the warming of the Earth (global warming) caused in turn by the presence and accumulation of greenhouse gases in the atmosphere (the greenhouse effect where heat is trapped in the atmosphere). These gases are carbon dioxide (CO_2) and methane (CH_4), released into the air by the combustion of fossil fuels such as coal, oil and gas as well as biomass. This process is not new, as it started during the Industrial Revolution.

Global warming is also caused by land-use change seen for example in the burning of forests that reduces forest cover and leads to deforestation. CO_2 is also released into the air when wood waste is burned during land-clearing operations. When wood decays, CO_2, CO_4 and other gases are released from the soil as deforestation itself reduces forest cover thus reducing carbon removal which offsets carbon emission. The pace of greenhouse emissions has accelerated since the Industrial Revolution such that by 1990 the atmospheric CO_2 concentration (approximately 360 parts per million or ppm by volume) was one-fourth higher than in the pre-industrial era, while the concentration of CH_4 (1.72 ppm) was more than twice that of the same period. Consequently, the Earth would have been 32°C colder than it is now had it not been for the greenhouse effect that has been building up over time.[3] The Intergovernmental Panel on Climate Change (IPCC) warned that by the end of the twenty-first century, it is possible that the Earth's temperature would rise by 2.4 to 6.4°C.[4] Should this occur, there would be a major redrawing of the map as global ice melting and sea level rises followed.

Climate change is projected to increase the number of displaced people throughout the world due to water shortages, rising sea levels and deteriorating pasture land. It is likely to affect the poorest of the poor within and across countries especially in the developing world. Climate change is seen by some to be a more imminent source of security threat to the world than is global terrorism.[5] While the best solution appears to be global poverty reduction, there are still measures that can be taken to mitigate and adapt to the negative effects of climate change on human well-being.

East Asia is a contributor to global warming as it hosts rapidly growing economies, first in Japan, Taiwan, Hong Kong and South Korea, followed by Malaysia, Thailand, Indonesia, Singapore and the Philippines, and of late, the phenomenal rise of China (and India). According to data on CO_2 emissions of 223 countries and territories worldwide posted by the Energy Information Administration, between 1980 and 2006, emissions from 46 countries and territories in Asia and Oceania, from Afghanistan to Wake Island, increased from 3558.55 million metric tons of carbon dioxide to 11,219.56 million metric tons. The world's total in 1980 was 18,503.12 million metric tons, while in 2006 this stood at 29,195.42 million metric tons.[6] Asia and Oceania's share of the world's total emissions nearly doubled during this 26-year period from 19.23 per cent in 1980 to 38.43 per cent in 2006.

Having said this, it needs noting that the problem of global warming and climate change is a 'problem of small numbers' in which 15 political entities, including the United States, the European Union's 25 member countries, China and India, are accountable for 80 per cent of the world's total emission.[7] The fact that not all these 15 political entities are part of the Kyoto Protocol regime is problematic for the rest of the world, particularly for most developing countries who do not belong to the world's major polluters.

Moreover, deforestation and other land-use changes have remained a problem in key countries in the region. Only a small fraction of the Philippines' forest cover remains[8] due to logging operations (both legal and illegal), wood-cutting for fuel by poor communities, and 'slash-and-burn' farming practices, while Indonesia's forest continues to be reduced by forest fires that result in the 'haze' problem affecting not only Indonesia, but also neighbours like Singapore, Malaysia and Thailand.

Land-use changes in the region include the conversion of forests and farms to housing facilities for Asia's growing population[9] and increasing lifestyle changes requiring huge homes with swimming pools, the building of shopping malls and factories for the region's growing economies, and recreational facilities that also require huge amounts of water, such as golf courses. The 2008 energy crisis fuelled the search for alternative energy sources including the cultivation of jathropa which involved land-use change.

Asia as a whole is highly vulnerable to the effects of global warming and climate change. For example, except for Antarctica, the Asian continent has

the scarcest fresh water supply in the world, a situation that could worsen as its glaciers melt with global warming, and the fresh water demand of Asia's growing population and cities increases.[10] An increase in the earth's temperature by 2°C is feared to lead to sea-level rises which are likely to inundate the Southeast Asian region's seven mega-deltas, which are home to some 200 million people.[11] By the 2050s, the IPCC projected a decrease in the availability of freshwater in Asia, particularly in large river basins and coastal areas in the heavily populated mega-deltas in south, east and Southeast Asia, which will be at greater risk due to increased flooding from the sea as well as from rivers.[12]

It must be noted in this regard that the world's two major archipelagic states (Indonesia and the Philippines), with thousands of islands vulnerable to rising sea levels, are located in Southeast Asia. Also in its neighbourhood are the small island states of the South Pacific, which are already challenged by poor socioeconomic and political conditions but are also highly vulnerable to rising sea levels. All told, the environmental consequences of global warming and climate change are likely to extend to food and other resource scarcities that could fuel conflicts and threaten life and limb of huge numbers of population living in the region. For example, Jakarta, Manila and Bangkok, already beset by massive flooding even from normal rainfall, are likely to be submerged should the sea-level rise even by a few metres.

A study on climate change and water resources in the Philippines which focused on three of the current six major reservoirs in the country, using climatological data (1968 to 1994) from PAGASA and runoff data (1948–1994) from the National Power Corporation (NPC), showed that there are indeed expected climate changes that would impact on the water resources sector, although a number of external factors, including degradation of watersheds, unchecked extraction of groundwater, rapid pollution from industrialization, saltwater intrusion along coastal areas, and sedimentation of reservoirs, also contribute to change in the water supply-demand relationship.[13] A study on the impact of climate change on the country's coastal sector asserted that one of the most certain outcomes of global warming is accelerated sea-level rise (ASLR), which would affect the country's 34,000 km of coastline through submergence of low-lying wetland and dryland areas, erosion, salt water intrusion, increased risk of flooding and storm damage whose consequences could include population dislocations.[14] With baseline data from all municipalities showing that the projected population size by 2025 is 143 million, some 2.3 million people are at risk of displacement through ASLR by 2025.[15]

The rise in food prices due to rising global demand can be traced to not only population growth and land-use change, where land is diverted from food production to other uses, but also from climate change that has wrought havoc in agricultural production cycles. Even as the rise in food prices had been traced to the rising costs of fuel and the search for energy security,

any decrease in the price of fuel may not necessarily lead to a decrease in the cost of food. Resource scarcities beyond food and fuel to include water are also seen as among the world's most imminent threats, threats that are connected to global warming and climate change.[16] This scarcity may imply serious displacements of people with serious human security implications. Governments must provide for their people's basic needs and even relative success in doing so yields a measure of regime legitimacy. Not a few of them would go to war to secure critical resources they need to ensure political legitimacy and regime survival.

Human security implications of global warming and climate change

While the concept of human security suffers from a lack of consensus as to its meaning, as well as a deficit in the generation of measurable indicators for the various dimensions of human security as articulated in the United Nations Development Programme's (UNDP) Human Development Report[17], the fact is that the term has increasingly been adopted by communities of security and development stakeholders throughout the world. For example, Canada and Japan have championed this concept in their foreign and development assistance policies, while other governments including the Philippines have used the term with little or no link to its original conception.[18] The UNDP defined human security in terms of 'freedom from fear and freedom from want' with seven dimensions.[19] The 2005 Philippine Human Development Report adopted the concept of human security, but added 'freedom from humiliation' as a third freedom.[20]

At the generalized level, climate change negatively affects the human security of vulnerable people. These have been summarized as follows: 'Climate change will affect the basic elements of life for people around the world – access to water, food production, health and environment. Hundreds of millions of people could suffer hunger, water shortage and coastal flooding as the world warms'.[21] In short, climate change has serious implications for the human security, especially of vulnerable people – the poorest of the poor throughout the world. The UNDP has also identified five risk-multipliers for human development that are related to climate change, even as it acknowledged that these vary geographically and socially. These are (1) reduced agricultural productivity (2) heightened water insecurity (3) increased exposure to coastal flooding and extreme weather events (4) collapse of ecosystems, and (5) increased health risks.[22]

In sum, among the human security implications of climate change in various dimensions are the following:

- Economic security refers to an assured basic income that usually comes from productive and paid work, or at the very least from a government

funded safety net. In agricultural societies, shifts in weather patterns attributed to global warming and climate change could pose economic uncertainties for farmers, while seawater warming would erode and threaten marine life that is the principal source of livelihood for small fisher folk. ASLR that would inundate mega-deltas would also lead to GDP loss with implications for workers' incomes and the ability of governments to provide safety nets for displaced workers.

- Food security refers to the ability of all people at all times to have both physical and economic access to basic food. Basic food can be grown, bought or accessed via a government food distribution system. The consequences of climate change on food production are many, including loss of food crops from ASLR and increasing severity and uncertainty of rain and drought, as well as destruction of marine life from the heating up of sea temperatures. According to the latest report of the Intergovernmental Panel on Climate Change (IPCC), by 2080 about 3.2 billion people will be experiencing water scarcity, while 200 to 600 million will suffer from hunger. Some 250 million could be displaced by phenomena related to global warming such as droughts and famine.[23]
- Health security refers to freedom from both actual and feared infectious and parasitic diseases, such as respiratory infection, diarrhoea, tuberculosis and malaria which are linked to unsafe environment, especially polluted water which contributes to nearly 1 billion cases of diarrhoea per year. Abrupt changes in weather and temperature are known to have caused respiratory diseases and allergies, increased the risks of malaria, cholera, typhoid fever, as well as water-borne diseases. *Mortality attributable to climate change* was estimated by the World Health Organization (WHO) to be at least 150,000 per year by 2000, with the highest deaths occurring in Southern Africa.[24] The UK's chief scientific adviser, Sir David King, wrote in January 2004 that due to global warming 'millions more people around the world may in future be exposed to the risk of hunger, drought, flooding, and *debilitating diseases such as malaria*'.[25]
- Environmental security refers to a healthy physical environment free from the intolerable strain caused by intensive industrialization and rapid population growth. Among the threats that undermine environmental security are water scarcity, deforestation, overgrazing of pasture lands, desertification, air pollution, and salinization. Many of these are either affected by or related to climate change. The IPCC also said that by 2050, 250 million people could be permanently displaced by climate-change related phenomena including droughts, floods and hurricanes. This figure is based on the current rate of 15 million displaced people each year. Environmental refugees are 'a new kind of casualty', and some 19.2 million people are now officially recognized as 'persons of concern' who are likely to be displaced due to environmental disasters. By the end of 2010, this figure is expected to rise to about 50 million.[26]

- Personal security refers to freedom from sudden, unpredictable violence that could come from the state (physical torture), other states (war), other groups of people (ethnic violence), individuals or gangs (crime, street violence), directed against women (rape, domestic violence), against children (child abuse), and self (suicide, drug use). Changes wrought by climate change in the other dimensions of human security could threaten the physical security of peoples as conflicts over water, food and other goods in short supply could erupt within communities, societies, nations, as well as between nations.
- Community security refers to a condition where traditional and new patterns of membership in the group do not pose a threat to the well-being of the individual. These threats could come in the form of traditional oppressive practices (bonded and slave labour, discriminatory treatment of persons due to gender, religion or ethnicity, among others). The implications for community security derive from the threats to other dimensions of human security. The IPCC moreover said: 'The growing number of disasters and conflicts linked to future climate change will push the numbers [of currently displaced persons[27]] far higher unless urgent action is taken. We estimate that between now and 2050 a total of one billion people will be displaced from their homes'.
- Political security refers to the condition of living in a society that respects and protects human rights. Its opposite is seen in political repression, systematic torture, ill treatment, or disappearances of persons, as well as high levels of military spending.

In addition to the IPCC, climate change has also been cited as among the causes of population displacement by other international agencies and institutions, including the United Nations Environment Programme (UNEP), the United Nations High Commissioner for Refugees (UNHCR), and the International Federation of Red Cross (IFRC). In 2008, UNEP said that there were more than 11 million refugees worldwide, while the UNHCR reported that there has been a rise in population displacement from 9.9 million in 2007 to 11.4 million in 2008 due to conflicts, climate change, and rising food prices, among other factors. For its part, the IFRC said that disasters traceable to climate change have contributed more to current levels of population displacement than war and persecution.[28]

Prospects of environmentally induced migration in Southeast Asia

A sharper analysis of the issue of population displacement from climate change and other environmentally related causes could be helped by the adoption of a common lexicon to describe the phenomenon. The use of the term environmental refugees creates special problems since 'refugees'

has a specific usage in international law and conventions. For the moment, 'forced migration' will do.

Several studies and reports have been published on forced migration. The alarming figures provided are only estimates, they are not based on empirical studies (see Chapter 11). *Christian Aid* published a report in 2007 stating that a billion people (or one out of seven people in our present world) could be forced out of their homes over the next 50 years due to climate change. Noting the United Nation's population and climate change figures and supposing that conflict, massive development projects, and widespread environmental deterioration would combine to make life unbearable for hundreds of millions of people, the lead author of the report said: 'Forced migration is now the most urgent threat facing poor nations…. Climate change is the great, frightening unknown in this equation'.[29] Current figures place population displacement from conflict, natural disasters, and development projects at 155 million. As many as 850 million could be added to this figure from water shortages, sea-level crises, deteriorating pasture land, as well as conflicts and famine that result from these conditions, although the report admits that the figures could be uncertain 'because there are no recent authoritative global figures on the number of people who could be displaced by climate change'.[30]

For Southeast Asia climate change is a real challenge that could induce high internal and inter-state migration flows in this century. The region is one of the most vulnerable regions in the global climate scenarios presented. By 2005, 44.1 per cent of the 563 million people will be an urban population living in coastal areas. And 80 per cent will live within 100 km of the coast. Some idea of the damage and consequences of climate change and the gradual sea-level rise at the coast and in river deltas is given by the tsunami that took place in Sumatra on 26 December 2004. The impact of this sudden phenomenon was enormous, devastating many coastal areas. But in Asia the spotlight on the importance of climate change has fallen on China and India, given their impact on emissions.

Concerns and debate on the impacts of global warming and climate change have remained muted in Southeast Asia.[31] Very recently the Asian Development Bank made public a long report on the economics of climate change in Southeast Asia. Although the objective of the report was to show how climate change adaptation will better protect the people living in the region, the report examines a wide range of climate impacts on the region. This and other documents and recent studies provide an important input to explain the possible impact of climate change on migration in the region. However, we need empirical studies that in this region have not yet been done. What is presented here is only a broad view of the causes that will affect the lives of millions of people and will push them to leave their livelihoods.

Regional climate scenarios in Southeast Asia

Regional climate change scenarios were limited in number and not very accurate. I will use the IPPC projections that were also used by the Asian Development Bank.

The average temperature in Southeast Asia has increased 0.1–0.3°C per decade over the last 50 years and, according to IPCC (2007) projections, by 2039 the mean surface air temperature in Southeast Asia will increase between 0.75°C (B1 scenario) and 0.87°C (A1F1 scenario), by 2069 between 1.32°C (B1 scenario) and 2.01°C (A1F1 scenario) and, by 2100 between 1.96°C (B1 scenario) and 3.77°C (A1F1 scenario). Warming is predicted in all of the seasons of the year while in most parts of Asia the greatest warming occurs from December to February.[32]

Regarding precipitation, the observed trend is towards decreasing rainfall during the second half of the twentieth century and a declining number of rainy days.

Following the Asian Development Bank report, by 2050, Southeast Asia's precipitation will increase 1 per cent under the A1FI scenario and 2.25 per cent under the B1 scenario, with the strongest rise starting in December and ending in May. But precipitation will increase at the end of the century, with great variations expected between March and May.

Desertification and land degradation

Desertification manifests itself in many different forms across Asia-Pacific. In terms of the number of people affected by desertification and drought, Asia is the most severely affected continent. The growing population has been exacerbating the pressure for exploiting natural resources. Many areas are suffering from serious water erosion, mainly because of unsustainable land management practices.

Southeast Asia has about 115 million ha of agricultural land. However, it also includes the highest proportion of degraded areas of forestland and the overgrazed highlands of Laos. Soil degradation is particularly severe where continual cropping and low-input agriculture is practiced. This includes large regions where subsistence farming is the rule in Southeast Asia. Evidence from four Southeast Asian countries indicates a degradation-induced decline in productivity of greater than 20 per cent.[33]

Many strong tropical cyclones and intensified ENSO events, with significant effects on agricultural production, have to be added to this. Rising sea levels have contributed to the loss of arable lands in low-lying coastal areas of the Philippines; increased soil salinity has affected rice production in Indonesia; and Vietnam has suffered from severe saltwater intrusion in agricultural areas.

Water availability and food production

Southeast Asia is one of the world's water-rich regions, receiving abundant rainfall and having copious water resources. The volume of water available

per capita is higher than in most other regions in Asia.[34] It is also one of the most heavily forested regions. But projections are also worrying because emission scenarios for the region show that areas under water stress are likely to increase substantially. According to the IPCC 2000, around 120 million to 1.2 billion people in Southeast and South Asia will experience increased water stress by 2020, and 185 million to 981 million by 2050.[35] Indonesia and the Philippines would benefit from weaker water stress in 2020 and beyond.[36] According to the B2 scenario some river basins will have the stress weakened; while other basins will have the water stress released. However, river basin areas in Thailand and Vietnam are projected to experience an increase in water stress with a decline projection of 13–19 per cent for the Red River in Vietnam and 16–24 per cent for the Mekong River, affecting the livelihoods of millions.

Southeast Asia is a major producer and supplier of grain, mainly rice and maize, and the largest producer of palm oil, natural rubber and coconut. Livestock has also risen very substantially in recent decades. But the production potential of major crops such as rice and maize has also declined in many parts of the region due to the increase in heat stress and water stress. Planting times and growing seasons have been changing due to erratic patterns of precipitation.

According to the Asian Development Bank, Indonesia, the Philippines, Vietnam and Thailand would continue to see potential rice yield decrease in the coming years under the A1F1 and B2 scenarios.[37] IPCC 2007 projects a 20 per cent increase in crop yields by the middle of 2015 (See Chapter 4). A reduction in fish production is also projected.

Nevertheless, the IPCC projects a 20 per cent increase in crop yields in Southeast Asia by the middle of this century (see Chapter 4).

Labour force occupation in agriculture represents 43.3 per cent in Indonesia, 13 per cent in Malaysia, 36 per cent in the Philippines, 49 per cent in Thailand, 58.6 per cent in Vietnam, 80 per cent in Laos, 75 per cent in Cambodia and 70 per cent in Myanmar.[38]

The only countries in which agricultural activities still dominate national income are Laos, Cambodia and Myanmar.

Natural disasters

Extreme weather events have increased in recent decades in the region. Heavy rains and tropical storms and cyclones have caused massive damage. Forest fires have also increased.

A vulnerability mapping study for Southeast Asia has been carried out recently, taking into consideration the frequency of tropical cyclones, floods, droughts, exposures to landslides and sea-level rise. The study found that the most vulnerable areas were the Mekong delta in Vietnam and Bangkok, given their exposure to sea-level rise, the northern part of the Philippines given its high risk to tropical cyclones, and finally Jakarta.[39]

The average number of people affected in the period 2000–2006 according to the Centre for Research on the Epidemiology of Disasters (CRED) was 10,609,575 a figure not comparable to the average number of victims in South Asia (114,635,097.7) and East Asia (88,642,416.3).[40] But Asia, in terms of occurrence, number of victims and damage, is the continent with major numbers and indexes of impact.

Sea-level rise

In Southeast Asia the sea level has risen in the last few decades between 1 and 3 mm per year. A minimal sea-level rise of 0.40 m has been projected for the region by 2100. This projection will imply an increasing inundation of large extensive coastlines and saltwater intrusion in coastal and groundwater resources. As I said, the Mekong delta and the Red River delta in Vietnam and Bangkok, given their exposure to sea-level rise, are areas of high impact.

A sea-level rise in this region will imply, according to the estimations of the Stern Report, an increase in the average annual number of people flooded in coastal areas, particularly in Indonesia, the Philippines, Thailand and Vietnam (around 20 per cent of the people that may be affected in the world).[41]

Against this global backdrop and taking into consideration the principal environmental push factors: desertification and land degradation, water availability and food production, natural disasters and sea-level rise discussed above with the data showing global warming and climate change flashpoints especially in Southeast Asia the prospects for forced migration within and outside the region appear to be indeed grim.[42] It is not coincidental that the most important issue on the agenda of the G8 Hokkaido Toyako Summit of 7–9 July 2008 was global warming and the related issue of nuclear energy.[43] Hopes are pinned on the forthcoming UN climate convention meeting in Copenhagen in 2009.

Nevertheless, ahead of Copenhagen, there are some indication of growing awareness regarding global warming and climate change in the region as seen in the recent behaviour of regional states.

Growing awareness of environmentally induced migration at the regional level

East Asia has a number of declarations, frameworks, agreements and other mechanisms to address the challenges of climate change and environmental degradation. Within Southeast Asia, ASEAN has recognized the importance of these issues in its various declarations, particularly the 1997 ASEAN Vision 2020 (AV 2020) and the 2003 Bali Concord II (BCII). Among the resolutions made in the AV 2020 on the environment are those pertaining to promoting cooperation in energy efficiency and conservation, the

development of new and renewable energy resources, enhancing food security and international competitiveness in food, agriculture and forest products to make the forestry sector a model in forest management, conservation and sustainable development,[44] and a clean and green ASEAN, including mechanisms for sustainable development ensuring regional environmental protection, sustainability of natural resources, and high quality of life for its people.[45]

However, even before the AV 2020 was fully implemented, ASEAN adopted the BCII in October 2003, seeking to build an ASEAN community based on three pillars: an economic community, a security community and a socio-cultural community. The only reference to environmental issues in the BCII is in the last item of the third pillar which incidentally addresses other issues. It says: 'The Community shall intensify cooperation in addressing problems associated with population growth, unemployment, environmental degradation and transboundary pollution as well as disaster management ...'[46]

It has similarly adopted policies to address these issues, in particular in the Hanoi Plan of Action (HPA) to implement the AV 2020 during its first six years, the Vientiane Action Program (VAP) to implement the BCII, and the Blueprint for an ASEAN Socio-Cultural Community that will be adopted during the 2009 ASEAN Ministerial Meeting (AMM) in July.

In the HPA, the member states agreed, among other economic integration measures, to enhance food security and global competitiveness of its food, agriculture and forestry products; to conduct eco-tourism promotion programs, to harmonize vehicle specification standards and regulations, including pollution and emission standards; to ensure security and sustainability of energy supply, with due consideration to the environment; and to cooperate regularly and share and exchange information on water resources management. Section VI of the HPA contains the most explicit policy directions to protect the environment and promote sustainable development. It has 15 specific action programs, ranging from full implementation of the ASEAN Cooperation Plan on Transboundary Pollution (emphasis on the Regional Haze Action Plan) by 2001 to public information and awareness raising in environmental and sustainable development issues.[47] Sadly, even as specific timelines have been agreed upon, the action plan on the environment has not been fully implemented. Environmental issues seem not to be seen as having their own intrinsic worth and are important only as they relate to economic growth. Thus, the crucial question of environmentally induced migration is not contemplated yet.

In comparison, the Vientiane Action Programme (VAP) adopted in December 2004 and seeking to implement the BCII has provided more measures relevant to climate change and environmental issues, although it appears to have been overtaken by the adoption of the ASEAN Charter and its ratification and coming into force in 2007–2008. Among its provisions are: to create responsive policies to enhance market reforms and liberalization

as well as preserve environmental sustainability, to promote a clean and green ASEAN, to address global environmental issues without impinging on competitiveness or social and economic development, to ensure sustainable management of ASEAN's coastal and marine environment, to conserve rich biodiversity, to sustain water resources, and to sustainably manage forest resources and ecosystems.[48] Annex 3 of the ASEAN Socio-Cultural Community identifies the corresponding program areas and measures to realize these goals. Again, the crucial question of environmentally induced migration is not contemplated yet.

In addition, ASEAN's participation in functional cooperation schemes with China, Japan and South Korea in the ASEAN+3 process has included environmental issues, although the environment did not get the attention of the leaders until 2002 at its Environment Ministers Meeting in Vientiane, which reviewed the progress made in the implementation of various commitments, including on transboundary haze, nature conservation and biodiversity, coastal and marine environment, among others.[49] Related issues are being taken up within this process, including in agriculture, health, tourism and energy by the respective ministries of the ASEAN+3 countries.[50] Their second joint statement to cover the second decade of functional cooperation includes environmental issues, energy and climate change as well as its third item.[51]

In conclusion, it can be said that the awareness in ASEAN of the implications of global warming and climate change in migration flows is still very faint, although there is growing awareness of the risk posed by climate change and global warming at a general level.

Policy recommendations for East Asia–EU cooperation

- Exchange experiences in forging regional cooperation in the domain of the environment, particularly climate change, environmentally induced migration and its implications for human security.
- Engage relevant stakeholders in and out of government to enlist their support and participation in responding to the challenge of climate change. Of special importance is the role grassroots organizations can play as vehicles for public awareness, feedback information, and policy generation, implementation and monitoring.
- Develop new norms pertaining to 'conditionalities' to development assistance including 'social clauses' attached to international agreements to demonstrate the principles of equal partnership between developed and developing countries.
- Design new forms of cooperation with multi-stakeholders, both state and non-state, that can lead to more effective responses to climate change challenges, including forced migration.

- Initiate consultations, debates, and discussions to craft a lexical set to deal with forced migration so that the difficulty posed by the use of the term 'refugees' can be addressed.

Notes

1. See Chapter 27.
2. See for example the Cebu Declaration on East Asian Energy Security of 15 January 2007 which includes addressing climate change signed by the 10 member states of ASEAN and the Singapore Declaration on Climate Change, Energy and the Environment, 21 November 2007 signed by the 16 countries of the East Asia Summit.
3. From Agus P. Sari (2003) 'Environment and Security: Mitigating Climate Change while Strengthening Security' in David B. Dewitt and Carolina G. Hernandez (eds) *Development and Security in Southeast Asia, Volume I: The Environment* (Aldershot, England: Ashgate Publishing Company), p. 209.
4. Intergovernmental Panel on Climate Change (2007) *Climate Change 2007: The Physical Scientific Basis* (Geneva: IPCC).
5. Chris Abbott, Paul Rogers and John Sloboda (eds) (2007) *Beyond Terror: The Truth about the Real Threats to Our World* (London, Sydney, Auckland, and Johannesburg: Rider of Random House Group company).
6. Data from Table H.1 co2 World Carbon Dioxide Emissions from the Consumption and Flaring of Fossil Fuels, 1980–2006, Energy Information Administration (2006) *International Energy Annual 2006*, http://www.eia.doe.gov/iea/; table posted in the web on 8 December 2008; next update will be in August 2009.
7. From the session on 'Managing Pandemics, Resource Competition, Climate Change: Implications for Asian Security and Prospects for Regional Cooperation', *The Sentosa Roundtable on Asian Security 2009*, S. Rajaratnam School of International Studies (RSIS), Nanyang Technological University, Singapore, 19–20 March 2009.
8. A decade ago, it was estimated that only about 17 per cent of the country's forest cover remained.
9. It is estimated that Asia's population growth will increase by 500 million in the next 10 years.
10. On water security issues, see Asian Development Bank and the Asia-Pacific Water Forum (2007) 'Achieving Water Security for All' in *Asian Water Development Outlook 2007* (Manila: Asian Development Bank).
11. Among the seven, the Vietnamese mega-delta is feared to be most seriously affected in terms of the area of land, the number of people that would be displaced, and implications for its Gross Domestic Product (GDP). From the session on 'Managing Pandemics ...', *The Sentosa Roundtable on Asian Security 2009*.
12. From the 4th Assessment Report of the International Panel on Climate Change, 2007.
13. Aida M. Jose and Nathaniel A. Cruz (1999) 'Climate Change Impacts and Responses in the Philippines: Water Resources', *Climate Research*, vol. 12, 77–84.
14. Rosa T. Perez, Leoncio A. Amadore and Renato B. Feir (1999) 'Climate Change Impacts and Responses in the Philippines Coastal Sector', *Climate Research*, vol. 12, 97–107.

15. *Ibid*., p. 103.
16. Chris Abbott, Paul Rogers and John Sloboda (2007) *Beyond Terror: The Truth about the Real Threats to Our World* (London, Sydney, Auckland, and Johannesburg: Rider of Random House Group company). This study listed climate change as the first among four global threats.
17. United Nations Development Programme (1995) *Human Development Report 1994* (New York: UNDP), Chapter 2 – New Dimensions of Human Security.
18. The Philippine Human Security Act of 2007 is the country's anti-terrorism law and has been criticized for having no relevance to the UNDP's view on 'human security'. See for example, Aris A. Arugay, (2007) 'Civil Society and Security Sector Reform (SSR) in the Philippines', *The Indonesian Quarterly,* vol. 35, no. 4, pp. 344–359.
19. Culled from United Nations Development Programme (1995) *Human Development Report 1994* (New York: UNDP).
20. Human Development Network, United Nations Development Programme, and New Zealand Agency for International Development (2005) *Philippine Human Development Report 2005: Peace, Human Security and Human Development in the Philippines* (Manila: Human Development Network), p. 1.
21. Akihiko Morita, 'Climate Change and Vulnerable People: Public Social Private Partnership in Adaptation', unpublished, undated paper likely written in 2008. Professor Morita is from the Tokyo Institute of Technology.
22. United Nations Development Programme (2007) *Human Development Report 2007* (New York: UNDP), pp. 26–31.
23. Intergovernmental Panel on Climate Change (2007) *Climate Change 2007: The Physical Scientific Basis* (Geneva: IPCC).
24. Jonathan Patz, et al., 'Impact of Regional Climate Change on Health', *Nature*, 17 November 2005, as cited in Chris Abbott, Paul Rogers and John Sloboda (2007) *Beyond Terror: The Truth about the Real Threats to Our World* (London, Sydney, Auckland, and Johannesburg: Rider of Random House Group company), p.12.
25. David King (2004) 'Climate Change Science: Adopt, Mitigate or Ignore?', *Science*, Vol. 3003, 5655, as cited in Chris Abbott, Paul Rogers and John Sloboda (2007) *Beyond Terror: The Truth about the Real Threats to Our World* (London, Sydney, Auckland, and Johannesburg: Rider of Random House Group company), p. 11. Emphases are mine.
26. From 'Population Displacement', *NTS Alert – a Fortnightly Bulletin of Current NTS Issues Confronting Asia* (July 2008/2), pp. 5–6.
27. These numbers include 25 million currently displaced by conflict and human rights abuses, 25 million by natural disasters, such as earthquakes, and 105 million by large development projects with 8.5 million currently officially classed as refugees. By 2050, twice as many people are at risk of being displaced by conflict and natural disaster.
28. *Ibid*., p. 6.
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Part IV
Mitigation and Adaptation Policies

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13

The EU and Germany's Policies on Climate Change

Frank Umbach

Introduction

The German presidency of the EU and the G8 summits since 2007 have selected energy security and the challenges of climate change as one of the most important policy issues on their agenda. In the EU, climate change is considered not just as a global environmental and ecological challenge, but is increasingly also perceived as one of the twenty-first century's most important security threats that 'directly threatens European interests'. The following analysis will focus on the EU's and Germany's achievements, but also the uncertainties and challenges of its energy-climate policy nexus and the implementation problems of the ambitious targets of its energy and climate policies. Furthermore, it will also examine the implications for global stability and human security as based on the approach 'Freedom from Fear'. This is understood as the freedom for individuals and communities from basic insecurity and from the consequences of conflicts, where individuals and communities are deliberately targeted with impunity.

The chapter concludes that:

1. Climate change and climate protection are inevitably linked with global energy policies, leading to an energy-climate nexus with far-reaching foreign and security implications for regional and global stability, prevention policies, and human security. But mitigating climate change can only be successful when a radical change in production, transformation and the use of energy takes place worldwide, including in China and India.
2. Given the unsustainability of the present energy trends, in light of the resulting implications for climate change and human security policymakers need to address these twin, interrelated challenges of energy security and climate change. This is to ensure the security of our global energy system and to reduce greenhouse gas emissions as part of an overall strategy of a sustainable energy security concept. Likewise, the

world has to adopt a dual-track strategy of adaptation as well as mitigation of climate change.

3. By recognizing that the current EU energy policy is unsustainable, the EU has set three very ambitious 20 per cent targets by 2020 with regard to renewable energies, to cutting greenhouse gas emissions and to improving energy efficiency and conservation. While the EU and Germany view themselves currently as the global forerunners and leaders of an ambitiously integrated climate and energy policy, it does not equate to the assumption that they are better and more adequately prepared for coping with the manifold security challenges of climate change on a global scale. In the mid- and long-term, the EU will only be as secure and prepared as the rest of the world is.
4. While most German and European foreign and security experts agree with the general conclusions of worldwide analyses of global climate change, and in framing its security implications as part of wider foreign policy concepts as an integral part of preventive diplomacies, it has remained unclear what priority should be given to those security challenges compared to others, particularly when those climate change security implications are interpreted rather as catalyst factors and not as the original cause of most international conflicts. Furthermore, there is still no real consensus among climate experts themselves with regard to the question of how disastrous the implications are, whether it wouldn't be better to prepare to adapt to climate change rather than fighting an already raging fire, as well as being more pragmatic and practical than trying to revolutionize the world. Nevertheless, a general consensus exists insofar that these threats are of transnational nature, demand new thinking in regional and global dimensions and they require unprecedented international cooperation as part of new 'comprehensive security' and 'human security' concepts.

Energy and climate change

In contrast to energy security and its vulnerabilities, climate change is more a recent concern, but closely linked with energy policies and energy security. The new energy-climate nexus is being determined by four major factors:

- Firstly, the burning of fossil fuels, coal, oil and gas to produce energy is presently responsible for 61 per cent of the global greenhouse gas (GHG) emissions and even 80 per cent when only OECD and countries with transition economies are considered. The international focus towards GHG emissions is directed towards CO_2 emissions which represent some 80 per cent of all GHG emissions, whereas all non-CO2 GHG emissions cover just 20 per cent.

- Secondly, the rising global fossil fuel use will drive up the emissions by 57 per cent between 2005 and 2030 in the Reference Scenario ('Business as usual' scenario by projecting present trends into the future), 27 per cent in the Alternative Scenario and 68 per cent in the High-Growth Scenario of the IEA. The United States, China, Russia and India are expected to contribute two-thirds of this increase.[1] Hence mitigating climate change can only be successful when a radical change of production, transformation and the use of energy takes place worldwide,[2] which also needs to include China and India. Three-quarters of the projected increase in energy-related CO_2 emissions by 2030 will arise from China, India and the Middle East, and 97 per cent in non-OECD countries as a whole. The OECD countries alone – even if they were to reduce their emissions to zero – would be unable to reduce the world's GHG emissions to a level that increases the global temperature just to 2°C as demanded in the Stern report to prevent more disastrous consequences for the world's climate and for worldwide security.
- Thirdly, energy supply disruptions can also be the result of extreme weather conditions or accidents: in August and September 2005, the hurricanes Katrina and Rita shut down 27 per cent of US oil production and 21 per cent of US refining capacity in the Gulf of Mexico[3] – with worldwide implications for global oil prices, energy policies, climate change, strategic oil stocks and perceptions of supply security.
- Fourthly, the substitution of traditional fuels with biofuels (like ethanol) in order to strengthen Western energy supply security and to mitigate climate change, for instance, has contributed to the world's soaring food prices and its sufficiency. In the light of increasing critical discussion of the present production basis for biofuels, it is rather overlooked that the future global production of biofuels and its share in the worldwide energy mix, and as a substitute for fuel in the transport sector, will be heavily dependent on the weather and climate change. The record storms and floods in the Midwest of the United States last June, for instance, struck at the heart of America's corn region at a time when the United States has become more reliant on corn (ethanol) for its fuel supply. It is expected that the share of biofuels will rise to at least 20 per cent in the following decades. Thus the hopes for an expansion of biofuel production are hostage to stable and adequate weather. In addition to the increasing geopolitical risks for future global energy security, the world becomes simultaneously vulnerable to increasing weather risks.[4]

The forecasted GHG emission scenario developed by the Intergovernmental Panel on Climate Change (IPCC) envisions a world in which the global population and national states will be threatened by massive food and water shortages, devastating natural disasters (i.e., intensified tropical storms and storm surges), and waves of deadly disease outbreaks.[5] With sea levels

projected to rise by between 0.18 and 0.59 metres this century that will warm the Earth's surface between 2 and 4°C, or even as high as 6°C, crossing these thresholds will make any management of the risks much more difficult, dangerous and unpredictable.

In the view of the IEA, exceptionally strong and immediate policy action is necessary to stop the energy-related global carbon dioxide emissions (CO_2). At around 450 parts per million (ppm) it would need to peak by 2015 at latest and then to fall by between 50 and 85 per cent below 2000 levels by 2050.[6] The IPCC report of 2007 has also called for 'resolute' action by governments to do more to fight global warming or face dire consequences. The Stern Review on behalf of the British Treasury had already concluded in the autumn of 2006 that inaction on climate change will only increase the costs of dealing with the impacts afterwards, which could cost the world economy more than 20 per cent of global GDP each year, whereas the costs of an effective prevention strategy could be limited to just 1 per cent of global GDP each year.[7]

Although the direct consequences of climate change themselves are hard to predict with certainty, climate change might be a catalyst or a 'multiplier threat' for insecurity and instability in already existing conflicts, which could trigger or prolong conflicts and further complicate any peacefully negotiated solutions. Climate change has already contributed impacts to existing conflicts such as the Darfur conflict in Africa, because desertification had forced people from their traditional homes and into areas where they often had to compete with other peoples for scarce resources such as water. Even the UN Security Council held its first ever debate on the impact of climate change on international peace and security in April 2007.[8]

Due to the interrelationship of improving energy (supply) security and mitigating climate change, both policy objectives can conflict with each other: the expanded use of domestic coal, for instance, can strengthen energy supply security, but will increase CO_2 emissions. (Table 13.1 shows the energy related CO_2 emission scenarios of the United States, EU and China.) Achieving only a 5 per cent reduction in emissions through a switch from coal to gas (in particular pipe-based), on the other hand, has already had negative impacts on energy supply security and the economic competitiveness of economies and national enterprises.[9]

At the same time, the US energy and climate policies have already undergone fundamental changes which will further increase with the new government of US President Barack Obama in the years ahead. The recognition has grown in the United States as well as in Europe that unmitigated climate change will have profound consequences for regional and global security policies. Andrew Marshall, the long-time influential head of the Pentagon's Office of Net Assessments, had already commissioned a report in 2002 to explore the security implications of an abrupt climate change development.[10] This path-taking study, though shelved by the official Pentagon's policies at that time, has meanwhile been followed with a number of new

studies on the security implications of climate change,[11] including reviews of high-ranking retired US admirals and generals.[12] Meanwhile, the global energy security challenges, its interdependencies with climate change and implications for future foreign as well as security policies of the West have already opened new policy options for a transatlantic agenda of common discussions on energy and climate challenges.

The German presidency of the EU and the G8 summits of the last two years have selected energy security and the challenges of climate change as one of the most important policy issues on their agenda.[13] On March 9, 2007, the European Council agreed on an integrated climate and energy policy. At the same time, the EU relationship with PR China has become much more complicated, which highlights growing economic-political interdependence as well as competition and strategic rivalries. China's energy and raw material policies in the Middle East and Africa have become controversial new issues of an increasingly ambivalent EU–China relationship of regional and global cooperation, competition and diplomatic conflicts.[14]

Moreover, climate change is increasingly perceived in the EU as one of the most important security issues of the twenty-first century[15] that 'directly threatens European interests', as the paper titled 'Climate Change and International Security' of the High Representative and the European Commission to the European Council of 14 March 2008 has concluded.[16] It is seen as a very important annex to the EU's 'European Security Strategy' of 2003 – the most important document of the EU's Common Foreign and Security Policy (CFSP).

The following analysis will focus on the EU's and Germany's achievements, but also the uncertainties and challenges of its energy-climate policy nexus

Table 13.1 Energy-related CO_2 emissions of the United States, EU, China and by scenario 2005–2030 (billion tonnes)

		Reference scenario		**Alternative policy scenario**		**High-growth scenario**	
	2005	**2015**	**2030**	**2015**	**2030**	**2015**	**2030**
World	26.6	34.1	41.9	31.9	33.9	34.9	44.8
OECD	12.8	14.1	15.1	13.2	12.5	13.9	14.6
Transition Economies	2.5	3.0	3.2	2.9	2.8	3.0	3.2
Developing Countries	10.7	16.4	22.9	15.2	17.9	17.4	26.3
USA	5.8	6.4	6.9	6.2	6.0	6.3	6.7
EU-27	3.9	4.0	4.2	3.6	3.2	4.1	4.2
PR China	5.1	8.6	11.4	8.1	8.9	9.5	14.1

Source: IEA 2007a, p. 199.

and the implementation problems of the ambitious targets of its energy and climate policies. Furthermore, it will also examine the implications for global stability and human security, based on the approach 'Freedom from Fear' and understood as the freedom for individuals and communities from basic insecurity from consequences of conflicts by targeting deliberately individuals and communities from impunity.[17]

The integrated climate and energy policy of the EU and its proclaimed leadership role in mitigating climate change

On March 2007, when the European Council agreed on an integrated climate and energy policy, it had also adopted an 'Energy Action Plan' (EAP) for the following years (2007–2009). The EAP favours a liberalized internal market for gas and electricity, enhanced measures for security of supply and a common approach to an external energy policy with a global dimension.[18] (Table 13.2 shows the average annual rate of growth and projections of EU – Primary Energy Demand) The EU's energy policy is to be aimed at a careful balance between all three parameters: security of supply, competitiveness and environmental/climate sustainability.

Under the German presidency, the EU agreed to the world's most comprehensive action plan (containing 17 individual measures) on climate protection and energy supply. The EU-27 were able to agree on a set of tasks and precise, legally binding targets at the March summit of 2007 as a symbol of Europe's determination:

- Energy efficiency should be increased by 20 per cent across the EU;
- The goals of the Kyoto protocol should be exceeded and carbon emission should be reduced by 20 per cent by 2020 compared to 1990 (if other industrialized countries such as the United States, India and China commit themselves to similar policies, the EU would be willing to reduce emissions by 30 per cent);
- Additionally, a 20 per cent share of the energy mix should be generated from renewable energy sources. Latvia, Sweden, Finland and Austria have already attained this target, although the Swedish and Finnish success is due to the use of nuclear energy.

In this regard, the EU sees itself as the leading political actor worldwide and a forerunner in the international efforts to contain climate change effects and hopes to benefit from this role politically as well as economically. (Table 13.3 shows the alternatives on the progressive diminution of demand on coal, gas and oil)

Disagreements existed concerning the ambitious climate policy targets, such as the increase in the share of renewable energies in overall EU energy consumption by 2020 and whether nuclear energy can be considered as a carbon free energy source.[19]

Table 13.2 EU – Primary energy demand 1971–2030 (Mtoe)

	1990	2005	2015	2030	2005–2015* (%)	2005–2030* (%)
Coal	451	317	291	275	–0.8	–0.6
Oil	626	671	678	670	0.1	–0.0
Gas	295	444	509	610	1.4	1.3
Nuclear	207	260	239	159	–0.8	–2.0
Hydro	25	26	34	37	2.8	1.4
Biomass and waste	46	83	127	182	4.3	3.2
Other renewables	3	13	33	72	10.0	7.2
Total	1,653	1,814	1,910	2,006	0.5	0.4

Note: *Average annual rate of growth.

Source: IEA 2007a, p. 616.

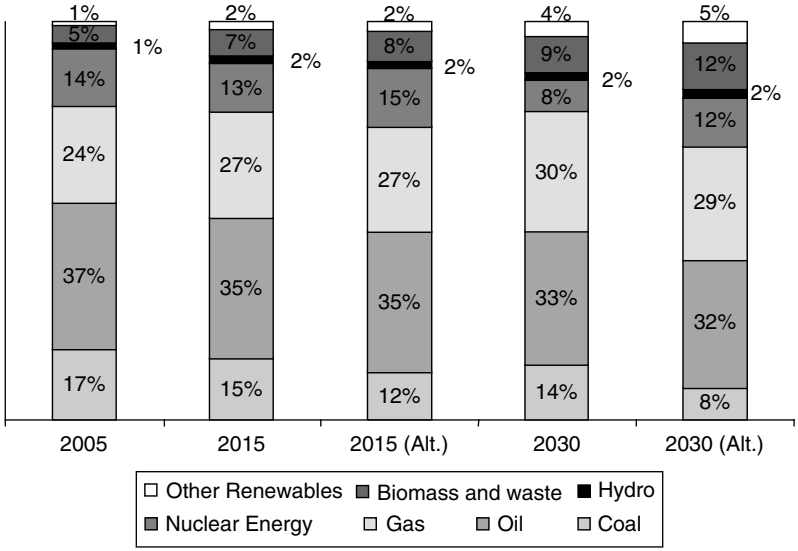

Table 13.3 Total primary energy demand of the EU 2005–2030 (Reference and alternative policy scenarios)

Source: IEA 2007a, p. 616.

The political credibility of the EU's ambitious climate protection agenda after its March 2007 summit is dependent on the translation of those decisions into politico-economic realities. With 75 per cent of CO_2 reductions, Germany takes up the lion's share of EU contributions to the goals of the Kyoto protocol by 2012. But closing the old industrial plants in the German

East – which accounted for much of the reduction – has already been done. With regard to carbon reductions by 2020 as envisioned by the EU, Germany will find it difficult to maintain this high percentage. Berlin is still in the process of setting the right priorities with regard to climate protection and increasing energy efficiency (see below). It also remains questionable whether the self-proclaimed leadership role of the EU on climate matters will be honoured and followed by the United States, India and other transition countries, as the Bali summit in November 2007 has shown.

The present and future development of the EAP and the integrated climate policies are also hampered by the fact that hitherto only a few members have implemented adequate strategies for renewable energy sources. Hence, even the EU won't be able to live up to its Kyoto Protocol obligations, which mean cutting greenhouse gas emissions 8 per cent between 2008–2012 from 1990 levels. In 2008, while Germany had already, with its 18 per cent reductions of its GHG emissions, largely met its target of 21 per cent for 2008–2012, the EU as a whole had reduced its emissions on average by just 2.7 per cent instead of the agreed 8 per cent.[20]

A major challenge is resulting from the contradictory objectives of mitigating climate change and the other two objectives of the energy triad, namely supply of security and the economic competitiveness of the EU.[21] The European Commission's energy demand management strategy has always emphasized the diversification in energy supply, the promotion of renewable energies and a neutral look at the nuclear option. After years of discrediting coal, the Commission also views coal now as an important energy source in the future, which can contribute to enhance security of supply in the EU. It decided to support the technical progress in terms of current clean-burning coal processes, like the Carbon Sequestration and Storage (CSS) technology.[22]

Driven by rising oil and natural gas demand, record high oil and natural gas prices, and Russia's foreign energy policies (i.e., pipeline gas dependencies on EU Member States on Russia) European concerns over energy security have constantly increased since the beginning of 2006. As the result, more than 50 new coal-fired plants are planned to go into operation over the next five years, being in use for the next five decades. But this renaissance of coal has sowed alarm and uncertainty among environmentalists who view the EU's climate protection policies as being in doubt in terms of the global mitigating strategies on climate change.[23]

But, calling for a coal moratorium to replace even aging coal plants with much higher efficiency grades and much less GHG emissions, is in particular dangerous and unrealistic for countries like Germany that has one of the highest electricity costs in Europe and, simultaneously, is still sticking to its policy of phasing out nuclear power. On one hand, the worldwide use of coal causes 40 per cent of global CO_2 emissions. Even modern coal plants produce more than twice as much CO_2 per unit of electricity as natural gas, the second most common fuel used for electricity generation. On the

other hand, however, both coal and nuclear power are still needed with the expansion of renewable sources, which need a reserve power (when wind and sun are not available) for the country's base load.

But natural gas as the only alternative has become too expensive with its operational costs, being linked to the rapidly rising worldwide oil price. Moreover, it would further increase the overall gas import demand from Russia – running contrary to the EU's and Germany's objectives of strengthening its (gas) supply security as the latest Russian-Ukrainian gas conflict of December 2008–January 2009 has highlighted again. That explains why not just China, India, and the United States, but also the EU has become so much interested in CSS technologies, because a world without coal is not realistic in the mid-term perspective.[24]

Due to the most advanced and innovative technologies delivering higher efficiency and lower environmental burdens, thus 'King Coal', accounting for 55 per cent of the global reserves of all non-renewable sources of energy and being available for the next 150 years in contrast to conventional oil (40 years) and gas reserves (60 years), could become a key energy source for power generation, heating and transport sectors alike as the 'bridge to the future' of a new energy century of non-fossil energy resources.[25]

Meanwhile, nuclear power is also undergoing a renaissance in the world and Europe alike. The EU's first 'Green Paper' of November 2000, being concerned over the projected increased external dependence over the next few decades, had already criticized the five (Germany, Sweden, Spain, Netherlands and Belgium) out of eight EU member states (the other three are France, the United Kingdom and Finland) with nuclear power who have adopted or announced a moratorium for nuclear power or decided to give up nuclear energy production. At present, nuclear energy does play a vital role – in 2006 it guaranteed 14 per cent of the EU's gross inland consumption (renewables 7 per cent) and produced 29 per cent of electricity in Europe (renewables 15 per cent) – in the sustainable production of electricity.[26] It is also the only industrially mature energy source with negligible greenhouse gas emissions which can be expanded. The Green Paper of 2000 had already warned that the EU would not meet its obligations under the Kyoto Protocol without nuclear energy. Annually, it avoids some 300m tonnes of carbon dioxide emissions – equivalent to half the amount produced by all the cars in the EU.

Against this background, an increasing number of EU Member States have begun to re-think the nuclear option, as the EU Commission, the IEA, the World Energy Council (WEC) and numerous international energy experts have recommended for years. Even Germany's unilateral withdrawal from the use of nuclear power may not last in the following years. Besides Russia and Ukraine as non-EU member states, Finland, France, Great Britain and many new Central European members of the EU have already indicated that they do not want to renounce the nuclear power option. In fact, the

construction of new nuclear power plants is being declared (or at least seriously considered), or the lifetimes of nuclear reactors are being extended (like in Sweden, Great Britain and Italy that have recently also announced the building of new nuclear power stations). For economic, environmental, technological and political reasons, the nuclear power option is also undergoing a renaissance in the United States, Russia and particularly in Asia. In 2007, 29 nuclear power stations were being constructed worldwide, another 64 were concretely planned, and another 158 were under consideration.[27]

Concerning nuclear energy, Germany has again (as during the last G8 summit) been largely isolated and failed to assert itself on the European level. The spring 2007 summit concluded that the lifetime extension of nuclear power plants can improve the CO_2 balance. Yet the European Council's agreement of 2007 was clearly a compromise, which lacked a common European response on the future of nuclear energy. France, a country that generates 40 per cent of its primary energy demand from nuclear energy and 77 per cent of its electricity supply, was thus able to comply with the required share of renewable energies without implementing any additional measures.[28]

The EU's climate policies: Ambitious targets versus uncertainties of implementation

The EU's March 2007 decisions on an integrated climate and energy policy recognize the fact that the current EU energy policy is 'unsustainable'. Given the projected business as usual energy and transport trends, the CO_2 emissions of the EU would rise by 5 per cent and worldwide by 55 per cent by 2030. The Commission has followed the recommendations by international climate change experts to stop the global average temperature from rising more than 2°C higher than pre-industrial levels. Given the fact that the energy sector gives rise to 80 per cent of all EU GHG emissions, the EU is focusing on raising the level of renewable energy sources up to 20 per cent by 2020 and increasing energy conservation as well as efficiency by another 20 per cent, which would help both to improve the overall energy balance and to decrease import dependencies as well as improve the environmental objectives.

Before this, on February 20, 2007, the EU concluded with a 'firm independent commitment' to reduce its GHG emissions by at least 20 per cent below the 1990s levels. If other OECD nations followed, the output of GHG emissions could be reduced by no less than 30 per cent by 2020. In the view of the EU Council, the developed countries should collectively reduce their emissions even by 60 to 80 per cent by 2050 compared to 1990. Even if the Kyoto process fails to materialize, EU emission trading will continue. The EU seeks to reduce its emissions by 8 per cent until 2012 by a spirit of solidarity amongst Member States with their 'differentiated responsibilities

and respective capabilities' and by emphasizing cost-efficient measures. The burden-sharing process implies that specific countries like Germany will have to carry a greater burden because of their greater economic power.

The EU shares the vision of reaching the ultimate objective of the UN-Kyoto Process on Climate Change and 'the strengthening and extension of global carbon markets, the development, deployment and transfer of the necessary technology to reduce emissions, appropriate adaptation measures to deal with the effects of climate change, action on deforestation and addressing emissions from international aviation and maritime transportation'.[29]

But the implementation of the agreed target to achieve at least a 20 per cent reduction of GHG emissions by 2020 compared to 1990 levels is still uncertain. However, between 1990 and 2005, the EU energy intensity improvements have been accelerated up to 19 per cent. In this regard, the target of reducing GHG emissions by 20 per cent does not seem so ambitious as it is often declared. But the need to determine national targets for the EU's declared GHG reductions is difficult to achieve given the very different energy situation and the economic capability of the 27 Member States for modernizing their energy sectors and reducing GHG emissions. Without a fair implementation of those agreed national targets, the EU's official policy and targets for mitigating climate change would remain on paper. The share of renewables, for instance, is today just 8.5 per cent in the EU's final energy consumption. In order to increase this share by another 11.5 per cent by 2020, to transform Europe into a low-carbon, high energy efficiency economy, a major investment across the EU is required, but on a very different scale. However, the relative costs are expected to fall due to technological innovation, rising prices for oil and gas (doubling between the summer of 2007 and the summer of 2008) as well as the fact that other energy producers face the costs of allowances of the EU's Emissions Trading System (ETS).

But as the result of the presently increasing critical global debate on the first generation of biofuels as a replacement for petrol and diesel supply for the transport sector, the 10 per cent binding minimum target for the share of biofuels in overall EU transport petrol and diesel consumption by 2020 has already become unrealistic and, thereby, the overall objective of improving the environment and stopping climate change rising to more than 2°C above pre-industrial levels.

In its implementation strategy of January 2008, the Commission proposed six key principles for its strategy and impact assessment: (1) cost effectiveness; (2) flexibility; (3) internal market and fair competition; (4) subsidiarity; (5) fairness and (6) competitiveness and innovation.[30] Its main instrument for implementing the 20 per cent reduction target for mitigating climate change is the EU's ETS. Although it covers some 10,000 industrial plants across the EU, today it accounts for just 40 per cent of all EU-27 GHG emissions. Furthermore, the contribution of small and large emitters to the

overall emissions covered by the ETS is uneven: Large installations cover only 7 per cent of the total number of installations, but produce 60 per cent of total emissions, whereas small installations represent around 14 per cent of all installations, but emit only 0.14 per cent of all emissions.[31] But instead of 27 national caps from each EU Member State, the Commission favours one EU-wide cap for the existing scheme. But the market-based 'cap and trade' solution needs to be strengthened, updated and extended with the inclusion of GHG emissions other than CO_2, and all major industrial emitters.[32]

If the EU is able to implement and achieve its March 2007 aims by 2020 the EU would be using 13 per cent less energy than today, which is equivalent to a saving of more than 100 billion euro and a reduction in CO_2 emissions of about 780 million tonnes per year.[33]

Global security implications of climate change

On 14 March 2008 the High Representative of the CFSP and the European Commission presented a paper on 'Climate Change and International Security', which highlights the implications of climate change for international peace and security.[34] They view climate change as an 'irreversible and largely unpredictable' process, and at best as a 'threat multiplier' exacerbating existing security trends, tension and instability. It envisions threats that already fragile and conflict-prone states and regions will be overburdened by climate change. The paper demands comprehensive policy responses by the international community and sees the EU itself in a unique position to respond to the impacts of climate change on international security and to take up a leading role. The paper lists seven sources of direct threats of climate change to worldwide peace and security:

- Conflict over depleting resources such as arable land, water, food and fish stocks;
- Economic damage and risk to coastal cities and critical infrastructure, which could cost the world economy up to 20 per cent of global GDP per year, whereas the costs of effective and timely concerted action can be limited to just 1 per cent;
- Loss of territory and borders, such as small island states and the potential conflict over resources in Polar regions which will become exploitable as a consequence of global warming;
- Environmentally induced migration, which the UN has predicted to be millions by 2020;
- Situations of fragility and radicalization, particularly in weak and failing states, by overstretching the already limited capacity of governments. It can lead to tensions between ethnic and religious groups within countries and to political radicalization, destabilizing even entire regions;

- Tensions over energy supply arising from intensified competition over access to, and control over, energy resources;
- Pressure on international governance because the negative impacts of climate change may fuel resentment between those responsible for climate change and those most affected by it (having both a north-south as well as south-south dimension). The international security architecture is already seen as under increasing pressure.

The chapter also highlighted the potential security impacts for the individual world regions.

The EU has recognized that despite its claim for a leading role in the process of mitigating global change and its interrelated impacts on worldwide peace, security and stability, it has to enhance its own common political will and capacities at the EU level. Those capacities range from observation, analysis and monitoring to pre-warning and conflict prevention, and finally to crisis management and disaster response instruments (both civil and military). Moreover, it needs to engage major powers and emitters such as the United States as well as China and to commit them to a new ambitious climate agreement under the UN framework (Kyoto-2).

Meanwhile, even some national defence ministries have begun to study the impacts of climate change on worldwide security as a key strategic trend. Their underlying geopolitical trends with climate change as an additional and often hitherto underestimated 'threat multiplier' may change regional and global power balances and complicate the likely conditions in which European armed forces have to be deployed and operate worldwide in the future.[35]

As melting ice caps have opened the prospect of exploring Arctic energy resources, the region may become a new international hotspot of conflicts. The region is suspected to hold as much as 90 billion barrels of undiscovered oil reserves, and 1670 trillion cubic feet of natural gas – amounting to 13 per cent of total undiscovered oil globally and about 30 per cent of the undiscovered natural gas resources.[36] When, on 2 August 2007, two Russian submarines planted a Russian flag at the bottom of the Arctic Ocean to claim a large portion of the world's biggest continental shelf economic zone, it highlighted the new 'resource nationalism' of Russia and its political ambitions to adopt unilateral strategies and power politics rather than following approaches of international law and multilateral political cooperation over an area with unsolved territorial claims. Russia's increased military activities in this region during the last 12 months have not only increased potential threat perceptions of Norway, Canada and the United States and influenced their defence policies, but also those of the EU and some of its Member States, thus climate change has numerous security implications for the region and for international politics.

Germany's climate policies in the context of its energy security

Germany has become a leading exporter of environmental technologies and legislative provisions, often copied by other countries. But similar to the EU's contradictions in its energy and climate policies, Germany is now being confronted with the implementation of the EU's integrated climate and energy policy. It has realized that its own even more ambitious climate policy targets will be difficult to implement, when the balance of the three objectives of the energy triad are maintained. These problems are partly because Germany's energy policies are to a certain extent still very idealistic, ambitious, provincial and over-optimistic at the same time.

Climate protection versus economic competitiveness

Germany has long been a leader in the area of renewable energy (like wind energy) in order to reduce carbon emissions and phase out nuclear energy.[37] Going even beyond the EU targets on mitigating climate change, the German government has now agreed, in its 'Integrated Energy and Climate Programme' of August 2007 (also known as the 'Meseberg Programme'), to reduce its GHG emissions by up to 40 per cent by 2020 (from the 1990 level), to increase the share of renewable energy for electricity production by up to 25–30 per cent and the generation of heat production by renewable energy by up to 14 per cent, to increase the use of biofuels with the aim of lowering fuel emissions by 10 per cent (equivalent to having biofuels account for up to 17 per cent of all fuels) and to a doubling of energy production compared to 1990.[38]

During the next 12 years, the government expects that industry and private people will invest some 313 billion euro on climate protection.[39] With offering the difficult implementation strategies of Germany's climate protection targets, the challenge is to balance these climate protection targets with its future economic competitiveness and with realistic modernization efforts by private industry and its citizens alike.

A particular problem has been seen in subsidizing solar electricity. The present subsidies have contributed to financing jobs in the solar industry of Japan and other countries rather than in Germany itself because no other country in the world is subsidizing solar electricity as much as Germany. Although China has become the largest producer of solar cells, for instance, it is mostly exporting them because solar electricity is too expensive and not competitive enough compared to fossil energy sources in China. According to independent economic analyses, German consumers need to pay 62–100 billion euro subsidies during the next 20 years – three times the present declining per-capita subsidies of hard coal in Germany. Given its inefficiency, due to Germany's weather (it contributed to just 0.6 per cent of the national electricity consumption of 2006), independent economic

experts as well as economic experts of the CDU have called for a 30 per cent reduction in these subsidies.[40] However, a recent government decision has agreed only to reduce those subsidies to around 8 per cent annually by 2011.[41]

In July 2008, the Economic Ministry went so far to declare that Germany won't be able to fulfil the targets of mitigating climate change, by reducing Germany's GHG emissions by 21 per cent by 2020 on the basis of the 2005 levels, without shrinking economic growth and losing jobs.[42] Indeed, without providing higher subsidies for older buildings, those climate protection targets will be difficult to achieve. But even with higher subsidies for private house owners, they will face great difficulties to compensate the necessary investments in energy efficiency technologies (on average, house owners need to invest at least 45,000 euro) with higher rentals (realistically only up to 11 per cent according to some new analyses), in times of already rising energy and living costs for their tenants. And it remains uncertain whether older homeowners will pay for new expensive credits for modernizing their houses and flats in order to improve energy efficiency when they will benefit financially only in 20 years or even later.[43]

For the global post-Kyoto negotiations, Chancellor Merkel supports a world per capita emissions target to find fair burden-sharing between OECD countries and developing states and transition economies with high economic growth (such as China and India), fearing large economic losses if emissions reduction targets are very high. The success of her strategy is seen in flexibility of targets and instruments. But with the outbreak of the economic-financial crisis in the summer of 2008, Germany together with Italy and Poland fought the Commission's proposals on the auctioning of permits for carbon emissions, because it wanted most permits to be given out free. It feared that the extra costs would make companies relocate outside the EU.

Climate protection versus (gas) supply security

As the world's biggest wind power systems producer (producing 37 per cent of all systems and components worldwide), Germany is benefiting more than others from the current global expansion of wind power and other renewable energy sources. The coalition agreement between Germany's coalition government parties stipulated targets of a 4.2 per cent share of renewables in primary energy consumption (PEC) by 2010, and 10 per cent by 2020. As the result of its Renewable Energy Sources Act ('Erneuerbare-E nergien-Gesetz/EEG'), renewables already accounted for 5.8 per cent of the Primary Energy Consumption (PEC) and 12 per cent of electricity generation in 2006. The German Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) hopes to achieve 16 per cent of PEC and 30 per cent of electricity generation by 2020. However, it also creates new problems for Germany's base load supply and economic efficiency. Moreover,

the combined share of hard coal (Steinkohle) and brown coal (lignite) as the second most important energy source is still higher than that of natural gas. For electricity production, the contributions from hard and brown coal (22 per cent and 25 per cent) have only been surpassed by that of nuclear power (26 per cent).

Furthermore, it does not answer the question as to where the rest of the energy demand will come from and to which extent the plans for phasing out nuclear energy will increase the dependency on gas imports from Russia or from the unstable Middle East – and, thereby, threatening Germany's future energy supply security. The recent decision of the German government to give up the 10 per cent biofuel target, as a result of the worldwide crisis of food prices and increasing global criticism for being too costly and ineffective, has put even more pressure on realizing the ambitious German and EU climate protection goals by 2020. In the mid-term perspective, however, the second generation of biofuels, comprised of plant waste such as straw or crops that do not compete with food production, offers a way out of the present problem.

As a consequence of the present dilemma, the German government now aims to compensate the biofuel targets by expanding wind power even more.[44] Although the expansion of renewables strengthens Germany's supply security in general, a further expansion of wind power will lead to even higher gas consumption because the reserve capacity (when the wind is insufficient) will rely primarily on gas turbines.

The future overall supply security and energy policy options had already been limited by its decision to end its domestic hard coal production (Steinkohle) by 2018. Although the decision does not imply another exit strategy from overall coal production, it will make Germany even more dependent on energy imports. The government decision is based on the assumption that the principal conditions of the worldwide coal market (cheap prices versus other fossil resources and a stable availability of coal worldwide) will not change in the following decades. However, as new studies in Europe and the United States as well as trends over the last 12 months are indicating, this assumption might be an over-optimistic scenario, which even ignores present strategic developments on the global coal markets.[45]

Moreover, by emphasizing the need for a national, European and global policy on climate change, the public impression was that it was giving up the declared need to preserve the balance in the triangle of objectives in energy policy and was subordinating energy policy to environmental protection and climate change policies as a single determining factor. At the same time, the anti-nuclear movement of the 1970s and 1980s meanwhile has developed into a new anti-coal movement that is calling for an end of coal as a national energy resource at all. In addition to the exit strategy of nuclear power, it would further narrow down the national energy mix. Consequently, it will

also lead to higher gas imports from Russia as well as politically unstable countries and weaken its national security of energy supply.

But given the fact that Russia itself is facing a gas crisis and has officially announced it has much more reliance on the expansion of coal and nuclear power, in order to compensate its unanticipated rise of domestic gas consumption and to maintain its gas export obligations,[46] Russia will produce even more GHG emissions (i.e., CO_2) as the result of Germany's unwillingness to modernize its coal plants and by raising Germany's gas imports from Russia. As a net result, by relying even more on gas consumption in the case of drastically lowering its coal consumption, Germany might find it easier to achieve its emission reduction plans in the light of the EU's newly declared targets, but simultaneously will undermine its major policy objectives of its global climate change strategy by promoting higher CO_2 emissions in Russia. Furthermore, the German Energy Agency (DENA) and the industry have repeatedly warned that without a large-scale modernization of Germany's existing and particularly older energy plants, an electricity gap may develop by 2012, which will increase up to 12,000 megawatts (equivalent to 15 large energy plants) by 2020.[47]

Germany's increasing isolation on nuclear power

Although the Merkel government has recognized the manifold challenges of energy supply security in the twenty-first century and is promoting an active foreign energy policy on the national as well as EU level, it maintains the promise made to its coalition government partner, the Social Democratic Party of Germany (SPD), to phase out nuclear power by 2021. At the same time, it has called for greater investment in renewable energy sources and steep cuts in GHG emissions, but also a reduction of Germany's rising dependence on Russian fossil fuels.

Meanwhile, Merkel's own political party and Economy Minister Michael Glos have warned that the EU will not be able to fulfil its targets on emissions unless more member countries favour nuclear energy, including Germany. Following the argumentation of the European Commission, many German as well as international energy experts, energy companies, the Deutsche Bank and others have all warned that Germany will experience significantly higher electricity prices, becoming even more dependent on gas imports from Russia and fail to meet GHG emission targets if the anti-nuclear policy is maintained.

A study of the German Institute for Economic Research (DIW) in Berlin concluded in the summer of 2007 that the climate protection measures of the German government and the EU last March will cost Germany economically around 1.9–5.7 billion euro per year by 2020, depending on fair European burden-sharing (taking into account the emission reductions achieved to date in the different EU-27 Member States; for Germany it

would mean reducing 31 per cent of its emissions on 1990 levels) and the implementation of a comprehensive package of climate protection measures domestically. But is also warns that it would be very difficult for Germany to achieve its reduction target by phasing out nuclear power.[48] Germany's present nuclear power plants avoid 150 mt CO_2 per year, which is equivalent to the entire CO_2 emissions of German traffic.

The Federation of German Industries (BDI) and others, however, had warned prior to the summit that overly ambitious climate protection targets would jeopardize the competitiveness of German companies without meaningfully improving global climate conditions. Indeed, compared with the 15 per cent of global CO_2 emissions today, the EU will only account for about 6 per cent of global CO_2 emissions, and 15 per cent of the new ones, by 2030.[49] However, not addressing the climate change problems may result in much higher costs afterwards.

The German view on climate change as a security risk

The German Advisory Council on Global Change (WBGU), an independent, scientific advisory body to the German Federal Government (set up in 1992), published a summary report of the global climate change and its worldwide security implications at the end of May 2007. In terms of risks analysis it warns that without resolute counteraction, climate change will overstretch many societies 'adaptive capacities within the coming decades'. The report warns that this 'could result in destabilization and violence, jeopardizing national and international security to a new degree'. Furthermore, its report from May 29, 2007 stated:

> climate change will draw ever-deeper-lines of division and conflict in international relations, triggering numerous conflicts between and within countries over the distribution of resources, especially water and land, over the management of migration, or over compensation payments between the countries mainly responsible for climate change and those countries most affected by its destructive effects.[50]

The WBGU has warned that climate change is only just beginning and its impacts will steadily intensify in the following decades. In the view of the WBGU, the impacts of climate change will steadily intensify in the following decades and could exacerbate existing environmental crises such as drought, water scarcity and soil degradation, intensify land-use conflicts and trigger further environmentally induced migration. In its view, new conflict constellations such as sea-level rise and storm and flood disasters could threaten cities and industrial regions alike. In its view, unabated climate change could even cause large-scale changes in the Earth system with incalculable consequences for societies worldwide.

On the other hand, the WBGU also concedes that climate-induced interstate wars are rather unlikely to occur. But it would not exclude the fact that climate change could trigger national and international distribution conflicts and intensify already existing problems such as state failure, the erosion of social order, and rising violence. The resulting dynamics may still threaten to overstretch the established regional and global governance systems, and thus destabilize international security.

WBGU has identified four major conflict constellations: (1) Climate-induced 'degradation of freshwater resources'; (2) 'decline in food production'; (3) 'increase in storm and flood disasters'; and (4) 'environmentally induced migration'. The WBGU perceives the need to master two major challenges in parallel: 'The shift in the centres of power of the political world, and the global turnaround towards effective climate policy.' In this context, it has identified six major threats to international stability and security as a result of climate change and a failed mitigation strategy:

1. Possible global increase in the number of weak and fragile states;
2. Increased risks for global economic development;
3. Growing international distributional conflicts between the main drivers of climate change and those most affected;
4. New risks to human rights and industrialized countries' legitimacy as global governance actors;
5. Triggering and intensification of migration;
6. Overstretching of classic security policy.

Every one of these six major challenges to international stability and security might be hard to manage. The interaction of these six major challenges, however, would intensify the threats to the international system and reveal a vicious circle: climate change can only be combated effectively through international cooperation, but with advancing climate change, the basis for constructive multilateralism will diminish and classic, military-based security policies will be unable to make any major contribution to resolving the impending climate crisis.

In summary, these six major threats may have the capacity to overstretch not just individual countries or subregions, but even the global governance system as a whole. The WBGU perceives in particular the challenge that the interaction between these six major threats may intensify regional and global conflicts. In its view, 'unabated climate change is likely to overstretch the capacities of a still insufficient global governance system'. The WBGU also fears that the 'greater the scale of climate change, the greater the probability that in the coming decades, climate-induced conflicts will impact not only on individual countries or subregions but also on the global governance system as a whole.' In this context, the report warns that 'unabated climate change is likely to overstretch the capacities of a still

insufficient global governance system.' While climate change thus poses a major challenge to international security, 'classic' security policy capacities to act are limited. In this light, the WBGU demands resolute action within the next 15 years in order to prevent the socioeconomic distortions and implications for international security that will otherwise intensify in subsequent decades.[51]

Most German foreign and security experts would agree with the general analyses of the WBGU,[52] and with the framing of the security implications of climate change within the wider foreign policy concepts as an integral part of preventive diplomacies. However, it has remained unclear what priority should be given to those security challenges in contrast to others, particularly when those security implications of climate change are interpreted rather as catalyst factors and not as the original cause of most international conflicts. Furthermore, there is still no real consensus among climate experts themselves with regard to the question of how disastrous the implications are, whether it wouldn't be better to prepare to adapt to climate change rather than fighting an already raging fire, as well as being more pragmatic and practical rather than trying to revolutionize the world.[53] Furthermore, although the 'securitization' of climate change by involving foreign and security experts and discussions of 'environmental security' have helped to raise public awareness of this major global challenge, it is also seen critically because of fears of a further militarization of international conflicts, which would undermine civilian instruments and strategies to fight the security implications of climate change.[54] But a general consensus exists that these threats are of transnational nature, demand new thinking in regional and global dimensions and require unprecedented international cooperation as part of new 'comprehensive security' concepts.

Conclusions

Climate change and climate protection are inevitably linked with global energy policies, leading to an energy-climate nexus with far-reaching foreign and security implications for regional and global stability, prevention policies and human security. Climate scientists largely agree that the world's glaciers and northern ice caps are melting at accelerating rates and that sea-level rise will threaten many coastal and low-lying areas. The central security threat is the rate of temperatures rather than the absolute size of differential warming.

But mitigating climate change can only be successful when a radical change of production, transformation and the use of energy takes place worldwide, which also needs to include China and India. The present energy trends are unsustainable in the light of the resulting implications for climate change and human security – a view that is increasingly shared

not only among environmental supporters, but also by energy, foreign and security experts worldwide.

However, as long as fossil fuels continue to dominate the global fuel mix, energy-related greenhouse gas emissions and increased reliance on imports of oil, gas and coal from politically unstable countries will increase concerns about climate change, energy and human security. Having no adequate and secure supplies of energy at affordable prices is being perceived as a major threat as soaring energy prices and consumption cause irreversible environmental damage for societies. If energy prices stay high, the big losers will be poor countries in particular because they will be hit economically, socially and politically much harder in comparison with the OECD countries. It may curtail their economic development prospects, undermining human security and leading to social-political unrest, state failure, new terrorist havens or large-scale migration. Hence, policymakers need to address these twin challenges of energy security and climate change to ensure the security of our global energy system and to reduce greenhouse gas emissions as part of an overall strategy of a sustainable energy security concept.

To do this, the world has to adopt a dual-track strategy of adaptation as well as mitigation of climate change at the same time. There is often a lack of expertise in Asia, Africa and Latin America with regard to timely and efficient national and regional short-term adaptation concepts and instruments for immediate action (on food security or natural or human disasters), and therefore neglect and overlooking of mid-term mitigation strategies. However, Europe and the OECD countries tend to focus the other way around: rather on mid- and long-term mitigation strategies by neglecting the need for the pressing need for short-term adaptation strategies and capabilities in mitigating the already present consequences of climate change. In the mid- and long-term future, however, without developing and implementing mitigating strategies for global climate change, most countries in the world (i.e., developing and 'failed states') will be overburdened by the global consequences of climate change in a way that any adaptation strategies seem hardly realistic at all. In this way, openness, transparency, free information (i.e., of proven national climate and energy statistics) and education of people on a national and local level are pre-conditions to cope successfully with the manifold challenges of the energy-climate nexus needed to maintain and improve human security worldwide.

During the first half of 2007, the German presidency of the EU and the G8 summit of 2007 selected energy security and climate change as the most important policy issues on their agendas. On 9 March 2007, the European Council agreed for the first time in its history on an 'integrated climate and energy policy' and an according 'energy action plan' for the following years (2007–2009). It has set three very ambitious targets of 20 per cent by

2020 with regard to renewable energies, of cutting greenhouse gas emissions and of improving energy efficiency and conservation. Thereby, the EU has recognized that the current EU energy policy is unsustainable. It had already previously advocated the reduction of GHG emissions to stop the global temperature from rising more than 2°C higher than pre-industrial levels. If other industrial nations will follow suit, the output of GHG emissions such as CO_2 or methane could be reduced even by 30 per cent. It has also agreed that emission trading in order will continue if Kyoto-II fails to materialize.

At the same time, it is increasingly being recognized in the EU that an accelerated, irreversible climate change has significant foreign and security implications, such as for regional conflicts, migration and refugee flows and other domestic security threats, particularly in 'failing states'. Following major research reports that have been published primarily in the United States and Great Britain on climate change and international security threats, on March 14, 2008, the High Representative of the EU's CFSP and the European Commission identified seven major threats to international security in their report 'Climate Change and International Security' to the European Council, which draws a systematic interlink between climate change and security dimensions. Already before, the Stern Report on the economic cost of climate change, commissioned by the British government, has noted that timely investments in carbon reducing cost less than the economic consequences of climate change.

In the light of the first commitment period of the Kyoto Protocol, ending in 2012, whether the EU is living up to its Kyoto-I protocol obligations will be a decisive indicator. Even before the EU's proclamation of an integrated climate and energy policy in March 2007, Germany has been a leader of the EU's effort of making progress toward formal post-Kyoto negotiations, bringing the United States onboard and articulating reduction requirements for the emerging economies. For the implementation of the agreed climate and energy policy targets and the future common climate and energy policies, Germany as the EU's strongest economy and a leader in renewable energies is of decisive importance. It has also begun to address increasingly the potential security implications of climate change on global and regional stability.

Against this background, and Russia's military intervention in Georgia in August 2008, the Arctic and its substantial energy resources might become one of the most dangerous international hotspots that links climate change and security policies more than ever before. While the EU and Germany are currently the global forerunners and leaders of an ambitiously integrated climate and energy policy, it does not suppose the assumption that they are better and more adequately prepared for coping with the manifold security challenges of climate change on a global scale. The EU will only be as secure and prepared as the rest of the world is.

Notes

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50. German Advisory Council on Global Change (WBGU), *Climate Change as a Security Risk. Summary for Policy Makers*, Berlin, 29 May 2007, p. 1.
51. See *ibid*.
52. See Wilhelm Sager (2008) 'Sicherheitspolitische Herausforderungen in Zeiten des Klimawandels', *Der Mittler-Brief. Informationsdienst zur Sicherheitspolitik*, No. 3; Harald Welzer (2008) *Klimakriege. Wofür im 21. Jahrhundert getötet wird* (Frankfurt/M: S. Fischer Verlag); and Hermann E. Ott (July 2007) *Internationale Klimapolitik 2020. Herausforderung für die deutsche (Umwelt-)Außenpolitik*. Kompass 2020: Deutschland in den internationalen Beziehungen: Ziele, Instrumente, Perspektiven (Berlin: Friedrich-Ebert-Stiftung).
53. See, for instance, Bjorn Lomborg (2008) *Cool It. Warum wir trotz Klimawandels einen kühlen Kopf behalten sollten* (Munich: Deutsche Verlags-Anstalt).

54. See Annabelle Houdret (2009) 'Umwelt- und Klimawandel' in M. A. Ferdowsi (ed.) *Internationale Politik als Überlebensstrategie* (Munich: Bayerische Landeszentrale für politische Bildungsarbeit), pp. 89–108, here pp. 93–96 and 103f.; W. Sachs, H. Ott (February 2007) 'Öljunkies auf Entzug! Umweltpolitik st Ressourcenpolitik ist Sicherheitspolitik', *Internationale Politik*, pp. 6–15 and Ulrich Schlie, Benedikta von Seher-Thoß (2008) 'Bundesverteidigungsministerium: Klimawandel und Sicherheit' in J. Bram et al. (eds), *Weltverträgliche Energiesicherheitspolitik* (Munich: Oldenbourg-Wissenschaftsverlag GmbH), pp. 54–59.

14

The Nuclear Energy Debate and Emissions Reduction: The Italian Case

Massimo de Leonardis

Introduction

This chapter will first describe the Italian situation with respect to energy consumption. Italy, like most industrialized countries, consumes a lot of energy and, not differently from most countries, is experiencing difficulty complying with the targets agreed in the Kyoto Protocol. A vociferous Green Party (*I Verdi*) has been active in Italy for almost 25 years, but until recently Italy, compared to other Western countries, had not developed many effective initiatives to reduce emissions of greenhouse gas. Italy almost completely lacks oil, gas and coal. Moreover, some 20 years ago Italy decided to close the existing nuclear plants. Therefore, the cost of electricity is much higher than in other industrialized countries. Thanks to the fall of Prodi's leftist government in spring 2008 and to the disappearance from Parliament of the extreme left and Green parties, the new centre-right Berlusconi government was able to express its willingness to build new nuclear plants. One of the issues now debated is if 'going nuclear' is not just a cheaper way to produce energy, but also the only realistic option to reduce emissions of CO_2 without endangering economic development.

Italy's consumption of energy

It is of course easy to describe Italy as a country that consumes a lot of energy. According to Eurostat, Italy consumes as much electricity as Turkey, Poland, Romania and Austria together (136 million inhabitants, compared to about 58 million in Italy) or, according to the International Energy Agency (IEA), as much as half a billion Africans. In 2025 Italy will consume 5.3 per cent of all the energy produced on earth, with 0.7 per cent of the world population. Again according to the IEA, Italy consumes, in one year, the same amount of oil consumed by India in 551 days and by all of Latin America in 439.

However, if we put aside these picturesque comparisons, we see that Italian consumption of energy is among the lowest. Both energy intensity (energy consumption per GDP) and the intensity of CO_2 emissions[1] are below the EU average.

Italy has 0.91 per cent of the global population, a share of 2.79 of Global GDP and 1.62 Share of Global Primary Energy Supply. Italian CO_2 emissions are equal to 7.7 tons/person per year and are 1.67 per cent of global emissions. Italy is the ninth emitter of CO_2 in the world (after the United States, China, Russia, Japan, India, Germany, Canada and the United Kingdom, in that order). According to *The Climate Change Performance Index (CCPI)*[2], which evaluates and compares the climate protection performances of the 56 countries that, together, are responsible for more than 90 per cent of global energy-related CO_2 emissions, in 2008 Italy ranked 41st, with a score of 47 (at the same level of China) compared to the 1st, Sweden, with a score of 65.6, and the last, Saudi Arabia, with a score of 30. Actually, compared to 2007 Italy lost six positions.

In signing the Kyoto Protocol Italy pledged to reduce the emissions of greenhouse gas registered in 1990 by 6.5 per cent by 2012. To reach this target Italy has to invert a negative trend which from 1990 to 2002 saw its emissions increase by 9 per cent, compared to an average decrease of 2.9 per cent for the EU (15 Member States).[3] Actually in 2006 Italy emitted 567.9 million tons of greenhouse gas compared to 519.9 in 1990.

The outlook for Italian energy use and CO_2 emissions is driven by the outlook for economic growth. Compared to 2000, real GDP in Italy is expected to increase 11 per cent by 2010 and 39 per cent by 2025. The best-case projection assumes continued energy efficiency efforts and structural change in the Italian economy, which would lead to much smaller increases in energy consumption. However, energy use is still projected to increase 17.1 per cent by 2010 and 27.6 per cent by 2025 above 2000 levels. Due to continuing substitution away from oil and an increased reliance on natural gas and renewable sources of energy, coal dioxide emissions are projected to grow at a much slower rate than energy consumption. Italy's coal intensity (coal emissions per euro of real GDP) is projected to improve by 16 per cent by 2025, after strong growth in electricity consumption leads to a higher intensity this decade. Meeting the Kyoto Protocol target in 2008–12 through a combination of domestic action plus purchases of international credits would increase the price of home heating oil by more than 11 per cent. Consumers would also pay more for gasoline and diesel.[4]

The targets established under the Kyoto Protocol as well as even more stringent restrictions agreed within the EU will be difficult to achieve as economic output grows. The growing population, at least through to 2020, will also add to the difficulty of reducing emissions. In 1990 the Italian population was 56.7 million, in 2000 57.5, in 2010, 2020 and 2025 should be respectively 57.8, 57.6 and 57.3. In the same years, real GDP in billions of

euro stands at 995, 1169, 1294, 1507 and 1624, with an increase of 39 per cent from 2000 to 2025. From 2000 to 2025 the energy consumption in million toe[5] will increase from 174.4 to 225.5, and CO_2 emissions from energy use from 421 million tons to 493 million.

Within the EU, Italy has committed to draw at least 25 per cent of its electricity from renewable sources by 2020 and to reduce by 13 per cent greenhouse emissions in manufacturing, transport and building. Italy is one of the six EU countries that didn't comply with the targets fixed for the first phase (2005–07). Actually most of the 'virtuous' European countries have cheated in making allocations, allocating more permits than allowed, so that the actual emissions were lower than those assigned by the governments.[6]

On 3 October 2008, the Italian government, through the Minister for European Affairs Andrea Ronchi, asked to revise the provisions of the European Strategic Energy Technology Plan endorsed by the European Council in March 2007, stating that it could present 'a threat to the competitiveness of the Italian industrial system'. The plan is known as 20–20–20, since it envisages by 2020 the reduction of 20 per cent of greenhouse gas emissions, of 20 per cent of energy consumption and an increase of 20 per cent of energy production from renewable sources. The minister asked for the risks of industrial delocalization, of rising electricity prices and of inflation to be considered careful ly. In particular the regulations for the reduction of CO_2 emissions 'seriously penalize small and medium cars' like those prevailing in Italy. More in general, according to the Italian government the impact of the plan on the European industrial system had to be softened in order to safeguard its competitiveness. In a period of a general slowing down of Western economies, of rising prices of raw energy materials and foodstuffs, of financial crisis and restrictions of credit, the costs of the plan could weaken European industries' competitiveness with respect to other countries and impose additional burdens on consumers. In order to avoid these dangers, Italy proposed:

1. The broadest possible interpretation of the concept of carbon leakage, expanding the number of firms receiving free allocation of permits, through the issue of a free quota based on parameters to be identified in the EU directive.
2. The progressive introduction of the mechanism of auctions for the thermoelectric sector also.
3. The allocation of emission allowances based on parameters (benchmarks) of efficiency, not of historical records emissions, to reward those who have already invested in clean technologies.
4. The affirmation of the non-binding character of intermediate milestones, to leave the member states free to reach them in the most appropriate way according to their production structure and their national peculiarities.
5. Setting minimum thresholds, in order to exclude disqualifying the smaller companies that do not produce significant emissions.

To sum up Italy wished to avoid submitting European industries to burdens which the firms of other competing countries are not asked to bear and asked for the full use of flexibility mechanisms, namely the importation from third countries of energy derived from renewable sources and purchase credits from other countries more virtuous in reducing emissions. The government estimated the cost for Italy of implementing the '20–20-20' plan at €18.2–25 billion per year, while according to the EU Commissioner for the Environment the cost is between €9.5 billion and 12.3 billion. In any case even according to the EU Italy spends 0.6 per cent of its GDP, more than Germany (0.5), France (0.4), the United Kingdom (0.4), the Netherlands (0.3), Poland (0.3), as much as Spain and less than Sweden and Belgium (both 0.7).

The Italian government's position was strongly supported by the industrialists' association (*Confindustria*) and most economists; in the EU Italy found some more or less explicit support from Germany, southern and eastern countries, while France and northern countries refused any change in the agreed policy. The compromise was reached in December confirming the goal of reducing emissions of greenhouse gases by 20 per cent by 2020, but by changing how they get there. On the definition of industries at risk of relocation (carbon leakage) that could benefit from being emission free at 100 per cent, the new draft welcomes the demand made by Germany to protect its manufacturing and production of cement, steel and aluminium. The claims for the protection of Italian ceramics, glass and paper will be subjected to a rather complicated calculation based on the percentage of extra costs for different sectors and subsectors of the purchase of certified emissions. The Italian Foreign Minister, Franco Frattini, claimed also the inclusion of 'a general review clause in March 2010 for the whole climate-energy package EU extended the assessment on the impact of competitiveness' as a great Italian success.

Until recently, Italy was not very active in developing alternative sources of energy like photovoltaic and wind panels, but is now accelerating the pace. At the end of 2005 the installed eolic power was of 1717 MW. However in 2008 it increased 37 per cent with respect to 2007, reaching 3743 MW. The photovoltaic power station of Serre (Salerno), inaugurated in 1993, was for many years the biggest in the world, but in 2007 photovoltaic produced in Italy only 39 GW, only little more than 0.01 per cent of the total consumption. In 2001 a plan had been prepared to build 10,000 photovoltaic panels; this plan has proceeded very slowly, however in the last 18 months photovoltaic panels have tripled and at the end of 2008 ENEL completed in Montalto di Castro a big plant to produce 7 million KW/h. In some cases, superintendents for the preservation of the environment and culture heritage blocked the installation of photovoltaic and wind panels, while Green parties and groups are divided, some being in favour and others against fearing damage to the landscape or

interference with the routes of migrating birds; in some cases, projects have been blocked or delayed to investigate possible interference with bats, reptiles and amphibians. Consequently, out of 100 projects only 20 are carried out, the opposite of Germany and Spain. An emerging solution is to place photovoltaic panels in deteriorated areas and on waste disposals. A leading columnist suggested that the well-known aesthetic taste of the Italians should be applied to find solutions to the problem of placing photovoltaic panels and wind panels safeguarding the landscape and the architecture.[7]

Italy's refusal of nuclear policy

Buying 12.8 per cent of its electricity directly from nearby countries, Italy is the second largest importer of electricity in the world; the first if one considers the balance with abroad. Almost completely lacking oil[8], gas and coal, for the 87.8 per cent of its electricity produced on national territory Italy is also largely dependent on imports: about 75 per cent of it is produced thanks to imports of fossil fuel, gas from Russia, Algeria, Libya[9], and, to a lesser extent, the Netherlands and Norway, oil from Russia, Libya and Middle Eastern countries. In 2005, Italy was the country most dependent on oil for the production of electricity in Europe and the sixth in the world. Now, in the world Italy is the fourth largest importer of natural gas (gas imports increased 118 per cent in the period 1990–2004). As a consequence electricity costs in Italy are 60 per cent more than the European average; double France and Sweden.

73.8 per cent of the gross national requirement of electricity is provided by thermoelectric plants, which use mainly fossil fuels imported from abroad. According to statistics provided by *Terna*, the company distributing electricity, in 2007 65.2 per cent of thermoelectric plants were stoked by natural gas, 16.6 per cent by coal, 8.6 per cent by oil derivates; only a small percentage, less than 2 per cent, used biofuel.

Most of the electricity produced in Italy from renewable sources comes from 'classic' ones: hydroelectric plants (located mainly in the Alps and in some areas of the Apennines and exploited to the full), which produce 10.7 per cent of the national energy requirement, and geothermal plants (almost only in Tuscany), which provide 1.5 per cent of electricity. 'New' renewable sources provide very little: eolic parks (mainly in Sardinia and the southern Apennines) still provide only 1.1 per cent of electricity[10] and photovoltaic only 0.01 per cent. (See in table 14.1 a comparison between the electricity generation mix of the EU-27 and Italy, and in tables 14.2 and 14.3 the share in electricity production of nuclear and renewables in EU-27 and the production capacity of renewables in Italy)

Italy is today the only country of the G8 group which has no nuclear plants, in spite of having been in the past one of the leading countries, among the

medium powers, in the nuclear field. In the 1950s Italy had played a leading role in the development of nuclear energy, being one of the six founding members of the European Atomic Energy Community, or EURATOM, established on 25 March 1957, which also included France, the Federal Republic of Germany and the three Benelux countries. On 1 January 1956, at the Naval Academy of Leghorn, and in collaboration with the nearby University of Pisa, the Military Centre for the Exploitation of Nuclear Energy (Centro per le Applicazioni Militari dell'Energia Nucleare [CAMEN]) started its activity, financed by the three Armed Forces, which was disbanded in 1975.

In the years 1957–58, the Italian Minister of Defence had secret conversations with his French and German counterparts on the development of nuclear cooperation in the military field. General de Gaulle's coming to power in France stopped these projects, since Paris preferred to go it alone.[11] Later the Italian government was the most convinced supporter of the *Multilateral [Nuclear] Force* (MLF) within the Atlantic Alliance, never carried out. However the Italian Navy tried to build a nuclear submarine and a nuclear naval tanker, but the project was dropped. In 1968, Italy signed the Treaty of Non-Proliferation, but objections were raised on its compliance with the Italian constitution, which 'allows, *under conditions of parity with other States*, the necessary limitations of sovereignty to a system that ensure the peace and the justice between the Nations'. Also, owing to the Soviet invasion of Czechoslovakia, Italy delayed the treaty's ratification until 1975 in the context of the Conference on Security and Cooperation in Europe (CSCE).

Italy had continued to develop nuclear energy for civilian use, of which in 1966 it was the third largest producer in the world after the United States and the United Kingdom and before France, Germany and the Soviet Union. In 1975, the first National Energy Plan provided for a strong development of nuclear energy, envisaging the building of 20 plants for a power of 20,000 MWE within 10 years, followed by others for a maximum power of 62,000, covering 70 per cent of Italian electricity needs, a percentage superior than in France.[12]

For various reasons, including political instability (14 governments between 1973 and 1987) and conflicts among regions, municipalities and trade unions, this ambitious plan was not carried out. The National Energy Plan of 1985 envisaged only seven nuclear plants. In addition to the two old nuclear plants of Garigliano (closed in 1982 due to obsolescence) and Trino Vercellese, those of Caorso, Montalto di Castro and a second one in Trino Vercellese were planned. The plan of 1985 was the last one. The current government has announced a new plan for spring 2009.

In November 1987 a popular referendum voted overwhelmingly[13] in favour of abolishing laws and regulations facilitating the establishment of new nuclear plants. The vote was largely influenced by the scare generated by the Chernobyl accident of spring 1986. The Italian government, going

beyond the actual provisions resulting from the popular vote, decided to close down the three existing nuclear plants.[14] It was a hypocritical decision, since it forbade the production of nuclear energy, not its use. Actually the referendum sanctioned mounting opposition to nuclear energy by the major parties; in particular the Socialist party (PSI) had made the 'exit from nuclear' a condition for re-entering the government. The Greens, which were starting to organize as a political party, stated, rather ridiculously, that consumption of energy would rise very little or not at all in the OECD countries and would actually decrease in Italy. They maintained that the cost of electricity would decrease substituting nuclear energy with renewable sources. So, in their opinion nuclear energy was both useless and dangerous. These forecasts were rapidly discredited since already in 1989 for the first time internal electricity requirements exceeded the available electrical power.[15]

It should be noted that the Italian Greens were not alone in making incorrect predictions, since in 1983 the environmentalist Amory Lovins forecasted a global consumption of energy in the year 2000 which was 40 per cent lower than the real one.[16]

The 'Italian National Agency for New Technologies, Energy and the Environment (ENEA)'[17] was only allowed to conduct research on Nuclear Fusion and Fission, and related technologies. Italian companies are allowed to make agreements with other countries to collaborate in the development of third-generation nuclear plants. Agreements of this kind now operate in particular with France, Slovakia and Romania.

The current debate in Italy: Is going nuclear the main solution for energy problems and CO_2 emissions' reduction?

According to the IEA,[18] in 2004 world consumption of energy from primary sources was: 34.3 per cent from oil, 25.3 per cent from coal, 20.9 per cent from natural gas, 10.4 per cent from biomass, 6.5 per cent nuclear, 2.2 hydroelectric, 0.5 from other clean sources (0.41 per cent geothermic, 0.064 per cent eolic, 0.039 solar, 0.0004 tidal power). If we consider the sources of electric energy, 39.7 per cent comes from coal, 19.6 per cent from gas, 15.7 per cent from nuclear, 16.1 per cent hydroelectric, 6.7 per cent from oil, 1.3 per cent biomasses and waste, 0.5 per cent eolic, 0.3 per cent geothermic, almost nil from solar, tidal power and waves.

Among the EU countries nuclear energy plays an important role, covering 35 per cent of the production of electricity. The countries of the EU have more than 1/3 of the active nuclear plants in the world, 146 out of 443.[19] The rising price of oil, the diminution of its reserves and the risks of political instability in producing countries[20] all play in favour of nuclear energy. Recently, on 15 April 2008, the EU Commissioner for energy, Andris Piebalgs, expressed a position in favour of nuclear energy for the first time: 'Nuclear

energy represents an important element of our struggle against climate change and of our security of supply of energy'.

We may say that 13 EU countries have an attitude in favour of nuclear energy: France, Finland, Bulgaria, Lithuania, Poland, Slovakia, Romania, Hungary, Czech Republic, Slovenia, Latvia, Estonia and Denmark. Six other countries are evolving a favourable position: the United Kingdom, Italy, Belgium, Ireland, Greece and the Netherlands. Only eight countries maintain an unfavourable position, even if most of them still have active nuclear plants: Germany, Sweden, Spain, Portugal, Luxembourg, Austria, Malta and Cyprus.

According to the report 'Europeans and nuclear security' published in February 2007 by Eurobaromètre,[21] 69 per cent of Europeans think that nuclear energy permits them to be less dependent on the imports of oil and gas. Fifty per cent believe that nuclear energy will make the price of energy more stable and 46 per cent consider that nuclear energy helps to limit global warming. Forty-six per cent think that nuclear energy cannot be easily replaced by renewable sources or by saving energy; 41 per cent have the opposite opinion. But 53 per cent of Europeans consider that nuclear energy has more risks than advantages (only Swedish, Bulgarians, Finnish and Czechs have the opposite opinion), 39 per cent are in favour of reducing the current proportion of energy of nuclear origin (34 per cent would like to keep it at the same level, while only 14 per cent wish to increase). It can be easily commented that many Europeans seem to have confused ideas or, at least, would like to have the best of both worlds.[22]

Actually, nuclear energy is losing ground: while in 1990 it provided more than 17 per cent of world electricity, in 2005 the percentage was 15.2; at the end of 2007 no new nuclear plant is under construction in the United States and only two in the EU, at Oikiluoto in Finland and at Flamanville in France. Of the 27 nuclear plants under construction in 2005, 15 are located in the Far East and 9 in countries of the former USSR.[23]

The electricity blackout which affected Italy on 28 September 2003 sounded an alarm bell. The Minister of Production stated immediately that the structural reason for the blackout was the complete rejection of nuclear energy. The recent political elections (18 April 2008), which marked the disappearance from Parliament of the extreme left and the Greens, have reopened the debate on nuclear energy in Italy. The centre-right government is in favour of building new nuclear plants and the opposition has dropped its prejudicial objections. On 15 May 2008 Prime Minister Berlusconi described nuclear energy as an 'indispensable choice'; a week later the Minister of Economic Development, Mr Claudio Scajola, announced to *Confindustria's* assembly that within five years the government would lay the foundations to build a group of nuclear plants of new generation. The Chairwoman of *Confindustria*, Mrs. Emma Marcegaglia, endorsed his statement.

The shadow Minister of Economic Development, Mr Matteo Colaninno, said 'Nuclear? Maybe. I am not against', but expressed doubts if Italy still has the scientific and technological know-how, warned that 20 years were needed to have a working nuclear capability and suggested exploiting photovoltaic energy in the meantime. The shadow Minister of the Environment (Mr Ermete Realacci, a leader of the environmental movement) was more critical, stating that today safe nuclear energy doesn't exist, suggesting engaging in research for fourth-generation nuclear energy[24] (which would be ready, in his opinion, only in 2030 or 2040) and developing renewable sources of energy: eolic, photovoltaic and hydroelectric (which, however, as we have seen is already fully exploited).[25] Another historical leader of the environmentalists, Mr Chicco Testa, has changed his previous opinions and now favours 'going nuclear', from the point of view both of energy efficiency and the reduction of CO_2 emissions, considering that in the most optimistic scenario renewable sources would cover only 35 per cent of electricity requirements.[26] Atomic energy has almost no emissions and therefore can make a great contribution to clean air from CO_2, and would avoid the rising cost of acquiring the right to pollute using fossil combustibles.

Even politicians most convinced of the necessity of going back to nuclear, stress, however, the necessity of having the largest bipartisan consensus. In fact, according to a Harris Poll for *The Financial Times* Italians are the most in favour of atomic energy (58 per cent) among Europeans. According to another poll, 62 per cent of Italians are in favour of producing nuclear energy, 47 per cent which agrees on building nuclear plants on national territory and 19 which would prefer locate the plants abroad, 35 per cent are against, adding together 9 per cent which would like to continue the present situation (i.e., buying but not producing nuclear energy) and 26 per cent which is opposed both to buying and producing; 3 per cent has no opinion. According to another poll, 46.8 per cent of Italians are in favour of building nuclear plants in Italy and 44.1 against, but only 41 are in favour of building them in their province, while 50.2 are opposed.[27]

Actually, during the electoral campaign, the current Minister of the Economy, Mr Giulio Tremonti, suggested accepting the offer of Albania, which has close historical and political ties with Rome, to build nuclear plants on its territory to provide energy for Italy; a prominent figure of the current opposition agreed. Building a plant abroad would be a confession of impotence in the face of the nimby (not in my backyard) syndrome, which the lack of energy of the authorities, the conflicting duties of local and national government and an intrusive judiciary make it difficult to confront. Another obstacle could be the traditional farraginous procedures of Italian bureaucracy: an expert has pointed out that in Italy 24 authorizations, which take at least 3–6 years, are needed to open a site, asking for them to be concentrated in 2–3 passages like in the United States and France to halve the time.

In the front line in favour of going back to nuclear energy is of course ENEA, which clearly expressed this position in its Report on Energy and the Environment 2007 (*Rapporto Energia e Ambiente 2007*), an 80-page document issued this summer. According to ENEA, within 30 years Italy should have this mix: 30 per cent nuclear, 30 per cent renewable, 30 per cent fossil, 10 per cent other. The three major companies, Enel, Edison and A2A (a multi-utility born from the fusion of Aem Milan and Asm Brescia) talk of building 3–4 plants to produce 10,000–11,000 megawatts, a ¼ of national requirements. One 'nuclear' megawatt would cost half of the current price.

One important step was taken on 24 February 2009 at the meeting between French President Sarkozy and Italian Prime Minister Berlusconi. Italian ENEL and French Electricité de France (EDF) signed an agreement to study the feasibility of building at least four nuclear plants on Italian territory, equipped with European Pressurized Reactor (EPRs), which produce lower levels of nuclear waste and are considered safer than conventional reactors. According to ENEL the first nuclear plant should start commercial service by 2020.[28]

In the meantime, many initiatives are taken in the field of emissions' reduction.[29] Enel, Italy's largest power company and Europe's second biggest listed utility by installed capacity, has developed a large investment programme for over €4 billion. An important part of this will be destined to develop renewable sources. This plan will avoid the emission of over four million tonnes of CO_2 a year. In the context of its global strategy on combating climate change, on 5 May 2008, Enel signed two cooperation agreements in Beijing for the abatement of greenhouse gas emissions, following other agreements already reached with leading Chinese, Indian and South American enterprises. ENEL owns 68 per cent of Elektrarne which has four reactors already operational in Slovakia plus two to be completed. A2A has commissioned the Milan Polytechnic to do a study on the feasibility of 4–6 plants with a capacity of 10–15,000 megawatts. *Finmeccanica*, with *Ansaldo Nucleare*, completed the nuclear plant in Cernavoda in Romania, won the bid for a nuclear plant in China, and participates in the development of the B100 reactor with Westinghouse. The Foundation EnergyLab brings together the Lombardy region, the Foundations Aem and Edison and five Milan universities (including my own, the Catholic University of the Sacred Heart) for nuclear energy which is sure and harmonious with the territory. Finally, ENI and ENEL have prepared a project on geological storage of CO_2 under land or sea which will compete to be one of the 12 commercial demonstration projects financed by the EU.

Conclusion

In some respects the outlook of Italy on the problem of greenhouse emissions' reduction is not very different from that of other industrialized Western countries. The main differences, deriving from a political system which

doesn't favour rapid decisions and until recently subject to the influence of forces having a biased view of free-market mechanisms, are that Italy is completely lacking the production of nuclear energy and, at the same time, is late in developing renewable sources of energy. The possibility of Italy solving these problems ultimately depends on the firm will of a stable government to overcome these two deficiencies. Recent years show a remarkable improvement in the development of renewable sources of energy, while ideological contrasts seem to be softening and prominent environmentalists have dropped their prejudicial opposition to nuclear energy. Possibly the impact of the economic crisis will favour more efficient solutions. But at local level, the nimby factor could still create many obstacles and political confrontation might reappear. Centre-left 'governors' of some regions have expressed their opposition to having nuclear plants in their territory, while centre-right 'governors' of Lombardy and Veneto are ready to accept them. These two regions are the most advanced from the economic point of view and need a lot of energy at a lower price.

The fact that even a rapid decision to 'go nuclear' could not bring nuclear energy in the short term should not be used as an excuse for doing nothing in this field. Particularly because 'renewable sources' having a significant impact is to be expected only in the very long term. In any case, it is very difficult to find a solution to the triple challenge of competitiveness,[30] security and sustainability.

Appendix[31]

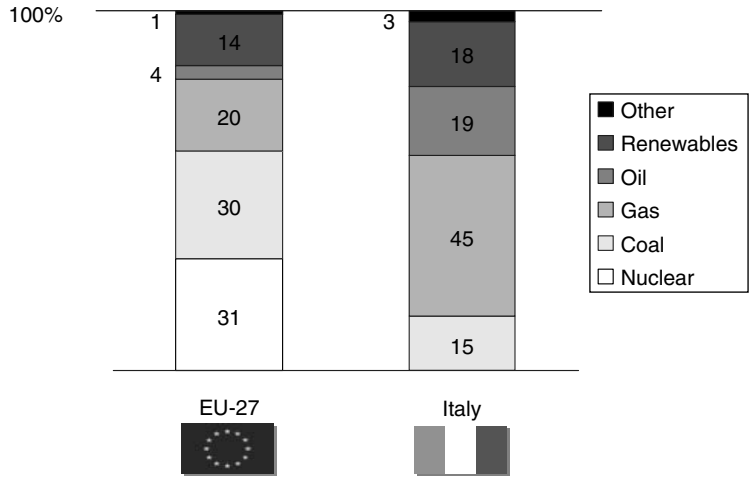

Table 14.1 Electricity generation mix: EU-27 and Italy

Source: *European Commission, EU policy data*, 2007.

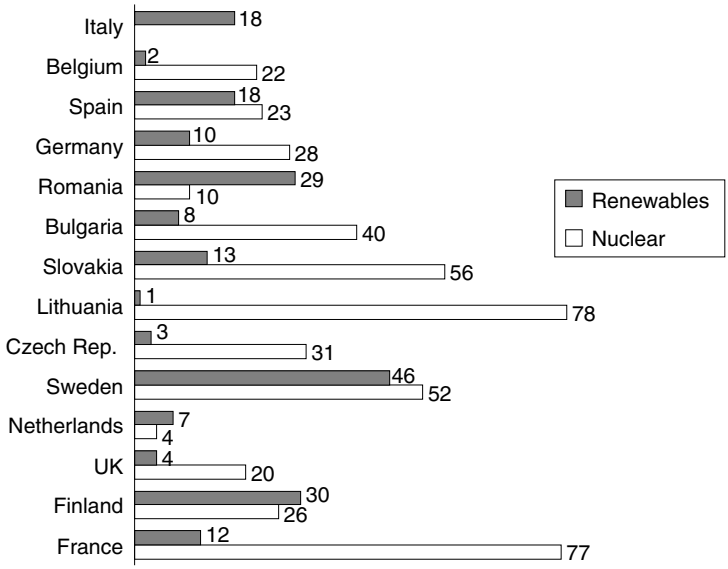

Table 14.2 Renewables and nuclear share in electricity production in Europe

Source: M. Beccarello (2007), 'Italy's Energy System: Strength and Vulnerabilities, PPP at Energy Security: A Challenge for the XXI Century?', Roman Forum, NATO Defense College, Rome 9th April 2007.

Table 14.3 Renewables in Italy

Sources	Power MW	Production capacity GWh
Hydric	500	–
Geotermic	50	350
Eolic	7.000	14.000
Photovoltaic	1.200	1.500
Biomass, hybrid plants	700	4.200
Biomass, dedicated plants	1.400	9.800
Biogas	50	350
Total	**10.700**	**30.200**

Source: M. Beccarello, 'Italy's Energy System: Strength and Vulnerabilities, PPP at Energy Security: A Challenge for the XXI Century?', Roman Forum, NATO Defense College.

Notes

1. Energy intensity is measured by the quantity of energy required per unit output or activity, so that using less energy to produce a product reduces the intensity. In 2003 the EU average was 204.9, for Italy 122.8. In 2002 the average CO_2 Intensity (CO_2 emissions per GDP) was 533.3, for Italy 365.8; World Resources Institute, *EarthTrends-Environmental Information*, http://earthtrends.wri.org/searchable_db/results.php?years=2002 (accessed 10 October 2008).
2. Germanwatch (December 2007) *The Climate Change Performance Index. A Comparison of Emissions Trends and Climate Protection Policies of the Top 56 CO2 Emitting Nations*, http://maps.grida.no/go/graphic/climate-change-performance-index-20081 (accessed 27 February 2009).
3. See P. Degli Espinosa (ed.) (2006) *Italia 2020 energia e ambiente dopo Kyoto* (Milano: Ambiente), pp. 28–29.
4. See International Council for Capital Formation (ICCF) (2005) *International Council for Capital Information, Kyoto Protocol and Beyond: The Economic Cost to Italy* (Brussels: ICCF), http://www.iccfglobal.org/pdf/Italyfinal101705.pdf (accessed 10 October 2008).
5. Ton of oil equivalent.
6. A. Clô (2008) *Il rebus energetico* (Bologna: Il Mulino), p. 49.
7. F. Alberoni, 'Buon gusto da applicare alle energie rinnovabili', *Corriere della Sera*, 19 January 2009.
8. Italy has documented reserves of crude oil amounting to 0.7 billion barrels, 80 per cent of them in Basilicata, the daily requirement of oil being 1,945,000 barrels per day.
9. The strengthening of the submarine gas pipeline *Greenstream* should in the future greatly increase gas imports from Libya.
10. According to other sources 0.80 per cent, compared to 2.80 per cent for Greece and Lowlands, 4.80 per cent for Germany, 7.50 per cent for Spain and 13.10 per cent for Denmark.
11. See L. Nuti (1990) 'Le rôle de l'Italie dans les négociations trilatérales, 1957–1958', *Revue d'histoire diplomatique*, no. 1–2, 133–56 (the issue has other articles on this subject); and L. Nuti (1992) 'Italy and the Nuclear Choices of the Atlantic Alliance, 1955–63' in B. Heuser-R. O' Neill (eds), *Securing Peace in Europe, 1945–62* (Basingstoke: Macmillan), pp. 222–45.
12. See A. Clô, (2008) *Il rebus energetico* (Bologna: Il Mulino), pp. 115–16.
13. Percentages of 'yes' on the three questions concerning the nuclear question were 71.90 per cent, 79.70 per cent and 80.60 per cent. Only 30 million over 45 cast their votes.
14. Also Sweden voted in favour in 1980 of progressively phasing out nuclear energy, but it took 25 years to shut Barsebäck plant, while others are still active. In the meantime, opinion polls show that Swedish citizens have changed their minds.
15. A. Clô (2008) *Il rebus energetico* (Bologna: Il Mulino), p. 122.
16. See L. Maugeri (2008) *Con tutta l'energia possibile* (Milano: Sperling & Kupfer), p. 273.
17. To meet demands of the growing environmentalist movement, in 1982 the CNEN (National Committee for Nuclear Energy) had changed its name to ENEA.
18. L. Maugeri (2008) *Con tutta l'energia possibile* (Milano: Sperling & Kupfer), pp. 2 and 5.

19. In 2005 these plants had an installed power of 368 GWE, with a net production of 2626 billions of KWh, covering about 15.1 per cent of the world production of nuclear energy in 31 countries over 193. Of the 31 countries, 17 belong to OCDE with 85 per cent of world production (Clo, 97).
20. The five big countries of the Persian Gulf (Saudi Arabia, Iraq, Kuwait, United Arab Emirates and Iran) produce today ¼ of the world requirements of oil.
21. Europa (2007) European Commission, http://ec.europa.eu/public_opinion/archives/ebs/ebs_271_fr.pdf (accessed 5 October 2008).
22. Main reasons in support of nuclear energy are: (1) It produces only very little greenhouse gas: 2.5 to 5.7 grams per kWh of electricity compared to 105 to 366 for thermoelectric and 2.5 to 76 for renewable sources; (2) It's relatively cheap (its total cost is estimated at €30 for MW/h), stable and predictable; so nuclear power can help to ensure the competitiveness of European economies and ensure a source of cheap energy to deal with constantly increasing needs; (3) Nuclear energy favours energy security and independence, eliminating two risks: the lack of supply (due to political turmoil in the countries exporting oil and gas) and the fluctuation of prices on international markets due to the depletion of fossil resources. Actually known reserves of uranium are 10 times those of oil. The main arguments opposed to nuclear energy: (1) Significant risk of accidents; (2) The waste issue has no satisfactory answers and waste management has a significant cost; (3) The risks of terrorism and nuclear proliferation for military use are very strong; (4) Nuclear energy hinders the development of renewable energy projects since it would mobilize substantial funding that could be used to develop renewable energy.
23. A. Clô (2008) *Il rebus energetico* (Bologna: Il Mulino), pp. 100–1; L. Maugeri (2008) *Con tutta l'energia possibile* (Milano: Sperling & Kupfer), pp. 256–58.
24. Which is being studied by *Del Fungo Giera Energia* in Milan. Founded in 2006, thanks to the high skill level of its engineers and designers it has been able to play an authoritative role in international projects for the development of fourth-generation nuclear technology (www.delfungogieraenergia.com).
25. See *Corriere della Sera*, 23 May 2008.
26. See C. Testa (2008) *Tornare al nucleare? L'Italia, l'energia, l'ambiente* (Torino: Einaudi).
27. See *Corriere della Sera*, 9 November 2008, 21.
28. EDF is a shareholder of Edison and A2A and has a partnership with Enel, which participates (12.5 per cent, sending *stagiaires* there) in the third-generation nuclear plant EPR being built in Flamanville (Normandy). At the Franco-Italian summit EDF agreed to give ENEL an option to own the same stake in five more EPR plants to be constructed.
29. For a general overview see 'Dossier Energia', supplement to *Corriere della Sera*, 15 November 2008.
30. According to A. Clô, (2008) *Il rebus energetico* (Bologna: Il Mulino), p. 111 'in a market system based on competitiveness nuclear is not competitive in respect to other sources, in particular the technology of methane gas'.
31. From M. Beccarello, 'Italy's Energy System: Strength and Vulnerabilities, PPP at Energy Security: A Challenge for the XXI Century?', Roman Forum, NATO Defense College, Academic Research Branch – Centro Alti Studi per la Difesa, Centro Militare di Studi Strategici, Rome 9 April 2007.

15
EU Policies for Renewable Energies

Javier de Quinto Romero and Julián López Milla

Introduction

The consequences of climate change, the high dependence on fossil fuels, and rising (or at least volatile) energy prices have compelled the European Commission to propose a comprehensive energy policy combining action at the European and Member States level. In the framework of this energy policy, the renewable energy sector stands out for its ability to reduce greenhouse gas emissions and pollution, exploit local and decentralized energy sources, and stimulate world-class high-tech industries. Renewable energy sources are largely indigenous, they do not rely on the future availability of conventional sources of energy, and their predominantly decentralized nature makes our economies less vulnerable to volatile energy supply. Consequently, they constitute a key element of a sustainable energy future. To reach the dual objective of increased security of supply and reduced greenhouse gas emissions, it is important to ensure that all Member States take the necessary measures to increase the share of renewables in their energy mix. The European Commission has proposed overall targets for the share of energy from renewable energy sources in final energy consumption by the year 2020.

Common framework for the promotion and the use of renewable energy in the European Union

The European economy faces a challenge in adapting to the demands of a low-emissions economy with secure energy supplies. A global commitment remains indispensable to tackling climate change, but the case for Europe to act now is compelling. The longer Europe waits, the higher the cost of adaptation. Moreover, reducing greenhouse gases and increasing renewable energy will make the EU much less dependent on imports of oil and gas. This reduces the exposure of the EU economy to rising and volatile energy prices, inflation, geopolitical risks and risks related to inadequate supply chains that are not keeping up with global demand growth.

The Community has long recognized the need to further promote renewable energy given that its exploitation contributes to climate change mitigation through the reduction of greenhouse gas emissions, sustainable development, security of supply and the development of a knowledge-based industry creating jobs, economic growth, competitiveness and regional and rural development.[1]

Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001, on the promotion of electricity from renewable energy sources in internal electricity generation, follows up the 1997 White Paper on renewable energy sources, which set a target of 12 per cent of gross inland energy consumption from renewables for the EU-15 by 2010, of which electricity would represent 22.1 per cent. It defines national indicative targets for each Member State, encourages the use of national support schemes, the elimination of administrative barriers and grid system integration, and lays down the obligation to issue renewable energy producers with guarantees of origin if they request them. With the 2004 enlargement, the EU's overall objective became 21 per cent. With current policies and efforts in place, it can be expected that a share of 19 per cent by 2010 (rather than the 21 per cent aimed at) will be reached.[2]

Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003, on the promotion of the use of biofuels or other renewable fuels for transport sets a target of 5.75 per cent for biofuels of all petrol and diesel for transport placed on the market by 31 December 2010. Member States were required to set indicative targets for 2005, taking a reference value of 2 per cent into account. This interim indicative target has not been achieved (biofuels counted for 1 per cent of transport fuel in 2005). The Commission's conclusion as regards assessing progress is that the target for 2010 is not likely to be achieved (expectations[3] are for a share of about 4.2 per cent).

Responding to the call made by the European Council of March 2006, the Commission presented its *Strategic European Energy Review* on the 10 January 2007.[4] As part of the Review, the *Renewable Energy Road Map*[5] set out a long-term vision for renewable energy sources in the EU. It proposed that the EU establish a binding target of 20 per cent for renewable energy's share of energy consumption in the EU by 2020, and a binding 10 per cent target for the share of renewable energy in transport petrol and diesel. The European Parliament noted in its Resolution on climate change (14 February 2007) that energy policy is a crucial element of the EU global strategy on climate change, in which renewable energy sources and energy efficient technologies play an important role. The Parliament supported the proposal of a binding target to increase the level of renewable energy in the EU energy mix to 20 per cent by 2020 as a good starting point, and considered that this target should be increased to 25 per cent of the EU energy mix.

The Brussels European Council of March 2007 reaffirmed the Community's long-term commitment to the EU-wide development of renewable energies beyond 2010 and invited the Commission to submit its proposal for a new comprehensive Directive on the use of renewable resources. This should include legally binding targets for the overall share of renewable energy and the share of biofuels for transport in each Member State.

Two key goals were set by the March 2007 European Council[6]:

- A reduction of at least 20 per cent in greenhouse gases (GHG) by 2020 (rising to 30 per cent if there is an international agreement committing other developed countries to comparable emission reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities').
- A 20 per cent share of renewable energies in EU energy consumption by 2020.

The European Council agreed that the best way to reach such goals was for every Member State to know what was expected, and for the goals to be legally binding. This meant that the levers of government could be fully mobilized; and the private sector would have the long-term confidence required to justify the investment needed to transform Europe into a low-carbon, higher energy efficiency economy.

The architecture developed by the Commission, responding to the invitation from the March 2007 European Council, was governed by the need to secure a political consensus to drive change and carry public opinion. The proposals rest on five key principles[7]:

I. The targets must be met: to assure Europeans of the reality of change, to convince investors to invest, and to show the EU's seriousness of intent to partners worldwide. The proposals must therefore be effective and strong enough to be credible, with mechanisms for monitoring and compliance in place.
II. The effort required from different Member States must be fair. In particular, some Member States are more able than others to finance the necessary investments. The proposals must be flexible enough to take account of Member States' different starting points and different circumstances.
III. The costs must be minimized: with a design tailor-made to limit the price tag of adaptation for the EU economy. The costs of change and the consequences for the Union's global competitiveness, employment and social cohesion need to be kept at the forefront in designing the right structure.
IV. The EU must drive on beyond 2020 to make even deeper cuts in greenhouse gases to meet the target of halving global emissions by 2050.

That means stimulating technological development and ensuring that the system can take advantage when new technology comes on stream, using the tools available to encourage innovation and create a competitive edge in clean energy and industrial technologies.

V. The EU must do everything possible to promote a comprehensive international agreement to cut greenhouse emissions. The proposals are conceived to show that the Union is ready to take further action as part of an international agreement, stepping up from the 20 per cent minimum target for greenhouse gas reductions to a more ambitious 30 per cent reduction.

And these are the tools that have to be used in order to deliver the targets:

A. Renewable energy. In choosing to fix a specific target for the EU as a whole, the special contribution that renewable energy can make to the twin goals of reducing emissions and improving energy security was recognized. In 2005, the share of renewable energy in the EU's final energy consumption was 8.5 per cent. An increase of 11.5 per cent is needed on average to meet the target of 20 per cent in 2020. The Commission's proposal[8] was based on a methodology according to which half of the additional effort is shared equally between Member States. The other half is modulated according to GDP per capita. In addition, the targets were modified to take into account a proportion of the efforts already made by those Member States that had achieved a certain increase in their share of renewable energy.

The options for developing renewable energy vary from one Member State to another. Some have potential in wind power, others in solar power or in biomass. But with lead times for bringing renewable energy on stream being so long and investors needing certainty, it is important for Member States to have a clear vision of where they intend to act. Therefore, the Commission proposed that Member States put forward a national action plan, setting out how they intend to meet their targets and allowing for progress to be monitored effectively. A specific effort is needed to achieve greenhouse gas emissions reductions and improved security of energy supply in the transport sector, which is why the European Council decided to fix a specific minimum target for sustainable biofuels of 10 per cent of overall petrol and diesel consumption.

B. Energy efficiency. The EU goal of saving 20 per cent of energy consumption by 2020 through energy efficiency is a crucial part of the strategy, and it is one of the key ways in which CO_2 emission savings can be realized. In its 2005 *Green Paper on Energy Efficiency*, the Commission showed that up to 20 per cent of EU energy use could be saved: equivalent to spending as much as €60 billion less on energy, as well as making a major contribution to energy security and creating up to a million new jobs in the sectors directly concerned.[9]

C. The Emissions Trading System (ETS). The Commission stated that it has been a pioneering instrument to find a market-based solution to incentivise cuts in greenhouse gas emissions, but a review of the ETS showed that it needs to be strengthened and updated if it is to meet its new objectives.[10] The structure of the ETS, with national allocation plans, had raised the risk of distortions in terms of competition and the internal market. The scope of the ETS, in terms of the sectors of the economy covered and the gases included, had also limited its ability to drive emission cuts.

A harmonized ETS covering the whole Union would be best suited to the internal market, with common rules to ensure a level playing field. National allocation plans would be replaced by auctioning or free allocation through common EU-wide rules. The allocations put on the market would be reduced year-on-year to allow for emissions covered by the ETS to be reduced by 21 per cent from 2005 levels by 2020. The power sector – representing a large part of emissions – would be subject to full auctioning from the start of the new regime in 2013. Most other industrial sectors, as well as aviation, would step up to full auctioning gradually, reaching full auctioning by 2020. Auctioning would be handled by Member States, and the revenues would accrue to Member States' treasuries. However, auctions would be open: any EU operator could buy allowances in any Member State. The auctioning process would generate significant revenues for Member States, which would help towards the process of adjustment to a low-carbon economy, supporting R&D and innovation in areas like renewable energy and carbon capture and storage, helping developing countries, and helping the less well-off to invest in energy efficiency. Member States should commit to using at least 20 per cent of their auctioning income for this purpose.

D. Other tools to reduce greenhouse gas. Since the revised ETS would only cover less than half of the GHG emissions, an EU framework would be needed for national commitments to cover the remaining emissions – covering areas like buildings, transport, agriculture, waste and industrial plants falling under the threshold for inclusion in the ETS. The target for these sectors would be a 10 per cent reduction in emissions from 2005 levels, with specific targets for each Member State. Some of this would be driven by EU measures – like tougher standards on CO_2 emissions from cars and fuel, and EU-wide rules to promote energy efficiency – but otherwise Member States would be free to determine where to concentrate their efforts, and what measures to bring into play to provide leverage for change.

The proposal for a Directive on the promotion of the use of energy from renewable sources[11]

The proposed Directive lays down the principles according to which Member States need to ensure that the share of renewable energy in EU final energy consumption reaches at least 20 per cent by 2020, and establishes overall

national targets for each Member State. The Commission stated that deferring a decision about whether a target is binding until second generation biofuels became commercially available was not appropriate, because it would not provide certainty for investors.

Three sectors are concerned in renewable energy: electricity, heating and cooling and transport. The overall approach is for Member States to retain discretion as to the mix of these sectors in reaching their national target. However, it is proposed that each Member State shall achieve at least a 10 per cent share of renewable energy (primarily biofuels) in the transport sector by 2020. This is done for the following reasons: (1) the transport sector is the sector presenting the most rapid increase in greenhouse gas emissions of all sectors of the economy; (2) biofuels tackle the oil dependence of the transport sector, which is one of the most serious problems of insecurity in energy supply that the EU faces; (3) biofuels are currently more expensive to produce than other forms of renewable energy, which might mean that they would hardly be developed without a specific requirement.

Member States' starting points, renewable energy potentials and energy mixes vary. It was therefore necessary to translate the overall 20 per cent target into individual targets for different national starting points and potentials, including the existing level of renewable energies and energy mix. It was done by sharing the required total increase in the use of energy from renewable sources between Member States based on an equal increase in each Member State's share weighted by their gross domestic product, modulated to reflect national starting points, and by accounting in terms of final energy consumption.

By contrast, the 10 per cent target for renewable energy in transport was set at the same level for each Member State in order to ensure consistency in transport fuel specifications and availability. Because transport fuels are easily traded, Member States with low endowments of the relevant resources will easily be able to obtain renewable transport fuels from elsewhere. While it would technically be possible for the Community to meet its biofuel target solely from domestic production, it is likely that the target will in fact be met through a combination of domestic production and imports. To this end, the Commission will monitor the supply of the Community market for biofuels, and will, as appropriate, propose relevant measures to achieve a balanced approach between domestic production and imports, taking into account the development of multilateral and bilateral trade negotiations as well as environmental, cost, energy security and other considerations.

To ensure that the overall targets are achieved, Member States should work towards an indicative trajectory, tracing a path towards the achievement of their targets, and should establish a national action plan including sectoral targets, while having in mind that there are different uses of biomass and therefore it is essential to mobilize new biomass resources.

In order to permit the reaping of the benefits of technological advance and economies of scale, the indicative trajectory takes into account the possibility of more rapid growth in the use of energy from renewable sources in later years. In this way, special attention can be given to sectors that disproportionately suffer from the absence of technological advance and economies of scale and therefore remain underdeveloped, but which in future could significantly contribute to reaching the targets for 2020.

The path takes 2005 as its starting point because that is the latest year for which reliable data on national renewable energy shares were available.

To create opportunities for reducing the cost of achieving the targets laid down in this Directive, it is recommended both to facilitate the consumption in Member States of energy produced from renewable sources in other Member States, and to enable Member States to count electricity, heating and cooling consumed in other Member States towards their own national targets. For this reason, flexibility measures are required, but they remain under Member States' control in order not to affect their ability to reach their national targets. These flexibility measures take the form of statistical transfers, joint projects between Member States and/or joint support schemes.

Imported electricity, produced from renewable energy sources outside the Community, may count towards Member States' targets. However, to avoid a net increase in greenhouse gas emissions through the diversion of existing renewable sources and their complete or partial replacement by conventional energy sources, only electricity generated by renewable energy installations that become operational after the entry into force of the Directive will be eligible to be counted. Such imports will be tracked and accounted for in a reliable way, in order to guarantee an adequate effect of renewable energy replacing conventional energy in the Community as well as in third countries.[12]

Specifically for biofuels and other bioliquids, the Directive sets up a system to guarantee the environmental sustainability of the policy, ensuring inter alia that the biofuels counting towards the targets achieve a minimum level of greenhouse gas savings.

Calculation of the share of energy from renewable sources

The share of energy from renewable energy sources shall be calculated as gross final energy consumption from renewable sources divided by gross final energy consumption from all energy sources, expressed as a percentage.

The gross final consumption of energy from renewable sources in each Member State shall be calculated as the sum of:

a. *Gross final consumption of electricity from renewable energy sources*. It shall be calculated as the quantity of electricity produced in a Member State

from renewable energy sources, excluding the production of electricity in pumped storage units from water that has previously been pumped uphill. In multi-fuel plants using renewable and conventional sources, only the part of electricity produced from renewable energy sources shall be taken into account. For the purposes of this calculation, the contribution of each energy source shall be calculated based on its energy content. The electricity generated by hydropower and wind power shall be accounted for in accordance with a normalization rule, calculated based on installed capacity and the average load factor over the previous years.

b. *Gross final consumption of energy from renewable sources for heating and cooling*. It shall be calculated as the quantity of district heating and cooling produced in a Member State from renewable sources, plus the consumption of other energy from renewable sources in industry, households, services, agriculture, forestry and fisheries for heating, cooling and process purposes. In multi-fuel plants using renewable and conventional sources, only the part of heating and cooling produced from renewable energy sources shall be taken into account (for the purposes of this calculation, the contribution of each energy source shall be calculated on the basis of its energy content). Aerothermal, geothermal and hydrothermal heat energy captured by heat pumps shall be taken into account, provided that the final energy output significantly exceeds the primary energy input. However, thermal energy generated by passive energy systems, under which lower energy consumption is achieved passively through building design or from heat generated by energy from non-renewable sources, shall not be taken into account.

c. *Final energy from renewable sources consumed in transport*. The energy content of the transport fuels shall be taken to be as set out in the Annex III of the Proposal for Directive. It may be adapted to technical and scientific progress.

Some Member States have a large share of aviation in their gross final energy consumption. In view of the current technological and regulatory constraints that prevent the commercial use of biofuels in aviation, a partial exemption for such Member States is provided: the amount by which they exceed one and a half times the EU average for the gross final energy consumption, at EU level in aviation in 2005 as assessed by Eurostat (i.e., 6.18 per cent), is excluded from the calculation of their gross final energy consumption in national air transport. Moreover, some Member States of an insular and peripheral character, that is, Cyprus and Malta, rely on aviation as a mode of transport which is essential for their citizens and economy and as a result have gross final energy consumption in national air transport which is disproportionate (more than three times the EU average in 2005). They are thus disproportionately affected by the current technological and regulatory constraints. For these Member States it is appropriate to provide for this exemption to cover the amount by which they exceed

the EU average for gross final energy consumption at EU level in aviation in 2005, as assessed by Eurostat (i.e., 4.12 per cent).

National overall targets and indicative trajectory

Each Member State shall ensure that the share of energy from renewable sources in gross final energy consumption in 2020 is at least their overall target for the share of energy from renewable sources in that year (Table 15.1).

Each Member State has to adopt a national action plan that sets out its targets for the shares of energy from renewable sources in transport, electricity and heating and cooling in 2020, and adequate measures to be taken to achieve these targets, including national policies to develop existing biomass resources and mobilize new biomass resources for different uses. Moreover, each Member State shall publish, and notify the Commission of, six months before its national action plan is due, a forecast document indicating its estimated excess production of renewable energy compared to the indicative trajectory which could be transferred to other Member States, as well as its estimated demand for renewable energy to be satisfied by means other than domestic production up to 2020.[13]

Table 15.1 National targets for share of energy from renewable sources in gross final consumption of energy

	2020 proposed shares (%)		2020 proposed shares (%)
EU-27	20	**PL**	15
MT	10	**ES**	20
LU	11	**BG**	16
UK	15	**FR**	23
BE	13	**LT**	23
NL	14	**SI**	25
CY	13	**DK**	30
IE	16	**RO**	24
HU	13	**EE**	25
IT	17	**PT**	31
DE	18	**AT**	34
CZ	13	**FI**	38
SK	14	**LV**	40
EL	18	**SE**	49

Sources: European Commission (2008a) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, and European Parliament (2008) European Parliament legislative resolution of 17 December 2008 on the proposal for a directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources.

The indicative trajectory shall respect the following shares of energy from renewable sources:

S2005 + 0.20 (S2020 – S2005)	→	as an average for the two-year period 2011–2012
S2005 + 0.30 (S2020 – S2005)	→	as an average for the two-year period 2013–2014
S2005 + 0.45 (S2020 – S2005)	→	as an average for the two-year period 2015–2016
S2005 + 0.65 (S2020 – S2005)	→	as an average for the two-year period 2017–2018

Where:
S2005 = the share for that Member State in 2005
S2020 = the share for that Member State in 2020

A Member State whose share of energy from renewable sources fell below the indicative trajectory in the immediately preceding two-year period shall submit a new national action plan to the European Commission by 30 June of the following year at the latest, setting out adequate measures to ensure that in future the share of energy from renewable sources equals or exceeds the indicative trajectory.

Renewable energy sources in the European Union: Evolution and perspectives

The share of renewable energy sources in primary energy consumption in the EU-27 has increased slowly, from 5.0 per cent in 1994 to 6.7 per cent in 2005 (Figure 15.1). The strongest increase came from wind and solar energy. In absolute terms, about 80 per cent of the increase came from biomass. Despite good progress, significant growth will be needed to meet, by 2010, the indicative target for the EU of a 12 per cent share of renewables (of primary energy consumption).

The share of renewable energy sources in final energy consumption has been increasing steadily since 1990 and reached 8.6 per cent in 2005 (Figure 15.2). Developments concerning renewable heat were driven largely by the increased use of biomass in combined heat and power (CHP) and, to a lesser extent, solar thermal and heat pump technology. The share of biofuels in road transport fuels only started to rise significantly from 2000 onwards, in response to new EU targets.

Growth in most forms of renewable energy accelerated strongly after the year 2000. Progress in solar PV (photovoltaics) was driven largely by developments in Germany and, most recently, in Spain, and for geothermal by the developments in Sweden and Germany (due to large installations of heat pumps). Hydro consumption has declined in recent years (due to lower than average rainfall, rather than changes in installed capacity). The strongest growth in wind energy took place in Germany, Spain and Denmark.

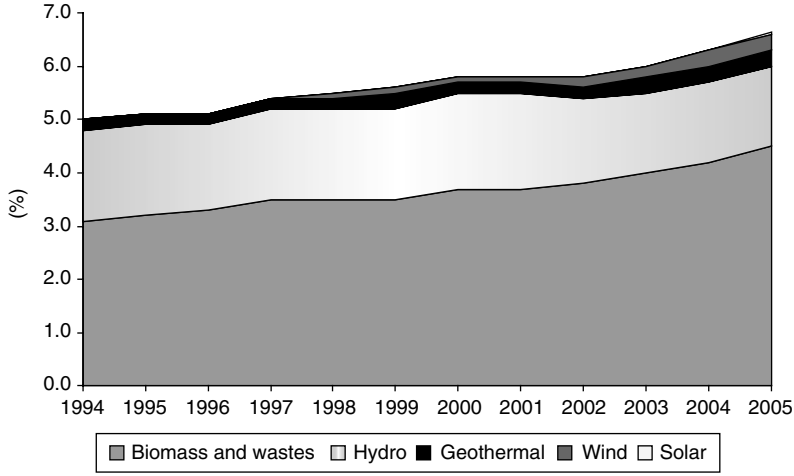

Figure 15.1 Contribution of renewable energy sources to primary energy consumption in the EU-27*

Note: * Shares in primary energy consumption (per cent).

Source: Eurostat.

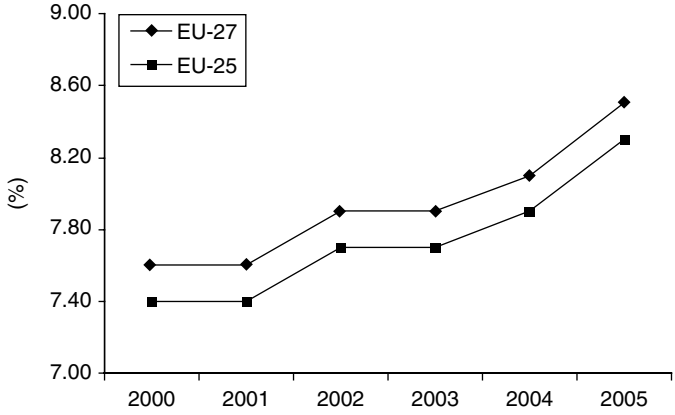

Figure 15.2 Share of renewables to final energy consumption, EU-25 and EU-27 (2000–2005)*

Note: * It is the sum of the final consumption of renewables for heat production (including the final consumption of district heat from renewables), the gross electricity generation from renewables and liquid biofuels for transport, divided by the final energy consumption (industry, transport, other sectors) of all energy sources, including consumption of the energy branch and distribution losses for electricity and heat production. The normalized hydro production is calculated on the basis of the hydro installed capacity (excluding capacity for pumping) and the average load factor over the last 15 years (1991–2005).

Source: Eurostat.

The percentage of renewables in final energy consumption varied between countries: from almost 40 per cent in the case of Sweden to almost zero at the bottom end of the scale (Figure 15.3). However, this overview masks the notable progress made across the Member States from 1991 onwards. For instance, over this period, Latvia, Lithuania, Romania and Estonia increased their absolute share by over 10 per cent. Ten Member States doubled their share in final energy consumption, with Bulgaria, the Czech Republic, Slovakia, Cyprus and Lithuania increasing their share by over a factor of four, albeit starting from a relatively low base. However, from 1991 to 2005, the shares in a small number of Member States actually declined (due, primarily, to a combination of rapidly rising final energy consumption and fluctuations in the production of hydropower due to lower rainfall).

The total installed wind power capacity in the EU-27 in 2006 was about 48,000 MW. Germany has the largest total installed capacity, although the annual growth rate of new installed capacity has declined in recent years. Spain has the second largest installed wind capacity, but has changed the legislative framework recently, and it might lead to lower increases in future installed wind power capacity. While Germany, Spain and Denmark remain

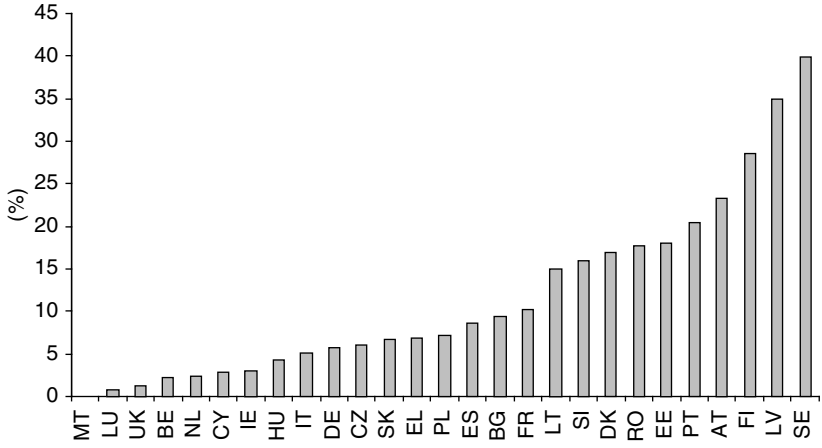

Figure 15.3 Share of renewables to final energy consumption, by country (2005)*

Note: * It is the sum of the final consumption of renewables for heat production (including the final consumption of district heat from renewables), the gross electricity generation from renewables and liquid biofuels for transport, divided by the final energy consumption (industry, transport, other sectors) of all energy sources, including consumption of the energy branch and distribution losses for electricity and heat production. The normalized hydro production is calculated on the basis of the hydro installed capacity (excluding capacity for pumping) and the average load factor over the last 15 years (1991–2005).

Source: Eurostat.

the front-runners – with installed capacities of 20,622 MW, 11,615 MW and 3135 MW respectively, they are no longer the only countries installing large wind power capacity. Other countries, such as France, the United Kingdom, Ireland, the Netherlands and Portugal, are catching up (Figure 15.4).

The market for solar PV remains heterogeneous and strongly dependent on developments in Germany. Germany is still a world leader in manufacturing solar cells (far ahead of Japan and the United States). The German success is largely due to a stable and favourable policy framework. Spain has good natural circumstances for solar PV and good market conditions for solar development.

In 2006, geothermal electricity reached a volume of about 855 MW. Italy remains the largest producer, with a total installed capacity of about 810 MW. Some 16 European countries have either some geothermal electricity or heat capacity installed.

In recent years, solar thermal also picked up, with Germany continuing to have the largest market (with more than 1.5 million m^2 installed in 2006). This development was taking place even at a time when subsidies for solar heating more than halved (from EUR 104/m^2 before 21 March 2006 to EUR 40/m^2 at the beginning of January 2007). Although far behind Germany, France also experiences strong growth in solar thermal.

Achieving the proposed new target for renewable energy will require a substantial effort, to fill the gap between the current levels (8.5 per cent

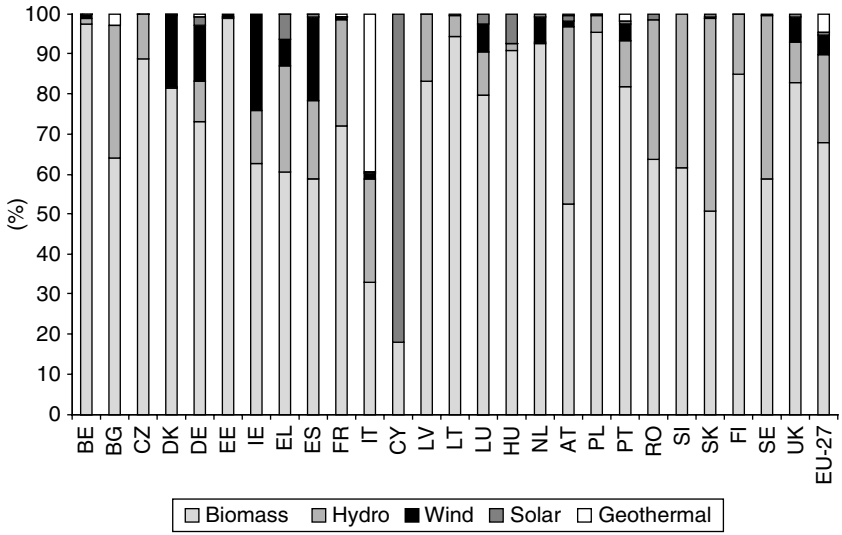

Figure 15.4 Gross inland consumption of renewables by source (2005)
Source: Eurostat.

in final energy consumption in 2005) and the objective of 20 per cent of renewable energy in final energy consumption in 2020. To meet the proposed targets, 15 Member States will have to increase their national share of renewables in final energy consumption by more than 10 percentage points compared to 2005 levels (Figure 15.5).

Large hydropower (>10 MW) continues to dominate renewable electricity production in most Member States, accounting, in 2005, for approximately two thirds across the EU-27 (Figure15. 6). This compares to 17 per cent from biomass and waste, 15 per cent from wind, and the rest from geothermal (1.2 per cent), and solar (0.3 per cent).

From 1990 to 2005, electricity production from renewables increased in absolute terms (an average of 2.7 per cent annually), but a significant growth in electricity consumption partially offset the positive achievement, limiting the renewables share in gross electricity consumption to only 14.0 per cent in 2005.

There are significant differences in the share of renewables between the EU-27 Member States. Amongst the EU-27 in 2005, Austria, Sweden and Latvia had the greatest shares of renewable electricity in their gross electricity consumption, including large hydropower (Figure 15.7). Denmark shows the largest share of renewable electricity when large hydropower is excluded.

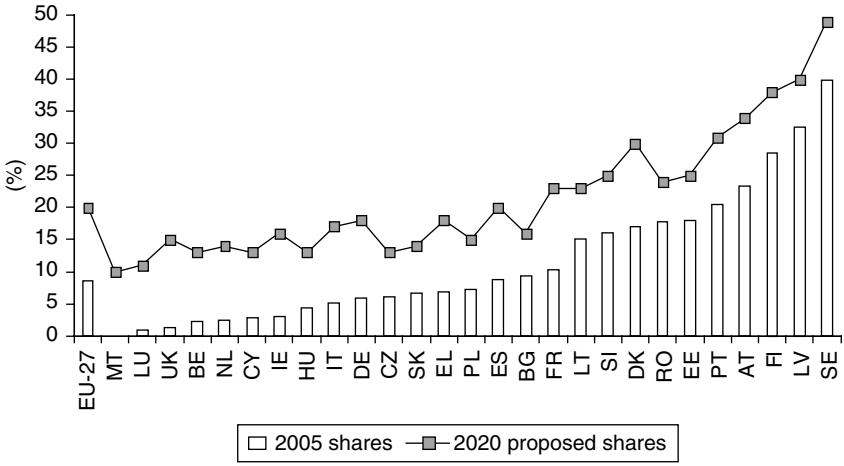

Figure 15.5 National targets fixed in Directive proposed by the Commission in January 2008*

Note: * Share of renewables to gross final energy consumption.

Sources: European Commission (2008a) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, and European Parliament (2008) *European Parliament legislative resolution of 17 December 2008 on the proposal for a directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources.).*

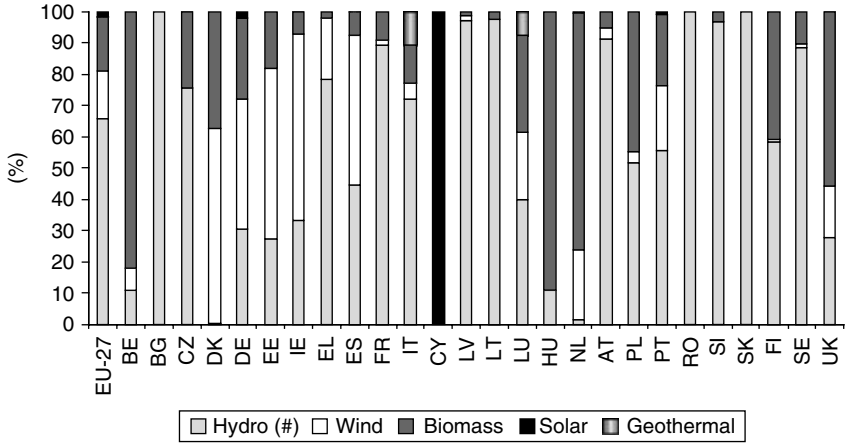

Figure 15.6 Electricity generation from renewables, by sources (2005)*

Note: * Does not include pumped storage.

Source: Eurostat.

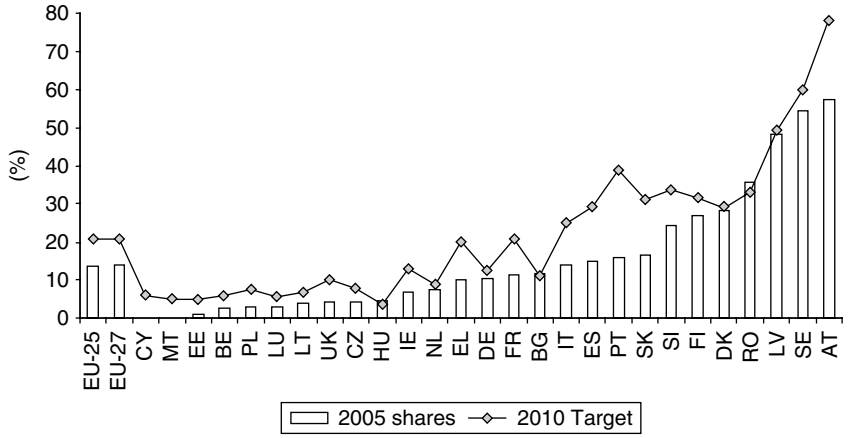

Figure 15.7 Share of electricity from renewable sources (2005 and 2010 indicative targets)*

Note: * Shares = [Gross Electricity Generation from Renewables / (Total Gross Electricity Generation + Net Electricity Imports)].

Source: Eurostat.

To meet the 2010 indicative targets, nine Member States will have to increase their national share of renewables in the electricity supply (generation + imports) by more than 7 percentage points compared to 2005 levels (the EU-27 will have to achieve a growth of 7 percentage points as well).

Support mechanisms for electricity from renewable energy sources

Currently, 27 Member States operate 27 different national support schemes for electricity from renewable energy sources. These can be divided between investment support (capital grants, tax exemptions or reductions on the purchase of goods) and operating support (price subsidies, green certificates, tender schemes and tax exemptions or reductions on the production of electricity). In overall terms, operating support – support per MWh – for renewable electricity is far more important than investment support. Market-based instruments providing operating support can be divided into instruments that fix a quantity of renewable electricity to be produced and instruments that fix a price to be paid for renewable electricity. Economic theory has shown that under ideal conditions, quantity-based instruments and price-based instruments have the same economic efficiency.[14] In practice, they have different results.

Quantity-based market instruments

- Quota obligations are used in seven Member States. Under a quota obligation, governments impose an obligation on consumers, suppliers or producers to source a certain percentage of their electricity from renewable energy. This obligation is usually facilitated by 'tradable green certificates' (TGC). Accordingly, renewable electricity producers sell the electricity at the market price, but can also sell TGCs, which prove the renewable source of the electricity. Suppliers prove that they reach their obligation by buying these green certificates, or they pay a penalty to the government.
- Under tendering, used in the past in three Member States on a broader scale, a tender is announced for the provision of a certain amount of electricity from a certain technology source, and the bidding should ensure the cheapest offer is accepted. Denmark has recently decided to use tendering for the development of off-shore wind projects.

Price-based market instruments

- Feed-in tariffs and premiums are used in 18 Member States. Feed-in tariffs and premiums are granted to operators of eligible domestic renewable electricity plants for the electricity they feed into the grid. The preferential, technology-specific feed-in tariffs and premiums paid to producers are regulated by the government. Feed-in tariffs take the form of a total price per unit of electricity paid to the producers whereas the premiums (bonuses) are paid to the producer on top of the electricity market price. An important difference between the feed-in tariff and the premium payment is that the latter introduces competition between producers in

the electricity market. The cost for the grid operator is normally covered through the tariff structure. The tariff with respect to the premium is normally guaranteed for a period of 10–20 years. In addition to the level of the tariff with respect to the premium, the guaranteed duration provides a strong long-term degree of certainty which lowers the market risk faced by investors. Both feed-in tariffs and premiums can be structured to encourage specific technology promotion and cost reductions (the latter through stepped reductions in tariff/premiums). Three Member States offer the choice between feed-in fixed prices and premiums, and one Member State offers a pure premium payment.

- Fiscal incentives, such as tax exemptions or reductions, are used as the main support scheme in two Member States and as supplementary instruments in others. Producers of renewable electricity are exempted from certain taxes (e.g., carbon taxes) in order to compensate for the unfair competition they face due to external costs in the conventional energy sector. The effectiveness of such fiscal incentives depends on the applicable tax rate. In the Nordic countries, which apply high energy taxes, these tax exemptions can be sufficient to stimulate the use of renewable electricity; in countries with lower energy tax rates, they need to be accompanied by other measures.

The effectiveness and efficiency of support schemes differ widely across the Member States. The different support schemes are characterized by different levels of maturity and policy schemes in some countries – in particular quota obligation systems – are fairly young systems and still in a transitional phase. Comparing the two main types of support schemes, namely quota obligations and feed-in tariffs, historic observations from EU Member States suggest that feed-in tariffs achieve greater renewable energy penetration, and do so at lower costs for consumers.[15]

Whilst harmonization of support schemes is considered a long-term objective, persisting barriers to the development of renewable electricity and the low level of competition in the electricity market imply that such harmonization could be premature.

On the other hand, renewable electricity is part of the internal electricity market and needs to comply with single market rules. Directive 2003/54/EC allows Member States to impose public service obligations which may relate to security on undertakings operating in the electricity sector. These include security of supply, regularity, quality and price of supplies and environmental protection, including energy efficiency and climate protection. Support schemes differ with regard to their compatibility with the principles of the internal market. With premiums, quota/TGC schemes, tendering schemes, tax exemptions and investment support, renewable electricity is normally traded in the electricity market and subject to market prices and conditions. The support is therefore remuneration on top of the electricity price. Since

the electricity is sold in the market, the producers participate on the regular electricity market in competition with other producers and this supply will have an influence on the price.

With feed-in tariffs, the renewable electricity is not sold directly in the market. The electricity is paid for through a purchase obligation which is normally put on the system operator. This electricity is shared among the customers and paid for through a fee included in the network tariff. Although renewable electricity which receives a feed-in tariff is not sold directly in the market, this additional supply will have an indirect impact on the market price.

The large number and small scale of most renewable electricity producers mean that easy and transparent grid access, not designed for and dominated by large incumbents, is crucial. The electricity market needs to become more transparent and competitive, with independent transmission system operators, to improve infrastructure access and balancing rules for renewable electricity. With the development of regional and European energy markets, it is important that the rules regarding renewables are objective, transparent and non-discriminatory.

The planned improvements to the internal electricity market are expected to facilitate the deployment of renewable electricity. However, when the single electricity market becomes competitive and new entrants producing renewable electricity can participate on a level playing field, certain design features of renewable electricity support schemes will have to be adapted.[16] The harmonization of support schemes remain a long-term goal on economic efficiency, single market and state aid grounds. By adopting best practices or combining national support schemes Member States can continue to reform, optimize and coordinate their efforts to support renewable electricity. A high priority should be given to removing administrative barriers and improving grid access for renewable energy producers.

Conclusions

At the moment, promotion of renewable energy is basically an EU issue. Neither in the United States nor in any other OECD countries have they introduced such kinds of energy policies, or at least with such scope.

As was shown in former pages, the EU is mixing different economic mechanisms (taxes, auctions, trading, etc.) in order to achieve goals that are increasingly ambitious. But, of course, big economic incentives are needed to develop the commercial use of renewable energy. Nowadays, renewable energy cannot compete with traditional fuels.

Renewable energy in the EU is basically focused on electricity generation and the substitution of combustion in industrial processes for electricity use. In electricity generation there are clear limits: renewable generation

(wind and solar) is discontinuous, and flexible and secure back up generation (mainly gas turbines) is needed.

In addition, there is a new and unexplored field for renewable energy: transportation, especially the car industry. During the following years we will probably see interesting developments in this area.

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http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0019:FIN:EN:HTML (accessed 16 January 2009); and European Parliament (2008) *European Parliament Legislative Resolution of 17 December 2008 on the Proposal for a Directive of the European Parliament and of the Council on the Promotion of the Use of Energy from Renewable Sources*, http://www.europarl.europa.eu/sides/getDoc.do?pubRef=//EP//NONSGML+TA+20081217+SIT+DOC+WORD+V0//ES&language=ES (accessed 16 January 2009).

12. A. Johnston, K. Neuhoff, D. Fouquet, M. Ragwitz and G. Resch (2008) 'The Proposed New EU Renewables Directive: Interpretation, Problems and Prospects', *European Energy and Environmental Law Review*, XVII, 3, 126–145.
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16

Adaptation to Climate Change in the EU – the Spanish Case

Alfonso Gutiérrez Teira

Introduction

Climate change is a global concern and adaptation to the impacts it causes is also a global need as all countries, either wealthy or poor and wherever they are, will need to take action to adapt their social, economic and environmental systems to the effects and vulnerabilities derived from it. However, for adaptation, unlike for mitigation, there are few potential global goals around which to build an agreement and few activities that can be globally adopted and applied (mitigation itself being one of them); instead, every country must define its particular adaptation strategy according to its national circumstances, fitting it to its particular environmental and geographical features, to its specific social and economic foundations, and to its specific political and administrative arrangements. Adaptation is basically a locally driven process that has to be tailored, within every country, to the socioeconomic, geographical and environmental situation found at each particular site, taking into consideration a strong local and community-based component.

The adaptation process can involve reactive (acting to correct actual impacts) and anticipatory options. The latter, prevention, is more desirable as it is cheaper and more cost-effective, not only in terms of money but also in terms of fatality avoidance and social welfare maintenance. Preventive adaptation is usually linked to building resilient or climate proof national socioeconomic systems through planning, which involves mainstreaming or integrating adaptation measures into all the national policy processes and sectoral planning, at all levels of administration. Therefore, national adaptation strategies are by definition complex and continuous processes from which results cannot be fully attained in the short term, and demand careful planning, strong participation and intensive work and data.

This chapter presents how adaptation to climate change is being dealt with and mainstreamed into planning and policies in Spain, at two levels: the national level and the regional level. This double approach tries to deal

with some features of the country that are relevant for adaptation. Spain is a developed country, but very vulnerable to climate change, extensively decentralized after a process that, in the last 30 years, has followed two paths. On the one hand, a top-down decentralization process, catalysed by the Spanish Constitution adopted in 1978, chiefly to the regional administrations (Autonomous Communities) in which the country is administratively organized. In this process, the state has kept powers to adopt legislation on matters considered of common national interest, and some management and executive powers where the general interest prevails, or in matters or resources shared by several regions (e.g., interregional water basins, open seas). On the other hand, a bottom-up transference process to the European Union has been also carried out since 1986, when Spain joined the EU, as regulated by the European Treaties.

Regional dimension: The EU and European policies

Why a regional dimension

In the case of Europe, there are at least two reasons that justify a regional approach to adaptation. First is that the EU Member States have transferred some of their national responsibilities to the European Union, either totally or partially, following some basic rules such as the principle of subsidiarity, that is that Community shall only take action where objectives can best be attained by action at Community rather than at the national level. Among the policies that lie under European responsibility, there are many sectors that are projected to be directly affected by climate change, for example, environment, agriculture, development and cooperation, energy, fisheries, health or trade. Besides, Europe has a joint research policy as well as a foreign policy, the influence of which is very significant for each Member State. To empower the implementation of the common policies, the EU manages and distributes its own budget. Common as they are, all these policies need an integrated approach and a single mainstreaming approach to tackle the impacts and vulnerabilities to climate change.

The second reason, beyond the policies put forth by the EU due to the powers it bears, is for a regional approach to adaptation. It has become more and more clear that, despite the undisputed local nature of adaptation, the regional approach is a critically important intermediate stage between the global and the country-led approach to climate change. Such an approach may allow the sharing of data and information, methods, tools and resources between neighbouring countries that share similar problems, it may also allow the seeking of common solutions to problems that extend beyond national boundaries or that are shared or that may have a transnational nature or generate frontier problems.

With respect to this, the EU has underlined the need to develop its own framework for adaptation to climate change, which is conceived as

the necessary action to ensure that adaptation to climate change is mainstreamed into all the relevant European policies and activities.

Towards a European strategy for adaptation

Europe, despite being a wealthy continent, is quite vulnerable to climate change (Figure 16.1).

Awareness of this has been raised by both research and the facts: on the one hand, the IPCC assessment reports,[1] the results of the European Climate Change Programme and several regional and national climate modelling and impact assessment projects showed the significance of likely changes in climate variables (mean temperature and precipitation) and the projected resulting impacts on important European areas (e.g., on agriculture, fishing, transport, tourism, health or biodiversity); on the other hand, some extreme events like floods or heat waves in the heart of Europe, and an increased recorded frequency of such events, convinced the public powers that action is needed. European summaries of the

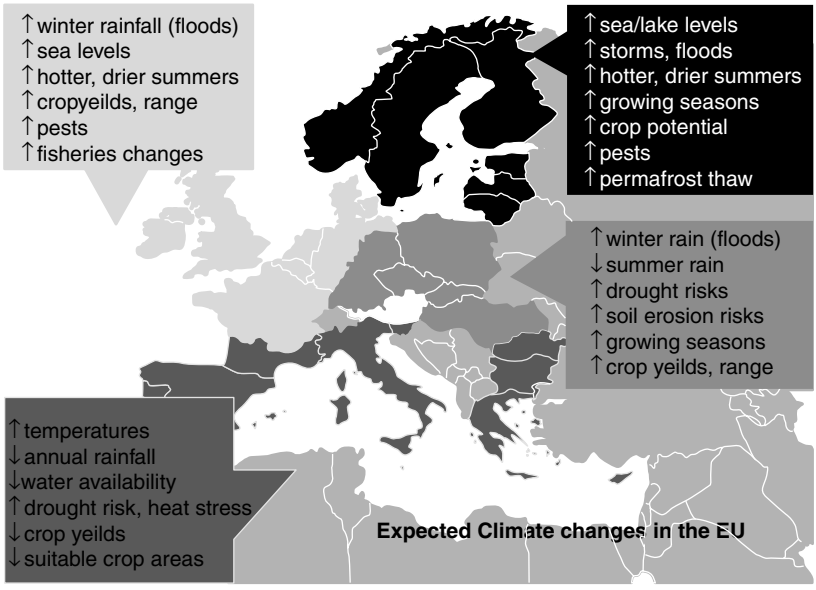

Figure 16.1 Significant impacts of climate change expected in the European Union*

Source: the EC website, http://ec.europa.eu/agriculture/climate_change/index_en.htm.

Note: * The nature of such changes will vary regionally, and their effects will be different for every EU country, depending on the bioclimatic region. Additionally, the particular socio-economic profile and local features of each country will be critical in defining the specific impacts.

impacts and vulnerability of EU systems and socioeconomic sectors have been compiled.[2]

In June 2007, the European Commission adopted and publicly launched a first policy document, the so-called Green Paper 'Adaptation to climate change in Europe – options for EU action', which analysed the facts and concluded there was a need to domestically adapt to the impacts of climate change.[3] The document proposed a comprehensive set of possibilities for action at the EU level, taking into consideration the range of its responsibilities, as mentioned above.

The aim of the Green Paper was to provoke public debate and consultation, seeking the widest participation, on how to deal with adaptation to climate change within the frame of the European powers. It was subject to a regular procedure for the participation of the formal institutions representative of the citizenship within the EU: the Committee of the Regions (representative of the regions within the countries), the European Economic and Social Committee (representative of the social and economic actors such as syndicates, SMEs, firms or NGOs) and the European Parliament (the only directly elected body of the European Union, with 785 Members elected every 5 years by the voters of the 27 EU Member States). Their views were expressed in the ways formally regulated for them, that is, opinions and resolutions, between November 2007 and April 2008.

In order to foster the participation of as many stakeholders as possible, beyond the formal trails mentioned above, a series of events and participatory mechanisms were also set in place, namely a high-level Conference in Brussels in July 2007, following the green paper publication, to which interested organizations and individuals were invited to contribute to the debate, including through the use of an Internet chat. A web-based public consultation followed the conference, lasting from July to November 2007, which resulted in the collection of more than 200 replies. Additionally, a series of subregional workshops were organized in Finland, Portugal, the United Kingdom and Hungary through autumn 2007, trying to cope with the specific climate change impacts and challenges for adaptation in the four main geographical regions of Europe (north, south, west, east) and foster a productive debate on the basis of the Green Paper. Participation included stakeholders, citizens, authorities, NGOs, the private sector, academics and civil society.[4]

What the Green Paper proposes. The approach proposed by the EU to set up its framework to face climate change is consistent with what it is proposing internationally, that is, that we face a double challenge: to mitigate climate change through deep cuts in greenhouse gas emissions, and to adapt to the inevitable changes in climate conditions. Both challenges, the EU argues, must be dealt with in parallel and simultaneously, as parts of a coherent policy for tackling climate change and to ensure sustainability, human

welfare and climate resilient development. The EU has established a climate protection target of a maximum 2ºC global mean temperature increases to allow adaptation to climate change for many human systems with globally acceptable economic, social and environmental costs.[5]

The EU's Green Paper builds on four pillars that represent all the different dimensions of actions that can be carried out at the European regional level, with the powers that the Member States have agreed to transfer to the EU. They neither constrain nor substitute the eventual action that each member state might take or is taking on their own. These four pillars are:[6]

Early action in the EU. This pillar comprehends all the options considered for sound adaptation in domestic policy, and comprehends the integration of adaptation when implementing and modifying existing and forthcoming legislation and policies; once all the likely analyses and mainstreaming are completed, the paper also considers that there might be policy gaps needing the development of new policy responses, whatever their nature is. The Green Paper also raises the integration of adaptation into all the existing Community funding programmes.

Integrating adaptation into EU external actions. The EU is aware that, to be coherent with its philosophy for climate change, it has to make adaptation part of its external policy, a field in which it has undertaken many responsibilities in representation of its Member States. In this framework, the Green Paper remarks that adaptation needs will have to influence EU bilateral relations with third countries, including the ODA. Beyond this, within the UNFCCC it has become clear that sharing knowledge, techniques and every available tool to fight against the impacts of, and vulnerability to, climate change is one of the keystones of an international approach to climate change; therefore the EU will try to enhance cooperation with third countries, whenever there are common problems that can be tackled jointly or synergically.

Additionally, the EU has a Common Foreign and Security Policy (CFSP), which has to be rethought in order to enhance the EU's capacity to prevent and deal with conflicts (border disputes and tensions over access to natural resources and natural disasters) that might be eventually accentuated by climate change. Finally, the paper also proposes revising the EU migration policy to take the impacts of climate change into account.

Expanding the knowledge base through integrated climate research. Wise adaptation can only be built on solid knowledge foundations, and despite evident progress in understanding and modelling the Earth-climate system, there are many uncertainties that avoid making a fully adequate evaluation of the impacts of and vulnerabilities to climate change at temporal and spatial scales matching those at which decisions are made, and to identify the optimal adaptation measures considering *inter alia* a cost/benefit criterion. An integrated, cross-sectoral and holistic approach is to be promoted together

with internalization of environmental costs of physical and biological system degradation. Research should address the complexity of interrelated factors which cannot be analysed independently. The EU's 7th Framework Programme for Research (2007–2013) places a strong emphasis on climate change, both in terms of predictive capacity, modelling and adaptation strategies.

The Green Paper tries to identify the key research areas where further knowledge should be developed, prioritize among them, and seek ways for optimizing communication between the scientific community and decision makers.

Involving the European society, business and public sector in the preparation of coordinated and comprehensive adaptation strategies. Participation of society in the adaptive response to climate change is viewed as key to building comprehensive and coordinated strategies, including possible policy and funding modifications. The Green Paper proposes starting and maintaining a structured dialogue with the parties and civil society concerned to explore climate change challenges systematically and sectorally, to consider the likely need to involve third countries neighbouring the EU and sharing similar threats in this dialogue, and to consider the establishment of an Advisory Group on Adaptation, made up of policymakers and civil society organizations, to further explore the EU response to the effects of climate change.

Next steps. With all these elements, the EU is embarked on going from strategic planning to the adoption of a White Paper (2009), which could have the form of a strategy, or a framework for action.

National dimension: Dealing with the impacts of climate change in Spain

Spain's climate and trends

In Spain, climate is extremely varied due to the inherent nature of the Mediterranean-type climate that is dominant in the country, which is additionally complicated as a result of its particular geographic location (between two continents, between two seas) and a complex topography: as a result, the spatial climate pattern is complex, and the interannual climatic variability is high, independently of climate change considerations.

Taking the great climate variability and complexity mentioned above into account, observation data show that, a general increase in temperatures was experienced in Spain during the twentieth century, of a magnitude greater than the global average, and particularly accentuated in wintertime.[7] As regards rainfall trends, though the spatial and temporal patterns are highly variable, a downward trend has been recorded on average, particularly in the last third of the twentieth century.[8]

Regarding future projections, despite their wide variation depending upon the socioeconomic scenario and the general climate model used, they show uniform temperature increase trends for the Iberian Peninsula throughout the twenty-first century, with winter 0.4°C/decade and summer 0.6–0.7°C/decade.[9] With regard to rainfall, and despite the uncertainties due to discrepancies between the global models, all of them show a significant reduction trend in total annual rainfall, with maximum projected reductions in spring. Regional models, which allow the detail of climatic projections to be enlarged, confirm these trends; as an example, the *PROMES* model[10] forecasts, for the last third of the century, a general temperature increase of 5–7°C in summer (3–4°C in winter), and a rainfall decrease in spring and summer, with an overall accentuation in the currently existing northwest-southeast gradient, making the wet NW wetter and the dry SE drier. Other projected changes are an increase in monthly temperature anomalies all year round, a higher frequency of days with high temperatures and a decrease in days with minimum temperatures.

Impacts and vulnerabilities of climate change in Spain

Spain was among the first European countries to be aware of its vulnerability to climate change. In 2005, the Spanish Ministry of Environment published the results of a first project aimed at approaching the vulnerability of natural resources and the sectors and systems most important for national wealth, called 'A Preliminary General Assessment of the Impacts in Spain due to the Effects of Climate Change'[11], also known as *ECCE project*. The analysis conducted followed a methodology for compiling the information available on the issue similar to the one used by the IPCC or the European ACACIA project. Climate and 15 thematic areas were thus analysed by more than 400 national experts. For each thematic area, the work carried out covered the following issues: sensibility to current climate, foreseeable impacts of climate change, identification of most vulnerable areas, interaction of the area with other sectors/systems, knowledge gaps, research needs, and finally an initial identification of adaptation options.

Complementarily, the Spanish Climate Change Office carried out the study *Impacts in the Spanish Coastline due to Climate Change*, developed through an agreement with the University of Cantabria, aiming at providing the Spanish administration with a scientific and technical toolbox for establishing the relevant policies and strategies for action in coastal areas facing climate change. The result was a comprehensive analysis in three phases: evaluating the likely changes in coastal dynamics, evaluating the effects of such changes, and defining climate change adaptation strategies for coastal areas.[12] Going beyond a traditional approach in coastal impact analysis that considers only the elevation of the sea level, this study also tackled and showed the importance of the potential changes in the energy and incidence angle of waves associated with climate change. The result of

this project was not only a detailed projection of impacts on and vulnerability of the Spanish coastline (about 7500 km), but also the development of an evaluation methodology that keeps on evolving and that will be exported for evaluations in other countries and continents (Figure 16.2).

Vulnerability of natural resources

Spain is part of the Mediterranean *biodiversity* hotspot, hosting high species richness and endemicity; climate change, which would impact the structure and functioning of both terrestrial and aquatic ecosystems, might have very significant negative effects on this wealth. The projected alterations in many species' distribution, phenology and interactions, the spread of invasive species and pests and a greater impact of both natural and anthropic disturbances could cause a significant increase in extinction rates, both of fauna and flora. In addition, the changes in the energy balance of the ecosystems might cause productivity loss, which would affect most groups of organisms and ecosystems, modifying in particular the marine trophic networks. The changes in ecosystems may have negative effects on the goods

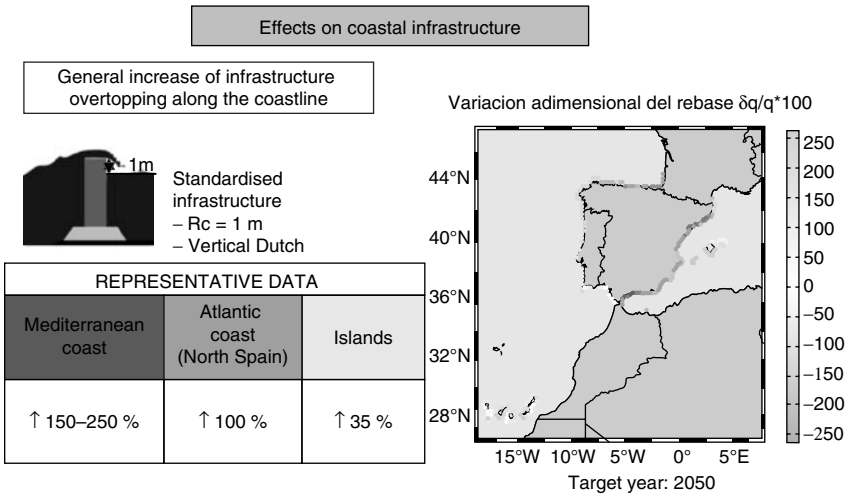

Figure 16.2 The vulnerability of the Spanish coastline*

Note: * In the figure is an example of one of the outputs of the assessment mentioned in the text, showing the projected increase in infrastructure overtopping by 2050. These detailed analyses provide key input for long term sustainability plans, and constitute one example of mainstreaming adaptation into sectoral planning.

Source: Med R. Medina, Iñigo J. Losada, F. J. Méndez, M. Olabarrieta, M. Liste, M. Menéndez, A. Tomás, A. J. Abascal, P. Agudelo, R. Guanche and A. Luceño (2005) *Impactos en la costa por efectos del cambio climático* (Madrid: Spanish Ministry of Environment), http://www.mma.es/portal/secciones/cambio_climatico/areas_tematicas/impactos_cc/imp_cost_esp_efec_cc.htm.

and services they provide, in particular for productive systems, including those depending on marine or coastal resources.

Many vulnerable habitats and ecosystem types have been identified, particularly those found in islands and other isolated systems (e.g., high mountain belts), and ecotones. Also, certain communities which are sensitive to summer drought, the sclerophyllous and lauroid forests, the coastal habitats and most continental water ecosystems are seriously threatened, as well as the benthic marine communities, and in particular the *Posidonia* and other phanerogams prairies.

Water resources in Spain are a limiting factor both for economic growth and social development and for natural processes, due to an irregular temporal and spatial distribution. Aggravating this situation, climate change is projected to cause a 5–14 per cent average decrease in water availability in natural regimes by 2030 (over 20–22 per cent by the end of the twenty-first century). The decrease would be coupled with an increased interannual variability of water availability. The most severe impacts are expected to affect the arid and semiarid southern and southeastern basins (i.e., the driest Mediterranean) and the Canary and Balearic Archipelagos.

Concerning *soil resources,* climate change is projected to exacerbate the desertification processes that are already affecting Spanish soils, chiefly in the dry and semiarid Mediterranean climatic regions. Additionally, the likely soil carbon content decrease might negatively affect the physical, chemical and biological properties of soils and have an effect on productivity, water storage and other services.

For *forests* and the *forestry sector*, the initial assessment rendered the most vulnerable forest systems in terms of potential contraction of their range areas (mountain forests, xerophitic and riparian woodlands); other impacts suggested are increased forest pests due to increased populations (several breeding cycles per year) and distribution ranges of pests and vector species. Also, physiological changes in forests could end up in many forests becoming net carbon emitters after the year 2050. Regarding *forest fires risks,* there will be an increased frequency, intensity and magnitude of fires due to increased fuel flammability and a prolonged average duration of the fire danger season.

Impacts on sectors and systems

Spain's economy has a strong dependency on *coastal areas*, which add up to a 7500 km coastline when considering its peninsular mainland, archipelagos and islets; a big percentage of its population is concentrated in coastal areas, where rich tourism, fishing, industrial and farming activities and services linked to coastal resources dwell. When focusing on the country's key vulnerabilities to climate change, Spain dedicated a special effort in identifying the threats to its coastal areas by undertaking the specific study mentioned

above, which provided an evaluation of changes in Spanish coastal dynamics, of the effects of such changes, and a definition of likely strategies to face climate change in coastal areas. It showed that the projected mean sea-level rise along this coastline varies from 10 to 68 cm for the end of the twenty-first century; overall, an average 50 cm rise can reasonably be expected, which could go up to 1 m in the most pessimistic scenarios. The study projects a general shoreline retreat of up to 50 m, as a consequence of both the average sea-level rise and to changes in the energy and incidence angle of waves. Deltas and beaches are among the most vulnerable systems, and coastal lowlands are prone to flooding (Ebro and Llobregat deltas, Manga del Mar Menor, Doñana coast).

Spain's dependency on the *tourism sector* makes the country particularly vulnerable to the plausible projections made under the future climate scenarios. The changes that have been pointed out as altering tourism patterns are linked to reduced water availability, which would cause viability problems for some traditional destinations, to the projected temperature increases, which could cause changes in seasonal activity schedules, reductions in the duration of vacation, delays in travel planning and election of destination (higher uncertainty), and changes in geographic patterns of tourism, with new competing destinations northwards. Additionally, the likely rise of the sea level and other effects associated with climate change would threaten the current location of tourist resorts and resources (beaches, etc.) and coastal tourism infrastructure.

Climate change might have a significant impact on *human health* in Spain. An increased frequency, intensity and duration of heat waves, found to be a highly likely effect of climate change throughout the twenty-first century, would increase the morbidity and mortality rate of extreme temperatures. Furthermore, the foreseeable increase in fine particles and ozone will constitute the main impacts in relation to atmospheric pollution. Additionally, the future climate scenarios may favour the geographic spread of infectious vectors that are currently within their distribution boundaries, or cause the establishment of new, subtropical ones.

The *agricultural* sector is another one that appears to be vulnerable to climate changes, though the complex relationship of crops with shifting factors (CO_2 concentration, air and ground temperature, rainfall patterns) makes it difficult to define the potential impacts, which might be unevenly and non-uniformly distributed in Spanish geography. Currently, the statistics for agricultural insurance show that the eastern half of the peninsula is the most sensitive to climate change. Stockbreeding may be subject to new animal health challenges associated with the new patterns of parasitic and infectious processes which have vectors that are linked with climate.

In a scenario of temperature increases and reduced rainfall, the *energy sector* is also potentially affected; the demand for electric energy will probably

increase and some traditional energy sources, such as hydraulic, will very likely be reduced; increases in oil and natural gas demands are also predicted. Only solar energy would be favoured by the plausible increase of insolation hours. There is also a potential for a higher production of wind energy, should wind patterns and intensities increase as well.

As far as *hazards of climatic origin* are concerned, changes in *flood* risk and regimes are expected, in particular an increase in the irregularity of the regimes of floods and flash floods in the Mediterranean-type areas. Regarding s*lope instability risk*, the likely increased torrentiality would cause more frequent surface landslides and debris flow, exacerbated by the land-use changes and reduced plant cover caused by climate change. The increased erosion on slopes would cause surface waters' quality-loss and a higher reservoirs clogging rate.

The Spanish National Climate Change Adaptation Plan

The Spanish Climate Change Adaptation Plan (PNACC in its Spanish acronym) was adopted in July 2006, aimed at mainstreaming adaptation to climate change into the planning processes and policies of all the relevant socioeconomic sectors and ecological systems in Spain, setting the scenario and framework for the assessment of impacts, vulnerability and adaptation options.[13]

A participatory and all-inclusive approach

Since it was first conceived, it has become clear to the Spanish Administration that the PNACC's development should become a major collective project, actively involving all the key stakeholders within all the relevant sectors and covering all the Spanish geographic areas (Figure 16.3).

Establishing a national adaptation framework has to take the political structure of the country into consideration, if it is to be operational. Spain, as mentioned earlier, is a complex, decentralized country constituted by 17 Autonomous Regions or 'Comunidades Autónomas' (CC.AA.) and two city states or 'Ciudades Autónomas'. Given the complex geographical and political identity of the country, it became evident a national adaptation plan for a country like Spain should be flexible enough to be useful when downscaled from the national to the more practical, local scale, where specific measures are set in place, and coordinated with all the administrative levels where there are legislative or executive powers.

Adaptation to climate change requires forecasts and strategies for the medium and long term. In addition, throughout the process of designing the different options, the participation of all interested sectors is required.

Thus, the plan's conception and drafting was subject to a wide consultation and participatory process engaging representatives of the public administrations at all levels (national, regional, local) and other stakeholders. Such

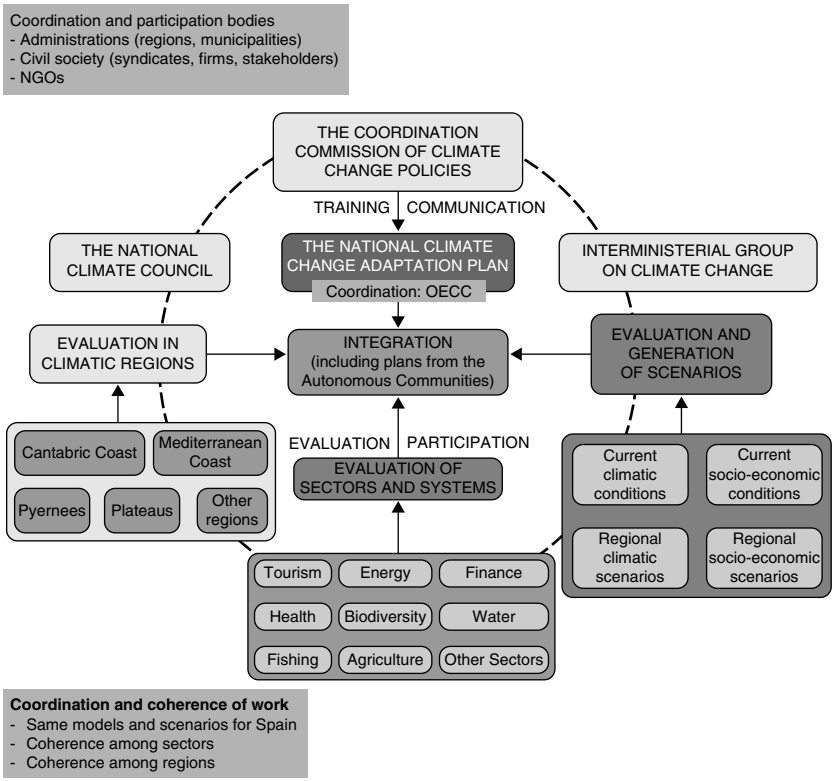

Figure 16.3 A scheme of the complex process of definition of the Spanish National Climate Change Adaptation Plan*

Note: * Different processes, sectors, data sources and geographic and political regions were considered, and a wide participatory process took place making use of the existing national participation and coordination platforms, which involved all the relevant stakeholders and political levels.

Source: PNACC.

a process was channelled through the main existing coordination and participatory bodies dealing with climate change in Spain: the National Climate Council, made up of administrations, research institutions, NGOs and socioeconomic actors; the Coordination Commission of Climate Change Policies (CCPCC), a coordination body for climate change policies between administrations, chiefly national and regional, but also local; and the Environmental Sector Conference, a high-level interadministrative coordination body for environmental policies. The plan was finally submitted to the Council of Ministers in October 2006.

The PNACC identifies, upon the results of the evaluations mentioned above, an initial set of 15 key sectors and systems for which the vulnerability assessment and identification of adaptation options is priority.

- Biodiversity
- Forests and forestry
- Water resources
- Soils
- Agriculture and stockbreeding
- Coastal areas
- Mountain areas
- Fishing and marine systems
- Hunting and angling
- Health
- Transport
- Industry and energy
- Tourism
- Finance and insurance policies
- Urban planning and construction sector

Each sector/system shall be subject to specific impact and vulnerability assessments, tailored to their particular elements, specific features, or the factors that might condition the adaptation options (distribution of powers, existence of planning/management specific institutions, available technologies, geographic, cultural and social factors, values and constraints, etc.). However, and despite the diverse approaches needed for each sector, there will be a common methodological approach and a unique knowledge base (e.g., use of common scenarios) that will guarantee a coherent global approach.

Additionally, the PNACC was drawn up bearing in mind that the sectors and systems dealt with are interdependent from each other; the plan tackles the challenge for the coordination and integration of disciplines, expert groups and institutions responsible for the different areas, and has foreseen the continuous feedback among all sectors so that the results of one feed regularly into the others (Figure 16.4). The Spanish Climate Change Office (OECC) is a General Directorate of the Ministry of Environment and Rural and Marine Affairs that plays the coordination role to ensure intersectoral coherence and feedback.

The PNACC, as a framework plan, is conceived as a permanent process for the generation of knowledge and building of capacity, aimed at setting foundations for the definition and application of policies based on the best likely available knowledge. Its aspiration is to become a useful tool for policy makers on key areas needing adaptation to climate change. With this clear spirit, the PNACC defines several initial objectives as its main expected outcomes, namely:

- Developing a series of regionalized climate scenarios for the twenty-first century, at a scale and resolution that fit Spanish geography and allow for adequate local simulation of current and future climate features and variables.

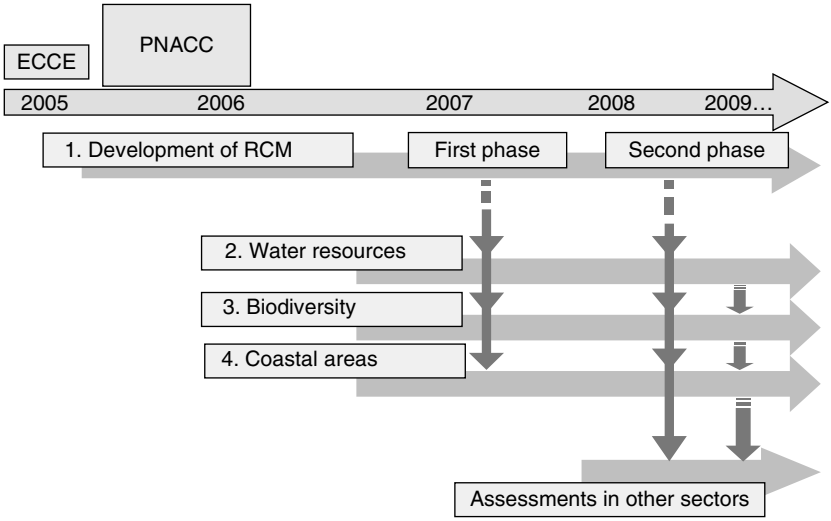

Figure 16.4 Conceptual approach to the Spanish National Climate Change Adaptation Plan*

Note: * A general framework (PNACC) based on the best available knowledge (collected in the ECCE project) is developed into Work Programmes that allow prioritizing the work in sectors and systems either considered key for the country, or being horizontal so that they should feed other sectors' evaluations. Regular feedback between sectors is foreseen, to ensure that updated knowledge informs the sectoral decision making

Source: PNACC; MARM (2009a).

- Developing methods and tools, and applying them, to evaluate the impacts, the vulnerability and the adaptation options of climate change for all the relevant Spanish socioeconomic sectors and the ecological systems represented in our geography. The specific training needs for each sector will be identified, and specific sectoral training actions will be designed.
- Defining and incorporating the most relevant research needs for climate change impact and vulnerability assessment into the Spanish R&D and innovation system. This will ensure that proper training and capability be mainstreamed into the scientific and technical sector.
- Carrying out a continuous information and communication effort regarding the plan and its activities, targeting both the general public and more specific actors, and tailoring precise activities to the different profiles of each actor type.
- Encouraging the participation and involvement of the relevant stakeholders within the target sectors and systems in the evaluation of vulnerabilities and the mainstreamed adoption of adaptation solutions.

- Reporting on the implementation and results of the evaluation projects and other actions carried out within the Plan's framework, and ensuring that the information generated (scenarios, detailed local and sectoral evaluations, recommendations and adaptation options derived from the studies made) is duly communicated to all the relevant actors, as a necessary means for the PNACC to be effective.

The plan in action

The PNACC is a framework plan which is quite open and does not define a specific set of activities, a schedule, or a budget. It just defines a series of priority action lines for each sector that are based on the preliminary existing vulnerability analyses. Therefore, it is to be developed through Work Programmes that define more precisely the priority sectors and activities to be carried out and the schedules for them. The CCPCC, a coordination body mentioned above, establishes priority action lines within the PNACC and the Spanish OECC coordinates, as also mentioned, several activities carried out under the umbrella of the PNACC, and assumes the plan's management and monitoring roles.

The First Work Programme was adopted in 2006, simultaneously to the PNACC, targeting the activities and sectors that are considered as high priority because (a) their importance for Spanish social and economic welfare and (b) because of their horizontal nature, that makes the results achieved within them essential for feeding the vulnerability analyses to be carried out in other sectors. The sectoral activities dealt with within the first Work Programme, which were being worked on when this text was written, were the development of regional climate scenarios and the evaluation of impacts, vulnerability and adaptation actions on coastal areas, water resources and biodiversity.

The backbone of a national adaptation plan is the availability of distributed models of the likely climate conditions in the future under different socioeconomic scenarios. These models must build on the best available observation data, regionalization techniques and global models, and retain the uncertainties linked to the different climatic models and scenarios. For the PNACC, the production, disposal and use of a normalized set of scenarios is a critical working line that will offer stakeholders a reliable and common basis for all the sectoral evaluations made by the public powers and, thus ensuring that the programmed works are tackled coherently, using the same baseline for all the sectoral evaluations, which should feed each other's evaluation.

The PNACC's first work programme is being carried out using a phased approach. In the first phase, a first set of regional climate scenarios suitable for Spain was developed and compiled using the available datasets and contrasted methods, aimed at providing regionalized climate projections for immediate use, to allow the first work programme to be developed (Figure 16.5).

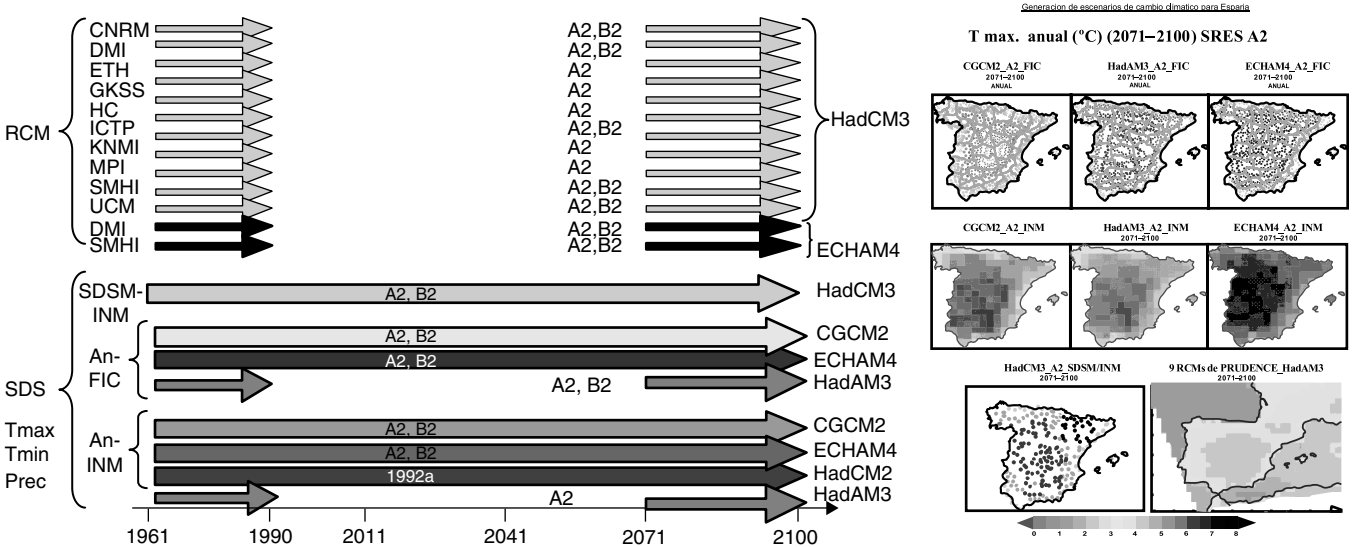

Figure 16.5 Left: set of regionalized climatic projections included in the 1st phase of the scenarios' generation task under the PNACC*; Right: a subset of outputs for the end of the century, for one of the variables (Annual maximum temperature).

Note: * These scenarios have been developed by several institutions (CNRM, DMI…); following different methodologies, either dynamic (RCM) or empirical (SDS); using information from several Global Models and scenarios (HadCM3, ECHAM4…), and rendering outputs for several time periods (arrows), up to the end of the century.

Source: AEMet.

This phase was completed in early 2007, and the results comprehend a database of scenarios available for any potential user on the website of the State Meteorological Agency of Spain[14] and an explanatory report.[15] The second phase started to be developed immediately after the end of the first, and is a long-term phase that aims at developing new methodologies tailored to the national situation, fostering the participation of the broad scientific community and investing in research and development. This second phase should allow the periodical provision of improved scenarios, for use by any stakeholder, public or private, carrying out local or sectoral impacts, vulnerability and adaptation assessments.

For coastal areas, the work underway is a mainstreaming exercise of climate change adaptation into a national 'sustainability Strategy for the Spanish coastal areas' that is underway, aimed at developing an Integrated Coastal Zone management system. Following the results and methodology to provide detailed models of the likely impacts of climate change in coastal areas mentioned above, a detailed projection of impacts and vulnerability has been carried out in several hundred small coastal units defined by a mix of socioeconomic and natural features. This has allowed a detailed diagnosis of the Spanish coastline to be made (the Mediterranean and the Archipelagos have been completed, work on the Atlantic coastline is underway) that will be the starting point to face coastal planning together with all the relevant administrations and the social and economic actors.

Water resources, another area prioritized under the PNACC, are also being subject to detailed evaluation, following a long tradition of water planning and management in Spain and a series of vulnerability analyses carried out to define the present Spanish water policies. More concretely, what is underway within the PNACC is an assessment of projected climate change effects, through the twenty-first century, on the natural hydrological regimes of basins, on the key and critical water demands (i.e., for irrigation, tap water, industry, etc.), on the current capacity of the Spanish hydrological system to cope with the likely changes, and on the ecological status of the water bodies. The outcomes of all these studies will provide key data to feed both water planning and all the related sectors and systems (biodiversity, agriculture, energy, etc). In the meantime, effective mainstreaming of adaptation into the sectoral regulatory framework has started, through the Water Management Planning Regulation (2007).

As mentioned above, Spain has a responsibility to protect the rich natural heritage it hosts, and to ensure the goods and services that the ecosystems provide to our society. With this objective, a study is underway aimed at evaluating the likely changes in the physical and ecological features of Spanish territory and its potential to host species and habitats, to develop models of future patterns of distribution of species and habitats, and to evaluate the effects of climate change on the possibilities for the

conservation of biodiversity. Subsequently, key vulnerable areas or possible shelter areas will be identified, and options for adaptation will be designed (design of protected areas, in situ and ex situ conservation, etc). Additionally, the results achieved should provide guidelines for other policies (infrastructure, land-use planning, etc.).

Another milestone in the Spanish adaptation strategy is the creation of a Research, Development and Innovation (R+D+i) Programme on Impacts and Adaptation to Climate Change, coordinated among the National and the Regional Administrations, which has been integrated within the National R+D+i Plan that has identified climate change as one of its strategic priorities. The current programme will allow knowledge gaps in four backbone national sectors (health, tourism, forestry and agriculture) to be filled, will provide all the agents with the best decision tools for the integration of adaptation to climate change in the sectoral policies, and will allow climate resilient plans and strategies to be designed.

Other activities have been tackled within the first PNACC's work programme, including the consideration of climate change in the Strategic and Environmental Impact Assessment procedures of programmes and projects, the establishment of contacts and agreements with key sectoral actors, both public and private, or the regulatory integration. All these have allowed the OECC to focus on immediate needs and priorities, which will be tackled in the 2nd Work Programme that will be launched in 2009 and deal with new key sectors (tourism, forests, health, etc.) and a battery of new activities.

Notes

1. See J. Alcamo, J. M. Moreno, B. Nováky, M. Bindi, R. Corobov, R. J. N. Devoy, C. Giannakopoulos, E. Martin, J. E. Olesen and A. Shvidenko (2007) 'Europe' in M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden and C. E. Hanson (eds) *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press), pp. 541–580.
2. See, for example, European Environment Agency, EEA (2006) *Vulnerability and Adaptation to Climate Change in Europe. EEA Technical Report nº5* (Luxembourg: Office for Official Publications of the European Communities, Luxembourg), http://www.eea.europa.eu/publications/technical_report_2005_1207_144937 (accessed 19 February 2009); and European Environment Agency, EEA (2008) *Impacts of Europe's Changing Climate – 2008 Indicator- Based Assessment. EEA Report No 4/2008* (Luxembourg: Office for Official Publications of the European Communities), http://www.eea.europa.eu/publications/eea_report_2008_4 (accessed 19 February 2009).
3. European Commission, Green Paper prepared by the European Commission for the Council, the European Parliament, the European Economic and Social

Committee, and the Committee of the Regions, *Adapting to Climate Change in Europe. Options for EU Action*, Brussels, 2007.
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5. For a scientific rationale see European Commission, The 2°C target. Information Reference document Prepared and adopted by EU Climate Change Expert Group EG Science, Brussels, 2008.
6. European Commission, Green Paper prepared by the European Commission for the Council, the European Parliament, the European Economic and Social Committee, and the Committee of the Regions, *Adapting to Climate Change in Europe. Options for EU Action*, Brussels, 2007.
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17

China's Emissions Reduction Policy: Problems and Prospects

Michal Meidan

Introduction

From the beginning of the era of reform and opening up, China's GDP maintained an average growth rate of 9.7 per cent per year[1] between 1978 and 2006. Since 2003, the pattern has accelerated, with per capita income reaching US$2200 in 2007.[2] This dynamic growth rate has inevitably entailed a strong rise in primary energy demand: from 410 million tons oil equivalent (mtoe) in 1978, it has more than quadrupled to 1863 mtoe in 2007,[3] and is expected to double again by 2030. China therefore went from consuming 6 per cent of global energy to 15 per cent in just under three decades. China is already the world's second largest energy consumer and could overtake the United States to become the world's largest consumer soon after 2010.[4] By that time, its GDP per capita will have passed US$3000.

The first aspect of China's energy insecurity is therefore the challenge to meet these demand increases. Even though China is relatively self-sufficient, thanks to its abundant coal reserves, it is becoming increasingly reliant on imported oil and gas to feed demand from a higher-income urban population and its rapidly developing economy. Moreover, Beijing will have to rely increasingly on international sources for oil with the unbridled rise in personal car ownership: there were 160 million vehicles on the roads at the end of 2007, of which 75 per cent were privately owned,[5] and in 2007, 52,700 miles of new highways were laid throughout the country.[6] Conversely, China's efforts to improve the efficiency of its vehicles could contribute not only to moderating demand for oil but also to improved efficiency in the rest of the world, as the country is becoming a net exporter of cars and trucks.[7] But currently, the Chinese transportation sector still accounts for one third of total Chinese petroleum demand and vehicle growth is a primary driving force behind China's increased demand for oil, 47 per cent of which was supplied by imports in 2006. This share is expected to increase to over 50 per cent in 2008 and 80 per cent by 2030.[8]

As China's growing middle class becomes richer, it is using more energy to run offices and factories, and buying more electrical appliances, cars and consumer goods. The massive urbanization trend has surpassed international predictions: in 2007, 577 million people, or 44 per cent of China's population, were urban dwellers,[9] and this is also pulling energy consumption up. Accompanying the 15 million rural Chinese that move into cities each year is a construction boom, meaning that every year China adds 2 billion square meters of building space. The trend is set for increased energy demand as China's population reaches income levels closer to those of Western countries. But with highly inefficient energy use – requiring almost five times more energy to create one unit of economic growth compared to the United States and up to 12 times more than Japan[10] – this development model is turning out to be unsustainable for both the country's economic development and the environmental strain this entails.

Energy conservation and environmental protection as a new policy priority in China

Thus, the protection of the environment has finally reached the top of China's political and economic priorities. In 2007, coal accounted for almost 70 per cent of China's primary energy demand, and while being an important contributor to fuelling China's economic growth, its widespread use gives rise to a series of problems. China's coal resources are second only to Russia's, with proven reserves estimated at 115 billion tonnes,[11] China's reserve-to-production ratio is of around 50 years at current production levels, but the predicted resources (5570 billion tonnes) mean that China should have enough coal to sustain its demand even as it becomes a net importer of coal, starting in 2007. In terms of coal use, however, supply is not the major cause of insecurity. Other issues now stand at the forefront, such as bottlenecks in the transportation system, unprofitable mining with a very poor safety record, and, above all, the unprecedented local, national and global environmental impact of burning 2,5 billion tons per year.

Indeed, China is the largest emitter of sulphur dioxide and the second largest emitter of carbon dioxide in the world, next to the United States (although the United States still produces more greenhouse gases in per capita terms). Sixteen of the world's 20 most polluted cities are in China and estimates suggest that between 300,000 and 400,000[12] people a year die prematurely from respiratory diseases, giving rise to over 50,000 environmentally related protests in 2005. Factoring in the environmental costs have meant an economic loss valued, in 2004, at 511.8 billion yuan,[13] making environmental insecurity[14] the newest and one of the most pressing issues that China's leadership faces. Furthermore, environmental degradation is not a purely domestic issue. Already, crops in Japan and South Korea are withering from Chinese acid rain, which poisons a quarter of the Chinese

landmass. International experts estimate that as much as 40 per cent of the air pollution in Japan and South Korea originates from China.[15] Toxic dust from Chinese sandstorms, the result of grassland erosion and logging that have helped turn 27 per cent of the country into desert, now travels as far as US shores.

The questions of climate change and environmental protection are now a clear component of Beijing's official rhetoric. Already taken into account in the 10th Five-Year Plan (2000–2005), with few concrete results, the reduction of greenhouse gas emissions, energy efficiency and conservation have become some of the leading priorities in the roadmap set forth by the government for the years 2006–2011. Despite the scientific uncertainties surrounding the question,[16] there is no longer any doubt in China that the country's exponential economic growth is a major contributor to the degradation of the natural environment.[17] The question now is how to shift the development path: what are the new policy priorities set out by Beijing, and what are the main obstacles to their implementation? How is international pressure shaping China's response to climate change and what can Europe do to further promote this issue on the Chinese agenda?

New policy guidelines

Up until the late 1990s, China's energy security debate and concerns focused on supply security and oil security. But the electricity shortages that emerged throughout China, starting in 2002 and intensifying until 2005, showed that China's energy insecurity also had domestic origins and highlighted the need for systemic reforms after two decades of piecemeal restructuring of the energy sector as a whole. The shortages were a testimony to shortcomings at numerous levels of energy policy making and implementation. There were misjudged predictions on the rate of rise in consumption, the inability to deal with the subsequent surge in demand, friction between coal prices and electricity tariffs that exacerbated power shortages and reflected the struggles over power and coal producers' interests[18] and, finally, the poorly coordinated investment projects and weak legal framework regulating the investments in new power plants. Thus, these cyclical shortages affecting the Chinese economy also triggered a series of initiatives to reorganize the institutional framework and render it less fragmented and more coherent.[19]

Subsequently, due also to greater international attention to the threats of climate change, the focus in China shifted as well. The two most authoritative reports to be published on China's energy policy in 2004 identified the following main priorities for China's future energy policy[20]: first, placing greater emphasis on energy conservation and energy efficiency, especially in industry; second, integrating environmental priorities into energy policy; third, maintaining domestic primary energy resources as the main

source of energy supply whilst improving their management; fourth, increasing the use of hydroelectricity, renewable energy, nuclear energy and natural gas, in order to reduce reliance on coal; and finally, developing alternative transport fuels. These reports demonstrated that energy efficiency and energy conservation were now the central focus of China's energy policy and laid out specific targets and objectives and identified the key steps to be taken.

The overriding goal was to reduce energy intensity by 20 per cent between 2005 and 2010. Thus, the Energy Conservation Plan and subsequent documents have set targets for individual energy intensive industries such as electrical power generation, steel, non-ferrous metals, oil refining, petrochemicals, chemicals, cement and plate glass, as well providing proposals for technological, process or management improvements needed to achieve these targets. By 2010, standards for energy using appliances are to be raised to international levels, and the systems for policy, regulation and technical support for energy conservation are to be improved. Policies for the transport sector, for construction and for the management of space heating and cooling were also included. The Energy Conservation Plan identified a number of projects which should yield significant savings in the short and medium term, such as retrofitting industrial boilers, district co-generation, oil substitution in certain sectors, heating and lighting.

This shift in thinking is also manifest in the guidelines for energy policy within the framework of the 11th Five Year Guidelines (2006–2010)[21]: the focus is less on supply security but increasingly on demand-side measures aimed at making energy use in China more efficient, less polluting and more sustainable. The government has set forth new ambitious targets, is promulgating new laws (the *Renewable Energy Law* in 2005, and extensive work is being done towards the *Energy Law*) and regulations to rationalize and rein in energy use in the country. Moreover, the national plan to address the challenges posed by climate change, issued in May 2007[22] in response to the growing international criticism of China's rising levels of greenhouse gas emissions, also deals with the new challenges to energy security. Finally, all the key ideas relating to energy policy developed over the previous few years were encapsulated in a White Paper published in December 2007.[23]

The National Climate Change Program places great emphasis on ways to mitigate the impact of climate change on the country while also outlining adaptation measures. The vast majority of these policies are, however, domestic programmes to be implemented throughout the economy, particularly in the energy sector, and are aimed at helping the country meet its broader economic development strategies. While these policies should ultimately have the effect of reducing greenhouse gas emissions, few were designed specifically for this purpose. Mitigation efforts include energy efficiency and conservation, both in industry and by private consumers, and consist of: industrial policies to increase efficiency and encourage the

introduction of advanced technology; restructuring and eliminating small power plants and closing down inefficient industrial plants; greater public awareness of the climate change challenge as well as a series of policies that promote end-user efficiency in energy consumption and in transportation. Greater diversification of the energy mix is also on the list of priorities and measures include incentives to develop and use cleaner energy sources (renewable energies, nuclear and natural gas).

The key priorities in terms of adaptation include agriculture projects, protection of forestry and ecosystems and water conservation schemes.

Industrial policies for mitigation

The Energy Conservation Plan recognizes the need for change in the structure of the economy, and for greater use of economic incentives to encourage energy efficient behaviour. Complemented by the revised Energy Conservation Law that was issued in October 2007, energy conservation now also places emphasis on the behaviour and performance of the government itself. The law places an obligation on public institutions to put systems in place to manage energy more effectively and thus to set an example to the rest of the country. It goes further to call for the establishment of a system of assessment for local governments and for government officials which takes into account their contributions to energy conservation.

The Energy Conservation Plan also identifies the need to formulate a more coherent approach to transport policy and to enforce standards in the construction industry. During 2007, central government took a number of steps to curb wasteful construction practices of local governments. In April 2007, new approval procedures were issued for public buildings.[24] A Circular in November 2007 called for tighter control of new construction in order to constrain levels of investment.[25] The government is also seeking to reduce the amount of energy expended in existing buildings for heating and cooling, especially in public and government buildings.

Industry remains the key focus of energy conservation efforts in China, for this is where substantial gains can be made in both the short and the long term. Of greatest importance is the program for one thousand enterprises. These companies together account for about one third of the total national consumption of energy and nearly 50 per cent of industrial energy demand, and the aim is to save 100 million tonnes of coal equivalent by 2010. A range of financial and fiscal policies such as providing income tax deductions for enterprises making energy-saving products or reductions of VAT on specified energy-saving technologies, equipment or products has also been introduced. The program also encourages upgrading existing facilities to save energy, and support financing and showcasing key projects, widespread adoption of energy-saving technologies, penalties for enterprises which don't report the required information, which falsify information

or which fail to establish the required internal management systems and enhanced coordination between government departments.[26]

In addition to this 1000-Enterprise program, the government has drawn up a range of measures to address the challenges posed by the energy intensive industries. These include raising energy prices, establishing voluntary agreements, closing small and outdated plants, and a number of specific measures in the power sector. The central government has ordered local governments to charge higher electricity prices for energy intensive industries, especially metallurgy and cement. The extra revenues raised are to be passed by the grid companies to local finance departments to support economic restructuring and energy conservation and pollution abatement.[27]

The Cleaner Production Promotion Law of 2002 encourages enterprises to reach voluntary agreements with local governments, to further improve their energy and environmental performance once they have reached national and local standards. For example, in Shandong Province two steel companies which signed agreements in 2003 achieved their voluntary three-year targets by late 2006.[28]

Great potential exists for future energy savings in the transport sector through further raising fuel efficiency standards in vehicles, replacing old vehicles, changing the structure of the road fleet, by encouraging the use of diesel and hybrid cars, and by investing in urban transport systems.[29] But there is little the government can do in the short term. Indeed, efficiency of oil use is not yet as critical an issue as the efficiency of coal and electricity use, though it will become progressively more important as the use of oil in transport continues to grow.[30] As a gesture, the government has ordered that government departments use vehicles with higher fuel efficiency standards and that departmental vehicles not be available for private use by employees.[31]

In addition to these measures directed at specific industries and institutions, the government is taking steps to raise the level of awareness of the energy challenges facing the country. The media has been encouraged to assist the government in monitoring energy use and saving, and in raising public awareness. Officials, even at the most senior level, give high-profile speeches on the subject and television programmes urge citizens to find ways to save energy.[32] This message has been reinforced by turning off unnecessary street lighting in cities such as Beijing and Shanghai for short periods.

Efforts to mitigate the effect of climate change are on par with the national economic development programme and are therefore supported by ambitious initiatives and an emerging legal infrastructure. But China must also adapt to the inevitable changes in its climate which will impact on the country's agriculture, livestock, water resources, biodiversity, forestry, coastal zone development, human health and general economic prosperity. Thus, the government has also formulated a range of policies, programmes and laws

aimed at increasing the country's adaptive capacity. Improved early warning systems and stronger infrastructure will play an increasingly important role across many sectors. In the agricultural sector, adaptation programs focus on improving irrigation infrastructure, as well as raising overall crop yield and developing stress-resistant seed varieties. The livestock sector will also see the expansion of hearty livestock strains, along with more careful land management and enhanced measures to detect and prevent animal disease epidemics. Similarly, plans are underway to strengthen protections for forests and other critical ecosystems, aiming to minimize the spread of pests, diseases and forest fires. For coastal regions and other water resources, early warning and disaster alleviation systems make up part of a comprehensive plan to reduce the impacts of floods and droughts.[33]

Obstacles to implementation

The logic of the planning process in China requires that any quantitative national target be allocated downwards to progressively lower levels of government. Thus each province, municipality and autonomous region has been allocated a target for the reduction of energy intensity by 2010. Little information appears to be publicly available on the exact level of individual targets and on how these targets have been set, though it is likely that they were reached through bargaining and negotiation, by reference to both the previous 20 years of energy performance in the province and by reference to the 2001–2020 energy plan.[34]

These key policy and legal documents have been backed up by a significant increase in financial support. Investment in energy efficiency by central government is set to rise to RMB yuan 21.3 billion in 2007, which is 13 times the level in 2006.[35] The government is also trying to attract foreign investment to this end. In 2006, China became the second destination for venture capital funding of environmental technologies (after the United States but before Europe), attracting US$221.8 million out of a total of US$1.28 billion that same year.[36] The Global Environmental facility and the Asian Development Bank are also contributing massively to environmental cleanup projects in China. While the country is clearly benefiting from international funding and technology transfers, it is also increasingly willing to foot some of the bill. In addition to the above-mentioned investment, according to SEPA, total investment in environmental protection as a share of GDP rose from 0.5 per cent in 1998 to 1.4 per cent in 2003. Yet, the Asian Development Bank lamented in 2007 that it still hadn't reached 2 per cent. The Chinese Academy for Environmental Planning disclosed that the figure was 1.3 per cent in 2005, and that only half of the funding actually found its way to legitimate projects. Between 2001 and 2005, about 60 per cent of the environmental protection funds spent in urban areas went into the creation of parks, factory production lines, gas stations,

and sewage-treatment plants rather than into waste or wastewater treatment facilities.[37] In general, Beijing is only progressively coming to realize the need to internalize the costs of environmental damage and to pay for some of the solutions by itself.

But how can the Chinese leadership deal with environmental issues within its borders, when environmental protection is still regarded as the duty of the rich?[38] Pollution taxes now exist in China, but for many factories it is cheaper to pay fines than to clean up pollution. Also, energy commodity prices do not internalize environmental costs: with current state-set energy prices, there are no real incentives to do this. Furthermore, restrictions on debt financing and foreign equity investment, unfavourable tax policies, and unclear regulations on clean development mechanisms all discourage foreign investment in clean energy in China.[39] Who will bear the brunt of financing clean technologies in China has now become a major domestic and international issue.

External pressures and participation in international forums

Several other initiatives have also been launched in order to promote the introduction of renewable energy, and to facilitate trade in carbon emissions rights and the Clean Development Mechanism (CDM) established by the Kyoto Protocol, for which 300 projects were reportedly launched by January 2007. In the fight against atmospheric pollution generated by the use of coal, the NDRC is planning to gradually shut down small thermal power stations in the country. China relies on these thermal power stations for 82 per cent of its electricity, but the majority of them are inefficient and polluting;[40] furthermore, a large number of them were built without the approval of and often in contradiction with the priorities enunciated by central government. This approach of the NDRC forms part of a series of initiatives formulated in January 2007 by central government in order to reduce the country's coal consumption by 2010.

At the national level, the fight for environmental protection has been launched both in rhetoric and in practice. China is creating funds to finance 'green' projects, to encourage research and development of new technologies, to reduce the emission of pollutants, to progressively organize a trading system in emission permits[41] and to help increase the country's arable land area. Beijing has also strengthened the legal establishment with regulations concerning the use of dangerous materials by industry and the Renewable Energy Law (2005), which should allow an increase in the share of renewable energy in the country's energy consumption.

China is already the leading renewable energy producer in the world in terms of installed generating capacity, with the largest hydroelectric fleet and fifth largest wind power fleet in the world. China plans to almost double the proportion of renewable energy it uses from 8 per cent in 2006

to 15 per cent in 2020, with concrete targets for hydro power capacity at 300 gigawatts (GW), bioenergy power at 30 GW, wind power at 30 GW, and solar power at 1.8 GW.[42] China ranked second for the absolute dollar amount invested in renewable energy in 2007 with approximately US$12 billion, trailing the leader Germany, which invested US$14 billion.

China is already a leading manufacturer of solar photovoltaic technology, with 820 megawatts (MW) of production by the end of 2007, second only to Japan.[43] The country is set to capitalize on this growing export opportunity as the world shifts to a low-carbon future. China is also competing for or taking the lead in the production of other critical renewable and low-carbon technologies such as solar water heaters (holding 60 per cent of the global market), energy efficient home appliances and rechargeable batteries.[44]

China has also succeeded in scaling up a range of low-carbon transport technologies; over 21 million electric bicycles and 1.64 million energy efficient compact cars were sold in 2007,[45] and domestic hybrid and electric vehicle technologies are progressing rapidly.

A low-carbon wave has also swept over China with efforts to create low-carbon zones and eco-cities, funded jointly by Chinese and foreign sources.[46]

Despite the efforts to raise awareness, the public campaigns and the amended laws, China will have trouble reaching the goals set by the 11th Five-Year Plan. The goal of reducing energy intensity by 20 per cent already seems impossible to achieve,[47] and central government is finding it difficult to impose its priorities on all of the provinces.

It is true that such a radical transformation of the structure and model of economic growth may well be difficult to implement so fast in China, and there is a high degree of variability among provinces: whereas the richer cities and provinces like Beijing, Zhejiang and Shanghai are meeting their targets, other poorer provinces such as Guizhou, Yunnan and Qinghai are not faring as well. Beyond the redefinition of priorities, numerous fundamental obstacles prevent progress to more efficient energy consumption and to the adoption of energy-saving measures that can be applied on a national scale, particularly the absence of a legal tradition and market mechanisms.[48] As long as the price of energy products remains controlled – and maintained artificially low – by Beijing, it will be difficult to introduce new sources of energy. Similarly, the environmental legislation in China remains incomplete and difficult to apply (as is the case, for example, with the Renewable Energy Law),[49] few regulations and standards have been formulated and the current legal body of laws seems more like a general roadmap than operative laws.

Civil participation, despite the activity of the NGOs, remains limited, and the protection of the environment is perceived as a problem of rich countries, or in the case of China, of well-off provinces.[50] It is nevertheless still true that the environmental protection initiatives are political and administrative, favouring a rationale of political campaigns. Because of that fact,

at the local level, the priority of economic development at all costs remains *de rigueur*, even more so as the cost of incompliance with environmental objectives remains very low for the public actors.[51]

Finally, even within the leadership, the commitment to environmental protection remains nuanced; while environmental protection and participation in international mechanisms are priorities for Beijing, their importance should not be overestimated. The pursuit of the country's economic development cannot be allowed to suffer from it.

From the first negotiations on the United Nations Framework Convention on Climate Change, Beijing has highlighted certain principles, defended more or less virulently over the years,[52] perhaps the most notable of which is the principle of sovereignty and the right of the country to utilize its natural resources for its development without outside interference.[53] This approach makes it difficult not only to adopt constraining commitments concerning the methods of exploiting natural resources and emissions, but, implicitly, also the work of reporting and of evaluating progress is made difficult, especially given that the role of the NGOs, which are supposed to fulfil this function, is limited.

Secondly, economic growth continues to be a top priority of the Chinese government. Although Beijing affirms the importance of moderating the natural and human costs of the current growth model and rate, China has preferred to let other international actors contribute more to this public good so that it can extract the benefits while making a minimal contribution. This approach is also justified by the decision-makers with the affirmation that the degradation of the global environment is primarily due to the industrialized countries which exploited natural resources extensively during their economic development. If the 'polluter pays', it would thus be up to the developed world to bear the majority of the costs and clearly to take the lead in any commitments undertaken.[54] On this point, the Chinese position has been constant ever since the first negotiations in 1992, and the American refusal to ratify the Kyoto Protocol in 2005 has indeed reinforced it, as it was perceived as a manifestation of the weakness of the West's commitment.

In terms of image, this position, which has been more extensively adopted by the Group of 77 (G77), allows China to promote its image as a champion of the developing world. While China is rapidly joining the ranks of polluters, and should thus bear the cost of that, Chinese diplomacy draws a distinction between 'survival emissions' and 'luxury emissions'.[55]

In sum, the role of this environmental diplomacy has to date been to avoid high-cost commitments, in particular any imposition of emission quotas, targets and ceilings, all the while providing more signs of greater activity as far as that is possible. Between 1990 and 1994, China hosted at least 18 international conferences on the subject and signed and ratified all the international agreements on the environment.

Conditional participation

China is indeed active in the international forums on climate change, all the more so as any arrangement for a post-Kyoto architecture will inevitably place more constraints on developing countries. How to reconcile, then, the image of a responsible country with its hesitation to deliver on concrete targets for the reduction of emissions?

China will be reluctant to accept emission quotas – it has so far refused to adhere to them – unless the calculation of the level of emissions were based on a per capita calculation, given that its per capita emissions are low, and unless the emission targets were calculated as a function of future growth and development prospects.[56]

The negotiation process promises to be long and complex; China will perhaps moderate its positions but will be highly reluctant to abandon its underlying positions, in particular in view of its image within the G77. The imposition of emission quotas and any concerted action aimed at changing the structures and the modes of the Chinese economic system may become a major point of contention. However, changing the level of quotas could be acceptable for China, with a transition from an initial period of non-binding targets to a higher and more solid commitment in a second phase. China would, no doubt, like to limit the international agreements to a regime that would facilitate concrete cooperation as well as funds intended to promote research and development in the field of new energy sources and for the introduction of renewable energy. But in the absence of other alternatives, and not wishing to withdraw from the negotiations on the Kyoto Protocol, China would make concessions, while attempting to reduce these to a minimum. A progressive approach could thus moderate Chinese reticence, on condition that the United States also takes part, and that the new architecture allows a progressive and joint elaboration of more long-term targets.[57]

Where does Europe fit in?

In the climate change debate, Europe should and can assert its leadership role. Already heavily committed to promoting a global climate deal, the prospects for getting China on board are numerous.

Initiatives such as eco-cities, funded by Singapore and the United Kingdom, are important not only in promoting a low-carbon economy in China, but also in helping China become a global leader in this area. By helping finance such initiatives and providing suitable technological assistance, China can be encouraged not only to switch development paths, but also to export a new form of growth. While this is not only politically appealing, it makes good financial sense to both Chinese and foreign businesses, and at the transitional stage of China's economic growth, now is the time to encourage such a shift. The question of technology transfers and

IPR protection still remain thorny issues that should be discussed and surmounted so that China's shift to a global leader and exporter of low-carbon development can be aided by the EU.

Notes

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56. *Ibid*. The emissions for the countries in Annexe B are calculated on the basis of past levels. With the standard of living in the developing nations still low, the emission quotas should, according to China, take into account the pursuit of economic development and future needs, which remain, however, difficult to evaluate.
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18

An Analysis of Energy Utilization Efficiency in China[1]

Shi Dan

Introduction

This chapters aims to analyse China's energy utilization efficiency and its variable trend, based on a constant price calculating methodology. It also analyses the causes of energy utilization deficiency from various aspects including supply and consumption, industrial structure and industrial energy utilization efficiency, direct and indirect import and export of energy and state systems and policies. The results show that in recent years the energy supply in China has been declining but its consumption continues to rise; the industrial structure has a negative effect on the efficiency of energy utilization; the share of the industrial sector and its energy utilization play a decisive role in the improvement of energy utilization efficiency in China; China's export of high energy-consuming products and its low position in international labour division produce an unfavourable effect on its energy efficiency utilization. A weakening energy policy and the management system adopted by China have hampered any improvement in energy efficiency. This chapter also seeks to make an international comparison of energy efficiency worldwide. When comparing China's energy utilization efficiency with other nations, there is great variance in the results due to the use of different calculating methods. However, there is no doubt that China has made a big step in improving its energy efficiency and the country is narrowing the gap in this field when compared to international standards. Finally, the chapter proposes measures to improve energy utilization efficiency, based on an acceleration of technological innovation, the conservation of a reasonable growth rate in the national economy, the optimization of the industrial structure and an improvement in the energy price mechanism.

Energy is an essential element in the existence and development of human society. The exploration and consumption of fossil fuels on a large scale have acted as a driving force in socioeconomic development. However, as these fuels come from non-renewable sources and their extraction and consumption cause huge ecological destruction, minimizing fossil fuel consumption is

a prime objective in achieving a sustainable social economy. Before carrying out a large-scale replacement of renewable energy for fossil fuel, the fundamental solution for this problem is to increase energy utilization efficiency. From various aspects and angles, this article attempts to analyse and compare energy utilization efficiency in China, in order to identify the key factors that affect its present state as well as to explore ways to improve.

The variation of energy utilization efficiency and its international comparison[2]

There is no specific meaning in the definition of *energy utilization efficiency*. A ratio between input and output is commonly used in both the social science and natural science domains for calculating energy utilization efficiency, but varied indexes are often adopted. For example, in scientific terms, energy utilization efficiency is reflected by the thermal efficiency or by the ratio of active and reactive power, whereas, energy utilization efficiency in economic terms is reflected by the economic outcome per investment unit. The former area of study focuses on the extent of the effect of the invested energy; the latter focuses on the extent of the economic return the invested energy produces. There is a certain difference between the two; the former is a means whereas the latter is a purpose. In this chapter, energy utilization efficiency refers to the ratio between the gross domestic economic output and the gross energy consumption, which has a reverse relation with energy consumption intensity. For easy calculation, energy consumption intensity will sometimes be used.

China's energy consumption and its international comparison since the country's reform and opening-up policy

At the beginning of the reforms in 1978, the aggregate energy consumption was 0.571 billion tons of standard coal, among which coal accounted for 70.7 per cent of total energy consumption. In 2006, the energy consumption reached 2.233 billion tons of coal, an increase of 2.91 times compared with the 1980 consumption figures, amounting to 68.9 per cent of total energy consumption. Figure 18.1 shows an increase in energy consumption from 1978 to 2006. Before 1999, energy consumption increased steadily at a rate of between 5 per cent and 8 per cent. Although the increase varied from year to year, it remained relatively stable. Hence, the years of 2000 to 2005 saw the biggest increase in energy consumption since the country's reform and opening-up policy. This rate of increase reached 60 per cent, which implied an increase of nearly 1 billion tons of standard coal. Taken across the whole range of fuels, during the 1980 to 2005 period, oil consumption increased by 2.7 times; coal consumption by 2.55 times and electricity consumption by up to 7.8 times.

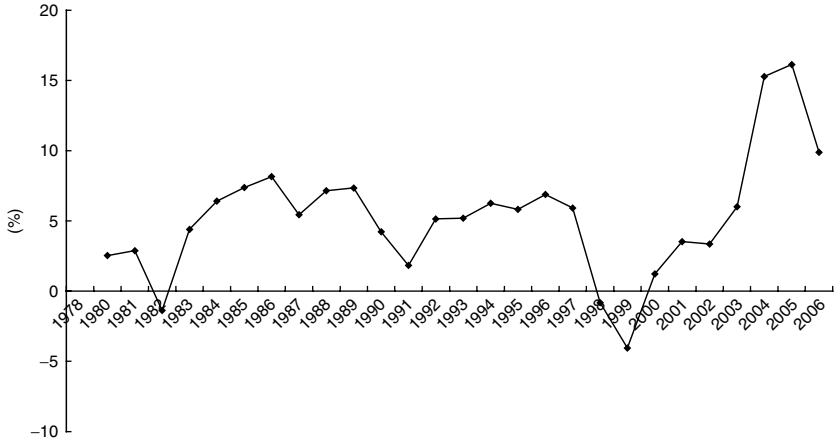

Figure 18.1 Changes in energy consumption in China (from 1980 to 2006)
Source: China Statistics Yearbook.

From a total energy consumption aspect, China is ranked second behind the United States. In 2005, US energy consumption represented 22.2 per cent of total world consumption, China's share was 14.7 per cent. Energy consumption from Japan, Korea and India only amounted to 5 per cent, 2.1 per cent and 3.7 per cent respectively. With regard to the speed of increased energy consumption, China was slower than that of the newly developed countries, such as Korea and Singapore, but was faster than that of the developed countries and regions, for example the United States. From 1980 to 2005, the energy consumption of the United States, Japan and the OECD increased by 29 per cent, 52 per cent and 37 per cent, while in the newly developed countries and regions, such as Korea, Singapore and Taiwan, the increase was 4.5 times, 7 times and 2.6 times respectively. Energy consumption in India increased by 3.1 times. However, taking the figures for the increase in energy consumption on a per capita basis, the discrepancy in energy consumption increase among nations is less than the total increased energy consumption. From 1990 to 2002, per capita energy consumption in China increased by 24 per cent, India 19 per cent, Singapore 39 per cent, Korea 98 per cent, United States 3 per cent, Japan 12 per cent, the United Kingdom 4 per cent, Italy 11 per cent, the Netherlands 9 per cent, France 12 per cent, with only Germany seeing a decrease of 6 per cent.

The variation and comparison of China's energy utilization efficiency

As the gross domestic product is calculated in price form, the historic comparison of energy utilization efficiency needs to be made without having

to take into consideration the influence of variable prices. In this chapter, firstly, the reduction index of GDP was calculated, and then an unchangeable GDP for each year, based on the 1978 price, was worked out. After that, the energy utilization efficiency from 1978–2006 was calculated at a constant price. Figure 18.2 shows the trend of such a change. From 1978 to 2003, energy utilization efficiency rose perpendicularly. In 2003, it reached its highest point at ¥21,554,000/per ton of standard coal, 2.38 times the 1978 value. However, after 2003, energy utilization efficiency began to decline. Energy utilization efficiency in 2006 was ¥19,566,200/per ton of standard coal, showing a 9.2 per cent reduction.

There are two methods in the international comparison of energy utilization efficiency: one is calculated at the exchange rate (refer to Figure 18.3); the other is at the state-set price of purchasing power (refer to Figure 18.4). By using the exchange rate as a calculating method, the energy utilization efficiency of China is the lowest in the world. In 2003, the energy utilization efficiency of the United States was 3.19 times that of China's, Japan was 0.36 times, Korea 2.02 times, India 1.43 times, Russia 0.36 times. By using the state-set price of purchasing power as a calculating method, China's energy utilization efficiency is in the leading range. In 2003, the energy utilization efficiency of the United States was 0.72 times that of China's, Japan 1.05 times, Korea 0.69 times, India 1.73 times and Russia 0.33 times. Because of the difference between the two methods, China's energy consumption intensity is probably overestimated when it is calculated at an exchange rate basis and is possibly underestimated when it is based on the state-set price of purchasing power. However, the fact that China's energy

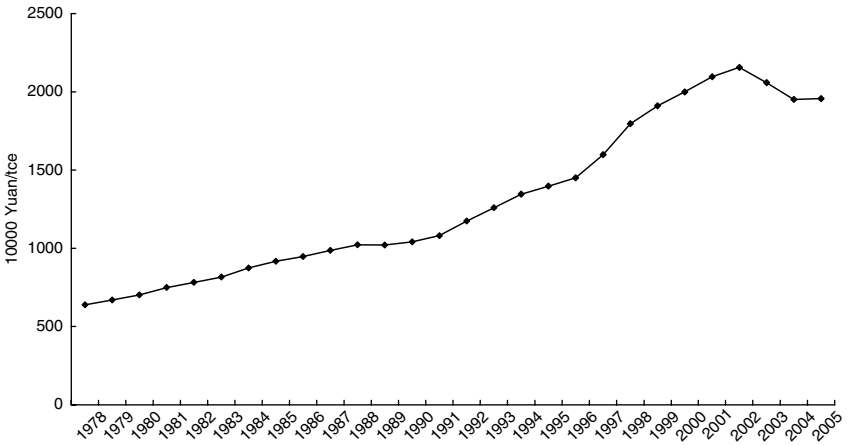

Figure 18.2 The trend of energy utilization efficiency calculated at a constant price
Source: China Statistics Yearbook.

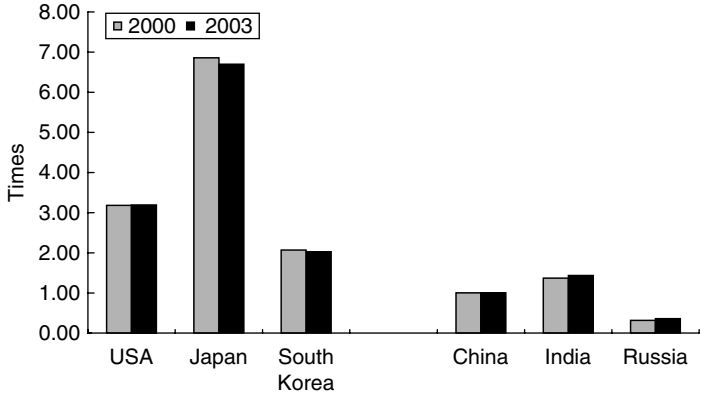

Figure 18.3 Energy utilization efficiency based on exchange rate calculating method (take China as 1)

Source: China Statistics Yearbook.

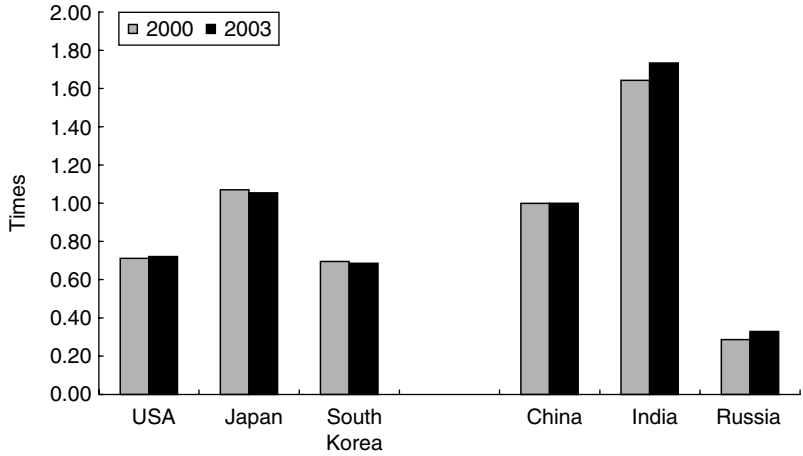

Figure 18.4 Energy utilization efficiency based on the state-set price of purchasing power as a calculating method (take China as 1)

Source: China Statistics Yearbook.

utilization efficiency has greatly improved is beyond contention. According to World Bank statistics, from 1990–2002, China's energy utilization efficiency rose by 121 per cent, ranking it number one in the world. The United States, Germany and the United Kingdom's efficiency increased by 17.9 per cent, 27.1 per cent and 19 per cent respectively. India's increased by 26.5 per cent whereas Korea and Japan dropped by 8.9 per cent and 1.2 per cent.

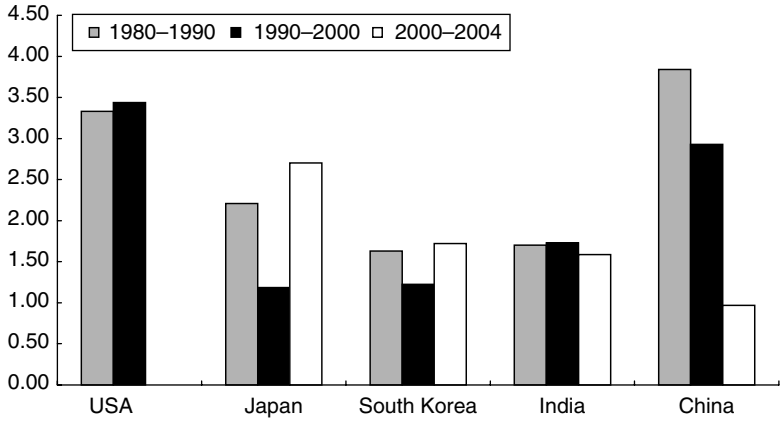

Figure 18.5 International comparison of the energy utilization elastic efficiency
Source: China Statistics Yearbook.

When the effects of the energy consumption index are removed, and if doing an analysis on energy utilization efficiency in China since 1980 only, in order to achieve a 1 per cent increase in the economic growth rate an equal increase in energy consumption is remarked. It is inverted for the elastic coefficient of energy consumption also referred to as the energy utilization efficiency elastic coefficient in this article. The elastic coefficient of energy utilization efficiency in China, from 1980–1990, was higher than both of the developed countries Japan and Korea, and similar to developing countries such as India. The coefficient in China remained level pegging with that of the United States for the period of 1990–2000. However, a sharp decrease occurred in China during the period 2000 to 2005, which was much lower than that of the United States (refer to Figure 18.5). The reasons for such a change will be analysed in the next section.

A comparison of the technical efficiency index

The main elements which affect energy utilization efficiency are energy production technology and utilization technology. Since the implementation of reforms and the opening-up policy in China, advanced technology was adopted leading to a marked improvement in the standard coal consumption level for power generation and electricity supply. The standard coal consumption for power generation dropped from 413 g/kWh in 1980 to 342 g/kWh in 2002. The standard coal consumption for electricity supply dropped from 448 g/kWh in 1980 to 370 g/kWh in 2005. The electricity utilization rate for power plants decreased from 6.44 per cent in 1980 to 5.87 per cent in 2005. The distribution loss rate was reduced from 8.93 per cent

in 1980 to 7.52 per cent in 2005. Compared with advanced international levels, the gaps in coal consumption in power generation and in power supply are narrowing. In 1980, China's coal generated power was 90.3 g/kWh higher than that of Japan, whereas in 2001 the difference between the two was reduced to 56 g/kWh. As for the coal consumption in supplying power, the difference between these two counties was 110 g/kWh in 1980, while in 2005 the difference was reduced to 58 g/kWh. The differences of electricity consumption and distribution loss rate were also decreasing. However, there was only limited improvement in China's efficiency in energy processing and conversion as a whole. According to the data from the National Statistics Department, the total efficiency of energy processing and conversion for China in 2004 was only 0.74 per cent higher than that in 1983. Nevertheless, in terms of types of energy, processing and conversion efficiency on electricity generation and coking coal preparation were greatly improved whereas that for oil refinery declined. In 2005, China's coal consumption for electricity supply was 374 g/kWh, which was 58g higher than advanced international levels. In other words, it was the equivalent in terms of consumption to 0.117 billion tons of coal in more than a year. Regarding the transmission loss rate, China's rate is 7.18 per cent, which is 2 per cent to 3 per cent higher than the advanced international level. It is equal to 45 billion kWh of waste per year, which is equivalent to a year's consumption for a given province in central China. The comprehensive coal recovery rate is 33 per cent for a large-scale coal mine whereas it is 10 per cent to 15 per cent in a small-scale mine. The oil recovery rate is only 27 per cent, representing a serious loss.

Both technology and infrastructure have a direct impact on final energy utilization efficiency. Outdated technology and infrastructure result in a low rate of energy utilization efficiency, which is the main reason for China's efficiency disadvantage compared to developed nations. For example, in China, on average, the capacity of a generating unit is 60 MW, whereas in Japan, all units below 100 MW have been discarded in public power plants. Regarding coal consumption, 70 g/kWh more can be saved from a 600 MW unit than from a 100 MW one. The average efficiency rate of an industrial boiler in China ranges from 60 per cent to 65 per cent, compared to 80 per cent to 85 per cent at advanced international levels. The average efficiency for a small and medium electro motor in China is 87 per cent compared to 92 per cent at international levels. The average fuel consumption of a goods vehicle is 7.55 L/100km compared to the foreign level of 3.4 L/100km. The continuous casting rate in China's steel industry was 82.5 per cent in 2000 whereas 98 per cent was achieved by Japan. The synthetic ammonia in China is composed mainly of coal and coke, whereas in other nations gas is the main component at a proportion of up to 80–90 per cent. On average, for the production of a ton of synthetic ammonia 1801 kgce is consumed, which is 830 kgce more than that of the foreign levels.

Diaphragm caustic soda and soda made through the ion-exchange membrane method consumes up to 78 per cent and 22 per cent of energy in the production process in China. The energy consumption of the latter is 30 per cent less than that of the former.

In 2000, China's overall energy consumption on diaphragm-membrane caustic soda was 1563 kgce per ton, which was 25 per cent more than the advanced international level. Regarding the energy consumption of cement, the difference ranges from 15 per cent to 65 per cent depending on the

Table 18.1 A comparison of energy consumption on typical products between China and those in the advanced nations, 1990–2005

	China			
Products	**1990**	**2000**	**2005**	**Foreign level**
Coal consumption in thermal power supply (kgce/kwh)	427	392	370	312
Comparable energy consumption per ton of steel production (large and medium-sized enterprises, kgce/t)	997	784	714	610
Comprehensive energy consumption of cement (kgce/t)	201.1	181.0	153	127.3
Comprehensive energy consumption of plate glass (kgce/wt.case)	34.8	25	22	15
Energy consumption of electrolysis aluminium alternating current (kgce/t)	16223	15480	14622	14100
Comprehensive energy consumption in crude oil processing (kgce/t)	102.5	118.4	104.3	73
Comprehensive energy consumption of ethylene (kgce/t)	1580	1125	986	629
Comprehensive energy consumption of synthetic ammonia (large scale) (kgce/t)	1343	1327	1314	970
Comprehensive energy consumption of diaphragm – membrane caustic soda	1660	1563	1460	1275
Comprehensive energy consumption of soda ash (ammonia soda process) (kgce/t)	560	467	450	350
Comprehensive energy consumption of calcium carbide(kgce/t)	2212	2190	2186	1800
Comprehensive energy consumption of railway transportation (kgce/t per km)	84.2	72.5	76.3	84.3

Source: Wang, Qing Yi and others (2006) *Manual on Energy Conservation 2006* (Energy Conservation and Environment Protection magazine agency).[3]

variation in pit stoves. In general, China's energy consumption for cement is 23.6 per cent higher than the foreign level. The energy consumption per ton of iron is 15.1 per cent higher and the fuel consumption of heavy goods vehicles is double that of the advanced international level.

However, it is evident that advanced technology has played an important role in the improvement of energy utilization efficiency since China's reforms and opening-up policies. Taking as an example the key enterprises in China's iron and steel industry, the comparable energy consumption per ton of steel production dropped from 1201 kg/ton in 1980 to 726 kg/ton in 2003, due to technical improvements on the continuous casting rate and surplus heat recovery. In the cement industry, with the technological adoption of the new dry process rotary kilns in large and medium-sized enterprises, the comprehensive energy consumption of cement has been reduced from 218.8 kgce/t in 1980 to 181 kgce/t in 2003. In China's railway department, freight transport energy consumption decreased from 147.4 kgce/t per kilometre in 1980 to 72.5 kgce/t in 2000. This was because steam locomotives were superseded by advanced diesel units. The ethylene energy consumption decreased from 2013 kgce/t in 1980 to 889.8 kgce/t in 2003 because of the implementation of advanced production equipment. Table 18.1 shows a comparison of the trend of China's energy consumption in some typical products with those of the foreign level.

Analysing the effects of macro factors on the decrease of China's energy utilization efficiency

The effects of a fluctuation in energy supply efficiency and energy consumption efficiency

Based on energy flow, some scholars in China have used a physics analysis method to compute the quantum efficiencies of these three stages: energy exploration and exploitation, processing and transforming and final consumption. This method has the merit of identifying the key stage for energy loss without considering a fluctuation of the economic factors such as the exchange rate and prices. However, this method is based on the studies of the efficiency of energy-consuming equipment, involving variation in the quantity of equipment. It is not possible to sum up directly the equipment's energy efficiency and therefore a representative sample is needed. Hence, this method also has its limitations in carrying out a macro analysis and international comparison of the energy efficiency. In this chapter, the economy is divided into two systems: energy production and energy consumption. The energy utilization efficiency is divided into energy supply efficiency and energy consumption efficiency. The energy supply efficiency is the input and output efficiency produced by the energy production departments. The output of the energy production departments refers to the total final energy consumption provided to its departments. The input

refers to the consumption of primary energy. The energy supply efficiency is a ratio between total final energy consumption and total consumption of the primary energy. Energy consumption efficiency refers to the utilization ratio of energy consumption departments, presented by a ratio of total national economic output and the final energy consumption.

Energy Utilization Efficiency
= National Economic Output/Total Energy Consumption
= Energy Supply Efficiency × Energy Consumption Efficiency
Energy Supply Efficiency
= Final Energy Consumption/Total Energy Consumption

Energy Consumption Efficiency = GDP/Total Final Energy Consumption
Total Final Energy Consumption = Consumption of Primary Energy
– Total Loss on Energy Conversion, Processing, Storage & Transportation.

It should be explained that the energy supply efficiency and the energy process and conversion efficiency cited in the *State Statistics Yearbook* are not the same. The former takes the consumption of primary energy as a denominator, while the latter takes the total process input as a denominator. Besides, the energy supply efficiency includes the loss on storage and transportation but the efficiency on process and conversion excludes such loss. Therefore, the results for the two are different. Apart from a common effect imposed by energy production technology, energy supply efficiency is still affected by three other factors:

First is the ratio on energy process and conversion. Since China implemented its reform and opening-up policy, the volume of final energy converted directly from unprocessed energy has been reduced. Taking the coal industry as an example, in 1980, 64 per cent of total coal consumption was used for final consumption without being processed. In 1990, this proportion dropped to 57 per cent, and to 29 per cent in 2005.

The second is the ratio of net import/export on energy. The author believes that, importing energy from overseas could save the energy consumption necessary for production or the energy loss during process and conversion, thus improving efficiency in energy supply. Statistics showed that, in 2005, the energy consumption on the exploration and exploitation of coal, petroleum and natural gas represented 4.8 per cent of China's total energy consumption. Coal for self-consumption in coal mining accounted for 0.8 per cent of raw coal output and electricity counted at 5.07 per cent of total electricity output. Self-consumption of gas and energy loss in the natural gas fields accounted for 3 per cent of its output. Without considering other factors, an increase in energy imports will reduce the total loss on energy process and conversion, and will positively improve energy supply efficiency in China. To increase energy imports is in fact to reduce the degree of energy self-sufficiency. Among energy net importers, China is the one with a comparatively high degree of

energy self-sufficiency. In 2003, the degree of energy self-sufficiency for the United States was 72 per cent, 16 per cent for Japan, 18 per cent for South Korea, 82 per cent for India and 98 per cent for China.

The third is the energy structure. Compared to petroleum and natural gas, coal has a low calorific energy value. The use of a big proportion of coal will inevitably reduce energy supply efficiency. From 1955 to 1975, the energy structure in Japan was changed from coal-oriented to petroleum-oriented, resulting in a 10 per cent increase in its end use energy efficiency. China is one of the few countries to still depend so largely on coal. From 1980 to 2002, the proportion of China's coal consumption dropped from 72 per cent to 66.3 per cent. The proportion of petroleum, natural gas, water and electricity, all of which are high heat value energies, rose from 28 per cent in 1980 to 33.7 per cent. This reduction in the use of coal had a definite impact on the improvement of energy utilization efficiency. However, from 2003, coal consumption climbed again to over 68 per cent and reached a rate of 68.9 per cent in 2005. At the same time, the structure of primary energy in America was comprised of 24.6 per cent coal and 64.8 per cent petroleum and natural gas; for Japan, 23 per cent coal and 60.5 per cent petroleum and natural gas; for South Korea, 24.4 per cent coal and 47 per cent petroleum and natural gas; for India, 55 per cent coal and 38.4 per cent petroleum and natural gas respectively.

Based on the statistics recorded by IEA, from 2000 to 2003, energy supply efficiency in China had decreased from 57 per cent to 54.4 per cent, which was a reduction of 2.6 per cent (see Figure 18.6). In contrast, energy supply efficiency ranged between 66 per cent and 69 per cent in the United States, Japan and Korea. Supply efficiency was higher in 2003 with respect to that of the year 2000. In addition, from an energy supply efficiency level, China is 10 per cent lower than the above-mentioned countries.

Energy consumption efficiency refers to the economy's efficiency, resulting from end use energy consumption. Figure 18.7 and Figure 18.8 provide a comparison between China's energy consumption efficiency and other countries and regions based on an exchange rate calculating method. They show a slight increase in China's energy consumption efficiency from 2000 to 2003 but with a relatively lower rate of increase when compared to that of the other nations. China's energy consumption efficiency was ranked low in the world chart. However, based on purchasing power parity, China's energy consumption efficiency was higher than the average of that of the United States, Japan and other OECD nations. From 2000 to 2003, the degree to which it improved brought it close to that of other nations. No matter which calculating methods are used (the methods of an exchange rate basis or purchasing power parity basis); China's energy consumption efficiency has been increasing. The degree to which it increased was higher than the average increase of the developed nations, such as the United States, Japan and other OECD countries, but lower than the average for India, Russia and other non-OECD nations.

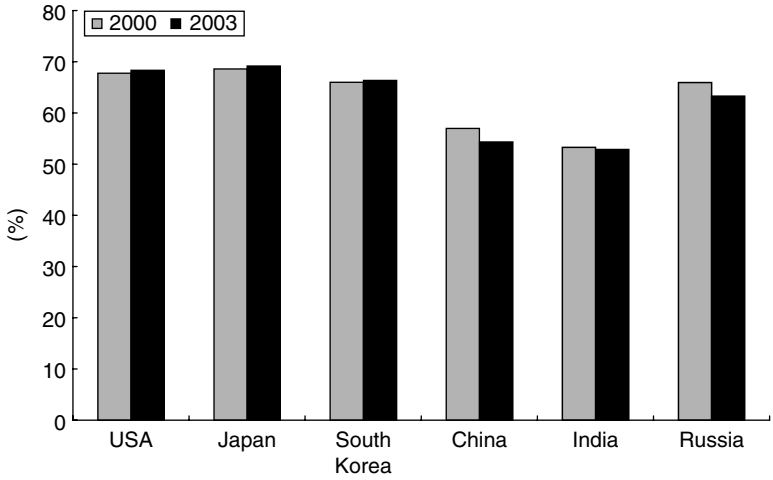

Figure 18.6 Comparison of energy supply efficiency

Source: Based on *BP World Energy Statistics 2006* and IEA STATISTICS (Review and Appendices of *China Energy Statistics Yearbook*, 2005).

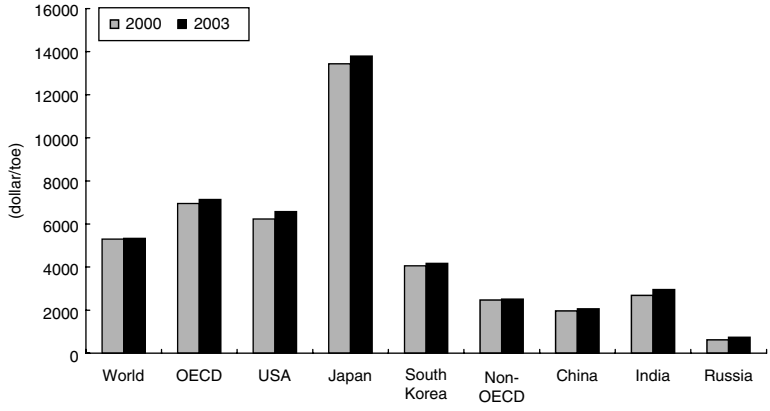

Figure 18.7 International comparison of energy consumption efficiency (exchange rate basis)

Source: Data organised by the author based on data from Appendices in *China Energy Statistics Yearbook,* 2005.

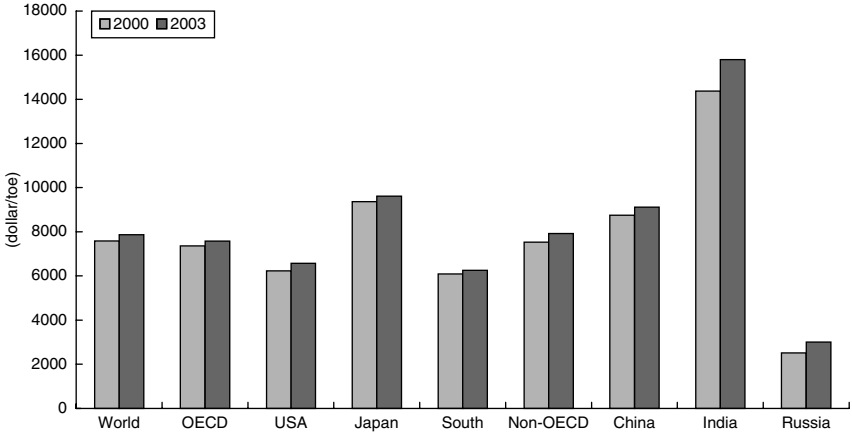

Figure 18.8 International comparison of energy consumption efficiency (purchasing power parity basis)

Source: Data organized by the author based on data from Appendices in *China Energy Statistics Yearbook*, 2005.

The influence of industrial structure and industrial energy consumption intensity

The reverse of energy utilization efficiency is industrial energy consumption intensity. For the convenience of analysis, this article analyses the effect of a change in industrial structure over its energy efficiency by means of the formula for energy consumption intensity. Herein, national economic energy consumption intensity is supposed to be *I*, therefore:

$$I = \sum I_J S_J \tag{1}$$

In formula (1), the left side is the energy consumption per GDP unit, in other words, is energy consumption intensity, which was represented in *I*. The right side I_J represents the energy consumption of industries. S_J is the production ratio for all industries, referring to the industrial structure. From formula (1), one can see that a change in industrial structure S and a change in industrial energy consumption intensity would have an effect on national economic energy consumption intensity. The degree of the effect can be seen from formula (2):

$$\frac{\sum I_{J1}S_{J1} - \sum I_{J0}S_{J0}}{\sum I_{J0}S_{J0}} = \frac{\sum I_{J1}S_{J0} - \sum I_{J0}S_{J0}}{\sum I_{J0}S_{J0}} + \frac{\sum I_{J1}S_{J1} - \sum I_{J1}S_{J0}}{\sum I_{J0}S_{J0}} \tag{2}$$

In formula (2), the first item of the right side is the contribution of a change in energy consumption intensity in all industries against a change in

national economic energy consumption intensity. The second item represents the contribution of a change in industrial structure against a change in national economic energy consumption. Industrial energy consumption intensity is calculated at a constant price in this paper and was compared in the second phase. The first phase is a comparison between the years 1995 and 2000 and the other one is between the years 2000 and 2005.

From 1995 to 2000, industrial energy consumption intensity, at a constant price, showed variant degrees of decrease, among which the decrease in secondary industry was the biggest. This can be presented in the decrease from 8.7 tce per 10,000 RMB to 5.3 tce per 10,000 RMB. The change in the industrial structure was 3 per cent down for the ratio of primary industry and 3.2 per cent up for secondary industry. The ratio for the construction industry declined slightly while tertiary industry remained stable. Compared with 1995, domestic energy consumption intensity decreased by 31.4 per cent in 2000. Owing to a decline in industrial energy consumption intensity, total energy consumption intensity decreased by 32.6 per cent and was 1.17 per cent up following a change in industrial structure. The decrease in industrial energy consumption intensity played a bigger role than the change of the industrial structure in relation to energy consumption intensity growth. The contribution of industrial energy consumption intensity and of its change ratio accounted for 83 per cent of total national economic energy consumption intensity as a whole.

From 2000 to 2005, the changes in industrial structure were: 2 per cent down for agriculture and 2 per cent up for secondary industry. The ratios of the construction industry and tertiary industry remained unchanged. Regarding industrial energy consumption intensity, that of primary industry and the construction industry rose slightly. A small decrease occurred in secondary and tertiary industries, where the manufacturing industry had only a 0.07 tce per 10,000 RMB reduction. From 2000 to 2005, national economic energy consumption rose by 0.2 per cent. A decline in industrial energy consumption intensity led to a decrease of 1.2 per cent in energy consumption intensity. A shift in structure triggered a 1.4 per cent increase in energy consumption intensity. Hence, the effect of a structural change was bigger than that of industrial energy consumption intensity. With a 0.2 per cent increase in national economic energy consumption intensity, secondary industry had a contribution of 91.5 per cent.

To sum up, a variation in both the ratio of the industry proportion and energy consumption intensity has a decisive impact on national economic energy consumption intensity as a whole. In 2005, the energy consumption intensity of secondary industry was 2.25 times more than that of primary industry; 2.69 times more than that of the construction industry; 1.32 times more than that of tertiary industry; 1.14 times more than that of total national economic energy consumption intensity. Before 2000, a rapid decrease in industrial energy consumption intensity is probably mainly

responsible for the decline in China's energy consumption intensity. After 2000, a slow decline in industrial energy consumption intensity and an increase in industrial proportion ratio enhanced the input for an increase in national economic energy consumption intensity.

China is among a minority of countries that take their secondary industry as their main industry. Worldwide, those countries that have a secondary industry proportion of more than 40 per cent, are China (46 per cent), Indonesia (43.6 per cent), Iran (41.2 per cent), Malaysia (48.5 per cent), Thailand (44 per cent), Vietnam (40 per cent), Venezuela (41.1 per cent), Nigeria (49.3 per cent) and Ukraine (40.3 per cent). In recent years, due to an adjustment in the industrial structure in developed countries, the manufacturing industries, in particular the high energy-consuming industries, have been transferred to the developing countries. After 2001, the accelerated development in China in iron and steel, cement, electrolytic aluminium and other high-energy consuming processing industries showed a strong link with the trend of an intensified global processing transfer to China. However, with the advance of technology, returns from manufacturing are no longer reliant on the processing procedures but more on design, research and marketing instead. In the international division, China has focused intensively on processing and has only a small market share on high return, high added value products in low polluting fields instead of design, sales and marketing. From 2000 to 2005, the domestic ratio on added value and the ratio on the contribution of added value to the economy's growth ratio decreased (see Figure 18.9). Of the additional new energy consumption, secondary industry's share was 73.9 per cent,

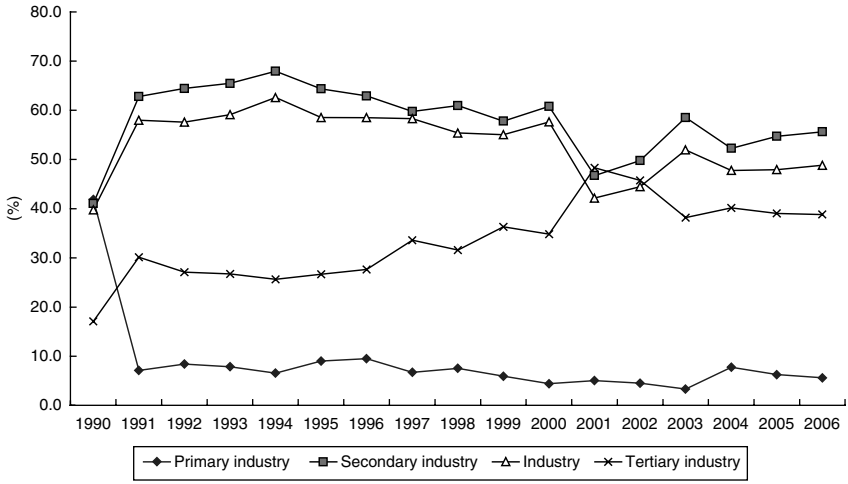

Figure 18.9 The industrial contribution rate on economic growth

Source: China Statistics Yearbook.

which accounted for 0.626 billion tce, equivalent to national energy consumption for 1985.

The influence of economic growth rate

Ever since implementing its reform and opening-up policy, China's economy has grown rapidly. From 1978 to 2005, the economic growth rate's highest peak was 15.2 per cent and the lowest was 4.1 per cent, with an average increase of 9.7 per cent. Over a 28 year period, from 1978 to 2005, the growth rates were recorded with the following pattern: 3 years with rates between 4.1 per cent and 7 per cent, 7 years with rates between 7 per cent and 9 per cent, 10 years with rates between 9 per cent and 11 per cent, 3 years with rates between 11 per cent and 13 per cent, and 5 years with rates above 13 per cent. Although the economic growth rate fluctuated, compared to before the reforms it is merely a relative change to its economic fluctuation. The period of intense fluctuations from before the reforms is long gone. From 1990 onwards, China has enjoyed consistent and steady growth.

The economic growth rate is a crucial factor affecting structural balance and economic efficiency. Over the past ten years, China has successfully stabilized its economic growth. However, it has failed to control its fast growth rate. Huge quantities of energy and resources were used to support the development at such high speed. As shown in Figure 18.10, during 1978 to 2006, apart from a couple of years, the growth in energy utilization efficiency was on average lower than economic growth. After the year 2000, particularly, the gap between these two increased dramatically. One can chart these two rates in opposite directions; on the one hand, economic growth has increased continuously and on the other hand, energy utilization efficiency has decreased.

A high and persistent economic growth rate triggers an increase in energy demands and leads to further energy investment and vice versa. During the 10th Five-Year Plan, fixed asset investment in energy in Chinese towns and cities increased rapidly. Investment rose 68 per cent from 2000 to 2005 and represented 14.3 per cent of total investment, 2.1 per cent up on 2000. In fact, the energy industry itself is an industry with high-energy consumption and low-energy utilization efficiency. An overdeveloping energy industry creates opportunities for enterprises that are high-energy consumers and ones that focus on energy technologies. To date, there are 23,680 coal-mining plants in China, 97 per cent being medium and small-sized. Motivated by an increasing coal price, a number of small mining units purchased obsolete mining equipment and facilities at a cheap price. The power consumption of this equipment is 60 KWH per ton on average, consuming 3 to 4 times more electricity than for new equipment. Additionally, the resource recovery rate in small-sized mines is only about 15 per cent. With such a low recovery rate, a vast quantity of the resource is wasted.

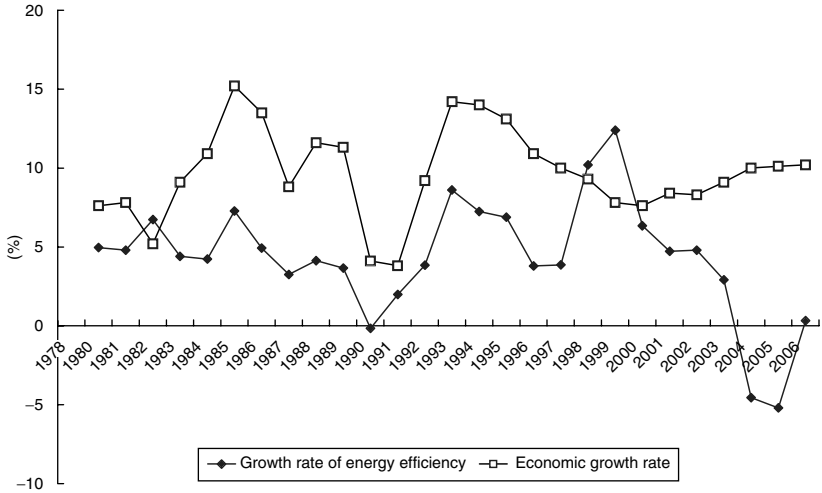

Figure 18.10 Comparison between the energy utilisation efficiency growth rate and the economic growth rate

Source: China Statistics Yearbook.

The effect of trade structure on energy utilization efficiency

The trade structure covers the direct and indirect trade of energy products. More particularly, direct trade refers to the import and export of energy whereas indirect trade refers to related energy import/export issues resulting from trade on energy-related commodities. As analysed previously, taking out other influencing factors, importing energy can enhance energy supply efficiency. However, energy importation implies a reduction of national income and hence, a decrease in energy consumption efficiency. An increase in the exchange rate can help to prevent an economic loss in energy importation at the same time as improving the efficiency of energy supply. If Chinese enterprises have the right to explore and utilize resources from overseas, an increase in national income, energy imports and energy supply efficiency can all be achieved. For instance, in the United States and other countries, through their multi-national energy corporations, energy imports from overseas and re-allocation of these has an impact on national income and energy supply efficiency. Hence, in a sense, energy enterprises working overseas play a significant role in enhancing China's energy utilization efficiency.

The effect of the indirect energy trade on energy utilization efficiency mainly depends on the structure of imports and exports. When trade balance breaks even, the export of high-energy products can increase energy demands and reduce energy utilization efficiency. Figure 18.11 shows the variation between industrial import/export and primary goods import/export. Since 1990, China's trade structure has changed fundamentally. In

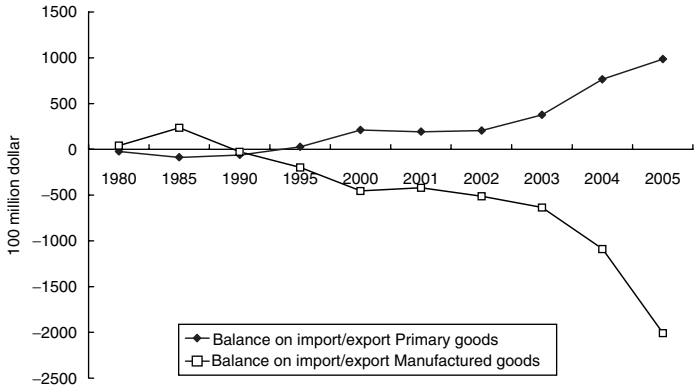

Figure 18.11 Balance on import/export on China's commodities for the years 1980–2005

Source: China Statistics Yearbook.

other words, China has changed from an importer of manufactured goods to an exporter and from an exporter of primary products to an importer. After 2000, a favourable balance on manufactured products expanded further. It seemed that the industrial structure was upgraded with the import of primary products and the export of manufactured goods. However, after the effects of globalization, a country's level of industrialization and its industrial structure can no longer be simply assessed by its export of manufactured goods. Worldwide production trends focus heavily on outsourcing and a shift in industrial production divisions leads to a reduction in technology and investment requirements. The industrial status of developing countries and their production capabilities are getting more recognition. However, such a change has not necessarily improved the technical level for developing countries, as it does not promote their development or bring noticeable benefits. Instead, more energy and resources are wasted and serious environmental pollution can be caused. This has been the result for many developing countries, such as China, which has played the role of the global production division due to its relative advantages in labour and resources.

Since 2003, the export volume of high-energy products has increased enormously. For instance, in 2005, the export of cement increased by 215 per cent as compared with the same period the year before, the export of plate glass increased by 38 per cent, the export of household porcelain increased by 7 per cent, the export of cast iron and spiegeleisen increased by 72 per cent, the export of steel increased by 44 per cent and the export of copper increased by 19 per cent. This rapid increase in energy production and consumption is the main cause of environmental pollution and

greenhouse gas emission. In 2005, the quantity of discharged smoke and dust was 11.825 million tons, 19.7 per cent higher than that in 2002. Sulphur dioxide emission was 25.49 million tons and was 27.8 per cent higher than that in 2000, exceeding the standards set in the 10th Five-Year Plan (FYP) for its environmental protection. During the first semester of 2006, contamination discharge was still a severe problem. Statistics show that in the first semester, discharge of chemical oxygen demand (COD) was 6.896 million tons in total, 3.7 per cent up compared to the same period of the previous year. Sulphur dioxide discharge was 12.746 million tons, 4.2 per cent up. The two key pollutants in China, COD and sulphur dioxide, increased respectively to a certain extent.

The influences of policies and system on energy utilization efficiency

Although the influence of policies and system on energy utilization efficiency cannot be directly expressed in numbers, it is certain that such factors cannot be ignored. Particularly in the early period of China's reform and opening-up, the system factor played a crucial role in the improvement of energy utilization efficiency. With a change in the operation of enterprises and with market-oriented economic reforms, the system gradually moved to a more policy-guiding role in supporting its economic efficiency.

Since China introduced its reform and opening-up policies, the government has put more emphasis on energy conservation. For example, in the 6th Plan for National Economic and Social Development, energy conservation was primarily addressed in relation to energy sections. Main energy-saving targets were set and key areas and industries were identified. It also stipulated that all energy consumption necessary for industrial production, targeting an average 4 per cent increase per year, should be realized through energy-saving measures and a reduction in energy consumption. It also projected a saving and reduction of 700 million to 900 million tce in energy consumption in 5 years time. Besides, a general outline on energy-saving measures was issued. In the 7th Five-Year Plan (FYP), it also set down a rule to strengthen the role of an economic lever, to establish and improve the policy and measurement methods to ensure improved energy supply capabilities, plus additional costs on energy consumption and a credit incentive for energy-saving related projects. Energy-saving objectives were continually stressed in the 8th FYP. Although targets were not specified in the following 9th and the 10th FYP, energy saving is still considered as the most important task of all. In other words, energy conservation is of prime importance in China's energy policy. In the 11th FYP, a target was set so that energy consumption intensity would decrease by 20 per cent by the end of 2010. In 2007, the *Energy Conservation and Emission Reduction Schemes* were issued by the State Council.

However, it must be noted that during the period of system reform, China's energy conservation work weakened in terms of its management and organization. Management on energy savings lost its organizational structure after the cancellation of the administrative departments in various industries. As a result, the advocating of energy-saving techniques was affected and some basic energy-saving work, for example energy statistics and energy measurement, were terminated by enterprises. The management and organization of energy conservation did not gain significant attention until a re-emphasis on its objectives in the 11th FYP. However, problems related to staff shortage, low job responsibility and lack of high-level management still exist. Energy saving is closely related to energy's demand and supply. When energy supply and demand is severely unbalanced the government pays more attention to energy-saving measures; conversely energy-saving work gets less support from the government and enterprises when energy requirements are balanced. In the early 1980s and 1990s, the government carried out a series of policy and practical measures to promote and execute energy savings. These included the setting up of an energy-saving special fund for investment in infrastructure and technology projects; interest rate incentives on credit and loans for energy-saving projects; loans repayable before tax; integration of bonuses obtained from special energy-saving awards into the total costs and tax exemption benefits, etc. All these measures promoted energy savings and produced results, but they were abandoned in the mid 1990s.

From the late 1990s, under a market-oriented economy, the government started to explore measures to promote energy saving with a strengthening of taxation, pricing and finance. Although the implementation of the Law of Energy Conservation indicated its legitimate status for domestic energy saving, it merely scraped the surface and still lacked efficient implementation and sanction mechanisms. Also, some essential supporting policies and measures to enable the execution of energy-saving regulations were not in place or provided for. There are some contradictory problems remaining in the policies and system. Policies are not in line with each other and there is conflict of interest between the related departments and units, all producing a negative impact on the development of China's overall energy savings.

With an energy-saving target of up to 20 per cent in the 11th FYP and the performance of its energy utilization efficiency, problems still remain in China's related energy-saving policy. The principal problems include inadequate investment in scientific research on energy saving; a low conversion rate for implementation of successful research; unclear channels; slow reform of the energy pricing system and its mechanism; insufficient pricing leverage on energy-saving improvements; ineffective public funding instruments in the energy-saving field; inadequate energy-saving investment from the government and a lack of special funding to support energy

savings. In recent years, the central government has adopted measures to control the growth in consumption as well as to reduce industrial overproduction by targeting a number of high energy-consuming, high polluting industries, resource focused industries, as well as focusing on the rapid increase on exported goods and the resulting pressures on energy, resource and environment management. The government issued the *Provisional regulations of promotion on industrial restructuring.* The *Industrial Technology Outlines* and *Notice of promotion of industrial restructuring on over production* were amended.

An export tax rebate policy on certain goods was adjusted. However, the execution and measures were suppressed by the interests of enterprises, regions and the state and, hence, failed to restrain the overdevelopment of high energy-consuming industries. The taxation policy mainly has an effect on the producers and has little impact on the end users.

Study conclusions and policy suggestions

From the above analysis and study, since the year 2000, the key elements that have an influence on China's energy utilization efficiency have been changed. Regarding production and consumption, energy supply efficiency has decreased and energy consumption efficiency has risen slightly. In relation to industrial structure and industrial energy utilization efficiency, as China is experiencing its industrialization stage, a shift in structure ultimately had a negative effect on its energy utilization efficiency. A reduction in China's energy utilization efficiency in recent years has been mainly due to a decline in the improvement in its industrial energy utilization efficiency, as at the same time, the ratio of industry is climbing. At the same time, some high energy-consuming industries are developing at an excessive pace. High export levels of high energy-consuming products and China's low-end position in global industry also led to a decrease of its industrial energy utilization efficiency. The energy utilization efficiency is linked with the pace of economic growth. It is inevitable that more energy and resources will be consumed throughout such long-term economic growth in China.

In view of the existing problems and obstacles in improving energy efficiency in China, the author believes that the government should continually reinforce its policies through a number of aspects, as detailed below:

1. To consider the improvement of energy utilization efficiency as an important approach to independent innovation and technical progress. To improve technology in the energy industry and to raise energy utilization efficiency by means of independent innovation. Firstly, in

order to make a breakthrough in key areas and prime sectors such as energy conservation, it is necessary to strengthen basic research, pioneering study and research into technological advances beneficial to the public in the energy field. Secondly, to build a technological innovation system that is focused on enterprises, through an integration of research and production. Finally, the application of research achievements should be promoted by various incentives to facilitate the practical implementation of new innovative methods.

2. To mark the industry sector's energy utilization efficiency as an energy conservation priority. To improve both energy and resource efficiency and to reduce pollution, it is necessary, first of all, to rely on new technology, a modification in production techniques, an improvement on product design and process and industry level and technology. Secondly, the promotion of durable economic development and the optimization of the industrial structure and the manufacturing framework is needed. Thirdly, it is necessary to cease using dated production methods and products, and to raise the environmental and technical standards for market entry requirements. Fourthly, the following are necessary: accelerating the adjustment on industrial internal structure; intensifying the development of high technology content and low resource-consuming industries; restricting the export of high energy-consuming products as appropriate; developing those industries and services that have a high added value and innovative technology.
3. To use macro-control as a measurement to maintain moderate economic growth. Moderate economic growth means to maintain economic growth so that various resources are comprehensively utilized within their normal boundaries without triggering serious inflation. China's moderate economic growth rate ranges between 7 per cent and 9 per cent. In its economic growth plan, generally speaking, the growth rate is set at no more than 8 per cent. However, in reality, China's economic growth rate has been recorded at over 10 per cent. China should continually reinforce macro-economic control by introducing finance, taxation, and exchange rate measurements. In order to prevent energy consumption from growing too fast, it must prevent the economy from overheating. Hence, it requires an adjustment of the economic structure and income redistribution in order to promote more employment and equal development in society.
4. Action is necessary to improve the energy price system and to give prices and taxation a role as levers. Whether it is from an overview of China's energy supply and demand, the energy efficiency improvement, the reflected scarcity of energy or the total cost of its production and consumption, China's energy prices should be further adjusted and increased, no matter from which angles they are being

perceived. A reasonable price can not only embody the relationship between supply and demand and the extent of the resource scarcity, but also needs to reflect the capacity of substitution and supplement. In recent years, energy price reform has been intensified, but energy scarcity has not yet materialized through pricing and taxation. This is because the interrelation between energy products and consumption is not given enough consideration. To improve China's energy price system the value on the energy product itself as well as the energy use value must be reflected. In this sense, a similar price can be shared by those energy products that have a similar value and energy use value. The resultant income from the measures imposed due to the scarcity of energy should be returned to the state rather than to the producers. This is to ensure that energy producers remain motivated in terms of energy conservation and energy savings instead of pursuing high profit returns. An excessive consumption tax should be imposed on those who overconsume energy in this way, reflecting social equality. At present, the reform and improvement on the pricing of processed oil, electricity and coal need to be accelerated. Taxation on resources should be raised appropriately. Ways and approaches of internalizing the external costs of energy production and consumption need to be explored. The energy industry's internal relationship needs to be managed and balanced. The energy industry needs to coordinate its development as fast as possible and in this way all energy resources should be utilized efficiently.

Notes

1. This article is funded by National Nature Science Foundation of China (project approval number: 50556002).
2. Unless specified, the author has sourced, calculated and organized all data used in charts and tables in this paper in relation to the particular period from the *China Statistics Yearbook*.
3. The data above are arranged and composed based on data in *Strategy and Policy of Energy Development in China* from *Energy Efficiency and Energy Conservation* by Wang, Qing Yi et al. (2004), Economy Science Publishing House 2.

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19

Japan's Policy for Energy Emissions Reductions and Foreign Aid

Shigeru Sudo

Introduction

Global warming and energy issues are recognized, in Japan, as two sides of the same coin because 90 per cent of greenhouse gases in Japan are produced by using energy. To achieve stable energy supplies and to respond to global warming, Japan has to shift to energy use that generates lower CO_2 emissions.

Development and diffusion of innovative technologies are key to meeting the long-term target of halving the world's total greenhouse gas emissions. Japan is promoting high-priority development of 21 innovative energy technologies, such as high-efficiency coal-fired power generation, innovative solar power generation and carbon capture and storage (CCS), as part of the Cool Earth Energy Innovative Technology Plan.

Global environment problems must be tackled on a global basis, and Japan will respond to problems through cooperation on energy conservation, transfer of environmental technologies and development and diffusion of innovative technologies.

Importance of energy saving

Currently, the importance of the improvement of energy utilization efficiency is widely recognized throughout the world. The reason is that the improvement of energy efficiency is expected to have, on a mid-term to long-term basis, a large effect on the promotion of both energy security and countermeasures against global warming. Energy issues and environmental issues are interrelated. From the viewpoint of energy security, a decrease in demand from an improvement in energy efficiency is equivalent to an increase in supply, and from the viewpoint of global warming, it simultaneously brings about a decrease in CO_2 emissions from a reduction in energy consumption.

Globally, Japan is at the forefront in the field of energy saving. In terms of the widely used index of energy consumption per GNP, if the basic figure

of 1 is for Japan, it is 2 for the United States and 8 for China, as shown in Figure 19.1. Thus, Japan is regarded as one of the most energy-efficient countries in the world.

Why has energy saving been promoted in Japan? Geographical factors such as Japan's land area and climatic conditions play a part. However, political, economic and social factors have been most important.

Firstly, market mechanisms have played a large role in energy saving through energy prices. As was seen in the oil crisis in the 1970s, price hikes in imported oils can be passed relatively easily on to the final consumer prices including oil products, electricity and gas since Japan depends upon imports for most of its energy resources. As a result, companies endeavoured to shift to a more energy-saving-oriented industrial structure and to intensify the development of energy-saving technology. In addition, consumers became more energy-saving minded by choosing energy-saving equipment and appliances.

In contrast, the United States and China are more endowed with domestic resources and have a number of energy-producing companies. Energy prices in these countries are less expensive than in Japan. Perhaps in these countries companies may find it politically more difficult to pass on oil price hikes. In the United States and China companies are more liable to price controls by the government because of the need to protect consumers' interests or regulate major energy producer companies' excessive profitability.

Furthermore, in Japan with its scanty domestic resources, direct government regulation, including the regulation of energy-saving standards for

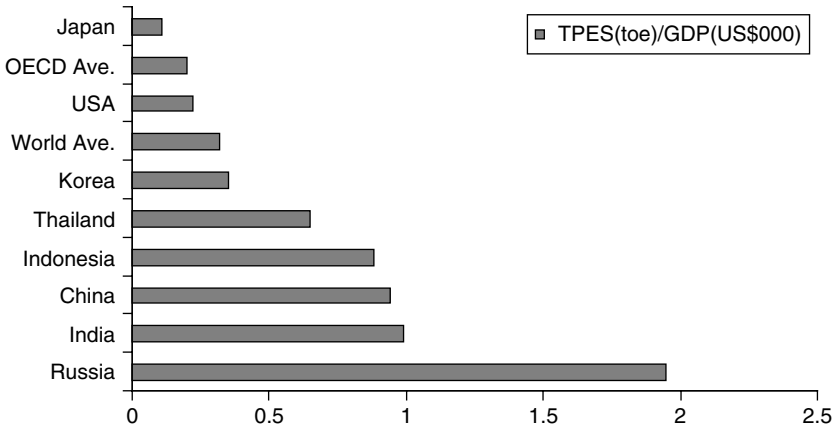

Figure 19.1 Energy efficiency of main countries

Source: Calculated by author using data in International Energy Agency, IEA (2007) *CO_2 emissions from fuel combustion* (Paris: OCDE/IEA).

factories, automobiles and electric home appliances, seems to be politically and socially more easily accepted. There is also general willingness in society to comply with regulatory measures as much as possible, not to mention the willingness to introduce voluntary regulation. In the USA there is a political climate where any government intervention is detested. In the past attempts have often been made to introduce new taxation on gasoline and to improve companies' average fuel efficiency economy. However, these attempts have been thwarted due to strong opposition in the US Congress.

Recently China has embarked upon setting energy-saving standards by following the example of the Japanese Energy Saving Law, etc. However, provincial governments and companies seem not yet to be ready to comply with central government's proposed regulations.

To briefly state the basic Japanese position on the theme of energy emissions reductions, it is that both hardware and software measures are essential for the success of energy-saving policies. In promoting cooperation in the field of energy saving in the future, technology transfers are important not only in hardware aspects but also in software aspects such as socioeconomic systems and institutions, as well as the culture of valuing things and avoiding waste. That is Japan's basic position.

High resource prices, resulting from the tight energy market and conditions of unstable supplies of energy resources, shall work as factors constraining economic development in developing countries. With respect to this, to preserve valuable domestic resources through efficient energy consumption and to save the cost of overseas resources imports is as important as to secure stable energy supplies. Moreover, developed countries' assistance to help developing countries enhance their efficiency in the use of resources will ease demand pressures on the market. It is also welcomed in terms of improving energy security.

Improvement in energy use efficiency will also contribute effectively towards a solution of the global warming issue, as it will reduce greenhouse gas emissions caused by energy use.

Perhaps it is against such a background that over the past several years a series of international frameworks of cooperation on energy saving came into being to integrate aspects of both energy security and global warming.

Japan's approach to climate change

Circumstances surrounding global warming issues

The first commitment period of the Kyoto Protocol started in 2008. There have been active discussions regarding the framework after 2013 following the first commitment period, and the United States and Australia, which have seemed passive about taking action so far, are beginning to participate actively, so more and more awareness has been raised on taking measures against global warming.

As for concrete international efforts against global warming, Japan signed the Kyoto Protocol in 2002 and is supposed to achieve the target of a 6 per cent reduction of total greenhouse gas emissions relative to a baseline (year 1990) during the first commitment period. In the Kyoto Protocol, the targets for reductions are set at 7 per cent for the United States (non-signatory), 8 per cent for the EU, and 0 per cent for Russia, relative to 1990. According to the emissions performance of major countries as of 2005, many had greenhouse gas emissions exceeding targets, so the pressing issue is that from now on, all the nations of the world including Japan will make efforts to further reduce emissions of greenhouse gases.

Therefore, Japan formulated the Kyoto Protocol Target Achievement Plan in April 2005 to meet the target of a 6 per cent reduction based on the Act on Promotion of Global Warming Countermeasures, and has been implementing a voluntary action plan in the industrial sector, while advancing energy-conservation measures and new energy measures, as well as promoting nuclear energy.

Before the Heiligendamm Summit in Germany, Japan announced a new proposal on climate change issues called 'Cool Earth 50' in May 2007. The proposal contains the long-term target of 'halving greenhouse gas emissions by 2050' as a common global goal. Three principles were also advocated: in the next-period framework after 2013, with the participation of all major emitting countries, a flexible and diverse framework will take into consideration the circumstances of each country, and compatibility between environmental protection and economic growth.

Following these trends, former Prime Minister Fukuda presented several concrete proposals on global warming issues when he gave a special address at the World Economic Forum held in Davos, Switzerland on February 26, 2008.

Basic scenario for the post-2013 framework

Specifically, the prime minister made proposals with the following six points about the countermeasures against global warming, which was one of the main themes of the G8 Hokkaido Toyako Summit on 7–9 July 2008, recognizing that the improvement in energy efficiency is the area where Japan can exercise its leadership internationally as well as regionally and take the initiative towards the establishment of an international framework.

1. Halve the GHG emissions in the world by 2050.
2. Achieve a 30 per cent energy-efficiency improvement in the world by 2020.
3. Ensure the equality fairness of burden-sharing, by taking the so-called 'bottom-up' approach where the world as a whole establishes mid-term GHG reduction targets for individual countries, while in the establishment

of individual national reduction targets, each country sets its own industrial, sectoral targets.
4. Review the benchmark year of 1990 from the viewpoint of international equality, from the standpoint of Japan as a country which rapidly improved energy efficiency before the year 1990.
5. Establish a new global funding mechanism in cooperation with European and American countries, besides the idea of Japan's establishing a new funding mechanism of a magnitude of 10 billion US dollars, so that developing countries can actively participate in the effort to reducing GHG emissions.
6. Promote transfer of Japan's high-level environment-related technologies to developing countries.

Out of these proposals, Item (1) and Item (6) are taken from the proposals 'Invitation to Cool Earth 50' stated in the '21st Century Environmental National Strategy', which was established under the former Prime Minister Abe. The GHG reduction targets under Item (3) match the basic line of the 'Asia-Pacific Partnership on Clean Development and Climate' (APP), which Japan has been eagerly promoting jointly with the United States, Australia, South Korea, the People's Republic of China, India and Canada (participation as an observer). In the APP, eight taskforces (TF) for different industrial areas are established, and Japan is serving as the Chair of two TFs, namely one for the steel industry and the other for the cement industry, and is studying and compiling recommendations on the national potential for carbon dioxide reduction in each of the industries. This 'bottom-up' approach is a practical approach reflecting the economic and technological situation of each industry and is easy for industries in each country to adopt, but if the reduction potentials should be made as the industrial reduction targets for each country, it would bring about a difficult problem in that there would be a big possibility that the total national targets, which are to be established based on the piling-up of industrial targets, would fall below the total GHG reduction targets for the entire world agreed upon internationally (e.g., 20 per cent reduction by 2020 and 50 per cent reduction by 2050).

With regard to the reduction of GHG emissions, while it is important to present obligatory national reduction targets derived from the reduction targets for the entire world, it is also indispensable to guide industries in the right direction so that they achieve such internationally agreed national targets. However, the establishment of reduction targets by the 'bottom-up' approach has a high risk, which is that it might make the achievement of the international agreement to prevent global warming difficult, as a result of excessively respecting the autonomy of individual countries. Especially in this approach, while it is indispensable to collect detailed data from all industries and sectors of participating countries in the world, it is quite

difficult for minor developing countries, and for major GHG emitting developing countries as well, to correctly estimate future GHG reduction potentials in the present globalized world economy and industries, and it will also require a fairly long preparation period to start the system.

Consequently, it is pointed out that there is a major difficulty in achieving the Bali Agreement under COP 13 to establish a new international framework by the end of 2009. Accordingly, we will be forced to face the dilemma that if we stick to the proposal of this bottom-up approach, we may not satisfy the international agreement to settle the matter in 2009. However, the bottom-up approach is also thought to be meaningful in the sense that it would present a benchmark about the measures to be taken by individual countries in fulfilling the global reduction targets by way of a top-down approach.

Energy-efficiency improvement projects under the 'Cool Earth – Innovative Energy Technology Plan'

To meet the long-term target of halving the world's total greenhouse gas emissions, development and diffusion of innovative technologies are the keys. Japan is calling on each country to invest in research and development in the energy field as well as promote high-priority development of 21 innovative energy technologies such as high-efficiency coal-fired power generation, innovative solar power generation and carbon capture and storage (CCS), as part of the Cool Earth Energy Innovative Technology Plan.

In this section, I will review the 'Cool Earth – Innovative Energy Technology Plan', which incorporates the energy efficiency improvement plan Japan is going to implement, from the viewpoint of improvement in energy efficiency.

The Ministry of Economy, Trade and Industry (METI) announced the 21 innovative technologies development plan on March 5, 2008, including high-efficiency solar power generation and the next-generation automobile. This development plan aims to achieve the Japan-proposed long-term objective of 'halving the GHG emissions in the world by 2050'. The same development plan was also explained at the G20 Regional Ministerial Meeting on Global Warming held in Chiba City on 14 March, so as to receive support from other countries.

The plan not only selects 21 innovative technologies but also demonstrates a process chart for the development of each of the selected technologies. METI estimates that on the strength of these technologies, about 60 per cent of the GHG emissions reduction objective through to 2050 (about 40 billion tons of reduction worldwide in 2050), which Japan is proposing, will be achievable.

The objective that Japan is proposing is to halve the GHG emissions in the entire world by 2050, compared with the level of today. According to

the IEA (International Energy Agency), if the world continues to grow in the future, the amount of CO_2 emissions worldwide would explosively increase, mainly due to the situation in developing countries, and it is expected to reach as much as 58 billion tons in 2050. While the amount of annual CO_2 emissions in the world in 2005 was 27 billion tons, Japan's objective is to halve this figure by 2050. To achieve this objective, the amount of CO_2 needs to be reduced by more than 40 billion tons. The Japanese government considers that it is indispensable to develop new technologies to achieve the objective, and thus, the innovative technology development plan was announced, which would lead to a drastic reduction in GHG emissions (see figure 19.2).

In the 'Cool Earth – Innovative Energy Technology Plan', 21 innovative technologies from five areas, which are shown in Table 19.1, are enumerated.

The central technologies, among others, are solar power generation with drastically reduced production costs through the adoption of new, different materials; electric cars which do not emit any CO_2; the technology to minimize the release of CO_2 into the atmosphere by burying CO_2 in underground layers, etc. and this plan intends to commercialize all of these technologies by 2030.

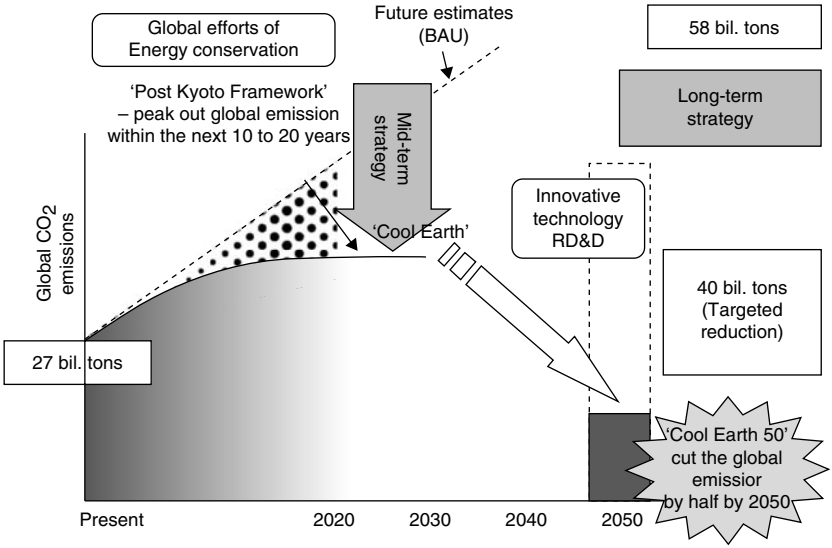

Figure 19.2 Target of 'Cool Earth' promotion programme

Source: Prime Minister of Japan, Special Address, 'Fact Sheet on Climate Change', 26 January 2008.

Table 19.1 Cool Earth-Innovative Energy Technology Programme

Sector	Innovative Energy Technologies	Target/Effects
Power Generation/ Transmission	High-Efficiency Natural Gas Fired Power Generation	Efficiency Improving
	High-Efficiency Coal-Fired Power Generation	Efficiency Improving
	Carbon Dioxide Capture and Storage (CCS)	Low Carbonation
	Innovative Photovoltaic Power Generation	Low Carbonation
	Advanced Nuclear Power Generation	Low Carbonation
	High-Efficiency Superconducting Power Transmission	Reducing Transmission Loss
Transportation	Intelligent Transport System (ITS)	Fuel Economy Improving by Solving Traffic Jam
	Fuel Cell Vehicle	Fuel Switching
	Plug-in Hybrid Vehicle/Electric Vehicle	Fuel Switching
	Production of Transport Biofuel	Carbon Neutral
Industry	Innovative Material, Production/ Processing Technology	Technology Replacement
	Innovative Iron and Steel-Making Process	Replacement of Reducing Agent
Commercial/ Residential	High-Efficiency House and Building	Reduction of the Air-Conditioning Energy by the Improvement in Insulating Aspects
	Next-Generation High-Efficiency Lighting	Reduction of the Electricity which Lighting Takes
	Ultra High-Efficiency Heat Pump	Fuel Switching
	Stationary Fuel Cell	Efficiency Improving
	High-Efficiency Information Device and System	Electric Usage Fee Reduction of Information Systems
	HEMS/BEMS/Local-Level EMS	Optimization which Utilized the Information Technology
Cross-Cutting Technologies	High-Performance Power Storage	Reducing Generating/ Storage Loss
	Power Electronics	Energy-Saving Technology of Inverters
	Hydrogen Production, Transport and Storage	Fuel Switching

Source: Ministry of Economy, Trade and Industry, METI '21 Innovative Technologies Development Plan', 5 March 2008.

These new technologies can be divided into two large categories. One type of the category is 'energy-saving technologies'; that is, such technologies that retain conventional functions and yet, reduce the amount of energy consumption needed to maintain their functions. The other type is 'low-emission energy source technologies'; that is, such technologies that deliver the same amount of energy and yet, reduce the amount of GHG emitted at the time of energy generation.

When we look at the measures stipulated in the Kyoto Protocol, which are to be deployed in a full-fledged manner henceforth, the above-mentioned technology plan is expected to have significant meaning. First, we can firmly say that in view of the emergence of the low-GHG emission-type industry, the manufacturing industry for raw materials for the new industry will eventually be required.

If developed countries come to make the reduction in GHG emissions their supreme objective, it could raise another problem that private enterprises in those developed countries would transfer their manufacturing plants to developing countries and as a result accelerate the increase in GHG emissions, which is allowed in the capacity of developing countries. In fact, we have already seen such phenomena, manufacturing companies are taking flight from the so-called environmentally advanced countries in Europe or, while investment in such countries is stagnating, investment in the former East European bloc, which has more room for emission quotas, is more active. This means that it has the same effect as exporting carbon dioxide emission sources, by practically purchasing emission rights.

Then, the approaches to develop innovative technology domestically and aim to drastically reduce GHG emissions from the domestic manufacturing industry should be appreciated as the responsible posture, which Japan as an industrialized advanced country should take.

Financial mechanisms to support developing countries to reduce emissions

As a related problem, even if an innovative technology is developed, if it is not spread to the rest of the world, it does not lead to the reduction of GHG emissions worldwide. From such a viewpoint, when an innovative technology is to be spread worldwide, a new problem arises as to who is to bear the cost. When developing countries accept the transfer of innovative technologies, such as energy-saving technology, costs will become a big factor, and therefore, it is recognized that Japan is expected, at the meetings of the summit and elsewhere, to contribute to the establishment of a framework whereby environmental countermeasures and energy-saving measures in developing countries are financially supported.

In this regard, Japan is proposing to establish a new financial mechanism, such as the Cool Earth Partnership, on the scale of US$10 billion in

five years starting from 2008. Through this program, Japan will cooperate actively with developing countries' efforts to reduce emissions, such as efforts to enhance energy efficiency. At the same time, we will extend the hand of assistance to developing countries suffering severe adverse impacts because of climate change. In addition, Japan aims to create a new multilateral fund together with the United States and the United Kingdom, and Japan calls for participation from other donors as well. Japan will use such instruments to strengthen solidarity with developing countries and work towards the reduction of greenhouse gases globally.

Japan thinks the innovating technology breakthrough is necessary to achieve GHG emission reduction and Japan proposes the Cool Earth Partnership program to support developing countries' efforts to reduce CO_2 emissions.

As the concluding remarks, I would like to reiterate that Japan, which is an environmentally advanced country and an industrial country as well, is trying to promote technological development through steady investment and support, and promote policies which are truly useful for countermeasures against global warming.

Conclusion

In Japan, global warming and energy issues are recognized as interrelated. This is because 90 per cent of greenhouse gases in Japan are produced by using energy. Japan depends on overseas sources for almost all of its energy resources, so its energy policy has sustained economic activities as well as being one of the most important policies. To achieve stable energy supplies and to respond to global warming, we have to shift to energy use that generates lower CO_2 emissions.

The post-Kyoto Protocol framework after 2013 is to be formulated by the end of 2009. Japan must reach the figures set for the first commitment period of the Kyoto Protocol, in terms of international fidelity. Based on this, in the next commitment period the aim should be to overcome the flaws in the Kyoto Protocol.

Japan will work on energy conservation and expand it internationally as much as possible in the next 10 to 20 years, in order to reach the target of peaking out greenhouse gas emissions. The amount of CO_2 emissions per unit of GDP in Japan is the smallest in the world. It is strongly required that China and India receive transfers of Japanese energy-conservation technology, which has achieved this high efficiency.

To meet the long-term target of halving the world's total greenhouse gas emissions, development and diffusion of innovative technologies are the keys. Japan is calling on each country to invest in research and development in the energy field as well as promote high-priority development of 21 innovative energy technologies, such as high-efficiency coal-fired power

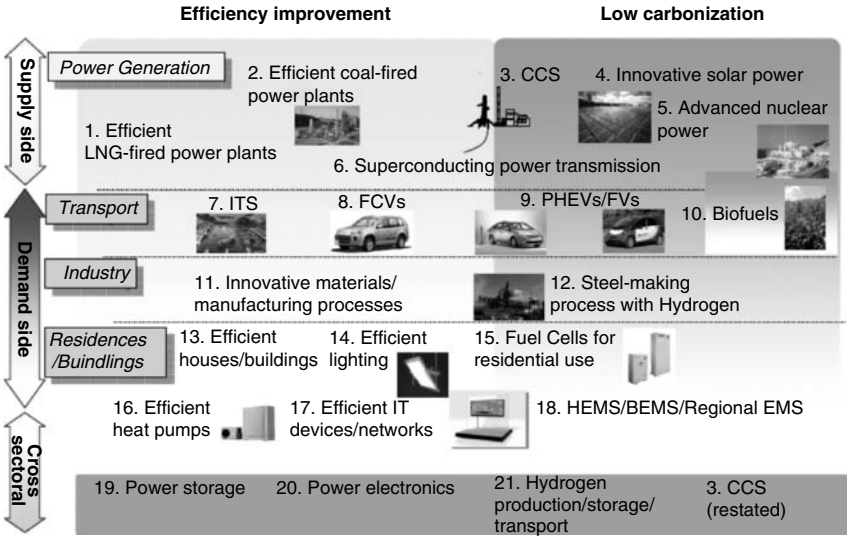

Figure 19.3 '21' Technologies to be prioritized

Source: Ministry of Economy, Trade and Industry, METI, 'Cool Earth-Innovative Energy Technology Program', March 2008, http://www.meti.go.jp/english/newtopics/data/pdf/31320CoolEarth.pdf.

generation, innovative solar power generation and carbon capture and storage (CCS), as part of the Cool Earth Energy Innovative Technology Plan.

Global environmental problems must be tackled by the world as a whole, and Japan will respond to problems through cooperation on energy conservation, transfer of environmental technologies, and development and diffusion of innovative technologies (see figure 19.3).

20

Coping with Climate Change: A Korean Perspective

Jae-Seung Lee

Introduction

Korea's position on climate change is unique. Korea is an OECD country and its economic size ranks 14th in GDP terms but is not subjected to reduction requirements under Annex I of the Kyoto Protocol. Considering its vulnerable industrial structure which relies heavily on energy-consuming sectors and its high dependence on exports, Korea has argued that a more flexible mechanism should be introduced in the Kyoto regime.

Regardless of the membership status in Annex I, however, Korea has accelerated efforts to reduce GHG emission, and these efforts will be reinforced in coming years. Various measures of energy efficiency, Clean Development Mechanism (CDMs) and demand-management have been introduced and implemented to participate voluntarily in lowering Green House Gases (GHG) emission.

Recently, the Korean government announced an ambitious goal to pursue 'Low Carbon and Green Growth'. The Lee Myung-Bak administration set climate change response as one of primary national importance. A consensus on green growth has been reached in the governmental and civil sectors.

However, there is a discrepancy between the goals of green growth and its implementation plan as they are not yet fully visualized. In the light of the current industrial structure, transition costs could be very high. Industrial adaptation to climate change is especially important in Korea since industrial performance will directly affect the general welfare of its people.

The burden of adapting to the climate change regime was not shared equally by all stakeholders. Climate change would most affect those with the weakest adaptation capabilities. Not only poor countries, but impoverished populations in advanced countries that lack resources and technical capabilities would be more vulnerable to the effects of climate change. Big businesses and affluent classes could get on a smooth track to a low-carbon society while small and medium-sized companies, as well as the less-affluent populations, are exposed to tough burdens in reducing GHG emissions.

This chapter explores measures to mitigate and adapt to the climate change regime in Korea. The chapter will first survey various kinds of impacts of climate change and the adaptation measures by the Korean government and industries. It then examines the prospects of newly announced 'Low Carbon Green Growth' strategies by the Korean government. This research will also discuss the difficulties that may arise in the process of adapting to the effects of climate change in Korea and its methods for responding to these challenges.

The impacts of climate change

The impacts of climate change can be addressed from diverse aspects.[1] Due to the disturbance in the ecosystem, there have been cases of unusual fluctuations in weather and mid- to long-term climate changes. All over the world, damage from natural disasters such as typhoons, rainfall and flooding have increased rapidly in recent years. The shifting of cropland and vegetation zones, increased production of tropical crops and changes in fish species have also been observed. Loss of coastline due to the increase of sea level is another concern. Changes in patterns of agriculture and fisheries production will induce changes in consumption patterns and new lifestyles, such as food, clothing and housing.[2] The effects of climate change on ecosystems differ by region and their impacts on human society are also diverse. The regional disparities of climate change are expected to increase. Due to regional characteristics or energy-consumption patterns of different regions, climate change can result in different patterns of regional development.[3]

Health problems stemming from pollution and climate change are also important aspects of human security. If climate change increases levels of air pollution, the number of patients that are more vulnerable to respiratory disorders such as children or the elderly will continue to increase. The increases in asthma and atopy patients have been linked to environmental pollution and the higher number of vulnerable people is believed to be a resulting impact.[4]

According to a recent report, the effects of climate change in Korea have been observed in many areas. Average temperatures have risen by 1.5°C in the last 100 years and sea levels have risen 22 cm in the last 40 years. Winter in Korea has become shorter by a month while the summer has become longer by 20 days compared to the 1920s. There have been increases in occurrence of typhoons and torrential rainfall. The estimated costs of damage due to typhoons and torrential rains have increased 3.2 times in ten years. Korea also saw 2127 deaths from heat waves in the last 10 years and 2227 malaria patients in 2007 alone.[5] It may still be problematic to attribute all of these natural disasters to climate change, but it has been widely noted the impacts of climate change would become more and more severe. To cope

with these changes, the need for comprehensive and sectoral climate impact assessments and adaptation measures at the national level has increased.[6]

The effects of climate change in the industrial sector can be largely divided into demand and supply sides. First, the demand side will see changes in final consumer goods consumption patterns due to global warming. These changes in consumption patterns will impact on those suppliers of relative final consumer products. Climate change may also affect national income leading to changes in domestic consumption. Climate change will also change export demands which will impact on domestic manufacturers. On the supply side, changes in production costs will change supply and demand, again impacting on domestic manufacturers.[7]

Diverse factors determine the adaptive capacity of the manufacturing industry. Factors include those that are specific to each industry such as technology, resources and effective implementation of disaster prevention systems, or general factors such as the quality of social infrastructures, effectiveness of industrial policies and national competitiveness. A corporation with many resources will have the capabilities to make investments to promote adaptability. Furthermore, a corporation that has constructed an effective disaster prevention system will be able to lessen damage from climate change.[8]

Climate change policy in Korea

Overview of climate change policy

Korea is currently the 10th biggest GHG emitter in the world. Total GHG emissions in Korea have increased at a rapid rate from 1990 to 2004. Energy-related emissions of carbon dioxide (CO_2) have grown dramatically in recent years, more than doubling between 1990 and 2004[9] (see Tables 20.1, 20.2 and 20.3).

In December of 1993, Korea joined the Climate Change Convention and in October of 2002 it ratified the Kyoto Protocol. However, due to its current status as a non-Annex I state, Korea is not bound by any obligations to reduce GHG emissions during the First Commitment Period. Korea believes that the absolute standards for reducing emissions in the Kyoto Protocol will

Table 20.1 GHG emissions index

Category	Unit	1990	1995	2000	2002	2003	2004	2005
GHG Emissions	Million t CO_2	310.6	452.8	528.6	569.3	582.2	587.3	591.1
GDP	100 Million	320,696	467,099	578,665	642,748	662,655	693.996	723,127
GHG Emissions/ GDP	t CO_2/Million	0.968	0.969	0.914	0.886	0.879	0.85	0.82

Source: KEEI (2004, 2005).

Table 20.2 GHG emissions by sector (units: million t CO_2)

	1990	1995	2000	2002	2003	2004	2005
Energy	247.7	372.1	438.5	473.0	481.4	489	498.6
	(79.8)	(82.2)	(83.0)	(83.1)	(82.7)	(83.3)	(84.3)
Industry Process	19.9	47.1	58.3	64.5	69.9	68.5	64.8
	(6.4)	(10.4)	(11.0)	(11.3)	(12.0)	(11.7)	(11)
Agriculture	17.5	17.8	16.2	15.8	15.5	14.9	14.7
	(5.6)	(3.9)	(3.1)	(2.8)	(2.7)	(2.5)	(2.5)
Waste	25.5	15.7	15.6	16.0	15.6	14.9	13
	(8.2)	(3.5)	(3.0)	(2.8)	(2.7)	(2.5)	(2.2)
Total Emissions	310.6	452.8	528.6	569.3	582.2	587.3	591.1
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Land Use & Forestry	–23.7	–21.2	–37.2	–33.4	–33.3	–31.5	–32.9

Source: KEEI (2004, 2005)

burden Korea's economy and thus desires differentiated obligations for participating countries. Korea has suggested a number of flexibility measures that would facilitate the participation of both developed and developing countries in emission reductions.[10]

The Korean government has begun to implement measures to reduce the growth of emissions in major sectors through the participation of various government agencies. The government has established the Commission for Climate Change to provide comprehensive means for mitigation projects and to assist the adaptation of the Korean economy and society to climate changes. The Prime Minister's Office (PMO) oversees the implementation of these tasks. The Special Committee for Climate Change was established in the National Assembly in March 2001.

Previous efforts to counter climate change in Korea are summarized in Comprehensive Plans to cope with Climate Change Convention (hereafter Comprehensive Plan) which has been renewed every three years since 1999. It aimed at building a solid foundation for a transition to an economy with less GHG emissions, and at minimizing negative effects on national living standards resulting from climate change.

The First Comprehensive Plan (1999–2001) consisted of 36 tasks including sector-specific reduction policy, technological development and the utilization of the Kyoto mechanism. During the period from 2002 to 2004, the Second Comprehensive Plan had been adopted for 84 tasks on 5 major agendas of capacity building. The Third Comprehensive Plan (2005–2007) undertook 90 tasks in its three major sectors. The first sector includes projects to establish a basis for implementation of the convention on climate change. The second sector includes sectoral GHG emissions reduction

Table 20.3 Country rankings of GHG emissions*

		World	1	2	3	4	5	6	7	8	9	10
		World	**US**	**China**	**Russia**	**Japan**	**India**	**Germany**	**Canada**	**England**	**Italy**	**Korea**
1990	Emissions	**21,024**	4,851	2,211	2,189	1,058	588	968	429	558	398	227
1990	(%)	100	23.3	11.0	9.8	5.1	2.8	4.6	2.1	2.7	1.9	1.7
2005	Emissions	**27,136**	5,817	5,060	1,544	1,214	1,147	813	549	530	454	449
2005	(%)	100	21.4	18.6	5.7	4.5	4.2	3.0	2.0	2.0	1.7	1.7
1990–2005	(%)	**29**	19.9	128.9	–29.5	14.8	95.5	–15.9	27.9	–5.0	14.0	97.6
Ratios												

Note: *Unit: Million CO_2 tons; Ranking based on the 2005 data.
Source: Ministry of Foreign Affairs and Trade, Major Energy Statistics (20 August 2008)

projects. The third sector includes projects to establish a basis for adaptation to climate change. Nineteen government departments, including the Ministry of Foreign Affairs and Trade, Ministry of Commerce, Industry and Energy, Ministry of Environment as well as Korea Energy Management Corporation (KEMCO), Environmental Management Corporation (EMC) and other related organizations, have participated in the plan.[11] In the Fourth Comprehensive Plan (2008–2012), the period was extended from three to five years and it elaborated a series of preventive measures to minimize the impact of climate change through mitigation and adaptation.[12]

On 19 September 2008, the Committee on Climate Change Response, chaired by Prime Minister Han Seungsoo, adopted the Comprehensive Plan on Combating Climate Change, which aimed at achieving the vision and objectives for Korea's climate policy for the next five years.[13] It states the vision of contributing to global efforts to combat climate change and achieving a low-carbon society through green growth. As objectives, the plan focuses on (1) developing climate industry as a new economic driving force; (2) improving quality of life and the environment; (3) contributing to global efforts to combat climate change. To develop climate industry as a new economic driving force, it adopts the following action plans: (1) promoting energy saving and the energy efficiency improvement of industry; (2) more than doubling R&D investment in climate change; (3) developing climate-friendly industries and promoting their export.[14]

Efforts at the international level

The Korean government also pursues active participation in international efforts to cope with global warming issues and undertake important initiatives in various collaborative projects. Korea's recent participation in major international climate change regimes includes:

- The Asia Least-cost Greenhouse Gas Abatement Strategy (ALGAS)
- The Renewable Energy and Energy Efficiency Partnership (REEEP)
- The Carbon Sequestration Leadership Forum (CSLF)
- The Asia-Pacific Partnership on Clean Development and Climate

President Lee Myung-Bak declared his commitment to actively participate in international action to tackle climate change at the G8 Outreach Summit meeting in Toyako in July, 2008. Considering Korea's position between developed and developing nations, President Lee mentioned Korea's potential to become a mediator of cooperation between developed and developing countries. He suggested developed countries provide market-based commercial incentives for developing countries, since the participation of developing countries would be critical in the post-Kyoto era. In addition, he proposed the 'East Asian Climate Partnership' and proposed intentions

to support the initiative with US$200 million over a period of five years to develop low-carbon policies, technological innovation, and model business programs for East Asian countries. Through launching the 'East Asia Climate Partnership', Korea would show a stronger leadership in the global arena. The 200 billion KRW of new resources would support developing countries' climate action for 5 years. In sum, Korea will become an 'early mover' towards a low-carbon society[15] and will pursue a more active market-based climate regime at the global level.[16]

Policy measures to reduce GHG emissions

The reduction of energy-related emissions is a crucial task for Korea. The Korean government plans to increase the current 2 per cent proportion of alternative energies to 5 per cent by 2011, and to 9 per cent by 2030. Furthermore, it is attempting to secure worldwide competitiveness in three strategic areas – hydroelectric fuels, solar energy and wind energy. It will also promote biofuels, tidal energy, hydrogen power, geothermal energy and waste treatment efforts. In order to reduce consumption, the current energy intensity will be reduced from the current 0.345 to 0.2 by 2030. In particular, policies also aim to support equipment that can promote energy efficiency. Investments will be expanded into areas such as CO_2 storage technology, alternative energy technology and nuclear energy technology.

The share of renewable energy in the total energy portfolio will also be raised, from 2.24 per cent in 2006, to 4 per cent in 2012, to more than 11 per cent by 2030, and over 20 per cent by 2050. Regarding the increased use of renewable energies, the Korean government has introduced a 'Feed-in-Tariff' system in the hope of expanding alternative energy businesses. In July 2005, the government concluded the Renewable Portfolio Agreement (RPA) with nine public enterprises, including Korea Electric Power Corporation (KEPCO), six different power generators (Korea Hydro and Electric Power Co., Ltd, Korea South East Power Co., Ltd, Korea Southern Power Co., Ltd, Korea Western Power Co., Ltd, Korea East West Power Co., Ltd and Korea Midland Power Co., Ltd), Korea District Heating Corp., and Korea Water Resources Corporation.[17] It expects to foster the area of alternative energies by following the examples of developed countries, and later by applying Renewable Portfolio Standards or Mandatory Buying Standards to power generators.[18] Nuclear energy will be an important element in replacing fossil fuels, too. Nuclear exports will be increased from 580 billion KRW in 2007 to 1170 billion KRW in 2012. The export of Korean-type nuclear reactors will also be enhanced.[19]

The renewable energy industry is also expected to boost employment. As of the end of 2007, the sector provided 14,000 jobs and the figure is expected to rise to around 100,000 by 2012 and to around 950,000 by 2030. One million 'Green Homes', 'Solar Town(s)' and 'Waste Energy Towns' will

be introduced. In 2012, the Renewable Portfolio Standard (RPS) system will be introduced to lay the foundation for an emerging renewable energy market and overcome the limits of government budgetary support in the long term.[20]

At the 2nd National Energy Commission in August 2007, the Korean government announced the plan to open the market for carbon emissions and to introduce a carbon fund of 200 million Korean won. In the domestic arena, it has been proposed that the government register and manage 50 reduction businesses and certify the Koreas Certified Emission Reduction (KCER) in the market. Carbon funds can diversify risks that are associated with many GHG reduction businesses and provide liquidity, making them essential to market development.[21]

The government is trying to encourage Clean Development Mechanism (CDM) in the Korean context to construct a foundation for the Kyoto Mechanism and to promote domestic efforts to reduce GHG emissions. As of September 2007, there were 33 CDM projects in Korea that corresponded to UN standards. CDM projects that are presently promoted by Korea include the reduction of nitrogen oxide, HFC23 pyrolysis, renewable energy projects – solar, wind, tidal, hydrogen energy – and various measures to enhance energy efficiency.

Energy efficiency of major energy-intensive industries such as steel and petrochemicals will be improved. R&D investment for developing technologies to improve energy efficiency will also be expanded. The production of hybrid cars and fuel cell cars will be spurred on to place Korea among the world's top four 'green car' manufacturers. By 2013, energy efficiency of newly manufactured automobiles will be improved by 30 per cent compared to existing vehicles. To strengthen support systems for enhancement of energy efficiency, the growth of Energy Service Companies (ESCOs) will be induced. Support for energy audit costs will be increased from 70 per cent in 2007 to 90 per cent in 2009 to encourage more SMEs to participate in energy audits.[22]

As discussed above, the Korean government has a clear vision and plan to mitigate GHG emissions. However, GHG reduction is a tough task in that the Korean industrial structure and current level of energy efficiency are not favourable for fast and massive emission reduction. First, the overall manufacturing proportion of GDP is much higher (26.4 per cent) when compared to the United States (14.9 per cent) and Japan (20.9 per cent).[23] Furthermore, Korea has an export-oriented economy and the core pillar of the industry was built on energy-intensive sectors such as steel, petrochemicals and cement. Second, efforts to increase energy efficiency have been enhanced in the industrial sector since the early 1990s and the current potential for further reduction is not high. In terms of CO_2 emissions relative to energy consumption, Korea is already located in an advanced position. As a result,

industrial adaptation to climate change and emission reduction will be very costly and painful for Korea.

Industrial adjustment to climate change

The direction government is taking to guide industrial adaptation is supporting the construction of a management system and capacity building to adapt to climate change. Major government policies to facilitate industrial adaptation include: (1) Activating a Clean Development agenda; (2) Constructing a GHG emissions management system; (3) Constructing a database for energy technology; (4) Promoting emission trading; (5) Operating a GHG reduction registration centre; (6) Providing financial incentives.

As of 2005, 10 GHG reduction registration centres were operating to ease the threat of disadvantages for corporations that are early actors in reducing emissions. In 2007, the government introduced KCER in which the government buys the records of GHG emissions reductions. Table 20.4 shows the growing numbers of registration applications and approvals.

The establishment of 10 Sectoral Task Forces for Climate Change aims at development strategies that reflect characteristics of different industries, constructing short- and long-term roadmaps for different industries, and developing a method of government support for sustainable development in the industrial sectors.

However, industrial adaptation to climate change is beyond the scope of government policies. Each company and industry should build its own strategy to manage the risk of climate change and to build up counter strategies. Table 20.5 summarizes the risk factors and counter strategies by industry. The determinants of adaptability vary according to the sector-specific nature as well as the assets and resources each industry possesses. Table 20.6 presents a list of these determinants.

The gap in adaptability would be found between large enterprises and small to medium-sized enterprises (SMEs). According to research conducted by the Korea Chamber of Commerce and Industry (KOCHAM) on 200 corporations that consume large amounts of energy, 58.7 per cent answered that they were not prepared to counter the effects of climate change. Of

Table 20.4 Annual registration applications and approvals

	2005	**2006**	**2007**	**Total**
Application	28	60	168	256
Registration Approved	–	41	62	103
Evaluation	–	51	104	155

Source: KEMCO (2008).

Table 20.5 Risk factors and counter strategies by industry

Industry	Risk Factor	Counter Strategy
High Energy-Consumption Industry	Strengthened regulations including carbon taxes Increased costs to reduce GHG emissions	Respond to higher production costs Improve production process through increased investments in GHG reductions
Auto Industry	Strengthened exhaust gas regulations Strengthened recycling regulations	Environmentally friendly investments (increase fuel efficiency, develop fuel cell vehicle)
Semiconductors	Strengthened PFC regulations	Develop technology to destruct PFCs Improve production process
Construction	Increases costs of raw materials Energy efficiency designs Production process restrictions	Develop environmentally friendly raw materials and energy efficient buildings
Home Appliances	Increased consumer demands for energy efficient products	High energy efficient products Ecopremium
Logistics	Increased demands for GHG emission reductions	Reduce GHG emissions during transportation

Source: Kim Hyun-Jin (2006). Modified by the author.

the corporations that responded 'not prepared' for the Climate Change Convention, 32.4 per cent identified that the reason was due to their not understanding the content, 24.1 per cent responded lack of resource technologies, and 15.7 per cent desired support from government policies. Corporations that responded 'prepared' also identified several challenges; lack of technological development and financial resources (26.5 per cent), uncertainty of Korea's obligations for reducing GHG emissions and the appropriate time for action (24.5 per cent), lack of economic incentives (19.9 per cent), lack of information of current international trends (19.9 per cent). Table 20.7 shows the preparedness to climate change.[24]

The awareness of climate change in the case of SMEs at 51.98 points, was 5.47 points lower than that of large enterprises, 57.45 points. In general, SMEs presented lower scores for all sub-categories that were given as indicators in the survey.[25] Regarding the awareness of climate change, SMEs had lower levels of understanding than large enterprises and in the case of understanding government efforts towards climate change, SMEs also showed much lower levels compared to large enterprises.[26]

Table 20.6 Determinants of climate change adaptability in industrial sector

	Determinant Factor
Economic Support	Satisfactory economic and financial support will increase capacity to adapt Lack of financial resources will hinder capacity to adapt
Technology	Lack of technology will limit methods of reducing impacts Regions that lack technology will find it difficult to promote development
Information/Training	Lack of Information and training will hinder capacity to adapt Abundant information sources will increase capacity to adapt
Social Infrastructure	Diverse social infrastructures provide more options for action and can promote adaptability capacity Characteristics and locations of facilities effect capacity to adapt
Institutions	Well-developed social institutions will increase capacity to adapt Policies and regulations may increase or reduce adaptability capacity
Equality	Fair distribution of resources will promote capacity to adapt Opportunities to utilize resources and clear ownership are crucial to adaptability capacity

Source: Han Ki Joo (2007: 54–56). Modified by the author.

Table 20.7 Preparedness to climate change

	Not Prepared	**Prepared**
Large Enterprises	50.7	49.3
Small and Medium Enterprises	35.1	64.9
Total	41.3	58.7

Source: KOCHAM (2004).

Toward green development: Recent policy shift and its prospects

The establishment of green-growth strategy

The 'Low Carbon, Green Growth' strategy presents a transformation of the Korean government's energy policies. The government has discarded its protective stance to initiate more pro-active strategies in an effort to gain new market opportunities in 'green industries'. The paradigm of low-carbon

green growth is a reformulation of key policies that concentrate on reducing GHG emissions, lessening dependency on fossil fuels, introducing an environmentally friendly growth model and technological development of alternative energies, in order to transform these policies into a driver of growth. A major goal of green growth is to improve energy efficiency, increase the use of alternative energies and to increase competitiveness and profits through technological development.

The First National Energy Plan, set out on 27 August 2008, supports 'Low Carbon, Green Growth' initiatives and presents long-term energy policy visions and strategies for the 'post-oil era'.[27] Within the National Energy Plan, it is stated that 'green energy' industries will be developed to enhance growth with environmental protection. The focus on the creation of a 'green country' that leads environmental growth is differentiated from past energy policies that concentrated on securing adequate supplies of energy. The portion fossil fuels takes in primary energy will be reduced from the present 83 per cent to 61 per cent in 2030, while the portion of renewable energy will be extended from 2.4 per cent to 11 per cent. Energy intensity will be improved from 0.341 at present to 0.185 in 2030.

The Green Energy Industry Development Strategy was announced on 11 September 2008, presenting comprehensive technological development and industrialization strategies within green energy sectors. It sets the goals for nine green energy industries that will reach 13 per cent of world market share by 2030. According to this strategy, the growth potential of green energy industries is predicted to have a production capacity of $17 billion in 2012, and $300 billion by 2030, with 105,000 jobs created in 2012 and 1,540,000 new jobs by 2030.[28]

To this end, the government, along with the business circle, will invest around 110 trillion won in facilities and Research and Development (R&D) for renewable energy. Facility investment for renewable energy, which is estimated to require 100 trillion won, will be appropriated by the government paying 28 trillion won and the private sector funding 72 trillion won. In overall R&D investments, 7.2 trillion won will come from government investments, while 4.3 trillion will be shouldered by the private sector.

Rethinking green growth strategies[29]

The strategy of 'Low Carbon Green Growth' shows the shifting stance of the Korean government from defensive adaptation of climate change regimes to pro-active strategies that take advantage of new market opportunities. This strategy also reflects the industrial imperative and competitiveness to survive the era of GHG reduction. For resource-scarce countries like Korea, energy strategies that concentrate on technology can provide an opportunity to achieve forward-looking policies. In addition, GHG reduction is not a choice, but has become an inevitable reality, and to this end, energy efficiency, reducing energy use and clean energy have become indispensable

elements. This also addresses standard virtues of environmentally friendly growth. However, the new government strategies still lack detailed action plans. 'Low carbon, green growth' strategies are not a set of concluded policies but contain characteristics of a policy paradigm. Also, the green growth strategies often omit to mention the cost of transition to the green growth paradigm. A huge gap can be found between the ultimate virtue of 'Low Carbon Green Growth' and socioeconomic realities. A successful industrial adaptation to the new paradigm will be the first key in determining Korea's adaptation to climate change regimes. Finding a 'sustainable' transition plan to approach green growth will be the most essential task for the Korean government and industries.

It is possible to question whether green energy industries have a stable future and market potential. This is primarily related to world consumption patterns of alternative energies to the year 2030. The IEA and other significant energy projections foresee consistent increases in the ratio of alternative energy consumption, but are pessimistic about alternative energies as ultimately a replacement for traditional fossil fuels. In reality, Korea's geographical situation limits its potential to develop alternative energies and it is difficult to secure large amounts of supplies due to costs and production restrictions. Furthermore, since the investment period for green growth focusing on alternative energies is long-term, it is difficult to create short-term employment or promote growth rates. How Korea will compete with countries like the United States, Japan and the EU, which occupy a leading position in the high-tech green energy market, must be addressed before it is possible to anticipate rosy outcomes. It will also be necessary to analyse practical methods to lessen the existing technological gap. Selective and strategic developments based on efficient resource distribution can help to fill the gap between policy objectives and practical implementation.

In addition to the impact of the new momentum for growth, the transformation of the paradigm must also consider costs and an action plan for change. In the case of GHG emissions, Korea's energy-intensive and export-oriented industry will have to bear the burden of obligatory reductions, and numerous SMEs will face difficulties in adapting to new regulations. In the case of many developed industrialized countries, there are conflicts between long-term benefits and short-term costs regarding climate change issues.

Conclusion

During past years, Korea has accelerated efforts to mitigate and adapt to climate change. Various measures to reduce GHG emission were introduced and these efforts will be reinforced in coming years. Energy efficiency, energy conservation, CDMs and demand-management have been emphasized and

implemented both in the public and private sector. Renewable energies have received special attention since they will not only contribute to reduce GHG emissions but also to expand new global markets. The Korean government also pursues active participation in international efforts to cope with climate change. These comprehensive efforts were well addressed in the green growth strategy.

However, a new green growth strategy has yet to produce a specific action plan. The cost-benefit analysis of shifting from the previous industrial structure to implementing green growth strategies is incomplete. Devising the right transition methods to move towards green growth will be a critical task for both the Korean government and the industrial sector. Eventually, the success or failure of a paradigm shift will be determined by the feasibility and efficiency of the policy measures to be introduced.

Notes

1. For various effects of climate change, see IPCC (2007) *The 4th Assessment Report*, http://www.ipcc.ch/ipccreports/assessments-reports.htm (accessed 27 January 2009).
2. Wha Jin Han (2005) *Climate Change Impact Assessment and Development of Adaptation Strategies in Korea (I)* (Seoul: Korea Environment Institute) (in Korean).
3. *Ibid*.
4. *Ibid*.
5. Prime Minister's Office, 'Comprehensive Plan on Combating Climate Change', Task Force on Climate Change, 18 September 2008.
6. *Ibid*. Key adaptation areas include the ecosystem, public health and urban areas.
7. Wha Jin Han (2005) *Climate Change Impact Assessment and Development of Adaptation Strategies in Korea (I)* (Seoul: Korea Environment Institute) (in Korean).
8. K. J. Han (2007) 'Economic Effects of Climate Change on Industrial Sectors', *KIET Industrial Economics* (in Korean).
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10. National Assembly Budget Office (2007) *Assessment of Comprehensive Plan for Climate Change* (in Korean).
11. *Ibid*.
12. Prime Minister's Office, *The Fourth Comprehensive Plan to Cope with Climate Change Convention,* December 2007 (In Korean) and S. J. Yoo (2008) *Climate Change Policies in Korea*, http://www.esri.go.jp/jp/workshop/080225/02_country1_Korea.pdf (accessed 28 September 2008).
13. This plan would replace the *Fourth Comprehensive Plan* in substance.
14. Prime Minister's Office (2008b) 'Comprehensive Plan on Combating Climate Change', *Task Force on Climate Change* (18 September 2008).
15. Mid-term goal is planned to be set in 2009.

16. *Ibid*.
17. RPA is voluntary in nature and agree to investments in alternative energies by the nine corporations amounting to over 1 trillion 261 million Korean won during the period from 2006 to 2008 to secure 333MW of alternative energy facilities, further expanding to 2 trillion Korean won during the period 2009 to 2011 (H. Y. Moon (2007) 'The Economics of Climate Change', *Maeil Daily Economy Press,* 136–141).
18. Ha-Young Moon (2007) 'The Economics of Climate Change', *Maeil Daily Economy Press* (in Korean).
19. Prime Minister's Office (2008b) 'Comprehensive Plan on Combating Climate Change', Task Force on Climate Change. (2008. 9.18).
20. *Ibid*.
21. The Ministry of Commerce, Industry and Energy (currently the Ministry of Knowledge Economy) has subsidized a carbon fund towards GHG reductions investments of 2 billion Korean won. Carbon fund investments include developing alternative energies to reduce CO_2, retrieving landfill gases to recycle and reduce methane gases, and reducing GHG from chemical, and semiconductor industry processing. Examples include solar energy, generators that retrieve lost heat, reduction of Non-CO_2 from display processes, and bio-gas industry.
22. *Ibid*.
23. International Energy Agency (2006) *Energy Policies of IEA Countries – the Republic of Korea* (Paris: OECD/IEA), http://www.iea.org/textbase/nppdf/free/2006/korea2006.pdf; and KEMCO (June 2007) *Introduction of KEMCO & Energy Programs in Korea,* http://americas.kgin.or.kr/report/download.asp?report=25065&no=2&file=Energy%20Programs%20Korea_KEMCO_2007.ppt&path=area/policy_report (accessed 14 September 2008).
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25. *Ibid*.
26. *Ibid*.
27. J. S. Lee, 'Economic and Energy Policy in the Lee Myung Bak Administration' (in Korean), paper presented at the annual conference of Korea Association for International Studies, 13 December 2008.
28. Prime Minister's Office, 'Comprehensive Plan on Combating Climate Change', Task Force on Climate Change (2008. 9.18).
29. Discussions in this part were referred from J. S. Lee, 'Economic and Energy Policy in the Lee Myung Bak Administration' (in Korean), paper presented at the annual conference of Korea Association for International Studies, 13 December 2008.

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21

India's Energy and Climate Concerns: The Inter-linkages, Constraints and Policy Choices

Devika Sharma

Introduction

It is necessary to understand the developmental and security concerns and challenges that face India. It is these concerns together that determine the country's energy choices and policy options vis-à-vis climate change. The first section of this chapter highlights some of the more salient features of India's current programmes on adaptation and mitigation of climate change and how the country proposes to take this forward in the coming decades. In the second section, the chapter highlights the key features of India's current and proposed action on climate change. It throws light on the language that underpins the country's twin concerns of climate change and development; it also lists the key policy interventions and scope for collaboration (through technology transfers). India is already 'paying' the cost for providing a global common good (through the adaptation to and mitigation of climate change), albeit as part of its national strategy for energy security. The third section ends the chapter with certain specific challenges that need further attention, not only by India alone, but by other countries as well. The search for solutions that simultaneously address the multiple concerns for the climate and inclusive growth are not unique to India. It also suggests ways in which the inter-linkages between climate and energy can be addressed; that is, the importance of looking at energy and climate-related issues in collaborative ways. This requires the need to revisit the science of climate change and look at the possibility of cooperation at levels other than the 'international', such as the regional level.

Setting the context

Perhaps for the first time in the history of international relations, countries are being called upon to *definitively* attune their nationally defined

pathways of economic growth to concerns that transcend traditional notions of security, risk, development and territoriality. Addressing climate change concerns by states, either individually, plurilaterally or multilaterally, can be viewed as providing a global common good. Defined succinctly in the book *Global Public Goods: International Cooperation in the 21st Century*[1], global common goods are goods whose benefits accrue across 'borders, generations and population groups' – to agents who do not necessarily 'pay' or 'pay equally'.

As the science of climate change has become firmer, so has the realization that action on climate change is a global public good with the potential to provide benefits across space and time. However, while states are coalescing around a unified end-objective, that is, to thwart the deleterious effect of anthropogenic greenhouse gas (GHG) emissions, the path mapped by states for moving towards that goal is far from unified. According to Article 4.7 of the United Nations' Framework Convention on Climate Change (UNFCCC), effective implementation of commitments by developing country parties will 'depend on the effective implementation by developed country Parties of their commitments under the Convention, related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties'.[2] There are three reasons why the approach to addressing climate change is a 'dichotomous' one; encapsulated best in the *common but differentiated responsibilities and respective capabilities* principle[3]:

- Responsibility for reducing climate change due to historical patterns as well as due to current per capita carbon dioxide (CO_2) emissions (see Figure 21.1 below), lies with the industrialized countries of the West;
- The continued gap between developing and developed countries in terms of capabilities and developmental goals (poverty alleviation, GDP per capita, inclusive growth), energy intensity and energy efficiency suggests

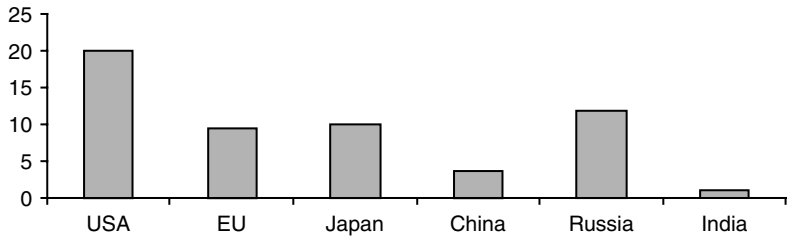

Figure 21.1 Per capita carbon dioxide emission (metric tonnes)
Source: Prime Minister's Council on Climate Change (2008:12).

the incapacity of developing countries to cut down on emissions that impact on their growth; and,
- The impactor versus impactee differential – that is, the poor in the developing world are more vulnerable to the impacts of climate change in spite of the fact that they are the least responsible for causing the problem.

The projected increase in emissions from China and India poses a challenge to the *common but differentiated responsibility* principle, particularly in the eyes of the Western world. Indeed, the Bush administration's decision not to undertake targeted emissions cuts was because India and China were not required to undertake comparable cuts. Alan Dupont emphasizes a similar concern that is growing in the West regarding the differential responsibility to reduce CO_2 emissions across the world:

> This small reduction would be more than offset by the rise in emissions from developing countries, *notably China and India* (emphasis added), which are exempt from emissions targets under Kyoto but have been reluctant to endorse a successor agreement for fear that signing up to mandatory targets would set back their economic growth.[4]

Being the most populous countries with growing economies, India and China are therefore 'seen by many as the world's biggest climate climate-change problem'.[5] However, this understanding does not take cognisance of the different steps that countries, such as India and China, have been undertaking.

Acting on climate change: Impacts and developmental constraints

According to the IPCC's Fourth Assessment, climate change will create more stress on the sustainable development capabilities of countries like India.[6] Changes in temperature could be considered a direct or indirect catalyst for various ecological changes in the Indian region. The predictions for the Indian subcontinent suggest that there would be an increase in precipitation in the summer monsoons and decrease in rainfall during the winters. This could lead to increase in floods in the summer monsoon and droughts in the winter season.[7] India ranks second among the world's countries with the highest population in the Low Elevation Coastal Zone (LECZ); that is, about 63,188,000 people, or 6 per cent of the world's population.[8] Mumbai, Vishakapatnam, Kochi have shown a sea-level rise of slightly less than 1 mm/year, while Chennai showed a rate of decrease. A sea-level rise of even 1 mm would pose stress for the inhabitants of the coastal regions of India in a few decades. India may experience a

5–25 per cent decline in rainfall during the winter months and the decline could be significant, resulting in droughts in the dry summer months. The date of onset of monsoon will vary more in the future. Intense rainfall spells that may occur due to a warmer atmosphere may lead to drastic rainfall events.[9] A rise in temperature is likely to accelerate the hydrological cycle, altering rainfall, magnitude and timing of run-off. Climate change could have an impact on soil moisture, groundwater and surface water availability, and occurrences of floods and droughts. Glaciers, which are headwaters to stream and rivers, may be a potential threat to lives and property. The sudden rise in the rivers due to their retreat could affect the population living on the low plains.

Many scholars, such as Benito Müller of Oxford University, suggest countries like India are at the bottom of the 'responsibility-for-climate-change' hierarchy.[10] Using concepts of harmless emissions and subsistence allowance,[11] the paper assesses India to be one of the least morally responsible for the problem of climate change.[12] India's developmental concerns are serious – despite the fact that the economy has registered an average growth rate of roughly 8 per cent during 2004–08. It is because of these developmental concerns (some of which are listed below) that action on climate change by India must not compromise rapid economic growth, which is essential not only for poverty eradication and improving standards of living, but also for adaptation to climate change.

- At present, about 27.5 per cent of India's population lives below the poverty line. India's per capita GDP (PPP) is US$2740, while the GDP per capita (PPP) for the United States is US$45,851. This statistic points to the fact that the capability of the average Indian to adapt to climate change is not comparable to the capability of an average American. Although poverty has declined over the years, the gap in income per capita has increased between rural and urban areas, as well as between rich and poor.[13]
- The growing gap between rich-poor, rural-urban and regions within India carries with it the potential of fermenting internal discord between the haves and have-nots. Lack of development, unemployment and abject poverty prove a potent recipe for insurgencies, secessionist movements and extremist violence. Given the transnational nature of several of India's conflicts, the possibility of development-related grievances spilling across borders is very real. Therefore, inclusive growth offers the best remedy for disaffected communities and regions rejoining the 'mainstream'.
- India offers to the world the greatest experiment in bringing socio-economic development to a people diverse in every conceivable way (language, region, religion and culture), through the workings of a democratic governance structure. This is no easy task. Most government policies

(good and bad) ultimately need to stand up to the litmus test of the 'vote banks' (citizens) of the respective political parties.

Indian action on climate change: Adaptation and mitigation

The developmental constraints highlighted above show why the Indian government has come up with an action plan to address climate change that does not sacrifice the country's development agenda. Yet, this constraint should not eclipse the fact that India has charted for itself an action plan that seeks to address climate change across a range of issues.[14] Charles Cormier's observation on India's action on climate change is particularly illustrative:

> The other myth in the international negotiations is that India is not doing anything on climate change. Interestingly, it is the first country to come up with a national action plan on climate change. It has set up a Prime Ministerial committee with a few experts in 2000 and its action plan was just published in 2008. Already as part of its 11th Plan and the Integrated Energy Policy, India has charted out an aggressive agenda to maximise every source of renewable energy and to tackle all of the inefficiencies in its energy system.[15]

The NAPCC identifies and prioritizes 'strategies that promote developmental goals while also serving specific climate change objectives'.[16] Action by India to address climate change (both in terms of adaptation as well as mitigation) has already made a beginning. According to the NAPCC, current government expenditure on adaptation to climate variability exceeds 2.6 per cent of the country's GDP.[17] Some of the existing adaptation-related programmes in existence in India pertain to the following: development of crops that can be grown in arid regions, drought proofing, reforestation and sustainable forest management, mandatory rainwater harvesting in many states, protection of coastal regions and their ecosystems, surveillance and control of vector borne diseases and so on. On the mitigation side, India has adopted a detailed policy, regulatory and legislative structure that can help in GHG mitigation – such as reforming energy markets to ensure that they are competitive and that prices reflect true resource costs. An energy-labelling programme for appliances such as tube lights, air conditioners, refrigerators, distribution transformers, etc., was introduced in 2006. For green buildings, the country launched an Energy Conservation Building Code (ECBC) in May 2007. Other initiatives include making energy audits of large industrial units mandatory, introduction of the metro in big cities (Delhi and now Bangalore), promotion of Compact Fluorescent Lamps (CFLs) and of biofuels through a mandate that requires 5 per cent blending of ethanol with gasoline, already in use in nine states and four Union Territories (UTs) of India.

Proposed action for the future

It is the 'way forward' highlighted in the NAPCC that seeks to take India's action on climate change to a substantially higher level. The NAPCC identifies eight national missions or programmes, which can carry India's action on climate change adaptation and mitigation forward in the coming decades. These missions[18] pertain to the following core areas:

1. Solar energy – solar thermal power generation, solar photovoltaic generation.[19]
2. Energy efficiency in industry – direct CO_2 emissions from industrial sources account for nearly 31 per cent of India's total CO_2 emissions (Prime Minister's Council on Climate Change: 2008: 20).
3. Energy efficiency in the residential and commercial sector (CFLs, space conditioning technologies), management of municipal solid waste (composting), and promotion of urban public transport (use of CNG, biodiesel from Jatropha and pongamia, metros).
4. Water – surface and ground water management, drainage systems, conservation of wetlands, desalination.
5. Security of the Himalayan ecosystem – monitoring, traditional farming, sustainable tourism.
6. Reforestation – target of one-third of India under forest cover. Under the *Greening India Programme*, 6 million hectares of degraded forest land will be forested.
7. Sustainable agriculture – dryland agriculture, use of biotechnology, providing information to farmers for greater farm productivity.
8. Creating awareness on climate change – climate modelling and data access for better coordination among ministries and departments of the government.

The eight national missions mentioned in the NAPCC highlight the priority areas for climate change mitigation as well as adaptation for India. Therefore, India has already made an earnest attempt at adapting to and mitigating climate change, as well as amplifying its scope of activities in the future. Four key pillars can be discerned upon which India's current and proposed action to address climate change is based, namely: energy security, energy efficiency, technology transfers and regulatory policy. The next section highlights these four underlying pillars that undergird India's action on climate change.

The four key pillars of India's action on climate change

The underlying philosophy or key aspects of India's action on climate change is not immediately discernible by way of a mere enumeration of the various

practices adopted and policies implemented, as mentioned in the foregoing section. Here we identify four chief characteristics of India's policy to address climate change. These four pillars can be seen as emerging from India's developmental concerns, international responsibilities and governmental constraints. On adaptation, there are a several areas of concern that India has already been focusing on, such as agriculture, water resources, health and sanitation, forests, coastal-zone infrastructure and extreme weather events. The interesting point to note is that energy security, energy efficiency, technology transfers and regulatory policy impinge on India's policy on mitigation as well as adaptation, albeit indirectly in the case of the latter. In addition, it is difficult to identify the underlying pillars of the country's policy on adaptation to climate change, given the close kinship between adaptive policies and the country's developmental policies. That is, programmes that address crop improvement, drought proofing, health (vector borne diseases), risk financing, disaster management, and livelihood preservation, are all integral to India's developmental process. What is novel is that in light of the growing concern for climate change, these developmental policies (and hence adaptation) have gained added urgency.

Energy security: Supply and demand dynamics

Implicit in the Government of India's (GoI) continued emphasis on rapid economic growth is the need for energy security. Several of India's proposed research priorities as well as its policy on clean energy are driven by a concern for meeting the country's spiralling demand for energy, albeit in a more efficient and effective manner. For instance, a recent newspaper article in a leading Indian daily reported that the Energy Resources Development Agency (ERDA) has already developed techniques for using hydrogen gas available from water to fuel cars. The interesting thing to note is the language of the news report – the article did not mention how this technology would be cleaner/greener, but that hydrogen gas would fuel cars and help India to '...meet the world's energy crisis likely to arise from diminishing fossil fuels'.[20]

As India grows economically, access to secure sources of energy is a necessity for achieving its developmental goals, as 'energy services underpin almost all aspects of human activity'.[21] At present, India faces an immense shortfall in terms of its demand for energy in all sectors. Total primary energy demand in 2005 was 537 Mtoe – equivalent to that of Japan's.[22] The country's demand is met by imports of not only coal and oil, but also since 2004, of natural gas. At present, India's import dependence is 12 per cent of total coal production, 70 per cent of total oil production and 17 per cent of total natural gas production.[23] India's energy import dependency is set to rise across all three energy sources (coal, oil and natural gas) in the coming decades.[24] Dependence on imports exposes the country to price volatility and the associated rise in the price of basic commodities, especially food.

Given these facts, the search for secure, affordable and accessible sources of energy is critical for undergirding India's economic growth. However, along with concerns about the availability, affordability and accessibility of sources of energy,[25] India is also increasingly factoring in the concern about the 'acceptability' of the energy source as a key aspect of the country's energy security. That is, the GHG-intensive nature of fossil fuels is a 'cost' that India is cognisant of, particularly given the fact that fossil fuels account for 66 per cent of the total energy mix in electricity generation (coal accounts for 55 per cent). According to the IEA, fossil fuel use has driven up CO_2 emissions, which stood at 1.1 billion tonnes in 2005.[26]

Therefore, India is exploring all options to assure its future energy security – including exploring options for a more diversified energy basket. Alternative energy sources that India is looking into include nuclear energy (through the country's three-stage nuclear power programme), hydropower,[27] renewable energy such as biomass power generation, wind energy and biofuels.[28] What is interesting to note is that a variety of energy choices are available to India. What needs to be worked out in a holistic manner is the balance between the costs and the benefits of adopting any energy choice, by minimizing the negative externalities attached to each. Therefore, India's energy basket will in the end have to be determined based on a number of concerns – the cost to the environment of exploiting a particular energy source, the cost of importing the resource and domestic availability of the resource.

Energy efficiency: Energy saved is energy produced

Apart from energy security, cost-effective energy-efficiency measures is the other recurring theme underlying India's proposed action on climate change, as discussed in the NAPCC. It is interesting to note that energy-efficiency measures as well as lifestyle choices that require greener standards of living are important to all eight missions identified in the NAPCC. Energy saving options can be exercised in diverse sectors – from industry,[29] to commercial and residential areas. The importance of energy savings and efficiency is evident in the government of India's decision to pass the Energy Conservation Act in 2001 that established the Bureau of Energy Efficiency (BEE). The BEE assists the government in developing 'policies and strategies with a thrust on self-regulation and market principles'.[30] India's Integrated Energy Policy (IEP) also makes the same point about the importance of energy efficiency and demand-side management, albeit within the framework of energy security. The BEE standards and labelling programme provide standards, procedures and regulation that prescribe limits on the energy performance (usually maximum energy use or minimum efficiency) of manufactured products. IEP states that 'lowering energy intensity through higher efficiency is equivalent to creating a virtual source of untapped domestic energy'.[31]

Given the importance accorded to energy efficiency, the NAPCC highlights several measures which simultaneously address India's energy security as well as climate-change concerns, such as: energy-efficient lighting – for example, the Bachat Lamp Yojana that has helped in promoting CFLs in place of incandescent bulbs, green buildings, space conditioning technologies, emissions savings in the transport sector by increasing the share of railways, public transportation systems (CNG/BRT) and so on. In the power sector, there are again immense opportunities for energy-efficiency savings in energy transmission and production. For example, supercritical and ultra supercritical plants can achieve efficiencies of ~40 and ~45 per cent, respectively (Prime Minister's Council on Climate Change 2008: 36). In the context of transmission and distribution of power, it has been estimated that India's current technical losses are as high as 16 to 19 per cent. Energy-efficient transformers and high voltage transmission systems can help to bring this figure down to about 6–8 per cent of losses.[32]

Access to technology and technology transfers

Closely connected to the objective of promoting energy efficiency is the issue of technology transfers. Access to technology is necessary not least because of its ability to make alternative energy sources cost-effective as well as competitive vis-à-vis dirtier fossil fuels. Given the enormous amounts of capital needed for initial investments in R&D/infrastructure in developing cleaner and more efficient energy choices, developing countries fail to develop them indigenously. It is for this reason that as part of the ongoing international negotiations on climate change, developing countries such as India have been demanding access to proven technology and know-how that allows the adoption of technologies that are not only cost effective but are also commercially viable under specific developing country conditions. One area in which technology transfers and energy collaborations can make a big difference to India's objective of moving towards a low-carbon future is solar thermal and photovoltaic (PV) power generation.[33] Technology transfers can help make solar energy commercially viable, particularly in remote areas of the country. At present, the investment costs of solar PV-based power systems are in the range of Rs. 30–35 crore/MW, while the unit cost of generation is in the range of 15–20 KWh. As compared to other sources of energy, solar is far costlier.

An important aspect of technology transfers is joint R&D cooperation between the private and public sector, between the centre and federal states and between countries (multilaterally or regionally, such as within south Asia). In the context of the latter, R&D collaboration is important for the speedy application of new and cleaner technologies that are attuned to the Indian scenario. India has explored options for clean coal technology (CCT) and carbon capture and sequestration (CCS). The transfer of technology through cooperation in scientific research however raises a host of

related issues – that of sharing Intellectual Property Rights (IPRs), mode for funding/financing and so on. One mechanism that was seen as facilitating the transfer of mature technologies already deployed in the West was the Clean Development Mechanism (CDM), an arrangement under the Kyoto Protocol. Despite the fact that as of June 2008, India has given host-country approval to 969 CDM projects, it has not entailed technology transfers from the West. Instead, most of the CDM projects use locally available technologies and domestic financial resources.

Regulatory policy

Apart from the adoption of energy-efficiency norms and standards, another critical intervention that has been suggested and implemented in the domestic sphere is that of promoting appropriate financing mechanisms and regulatory policies. This is particularly important to address the inherent 'split-incentive' problem of consumers having to pay the additional investment for efficiency improvements while those who reap the benefits might belong to a group which is far bigger than the 'buyers'. Through price signals and interventions by the government, it is possible to create the appropriate market conditions for the feasibility/viability of energy-efficient services and equipment. It is also likely to engineer lifestyle changes by nudging consumers to make 'informed' choices in favour of changes that are more cost-effective. Governments can use taxation, economic and fiscal incentives as well as subsidies to increase the demand for and supply of energy-efficient products and services. At the same time, there is also a need for India to move towards rational energy pricing that is based on long-term average economic costs.[34]

Way ahead: Further challenges and possible response options

The foregoing sections highlight how India's developmental concerns frame the country's strategy to address climate change. The inter-linkages between the country's climate and energy security concerns are evident in the frames of reference used as well as the policy choices and preferences highlighted. As India grows and hopes that its economic growth percolates to a far wider cross-section of society, it will need to play a bigger role on issues concerning climate change, energy security and development. At the interstices of the domestic and the global – where transboundary concerns intermingle with very real grassroots concerns – India will need to adopt a more holistic approach to address its primary developmental goals, while also acting on its international responsibilities vis-à-vis the environment.

However, there are certain challenges that will require greater attention in the future, irrespective of how the international negotiations on climate change shape up. This section highlights some of the challenges that India, as well as other countries in the world, will have to face up to in the future.

Along with the challenges, this section also emphasizes possible response options to address these challenges.

Levels of vulnerability, culpability and negative externalities

It is imperative to understand that there exist diverse levels of vulnerabilities not only within the developing world, but also within India. Globally, climate change is likely to impact on low-lying island states, low-lying deltaic regions and areas under water stress much more than other areas.[35] Similarly, within India as well, there are regions which are likely to be disproportionately affected vis-à-vis others. For example, within India, areas such as the Sundarbans will probably face the worst of the impact of climate change as sea levels threaten to rise. According to a study done in the Jadavpur University in West Bengal, roughly 80 square kilometres of the Sundarbans have disappeared over the last 30 years.[36] While the disappearance of the land cannot be attributed solely to climate change, this fact does nonetheless point to the natural vulnerability of the region to sea-level rise.[37] Even within this group of more vulnerable regions within India, it is the poorer segment of society that will face the brunt of climate-change impacts. For example, most of the residents of a village in the Sundarbans that was washed away were poor fishermen and farmers who had done nothing to contribute to GHG emissions but are in the frontline in terms of facing the negative impacts of climate change. Indeed, estimates suggest that the poorest in the world, about a billion people, are hardest hit by flooding, drought and the spread of disease.[38] It is because a large segment of India's population does not have access to electricity, let alone energy-efficient technology, it is likely that the benefits arising from a near-total adoption of energy-efficiency measures will be nullified. It is necessary therefore that the poor be given access to 'modern' and clean energy choices, which at the same time make economic sense to them. On the adaptation side, India has two risk-financing programmes, such as the Crop Insurance scheme, which supports the insurance of farmers against climate risks, and the Credit Support Mechanism, which facilitates the extension of credit to farmers, especially in instances such as crop failure due to climate variability.[39]

While choosing more climate-friendly energy choices, the government of India needs to take a host of other constraints into consideration. This is particularly important in the context of developing hydropower as an alternative to fossil fuels. Hydropower has the attendant problem of displacing people and hence of providing adequate compensation. These governance issues call for a shift from top-down policymaking, wherein the government is a partner of the various stakeholders and civil society organizations or representatives involved. The following example perhaps brings this point out best. India's search for energy security, particularly in the context

of the rising price of fossil fuels, has pushed hydropower to the forefront. The hydropower potential of the northeast in India offers great promise in this respect. However, over the last few years, India's decision to build dams on the River Teesta has met with protests from the local *Lepchas* of Sikkim. Not only are these dams said to be in high-risk seismic zones, but they are also environmentally suspect. The local community also sees the building of dams as a 'desecration of their sacred landscape'.[40] Therefore, the government of India must balance the needs and interests of not only the nation, but also the need for equity and fair compensation/resettlement special interests of local communities, such as the *Lepchas*.

On other side, however, is the fact that there are varying carbon footprints within the country. Despite the fact that 44 per cent of India's population does not have access to electricity and 27.5 per cent live under the poverty line, access to the same amount of energy by the remaining proportion of the population is enough to make India the fourth or fifth highest emitter of CO_2 in the world – clearly a result of India's total population. The Carbon Dioxide Information Analysis Centre of the US Department of Energy (DOE) puts India at number four, if the European Union (EU) is not taken as a whole and taking the time frame of 1858 to 2004.[41] Even though the average CO_2 emission per person is about 1.2 tonnes in India (the United States is 20), what is important to point out is that the affluent Indian has a carbon footprint that is increasingly akin to what is the average in the West. According to a pilot study carried out by The Energy and Resources Institute (TERI), an average Indian has a carbon footprint which is just 30 per cent of the world average and 6 per cent of that of an average US citizen. Based on estimates from the small sample surveyed, however, it is estimated that an individual in the high-income category has a carbon footprint equal to almost 45 per cent of the world average and that of a middle-income category about 23 per cent of the global average.[42] It is therefore necessary to focus on this group to make sustainable living a part of personal lifestyle choices. To this end, fiscal incentives, tax benefits, labelling of 'white' goods[43] and campaigns to create awareness need to be stressed.

Along with the work done by the BEE mentioned above, ongoing research and consultations with relevant stakeholders by organizations such as TERI has been seminal. For instance, a stakeholder dialogue held in Goa in October 2007 dealt specifically with the scope for energy efficiency in the construction sector. Given the fact that India's construction sector is growing at 9.2 per cent (as opposed to the world average of 5.5 per cent), the scope for greener buildings to make a difference in people's lifestyle choices cannot be emphasized enough.[44] Apart from the construction and household sectors, the Indian government needs to make greater efforts in the transportation sector. According to the Energy Information Administration (EIA), India is expected to show the largest increase in transportation energy sector consumption amongst the non-OECD countries. Therefore, the

transportation sector is clearly an important area for future governments in India to focus their policies and action on.

Decoupling energy security and climate change

Addressing climate change, particularly its mitigation, presents a peculiar problem for countries and individuals. The science of climate change is still in the process of becoming firmer; and for many, the effects are not all negative. Climate-change impacts have made losers out of some and winners out of others. Take for example just two news reports – one that states simply that the *Climate fight is about survival*[45], while the other talks about opportunities – *Greenland: land of ice goes green as warming turns the cabbages into kings*[46]. This and the fact that the benefits of climate change are not immediate and accrue in the long term, often in imperceptible ways as compared to the cost of mitigating it, climate change remains far from presenting a 'clear and present danger' in equal ways for people around the globe.

It is the language of energy efficiency and energy savings that speaks to the 'user/buyer' in a more tangible way than talking about climate security alone. In a developing country where a great number of people either do not have access to electricity or whose lifestyles are not GHG-intensive cannot be asked to adopt costly energy-efficient technologies solely on the basis of mitigating anthropogenic GHG emissions. What makes sense to those who are poor is saving money. It is precisely this reason that was responsible for the successful adoption of CFLs in several villages of north India, and not the prospect of global warming. Therefore, making the case for climate change by talking in the language of energy security is an effective approach, even though it does not engineer a paradigm shift in thinking.

What may eventually help in creating a paradigm shift in our understanding of energy security in the context of climate change is looking at development[47] collaboration and global public goods as keywords for engineering that shift. The decoupling of energy security from climate security is a challenge not only for India but for the rest of the world as well. In many respects, as we have seen in the context of the CFL example, energy security is the language that becomes necessary to use in order to address climate security. While this approach has certain drawbacks, in that one does not rise above the linkage between the two, one has to realize that in the short term, energy security (savings) becomes an important tool in engineering a shift in lifestyles. For the long term however, identifying win-win options is a challenge that all countries alike in the coming decades will have to focus on, such as developing alternative renewable energies in such a way that they emerge as a cost-effective alternative to cheaper but dirtier fossil fuels.

Global problem: National and regional solutions

Even though the science of climate change is becoming stronger, the strategies for mitigation and adaptation are still driven by country-specific priorities and agendas. That is, although we are thinking about climate change in globally interconnected ways, countries still approach this 'global' problem in state-driven and sovereign ways.[48] This is an interesting dichotomy. On the one hand, there is a near-complete recognition of the inter-relatedness of unchecked activities that cause local pollution and global warming. That environmental security is a prerequisite for resource security, and hence development, is a fact beyond doubt. However, on the other hand, when it comes to addressing this 'global' problem, particularly in the context of international negotiations, the path is still charted as per the dictates of state sovereignty. This sovereign approach is in part a result of the fact that international treaty-making and negotiations recognize states as actors, and not civil society groups, epistemic communities, transnational actors and so on.[49]

This dichotomous approach to addressing climate change (roughly speaking – between North and South) is similar to the debate between naysayers and those who support climate change mitigation and action, particularly if seen in philosophical terms. It is the need for scientific certainty that is behind the need for complicated computer modelling to make impact assessments of global warming, determine the extent of moral responsibility for historic emissions, or decide whether the per capita formula is the best equity-based formula for limiting/reducing GHG emissions or not. However, this search for exact numbers shifts the focus to issues of IPR-sharing, technology transfers, concepts such as historic and innocent emissions and so on. Differences over numbers and timelines divert attention from the more substantial need for a reflexive understanding of science and policy.[50] It also takes attention away from other ways in which solutions can be found at the interstices of sovereign nations – across borders, within regions, multilateral organizations and networks of civil society organizations.

The Asia-Pacific Partnership on Clean Development and Climate (AP6) is an interesting example of a group of countries seeking to address climate change and energy security in collaborative ways. However, the AP6 has been the subject of a lot of criticism, mainly for threatening to be a parallel mechanism to the Kyoto Protocol, while others point to the fact that the United States is using the AP6 to divert attention from not undertaking any responsibility under the Kyoto Protocol. While the criticism is valid, the AP6 does proffer benefits for collaboration in technology development and deployment for improving energy efficiency and cutting GHG. The APP's membership is made up of developing (China and India) as well as industrialized (Australia, Japan, South Korea and the United States) countries. It seeks to accelerate the development and deployment of clean energy

technologies. Importantly, it addresses 'energy security, national air pollution reduction, and climate change in ways that promote sustainable economic growth and poverty reduction'.[51] The partnership has been hailed as complimentary to the Kyoto Protocol. What is interesting is that the AP6 brings together countries that represent 'about half of the world's economy, population and energy use, and produce about 65 per cent of the world's coal, 48 per cent of the world's steel, 37 per cent of the world's aluminium and 61 per cent of the world's cement'.[52]

Apart from plurilateral organizations such as the AP6, other ways in which the inter-linkage between climate and developmental concerns of countries can be addressed is by focusing on the region. Particularly in the context of south Asia, the region presents an area where there is an overlap in terms of security concerns, development-related grievances, the demand and supply of different sources of energy, and the impact of global warming. The implications for the region are very real when it comes to the impact of climate change on human security. According to the Intergovernmental Panel on Climate Change (IPCC), by 2050, 35 million refugees could migrate into India from a possible flooding of the Brahmaputra delta in Bangladesh. This gives evidence of the tension-multiplying effect of climate change on the Indian subcontinent. Therefore, from the study of the impact of climate change on the Himalayan ecosystem and regional climate, to the need for engaging in efficient trade in energy (that takes advantage of the respective resource endowments and demand), the region is an important level for addressing the developmental, climate and energy concerns of India.

Conclusion

India has made a convincing start at mainstreaming climate-change concerns into its development agenda. Slowly but surely, the livelihood concerns of its people and the country's development agenda have accommodated the concern for the climate and global warming. Adaptation to climate change, even more than mitigation, requires the concerted drive towards providing social and economic development for the people. As mentioned above, scores of projects and programmes in India contain elements that seek to address risks from climate variability through adaptation schemes in the area of agriculture, water, coastal regions, forests and biodiversity, disaster management, and so on. On mitigation, what is interesting to note is the vast array of policy choices, interventions and mechanisms through which India proposes to carry forward its concern for the climate, although many of these policies are clothed in the language of energy security.

Despite these efforts, there are some difficult questions that need to be asked – of the GHG-intensive lifestyles of upper sections of Indian society as well as the need for introducing adjustments in regulatory norms and energy-efficiency standards. At the same time, there needs to be a greater

dialogue and collaboration with not only other countries, but also entities (civil society groups and local bodies) across the different levels of governance within the country. Given the continued centrality of the sovereign state, the frame of reference for the international negotiations on climate change will remain tied to national agendas and the costs and benefits borne by each economy. However, as climate change science becomes even clearer, there is a need to reflect on re-assessing an approach that is 'differentiated' but is not necessarily a conflictive one, to addressing the global concern for the climate. How this can be engineered remains to be seen. However, it is the construction of 'common ownership' (of the planet's resources and atmosphere) along with the 'common purpose' (of saving the planet) that is going to be the challenge for the world in the coming decades.

Acknowledgement

I would like to express my gratitude to Amb. C. Dasgupta for taking time out to make constructive comments on my paper.

Notes

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2. UNFCCC (1994) *Full Text of the Convention*, http://unfccc.int/essential_background/convention/background/items/1349.php (accessed on 21 December 2008).
3. The Kyoto Protocol commits developed countries (Annex I) to stabilize and reduce their GHG emissions by setting binding targets – that is, an average of 5 per cent against 1990 levels over the five-year period 2008–2012 (UNFCCC 2008).
4. A. Dupont (2008) 'The Strategic Implications of Climate Change', *Survival*, vol. 50, no. 3, 29–54.
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10. Stated conversely, other scholars have highlighted the fact that if all countries had per capita emissions comparable to India's current levels, there would be no problem of climate change in the world.
11. That is, the moral duty of bringing more people above the poverty line.
12. B. Muller, N. Hohne and C. Ellermann (2007) *Differentiating (Historical) Responsibilities for Climate Change* (Oxford: Oxford Institute for Energy Studies), http://www.oxfordclimatepolicy.org/publications/DifferentiatingResponsibility.pdf (accessed on 20 September 2008).
13. Undoubtedly, there are islands of affluence in the country – the rich and their lifestyles are similar to those of the rich in the developed countries of the West.
14. India signed the UNFCCC on 10 June 1992 and ratified it on 1 November 1993. Under the UNFCCC, developing countries such as India do not have binding GHG mitigation commitments in recognition of their small contribution to the greenhouse problem as well as low financial and technical capacities. India signed and ratified the Kyoto Protocol in 2002.
15. Charles Cormier (2008) 'Low Carbon Growth Opportunities in India', paper presented at the 3rd TERI-KAS Conference on Resource Security: *The Governance Dimension in Goa*, 3–4 October 2008. Mr Cormier is Team Leader, Environment and Water Resources Management at the World Bank in New Delhi.
16. Prime Minister's Council on Climate Change, Government of India (2008) *National Action Plan on Climate Change*, http://pmindia.nic.in/Pg01–52.pdf.
17. *Ibid*.
18. The missions are to be institutionalized by the respective ministries of the government and will be composed of members of difference ministries (Finance, Planning Commission) as well as representatives of industry, industry bodies, academia and civil society.
19. The National Solar Mission sees itself as responsible for the deployment of commercial and near-commercial solar technologies in India, establishing a solar research facility, developing integrated private sector manufacturing capacity for solar material, equipment, cells and material, providing funding opportunities through government grants, joint R&D with international organizations and so on.
20. M. Dasgupta (2008) 'Water-Propelled Cars May Run on Indian Roads, in about Two Decades', *The Hindu*, 29 September 2008.
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23. *Ibid*.
24. According to the IEA, by the end of 2030, India's oil import dependency is set to rise to 90 per cent, natural gas imports are projected to quadruple between 2020 and 2030 from 12 bcm to 61 bcm and coal import dependency is set to rise from 12 per cent in 2005 to 28 per cent in 2030 (2007: 490–509).
25. Asia Pacific Energy Research Centre (2007) *A Quest for Energy Security in the 21st Century* (Tokyo, Japan: Asia Pacific Energy Research Centre, Institute of Energy Economics).
26. Importantly however, even though India's CO2 emissions are rising, in terms of per capital emissions, India is far below the rest of the world. See IEA (2007) *World Energy Outlook. China and India Energy Insights* (Paris: OECD/IEA).

27. According to the NAPCC, India's hydropower potential has been estimated at 148,700MW. There is specifically a potential for small-scale hydropower (15,000 MW), primarily due to its cost competitiveness and benefits for rural electrification.
28. The Indian government has taken initiatives for promoting use of biofuels such as bio-ethanol derived from molasses and biodiesel derived from non-edible seeds of plants like Jatropha, Karanja in the transport sector.
29. TERI carried out a detailed study for the Office of the Principal Scientific Advisor to the Government of India in 2006 which analyses the energy savings possible in several sectors of industry, such as the aluminium, iron and steel, cement, textile, fertilizer, pulp and paper industry. See TERI (2006) *National Energy Map for India: Technology Vision 2030* (New Delhi: TERI Press).
30. Bureau of Energy Efficiency, Ministry of Power, Government of India (2008) *The Action Plan for Energy Efficiency*, http://www.bee-india.nic.in/aboutbee/Action%20Plan/actionplan.pdf (accessed on 20 September 2008).
31. Planning Commission, Report of the Expert Committee (2006) *Integrated Energy Policy* (New Delhi: Government of India, Planning Commission, August 2006).
32. Prime Minister's Council on Climate Change, Government of India (2008) *National Action Plan on Climate Change*, http://pmindia.nic.in/Pg01–52.pdf.
33. According to the NAPCC, just 1 per cent of India's land area can meet the country's entire electricity requirements until 2030 (Prime Minister's Council on Climate Change 2008: 18).
34. *Ibid*.
35. C. Dasgupta (2008) 'Energy, Climate and Security: New Dimensions of Geopolitics', in Devika Sharma and Ligia Noronha (eds) *Energy, Climate and Security: The Inter-linkages* (New Delhi: Anshah Publishing House).
36. S. Sengupta, 'Living on the Edge: Indians Watch Their Islands Wash Away', *International Herald Tribune*, 10 April 2007.
37. The disappearance of the land has in the popular media been attributed to sea-level rise caused by snowmelt in the upper reaches of the Himalayas that cause rivers such as the Brahmaputra to swell before draining into the Bay of Bengal.
38. 'Adapt or Die. Climate Change and the Poor', *The Economist*, 12 September 2008, http://www.economist.com/daily/chartgallery/displaystory.cfm?story_id=12202374&fsrc=rss (accessed on 15 September 2008).
39. Ministry of Environment and Forests (2007) *India: Addressing Energy Security and Climate Change*, envfor.nic.in/divisions/ccd/Addressing_climate change_09–10-07.pdf (accessed on 15 February 2009).
40. Vibha Arora (2008) 'Gandhigiri in Sikkim', *Economic and Political Weekly*, 20–26 September, pp. 27–28.
41. See Carbon Dioxide Information Analysis Centre (2004) 'Top 20 Emitting Countries by Total Emissions for 2004', http://cdiac.ornl.gov/trends/emis/tre_tp20.html (accessed on 20 September 2008). However, taking India's emissions from 1858 to 1947 while it was a colony of the British is not fair. This is something that Muller et al. take into consideration in the study on 'Differentiating Responsibilities for Climate Change', naming those emissions 'harmless emissions'. Taking into account India's harmless emissions therefore, India's historical contribution to total GHG emissions in the world come down from 3.9 per cent to a mere 0.3 per cent. P. Kant, 'Global Warming & India's

Responsibility', *The Hindu*, 18 December 2007, http://www.hindu.com/2007/12/18/stories/2007121855200800.htm (accessed 25 September 2008).

42. The global average carbon footprint is about 4 tonnes of CO2 per person, while the national average for the United States is 20, United Kingdom 9, China 3, and India 1.2. The carbon footprint of an average household in each of the following four income classes was estimated based on responses from 20 households in the city of Kolkata. The high-income households with a monthly income between Rs 60,000 and above. TERI (2008) 'Building an Energy Secure Future for India through a Multi-stakeholder Dialogue Process', unpublished Year 2 Report of the project funded by the Nand and Jeet Khemka Foundation.
43. Lifestyle choices in India, particularly of luxury or 'white' goods, are already constrained by comparatively higher taxes. For example, standard taxation rates are 8 per cent, 10 per cent and 12 per cent on all goods, which do not qualify for the higher or reduced rates; while a higher rate of 20 per cent is levied on certain luxury goods, whereas a lower rate of 4 per cent applies to certain basic commodities.
44. In a study conducted by TERI, implementation of energy-efficient measures would help achieve a 30 per cent energy saving in new residential buildings and 40 per cent energy savings in new commercial buildings.
45. E. Rosenthal 'For Some, Climate Fight Is About Survival', *International Herald Tribune*, 19 December 2007.
46. 'Greenland: Land of Ice Goes Green as Warming Turns the Cabbages into Kings', *The Times*, 20 September 2008, http://www.timesonline.co.uk/tol/news/environment/article4791047.ece (accessed on 25 September 2008).
47. Manish Tiwari, spokesperson of the All India Congress Committee made the point of redefining the language of energy security, at the 3rd TERI-KAS Conference on 'Resource Security: The Governance Dimension', Goa 3–4 October 2008. Mr Tiwari emphasized the need for decoupling energy security and climate security and suggested that a paradigm of cooperation in the region (as too for the world) can ensue if we change the discourse from one centred on security to one focused on development.
48. An example of how countries continue to respond to the logic of cost effectiveness, rather than global climate change concerns, is the continued importance of coal in countries such as China and India (and increasingly even rich countries in Europe and the United States). Instead of getting off coal, what countries are trying to do is to find ways in which the use of coal can be made both acceptable as well as affordable through clean coal technologies.
49. This is true even though the findings of bodies such as the IPCC form the basis of asking states around the world to take up more responsibilities to reduce GHG emissions.
50. This need for a shift away from 'scientific truth and (un) certainty' has been espoused by David Demeritt in his constructionist understanding of the science of climate change. He suggests that the science of climate change must rely more on the 'rhetoric of social trust and solidarity (emphasis added) in trying to construct a political response to climate change'. See D. Demeritt (2001) 'The Construction of Global Warming and the Politics of Science', *Annals of the Association of American Geographers*, vol. 91, no. 2, 307–337. While numbers are helpful in determining how much action each country may take, the problem arises when the focus of the negotiations shifts to agreed upon numbers alone, and not immediate action.

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52. US Department of State (2007) *Asia-Pacific Partnership on Clean Development and Climate Ministerial Meeting*, http://www.state.gov/r/pa/prs/ps/2007/oct/93459.htm (accessed on 28 September 2008).

22

Climate Change and Human Security in Southeast Asia: Issues and Challenges

Mely Caballero-Anthony

Introduction

Against the flurry of international summits and meetings held on the environment – most recently the UN Summit on Climate Change – the critical issue of climate change has no doubt become the top security agenda for the global community. Spurred by a number of scientific studies on the catastrophic effects of climate change and more recently by the report of the influential Intergovernmental Panel on Climate Change (IPCC), world leaders have agreed that climate change is now a global problem.

The global consensus on the grave security challenges posed by climate change, however, is not matched by a consensus on how best to address this problem.[1] The differing political responses and contentious negotiations taking place in the international community has been aptly described by US Secretary of State, Condoleezza Rice, who argued that the 'one size fits all approach would not work; there must be room for each nation to tackle the problem through medium-term programmes that reflected its own needs and did not require it to put aside economic growth for the sake of the environmental health'.[2]

The complexities that come into play in this environmental conundrum are most saliently found in Southeast Asia – a region noted as one of the highest emitters of greenhouse gasses (GHGs), a place most often plagued by serious forest fires causing transboundary pollution haze as well as where rapid deforestation and destruction take place. It is also a region most adversely affected by natural disasters brought on by torrential rains and large-scale floods, and where irregular weather patterns increasingly bring on periods of long droughts. And as though these crises were not enough, the states and societies of Southeast Asia are also still experiencing the deleterious impact of other major security crises – most notably the Asian financial crisis of 1997 and the SARS health crisis in 2003. In the face

of huge and serious security problems affecting the region, the question that therefore confronts us today is how states in the ASEAN are dealing with the grave challenge of climate change.

Climate change: Implications for Southeast Asia

Before we examine the kinds of responses found in the region, it will be useful to discuss some facts about the implications of global climate change – global warming – for the ASEAN region. The 2007 Expert Group Report on Climate Change and Sustainable Development has identified five likely outcomes most pertinent to Southeast Asia. These are:

1. Rises in sea levels (which will submerge low-lying coastal plains and river deltas) and more intense cyclones increase flooding of deltas and coastal plains – placing already endangered coastal ecosystems at risk; and which could alter river flows and affect hydroelectric power;
2. More intense summer monsoons, increasing the degree and frequency of destructive flows and soil erosion;
3. Major loss of mangroves and coastal reefs;
4. Melting of mountain glaciers (from the Himalayas) reducing vital rivers flows and increasing pressure on water resources (in turn, decreasing fresh water availability resulting from higher rates of evaporation and salinization);
5. Greater uncertainty associated with water management and supply – leading to increased pressure on water resources what with rising population and the need for irrigation.[3]

With these projected climate outcomes, we can draw out a number of threats and risks to human security. In the interest of time, let me just highlight some of more 'immediate' risks and threats.

Frequency of natural disasters

It has been established that around 188 million people worldwide were adversely affected by natural disasters in the 1990s – six times more than the 31 million directly or indirectly affected by war.[4]

- Meanwhile, in 2006, Asia suffered 44 per cent of worldwide natural disasters, with 119 million killed or affected and about US$25 billion in economic damage (72.9 per cent of worldwide damage).
- Considering that most of Asia's densest aggregations of people and productive lands are on, or near, the coasts, including the cities of Shanghai, Tokyo, Jakarta, Manila, Bangkok and Singapore – the risks and vulnerabilities have therefore increased with their increased susceptibility to cyclones driven by sea warming and the rising sea levels. Furthermore,

these cyclones produce strong tidal waves, especially during La Niña years, which can increase the severity of coastal flooding – consequently threatening lives, infrastructure, agriculture and fresh water supply.

Food security

The Consultative Group on International Agricultural Research has predicted that food productivity in Asia will decrease by as much as 20 per cent due to climate change as the geographical boundaries of agro-ecosystems, as well as species composition and performance, will change. In addition, more permanent shifts in seasonal climatic patterns that bring on more frequent and intense weather extremes will badly disrupt agriculture, fisheries and the natural resource base of the region.

- In terms of fish stocks, we note that Asia is currently the world's food bowl, producing nearing 60 per cent of global fish production – which in turn makes up a large chunk of Asian countries' export earnings – contributing up to 40 per cent to the agricultural GDP. Three of the top 12 fish-producing nations are in SEA (Indonesia, Thailand and the Philippines) and produce much of the fish supply in the region. This supply would be severely challenged with rising sea levels and higher inland water temperatures.
- For the mostly agriculture-based economies of ASEAN, increased temperatures could threaten grain supplies due to high temperature-induced grain sterility; while shifts in rainfall patterns could render previously productive land infertile – accelerating erosion, desertification and thus reducing crops and livestock yields.
- Furthermore, a reduction in water available for irrigation will have a serious impact on crop yields especially in the region which is much more dependent on irrigation than other regions of the world that grow rice and cereals.

Health security

The rise in global average temperatures has been identified as one of the primary reasons behind the extending ranges and seasons of various tropical disease-carriers (including malaria and dengue fever). Warmer temperatures change the distribution of vectors and enable them to thrive in previously inhospitable areas, thus at warmer temperatures parasites develop more rapidly in mosquitoes.

- For instance, a study by the WHO has estimated that 154,000 deaths annually are attributable to the ancillary effects of global warming, due mainly to malaria and malnutrition. This number could nearly double by 2020 and currently, some 40 per cent of the world's population lives in

areas affected by endemic malaria and many countries in ASEAN and the wider A-P region are already seriously affected by the diseases.[5]
- With high incidence of poverty and an overpopulated environment, the risks of infectious diseases in SEA are therefore heightened – but the problem is further compounded by its poor public health infrastructure.

Water scarcity

As noted earlier, changes in the variability and distribution of rainfall could also exacerbate fresh water scarcity in water deficient states. In a world where over 2 billion people already live in countries suffering from moderate to high water stress, and half the world's population is without adequate sanitation or drinking water, relatively small shifts in rainfall patterns could push countries and whole regions into deficit, leading to a series of water crises with global implications. In this regard, countries which are already water deficient will suffer the worst shortfalls as rainfall patterns shift and become more variable.

- In Asia alone, per capita water availability has declined by between 40 and 65 per cent since 1950 and the World Bank had estimated that by 2025 most states in the region would be facing serious water shortages unless strong action is taken. But this is compounded by the fact that 20 per cent of the global increase in water scarcity is directly attributable to climate change (with the remaining 80 per cent because of growing demand).
- Given the strong linkages between water supply and agriculture, declining water levels could therefore have adverse consequences for food production in countries like Myanmar, Thailand, Laos, Cambodia and Vietnam.
- There is also the potential for water scarcity as a potential driver of interstate conflict.

Energy security

The IEA expects a 50 per cent increase in fossil fuel usage over the next 15 years, which will dramatically push up GHS without mitigating measures. As we all know, fossil fuels are responsible for nearly 80 per cent of anthropogenic GHS, which are the major causes of global warming.

The problem we face now is that alternative technologies are either more expensive than conventional fuels, require longer periods to install or demand enormous capital investments.

- In ASEAN, concerns about climate change have fed into a parallel debate about energy security and have now led to more talks about plans to consider nuclear power as an alternative source of energy.
- Apart from the need to utilize carbon-free forms of energy, this nuclear power bandwagoning is driven by the need to increase energy supply

amidst rapid economic growth. The Indonesian government has indicated that Gorontalo in Sulawesi would likely become the country's first province to have a 4000 megawatt nuclear power plant, which is expected to supply 2 per cent of the country's total energy demand by 2017. Thailand also released plans to spend an estimated US$6 billion to build nuclear power plants by the year 2021 while Vietnam plans to build its first nuclear energy plant by 2020.

In brief, the negative impact of climate change has and will continue to generate human suffering, economic decline and potentially will increase political instability. In a region that is already grappling with a number of socioeconomic and security problems – the impact of the same consequences of climate change can only be much more severe.

What has been done?

ASEAN's responses to climate change can be understood by examining the underlying perceptions by states in the region about the kinds of environmental risks and values that threaten their own interests. In this regard, I suggest that we examine ASEAN's approach to dealing with climate change in four broad areas: (1) addressing the burning of peatlands and forest fires as root causes of climate change; (2) national initiatives among ASEAN member states on mitigating and adapting to climate change; (3) common challenges faced by ASEAN member states in mitigating and adapting to climate change; and (4) the regional framework of climate change mitigation and adaptation mechanisms.

Addressing root causes of climate change: burning of peatlands and forest fires.

There are several reasons why peatlands play such a significant role in tackling climate change. First, it is important to note that much of the peatland in the world is found in Southeast Asia – particularly in Indonesia. Apart from being a major source of carbon emissions, the burning of peatlands and environmental fires have also been a source of the annual transboundary haze problem in Southeast Asia.[6]

> Peat is dry un-decomposed plant material, is said to contain carbon equivalents of 100 years of current global fossil use. Moreover, it can be easily ignited thus causing more fires and carbon emissions due to intense heat during the dry seasons. In addition to this, it should be noted that carbon dioxide emissions would continue even if fires could be prevented and stopped. The oxidation of the current desiccated peatland top soil results in an average of about 86 tonnes of carbon dioxide a year.[7]

While carbon emissions covered under the Kyoto Protocol include emissions from industries, housing, traffic and agriculture,[8] a lot of the carbon

emissions in the developing states in Southeast Asia – such as Indonesia – result from forest fires from peatlands. (Unfortunately, forest fires are also the one major contributor to deforestation in the second-largest 'lung'/forest in the world due to commercial land conversion).[9] Second, there has been an established linkage between the haze crisis and global temperatures. Shortly after the major haze crises of 1997 and 2006, the world experienced record-breaking global temperatures in 1998 and (predictions for) 2007. Such an observation only serves to further reiterate the link between environmental fires and climate change. Global warming only serves to exacerbate the haze problem by creating a vicious cycle by increasing the risks of more intense forest fires during the hot and dry seasons.

Third, the burning of peatlands may only worsen as more incidents of deforestation may occur, ironically, as a result of giving in to global demands for alternative energy sources. Biofuels have been identified as a highly viable option as they are much cheaper than other renewable sources such as solar and wind energy. In January 2007, the European Commission had set a new target for its 27 member countries, to replace 10 per cent of petrol and diesel with biofuels by 2020 as compared to its previous target of 5.75 per cent by 2010.[10] Indonesia and Malaysia are prime markets for biofuel, in particular palm oil as they account for 83 per cent of production and 89 per cent of global exports.[11] Moreover, there is concern that unregulated biofuels production due to the expansion of plant fuels would take away land from food production, thus posing a threat to food security and perpetuating poverty. According to Wetlands International, poverty in Indonesian peatlands is said to be four times higher than in other lowland areas.[12] These factors therefore put further pressure on the Indonesian government and its ASEAN counterparts to effectively address forest fires and the haze issue.

In response, ASEAN leaders have securitized the haze problem since 1995, leading to the adoption of major agreements such as the Regional Haze Action Plan (RHAP) in 1997 and the ASEAN Agreement on Transboundary Haze Pollution.

The RHAP had three main component programmes – prevention, mitigation and monitoring. This signified a narrowing of intergovernmental action as the most affected countries were designated to spearhead the three RHAP programmes; Malaysia took the lead in prevention, Indonesia in mitigation and Singapore in monitoring of fires and haze. Yet despite this division of labour, mitigation on the part of Indonesia has been poor. Deploying officials to immediately respond to those hard to reach areas has been a time consuming exercise that deters catching the culprits. Widespread corruption has also impeded investigations in identifying the culprits.

The 2002 ASEAN Agreement on Transboundary Haze Pollution, which essentially sets forward a number of strategies to address land and forest fires in Indonesia, establishes a subregional Technical Working Group to address

land and forest fires in the northern part of the region, as well as build a regional Haze Pollution Control Fund. However, Indonesia still refuses to sign this agreement, thereby limiting the extent to which other ASEAN states are able to intervene in the problem. There is also the dilemma of addressing symptoms rather than the root causes of the fires. For instance, cloud-seeding initiatives to put out environmental fires are very costly and provide, at most, temporary relief. One cloud-seeding operation in Sarawak during the haze crisis in 2006 was said to have cost the Malaysian government RM55,000. Alternatively, irrigation of peatlands is a much more sustainable method but requires a long period before seeing results. This inexpensive local initiative of blocking existing canals that surround peatlands with logs and sandbags has proven to be a success, for not only has it put an end to fires but also allowed forests to recover and created a new food source with fishes breeding in the blocked off canals, thereby satisfying locals' food and water security.

The 2006 ASEAN Peatland Management Strategy (2006–2020) does acknowledge this by highlighting the need to employ measures that ensure sustainable development and multi-stakeholder and multi-agency involvement. The meeting also acknowledged its past errors, such as channelling resources to fire suppression and emergency purposes rather than preventive measures. The problem lies, however, in enforcing the policies which would only show results over time. Moreover, building up awareness amongst the locals, as well as providing compensation where necessary, is critical to ensure that locals would not have to resort to slash and burn tactics for their survival. It is also important to channel more funds into this project.

Since 2006, there has been escalation of talks on addressing the haze problems due to the recurrence of this problem. And, complementing these regional programmes there are also bilateral ones, such as that between Singapore and Indonesia. Singapore has offered to deal directly with the Muaro Jambi regency of Indonesia, which has been identified as part of the 35 fire-prone areas that need particular attention. Known as the Jambi Master Plan, the National Environment Agency (NEA) of Singapore will assist the regency in enhancing its capacity in preventing and mitigating fires. It would also assist the Jambi government in sourcing out for financial and technical resources, including matching agencies to project. The Asian Development Bank also noted that it would provide technical expertise and funding for some projects under the Jambi Master Plan. Other elements under the plan include legislation and enforcements and early warning and monitoring.[13]

National initiatives within ASEAN on climate change

Mitigation and adaptation are distinctly different measures to cope with climate change. Mitigation involves taking measures to reduce GHG emissions

and to enhance carbon sinks (the forests), targeted at reducing the extent of global warming. Such measures constitute the long-term solutions against climate change and could include, inter alia, energy efficiency and conservation, use of clean, alternative energy sources as well as carbon capture and storage. Adaptation, on the other hand, would consist of measures to reduce the vulnerability of human and natural systems against existing or anticipated climate change effects, and is necessary since not all climate change problems could be mitigated. It will be worthwhile to look at how ASEAN member states had individually attempted to mitigate and adapt to climate change.

Cambodia: The National Environmental Action Plan (1998–2002) was prepared to guide the integration of environmental concerns into national and local development policies, economic decision making, and investment planning, and it focused on selected key areas such as forestry, fisheries, agriculture, conservation, energy development, and waste management. In addition, the preparation of a National Biodiversity Strategy and Action Plan is at the final stage, with a goal 'to use, protect and manage biodiversity for sustainable development in Cambodia'. Besides these initiatives, a National Action Plan on Climate Change has been prepared with the aim of supporting national development priorities while contributing to global climate change countermeasures efforts.

Indonesia: Notwithstanding its refusal to accede to the 2002 ASEAN Agreement on Transboundary Haze Pollution, Indonesia has made preparations for a long-term adaptation strategy for coastal areas based on three adaptation strategies: retreat (whereby the government would also prepare and plan a migration strategy that would have only a slight impact to the livelihood of the communities affected), accommodate and protect.[14] Jakarta authorities would also inform the local communities of the dangers of certain areas through public campaigns, and issue residential bans on certain coastal areas. In addition, a public information campaign, explaining the dangers of certain coastal areas and explaining the government programmes to move local residents to a different location, would be implemented. Following the migration, the government would then issue residential bans on various coastal areas that are prone to the impacts of sea-level rise.

Laos: In terms of mitigating climate change, Laos has sought to address deforestation. Towards this end, it has cooperated with Germany on joint poverty reduction programmes, especially in rural areas.[15] This involves 6 million euros for 'avoided deforestation' activities in order to ensure sustainable forest management to help protect Laos' great potential as a carbon sink, noting that forests account for as much as 69 per cent of the country's area, for the benefit of global climate protection. The rural Laotians could benefit from this collaboration through the generation of income via biomass management and compensation payments for forest

protection. As such, the project would achieve the double effect of poverty reduction in parallel with environmental policies.

Malaysia: The country has instituted a range of guidelines and policies to mitigate climate change.[16] First, the fourth thrust of the Ninth Malaysia Plan 2006–2010 essentially strives to improve the standard and sustainability of quality of life. Also, the National Physical Plan has been initiated to designate environmentally sensitive areas (ESAs) for sustainable forest development.[17] To adapt to climate change, Malaysia has also implemented the Programme to Plant Mangroves and Other Species along the Coastal Areas in Malaysia, drawing from the lessons of the 2004 tsunami. A special taskforce was formed to coordinate the planting of mangroves and other species along coastal areas.[18] In raising public awareness, the Malaysian government has been engaging members of the media.[19] Kuala Lumpur has also attempted to enhance the streamlining of various non-state environmental activities. For instance, relevant NGOs in Malaysia have been organized collectively under the Malaysian Climate Change Group (MCCG) to generate discussion and dialogue with stakeholders.[20]

The Philippines: In 1989, the Philippines Strategy for Sustainable Development (PSSD) was adopted to serve as the blueprint for the country's sustainable development efforts. Also, the Philippine Agenda 21 (PA 21) was initiated towards developing the full human potential, which puts people at the centre of the development focus, involving science and technology (S&T) measures.[21] These have implications for climate change mitigation, since some of the principles envisage ecological soundness and achieving bio-geographical equity and community-based resource management.[22] To mitigate climate change through addressing deforestation, the Department of Environment and Natural Resources (DENR)'s agro-forestry programme has been intensified, involving the massive planting of fruit-bearing trees within forests funded by a PhP 2 billion budget by the Arroyo administration for the purpose which she announced during her State of the Nation Address.[23] In streamlining non-state environmental activities, the Philippine Network on Climate Change has been formed.[24] The Philippine Climate Change Program Development, the Foundation for the Philippine Environment (FPE), in coordination with the Institute for Climate, Energy and Environment (ICEE) provides training for local government units and other stakeholders on local action planning on climate change.

Singapore: The tiny island state has a National Climate Change Strategy, overseen by a National Climate Change Committee (formerly known as National Energy Efficiency Committee) established to lead and coordinate efforts in addressing the issue amongst the various ministries, the private sector and the masses. The emphasis has been placed on a multi-level holistic approach towards improving energy efficiency.[25] In addition, government-endorsed and supported research on alternative energy sources, such as

solar energy, has been carried out. Public awareness of climate change has been raised through the promotion of energy efficiency, such as providing citizens with money-saving incentives and attractive prizes to be won in related contests and more energy-efficient infrastructure and appliances have become available on the market to encourage consumers to be more environmentally friendly.[26] The Singapore Environment Council, a state-oriented independent body, has been designated to nurture, facilitate and coordinate environmental causes and groups in Singapore.[27]

Thailand: The Royal Thai Government established a National Climate Change Committee (NCCC), chaired by the Permanent Secretary of the Ministry of Science, Technology and Environment (MOSTE), and a Climate Change Expert Committee (CCEC), in response to climate change issues. The Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality (1997–2016) provides the principal set of guidelines for national resources conservation and environmental protection in Thailand. Based on this 20-Year Environment Plan, a 5-year Environmental Quality Management Plan has been prepared to guide natural resources conservation and environmental protection, complementing the 5-year National Economic and Social Development Plan and thus giving equal emphasis to both natural resources conservation, environmental protection as well as economic and social development of the country.[28]

Vietnam: In May 2008, Hanoi instituted a National Target Programme on Climate Change and Sea-Level Rise, piloting climate change adaptation and mitigation projects in provinces most at risk of sea-level rise over the next two years, with the plan targeting nationwide adoption from 2011–2015.[29] As part of the national efforts in ensuring diverse and sustainable agriculture, farmers would be required to employ the latest energy-efficient technologies and infrastructure needed to be modernized. To reduce GHG emissions, the Vietnamese Government is also aiming to increase the proportion of forest coverage from 37 per cent in 2005 to more than 42 per cent by the end of 2010. Greater use of renewable energy sources such as solar, wind and hydroelectric power has been envisaged along with greater investment in nuclear energy. To adapt to climate change, anti-flooding initiatives have been proposed, chiefly the US$1.16 billion project dubbed 'Live Safely with Flooding' outlined during a recent meeting in Da Nang City between Hanoi and local government officials.[30]

Other initiatives: At the subregional level, other forms of partnerships and initiatives also exist. For instance, Laos and Vietnam are amongst the 14 recipients of the World Bank's Forest Carbon Partnership Facility (FCPF), which became functionally operational on 25 June 2008, aiming to reduce deforestation and forest degradation by compensating developing countries for GHG emission reductions.[31] Another interesting subregional climate change programme is the Heart of Borneo (HoB) Initiative, signed in Bali,

Indonesia on 12 February 2007, with the goal of conserving and managing the transboundary highlands of Borneo and parts of the adjacent foothills and lowlands, which straddle the borders of the three ASEAN Countries of Brunei Darussalam, Indonesia and Malaysia.[32] Towards implementing this initiative, Sabah and Sarawak are currently preparing project documents to be consolidated into a National Project Document.

Challenges facing ASEAN states

At the national and regional levels, ASEAN member states face a multitude of challenges in the process of tackling climate change. For instance, affordability of the technologies member states prefer to use has been a perennial issue, taking the utilization of renewables in power production as an example. As a result, nuclear power appears more appealing as it is cheaper than other renewable sources of energy. To date, Indonesia, Malaysia, the Philippines, Thailand and Vietnam are either mooting plans or have instituted programmes for civil nuclear energy usage.

More in-depth studies have to be undertaken to enable each country to develop appropriate measures and action with regard to the possible impacts of climate change, and this would include the implementation of more applications to gain field experience and additional operating data. However, the main issues surround the availability, reliability and variability of activity data and local emission factors, and institutionalization and linkages among government agencies of the inventory process. In the mobilization of people to support climate change initiatives, awareness of the importance and roles of the ecosystem has to be raised, along with the dissemination of information and knowledge on the ecosystems, habitats and biodiversity, as well as intensified popular participation.

At the micro and macro-level, a balance of social, economic and environmental development needs to be achieved. Capacity building, in particular at the local government level, carries greater room for improvement. ASEAN member states also possess varying standards of enforcement and limited resources to pursue climate change programmes.

Towards a regional framework on climate change (and energy)

While ASEAN member states' governments have recognized the potential risks of climate change and have taken steps to mitigate and/or adapt to climate change, a regional framework on climate change has not been developed at this current juncture. This was attributed to several reasons:

- Issues relating to climate change, such as sustainable development, water food and resource scarcity and energy security, are being addressed in

other separate agreements and plans of action. The ASEAN Vientiane Action Programme (VAP) (2004–2010) has outlined several working groups on: multilateral environmental agreements, nature conservation and biodiversity, coastal and marine environment, and environmentally sustainable cities' water resources management.

- When addressing climate change, more emphasis is given to reducing carbon emissions. As mentioned above, the source of carbon emissions in ASEAN are largely from the burning of peatland and forest fires. According to Wetlands International, Indonesia accounts for a tenth of global carbon emissions from human activities as it emits on average 2 billion tonnes of carbon dioxide a year, thus making Indonesia the third biggest emitter of greenhouse gases in the world after the United States and China.[33] Since 'convincing' the region about the effects of climate change can be difficult, highlighting the haze and its immediate and apparent socio-economic problems on one level would be more effective in getting states in the region to act. In a way, it becomes a stepping-stone to addressing the broader issue of climate change; thereby increasing greater awareness on climate change, which would be gradual.

Nevertheless, there have been gradual, incremental steps towards closer regional cooperation to combat climate change. A notable instance has been the *Singapore Declaration on Climate Change, Energy and the Environment* adopted on 21 November 2007, emphasizing energy efficiency, countering deforestation, calling for individual and collective action by a broad range of sectors as well as encouraging active participation in the process of developing an effective, comprehensive and equitable post–2012 international climate change arrangement under the UNFCCC process.[34]

In July 2008, the inaugural ASEC Brown Bag Series forum was launched by the ASEAN Secretariat to raise awareness of ASEAN's initiatives among its staff, government officials and the public at large. It serves as a venue to share ideas and insights on key issues facing the region and to generate public interest. Without doubt, climate change tops the list of issues being discussed. In fact, the first of the Brown Bag Series had been titled 'Climate Change and Deforestation: What Role for the New ASEAN?' which was being organized by ASEAN in cooperation with the German Regional Forest Program (ReFOP).[35]

Another initiative which may signal closer regional harmonization of plans to mitigate and adapt to climate change is the *East Asian Summit (EAS) Cebu Declaration on East Asian Energy Security*, signed in Cebu, Philippines on 15 January 2007. This calls for a new approach linking climate change with the need to develop new, cleaner sources of energy. Goals outlined under this scheme include ways to improve efficiency and environmental performance of fossil fuel use; reducing dependence on conservational fuels through an intensified energy efficiency and conservation programme, hydropower, the expansion of renewable energy systems, and biofuel production/utilization

and for interested parties, civilian use of nuclear power, and mitigating greenhouse gas emissions through effective policies and measures – thus contributing to abating global climate change, for instance.

Two measures outlined in this agreement are worth noting:

1. The increasing of capacity and reduction of costs of renewable and alternate energy sources through innovative financing schemes. In this regard, it would be interesting to examine progress in the instituting Clean Development Mechanism (CDM) Capacity Building Activities (see table 22.1). A quick review of CDM projects undertaken by ASEAN countries revealed that the record is highly uneven. As of June 2006, seven countries submitted 61 CDM projects to the UNFCCC (see Table 22.2) and of the seven, three so-called LDCs submitted only six projects while the three LICs submitted six.

The majority of the projects are on biomass power and agricultural waste, consistent with economic structures that are based on agriculture and food processing in the region. It also reflects biomass as an important source of energy in the region.

But, when ranked according to the CER (carbon emission ratio – equivalent to one tonne of carbon dioxide) generation category, one can distinguish the ASEAN region by the three groups: high, middle and low CERs.

High CER-generating countries comprise Malaysia, Thailand and Indonesia. The middle CER-generating countries are the Philippines and Vietnam. Low CER-generating states comprise Cambodia and Laos PDR.

Two observations can be made. Although renewable energy is currently the leading CDM project type worldwide, when it comes to the number of projects, ASEAN countries so far only have a limited amount of renewable energy project documents in the official validation and methodology

Table 22.1 CDM institutions in ASEAN

Country	Kyoto Protocol ratified	DNA notified to UNFCCC	Published DNA Procedures	Necessary CDM conditions fulfilled	Supportive CDM framework
Cambodia	22 Aug 2002	Nov 2003	Yes	Yes	Yes
Indonesia	3 Dec 2004	Oct 2005	Yes	Yes	Yes
Lao PDR	6 Feb 2003	Nov 2003		Yes	
Malaysia	4 Sep 2002	May 2003	Yes	Yes	Yes
Philippines	20 Nov 2003	Sep 2004	Yes	Yes	Yes
Thailand	28 Aug 2002	Jun 2004	Yes	Yes	Yes
Vietnam	25 Sep 2002	Dec 2003	Yes	Yes	Yes
Total ASEAN 7	7	7	6	6	6

Source: Data from UNFCC website, status June, 2006 and personal communication.

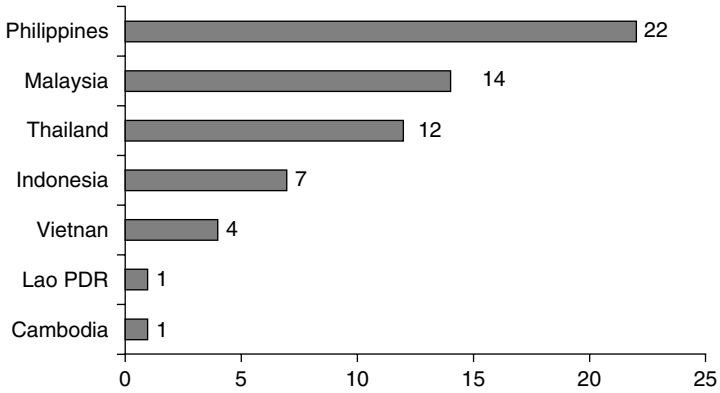

Table 22.2 CDM projects submitted to the UNFCCC as of June 2006 by ASEAN countries

Source: UNDCCC website as of June 2006.

development processes. This may be because CDM revenue is not yet taken into account by potential equity investors or loan providers despite generating free cash flow that can be readily applied to debt service obligations.

The weakness of the CDM projects (especially in the LICs) can therefore be summed up by the following: poor involvement of other stakeholders, especially from the private sector; bureaucratic, less flexibility to adapt to change in the CDM procedures and market; and staff are less motivated to work than in the mixed governmental-NGO model as those in some Latin America countries.

2. On the setting of individual goals and plans of action for improving energy efficiency and increasing capacity through and developing new, cleaner sources of energy. The current concern about nuclear energy in Southeast Asia has been a significant development. Since the 1980s when interest in nuclear energy had waned due to international cases of nuclear accidents (Three Mile Island and Chernobyl), the renewed interest in nuclear power plans has generated mixed responses in the region.

Thus, varying levels of development of states in the region lead to different capacity levels to deal with the issue, which result in different priorities which may clash, for example, the issue of nuclear energy in SEA. For instance, in Indonesia, there is the need to secure increasing demand for energy. Since nuclear energy has been cited as a carbon-free form of energy and is relatively cheaper than other renewables such as solar and wind power, it is an attractive option. Indonesia has been seeking help from Russia to build a nuclear energy power plant.[36] However, the country's volatile terrain impedes the state from pursuing this energy policy.

Biofuels (such as palm oil) have also been attractive alternative energy sources. In January 2007, the European Commission set a new target for its 27 member countries, to replace 10 per cent of petrol and diesel with biofuels by 2020, as compared to its previous target of 5.75 per cent by 2010.[37]

Indonesia and Malaysia are prime markets for biofuels, in particular palm oil as they account for 83 per cent of production and 89 per cent of global exports.[38] This would be problematic as unregulated biofuels production to meet the demand for energy could result in land being taken away from food production, thus posing a threat to food security and perpetuating poverty.

In order to deal with this, it is vital to further engage companies and local farmers to ensure that they keep to sustainable practices, and organizations or institutions must provide incentives for them to do so.

One of these is the Roundtable for Sustainable Palm Oil (RSPO), an association created by organizations carrying out their activities in and around the entire supply chain for palm oil. They promote the growth and use of sustainable palm oil through cooperation within the supply chain and open dialogue with its stakeholders. They also aim to advance the production, procurement and use of sustainable oil palm products through the development, implementation and verification of credible global standards and, the engagement of stakeholders along the supply chain.

The incentive is already starting to grow even from those demanding biofuels. The Netherlands, which is Europe's largest biofuel importer, most of which comes from Indonesia, has been drafting the Cramer Commission which proposes legislating that the Netherlands should not accept biofuel imports that have been grown on peatland. The UK is currently working on biofuel certification systems.

Other issues

One issue that is getting quite some attention of late is the idea of Avoided Deforestation (AD). In fact, Indonesia wants to form the Forestry Eight, which will propose AD as a way to mitigate climate change. It was reported that Jakarta would more or less take up this position, and propose a main agenda discussion on how to achieve Reduced Emissions from Deforestation (RED), leading up to the United Nations conference on climate change held in Bali in December 2007.[39]

The major argument in favour of carbon market-financed AD is that it will provide an opportunity to respond with critically needed funding for conservation work. It has been said that global AD funds will be in the order of US$100 billion annually. However, carbon market-financed AD could hinder real and meaningful ways of mitigating global warming by reducing GHG emissions from fossil fuels.

For example, International NGOs like Friends of the Earth International have said that Avoided Deforestation/destruction, which is a carbon-offsetting scheme, is being used as a smoke screen to ward off legislation and delay the urgent action needed to cut emissions and develop alternative low-carbon solutions. Therefore, AD should be financed through public funds, sourcing from fossil fuel or carbon taxes, and should not come from the carbon-market mechanism.

Even with public funding, which has always been a financing mechanism for conservation work and NGOs, the London-based Forest People's Program in June 2007 warned that the AD scheme risks renewed and even increased state and 'expert' control over forests, overzealous government support for anti-people and exclusionary models of forest conservation (evictions, expropriation) to protect lucrative forest carbon 'reservoirs', and unjust targeting of indigenous and marginal peoples as the 'drivers' of deforestation. This is problematic as it might also create a culture of corruption at official and other levels, which in turn would lead to exploitation of these indigenous and marginal peoples, and to poverty.

Current AD development initiatives are led by the World Bank, big international conservation NGOs, and carbon-trading brokers and consultants. The failure and destructive performance of these parties in the past, and ongoing global environmental and development initiatives, is very well documented, which should have effectively undermined their authority and credibility to lead the world in fighting against climate change.

The way forward

The following discussions have underscored two major issues in the regional/global response to mitigate as well as to adapt to the impact of climate change – one is that this global issue requires no less than a multi-dimensional and comprehensive approach, and the other is that addressing climate change highlights the need for multi-level governance.

In Southeast Asia, the cognisance of the sub-national and intra-state dimensions in handling forest fires have significantly improved the way ASEAN is coping with the perennial problem of haze. To avoid deforestation, there is a need to tackle the underlying causes. Some of these are: macroeconomic strategies that provide strong incentives for short-term profit-making instead of long-term sustainability; deep-rooted social structures that result in inequalities in land tenure; discrimination against indigenous peoples, subsistence farmers and poor people in general; and political factors, such as the lack of participatory democracy, the influence of the military and the exploitation of rural areas by urban elites, overconsumption by rich consumers, and uncontrolled industrialization.

In contrast, there are measures worth taking in order to adapt to climate change, alongside efforts to mitigate climate change, comprising the following.

1 Improving health surveillance: Climate change has far-reaching consequences on safe drinking water, food sufficiency, secure shelters and healthy social conditions. Due to deterioration of such premises as a result of climate change, there was an anticipated outbreak of diseases such as malaria, diarrhoea as well as the Nipah and West Nile viruses carried by fruit bats and mosquitoes.[40] Therefore, a better region-wide health surveillance and alert system could be instituted as a safeguard against climate change-related epidemics that have transboundary ramifications.[41]

2 Following international mechanisms on GHG reductions: It would be ideal for ASEAN member states to adhere to international mechanisms on GHG emissions, through which developing nations could receive financial incentives from wealthier nations. This is particularly applicable for ASEAN due to problems with financial constraints in some of the member states. However, the issue of government prioritization has to be resolved. Environmentalist groups had pointed out that the Indonesian government had developed a habit of exploiting climate change as a justification to secure foreign loans, then channelling the funds elsewhere, paying direct cash assistance to poor citizens after fuel price rises for instance.[42]

3 Sustained investments in research, development and technology (RD&T): Climate change and its ramifications will not remain static. As such, to cope with changes anticipated with this global phenomenon, continual and sustainable investments in RD&T will be necessary to seek techniques to adapt to and mitigate climate change. However, as Singapore's Prime Minister Lee Hsien Loong pointed out in 2007, this would have to take into account the varying national contexts in Southeast Asia, in terms of geographical size, population, development stage and endowment of energy resources among other factors.[43]

All these would be applicable in the comprehensive, regional fight to cope with climate change.

Notes

1. See Chapter 1.
2. 'US Will Take Lead in Climate Change Fight', *Straits Times*, 28 September 2007, http//www.straitstimes.com.
3. See Executive Summary, Scientific Expert Group Report on Climate Change and Sustainable Development, Prepared for the 15th Session of the Commission on Sustainable Development, 'Confronting Climate Change: Avoiding the

Unmanageable and Managing the Unavoidable', February 2007, available at www.confrontingclimatechange.org.

4. N. Purvis and J. Busby (2004) 'The Security Implications of Climate Change for the UN System' in Geoffrey D. Dabelko (ed.) *Environmental Change and Security Project Report,* Report, Issue 10, Woodrow Wilson International Center for Scholars, pp. 67–73.
5. See World Health Organization, WHO (2002) *The World Health Report 2002: Reducing Risks, Promoting Health Life* (Geneva: The World Health Organization), p. 72, http://www.who.int/whr/2002/en/ (accessed 3 February 2009).
6. The effects of the 1997/98 haze crisis have been disastrous to the economic, health and social security of many in Southeast Asia. Air quality in Indonesia's neighbouring states Malaysia and Singapore deteriorated significantly during haze crises, with PSI levels remaining largely in the unhealthy range as a result of the various poisonous gases and particle matter from the fires. The economic loss caused by the haze crisis was estimated to be US$ 9 billion, not to mention the 70 million people who were adversely affected. See ASEAN (2001) *Second ASEAN State of the Environment Report 2000* (Jakarta: The ASEAN Secretariat).
7. 'Peatland Degradation Fuels Climate Change', *Wetlands International,* available from www.wetlands.org (accessed 20 April 2007).
8. 'Peatland Degradation Fuels Climate Change', *Wetlands International,* available from www.wetlands.org (accessed 20 April 2007).
9. Fifty-seven per cent of land clearing method is done by forest fires, see DFID and World Bank, 'Executive Summary: Indonesia and Climate Change – Working Paper on Current Status and Policies', March 2007, p. 3.
10. 'Greater Use of Biofuels Threatens Rain Forests, Environmentalists Warn', *AFP*, 19 April 2007.
11. *Ibid*.
12. 'Peatland Degradation Fuels Climate Change', *Wetlands International,* available from www.wetlands.org (accessed 20 April 2007).
13. 'S'pore Offers Help to Regency in Jambi to Fight Haze Problem in Indonesia', *ChannelNews Asia*, 6 March 2007.
14. 'Indonesia's Initial National Communication to the UNFCCC', July 2000, pp. 4–22.
15. Federal ministry for economic development and cooperation, 'Lao-German Government Negotiations: Parties Agree on Activities to Protect the Climate through Forest Conservation', http://www.bmz.de/EN/press/pm/2008/april/pm_20080403_30.html (accessed 2 February 2009).
16. Existing national guidelines to mitigate climate change include the Sustainable Forest Management (SFM), Integrated River Basin Management (IRBM) and Integrated Coastal Zone Management (ICZM). The National Environment Policy, National Biodiversity Policy and National Forestry Policy constitute the country's existing climate change policies.
17. Under NPP 18, ESAs would be integrated in the planning and management of land use and natural resources to ensure sustainable development while under NPP 19; a Central Forest Spine (CFS) would be established to form the backbone of the ESA network.
18. Mangrove forests can act as wave breakers and stabilize coastal areas. A RM40-million budget has been approved under the Ninth Malaysia Plan to fund this programme and involves the participation of several civil society organizations such as the MNS, WWF, SAM and GEC. By the end of 2007, a total of 397.1 hectares of mangrove and other species would be planted and

the target for 2008 is set at 2000 ha. See Presentation by Forestry development division, Ministry of Natural Resources and Environment, Malaysia. http://www.lestari.ukm.my/downloads/file/seminar/110308/Linking%20Protection%20of%20Ecosystem%20Services,%20Knowledge%20%0Sustainable%20Development.pdf.

19. A series of intensive training/workshop/brainstorming sessions would be held for journalists over a six-month period in Kuala Lumpur and five other major towns across the country. In parallel, the mass media would be monitored for six months following the training in order to assess the coverage that is given to climate change-related issues. Such an assessment would then help strengthen future training sessions as well as forming the basis for future projects to create greater public awareness. See 'Malaysia's Initial National Communication to the UNFCCC', July 2000, p. 107.
20. In collaboration with the National Climate Data Centre (MMS), the MCCG is preparing an educational fact-sheet for general distribution. The MCCG has also been closely following the UNFCCC intergovernmental negotiating process, besides monitoring the alternative sources of information on climate change being circulated among NGOs worldwide.
21. The principles of PA21 are: developing holistic science and appropriate technology, promoting the use of holistic rather than reductionist science in finding solutions to development problems; cultural, moral and spiritual sensitivity which encourages the nurturing of local and indigenous knowledge and respect for the diversity of culture, moral standards and spiritual nature of Filipino society; self-determination, which advocates respect for the rights and capability of people to decide on their development course; national sovereignty; gender sensitivity; peace, order, and national unity; social justice, inter- and intra-generational, as well as spatial, equity; participatory democracy; institutional viability; viable, sound and broad-based economic development; sustainable population; ecological soundness; bio-geographical equity and community-based resource management. Refer to 'The Philippines' Initial National Communication to the UNFCCC', 1999, p. 31.
22. The Philippines has also pioneered the regional initiative in phasing out inefficient incandescent light bulbs in favour of more energy-efficient compact fluorescent lamps (CFLs) which could achieve the double goal of reducing GHG emissions and cutting household energy costs. See 'ADB: Philippines Phasing Out Incandescent Bulbs to Cut Greenhouse Gas Emissions', *ENP Newswire*, 5 February 2008.
23. The programme includes the means of empowering upland communities by making them 'stewards' of their own environment, which would be the best way of protecting the country's natural resources and would provide them with more livelihood opportunities. President Arroyo has a vision of a nationwide upland development plan that is to be anchored on agro-forestry improvement and reforestation. See Dept. of Environment and Natural Resources, Philippines, 'DENR to intensify agro-forestry in upland areas to ease climate change and create economic opportunities', 16 Sept 2008, http://www.denr.gov.ph/article/articleview/4972/1/39 (accessed 3 February 2009).
24. This network comprises some eight national environmental NGOs involved in several information dissemination activities in schools, regularly organizing workshops to raise awareness on climate change issues among students and teachers. To raise public awareness of climate change, it has also disseminated t-shirts and multimedia materials such as brochures, and documentary films.

25. Initiatives to improve energy efficiency includes the energy labelling scheme for households, energy smart building scheme for buildings, the fuel economy labelling scheme for new passenger vehicles as well as the energy audit scheme for large energy consumers.
26. Efforts were also being made to create an aesthetically greener Singapore via the organizing of more outdoor and eco-friendly activities, such as nature walks and water activities.
27. These groupings include the Nature Society, Waterways Watch, ECO-Singapore and Climate Change Organization. See Singapore Environment Council, www.sec.org.sg.
28. 'Thailand's Initial National Communication to the UNFCCC', October 2000, p. 76.
29. 'Climate Change Threatens Vietnam', *Vietnam News*, 26 May 2008, http://vietnamnews.vnagency.com.vn/showarticle.php?num=03MIS260508 (accessed 3 February 2009); see also 'Climate Threat Taken Seriously', *Saigon Times Weekly*, 2 February 2008.
30. In the first phase of the project, US$638 million would be spent on relocating 21,300 families living in the most vulnerable areas of central Vietnam. Houses would be designed to withstand storms and floods and the people will receive financial assistance to reinforce them. Infrastructures would also be strengthened against the force of floodwaters, including irrigation works, reservoirs and anti-erosion dykes. This project is particularly significant for more than 15 million people in 11 central Vietnam provinces and involves the improvement of anti-flood measures until 2020 and even further for central Vietnam, as well as providing work opportunities for each province. See Ministry of Natural Resources and the Environment, Vietnam, 'Anti-flooding Projects Need Boost', 15 August 2008; and Ministry of Natural Resources and the Environment, Vietnam, 'Central Vietnam adopts $1b flood plan', 04 June 2008.
31. Under the FCPF, countries would receive grant support as they build their capacity for REDD (reduction of emissions from deforestation and degradation) and tap into future systems of positive incentives for REDD. The inclusion of Laos and Vietnam highlights their critical importance in terms of capacity building for reforestation largely due to the problem of illegal logging in Indochina. This initiative would also serve to provide greater support and assistance to rural communities that depend on forest produce for their livelihood.
32. http://www.lestari.ukm.my/downloads/file/seminar/110308/Linking%20Protection%20of%20Ecosystem%20Services,%20Knowledge%20&%20Sustainable$20Development.pdf.
33. 'Shocking Climate Impact of Wetland Destruction in Indonesia', *Wetlands International*, 2 November 2006, www.wetlands.org (accessed 20 April 2007).
34. The individual and collective actions aim to address climate change, including greenhouse gas emissions, considering the principles of equity, flexibility, effectiveness, and common but differentiated responsibilities and respective capabilities, as well as reflecting different social and economic conditions of the member states. See http://www.aseansec.org/21116.htm (accessed 3 February 2009).
35. The objective of this first of the series has been to reach a better understanding of the kind of policy coordination and integration that will be required in both the forest and the coronment policies in order to mitigate the risks of climate change. See 'Secretary-General of ASEAN Launches ASEC Brown Bag Series', *US Fed News*, 8 July 2008; and also 'ASEAN Forum Raises Awareness on Initiatives', *Thai News Service*, 8 July 2008.

36. 'Russia to Help Indonesia Build First Nuclear Power Plant', *People's Daily*, 23 November 2006, http://english.peopledaily.com.cn/200611/23/eng20061123_324487.html (accessed 3 February 2009).
37. 'Greater Use of Biofuels Threatens Rain Forests, Environmentalists Warn', *AFP*, 19 April 2007.
38. *Ibid*.
39. See A. Ruwindrijarto 'Community Logging May Address Deforestation', *Jakarta Post*, 22 September 2007.
40. In Southeast Asia alone, the estimated deaths linked to diarrhoea exceeded 500,000 in 2005 and climate change would be expected to increase this number significantly. See 'Climate-Related Diseases to Cause Health Setback', *The Jakarta Post*, 14 December 2007.
41. A study in India and Africa revealed a link between climate change and an increase in diarrhoea and vector-borne diseases such as malaria. See 'Climate Change/Possible Disease Outbreaks; Experts Call for Better Monitoring of Health', *Bangkok Post*, 1 September 2007.
42. 'Govt Told to Kick Climate Loan Habit', *The Jakarta Post*, 5 July 2008.
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23

Climate Change Awareness and Responses: Some Initiatives and Perspectives from Malaysia

Mazlin bin Mokhtar

Introduction

Malaysia is committed to addressing climate change both internationally and nationally. Apart from participating actively in the negotiation processes and ratifying the multilateral environmental agreements on climate change, the country has also implemented its commitments to the agreements and harnessed the opportunities created by them. Furthermore, since the 1990s there have been other national responses, including policies, plans and programmes that indirectly contribute to addressing climate change, in tandem with the country's pursuance of sustainable development. As the awareness and capacity grew through participation in international climate change discourse and the implementation of national activities, the need for a concerted holistic policy on climate change became apparent. Despite the existence of several relevant sectoral policies, stakeholders deemed that a dedicated policy is necessary for addressing climate change as it is cross-sectoral in nature, involving more than merely environmental issues, but also affecting economic growth and human well-being. The policy, which is currently being drafted with a view to steer strategic responses to fortify the nation's resilience to the implications of climate change on development and economic growth, consists of several key elements that include objectives, principles, strategic thrusts and key actions. Its formulation and finalization involves extensive stakeholder consultations before it is presented to the Cabinet Committee on Climate Change for adoption. The drafted policy will help ensure security in supply of resources, water and energy in particular, for the continuous and growing needs of economic sectors, as well as the provision of basic societal needs, notably food and water, for sustainable livelihood.

Climate change scenarios: Global and Malaysia

Over the past decade it has been increasingly recognized that climate change is one of the world's greatest environmental challenges, which is likely to bring widespread and unpredictable implications globally. Despite the fact that the exact pace and extent of the changes are still overshadowed by uncertainty, more scientific consensus has come into view, indicating greater evidence of the impact on some human and natural systems. Unless we can adjust to it, the burden and heavy price on the environment and economy will not affect us now, but will also be borne by our succeeding generations.

Past records and future projections of global climate

Through the assessment work of the IPCC, it was reported that global surface temperatures have increased by 0.76 ± 0.19°C over the last 150 years.[1] This warming is expected to escalate in the future, as scenarios show an increase of global average temperature by 0.2°C per decade for the next two decades.[2] The warming is likely to affect precipitation amounts and patterns, resulting in more and intensified occurrence of flood and drought. In addition to warming of global ocean temperature, the estimated rise in sea level during the twentieth century is 0.17m and a higher rate at 1.8mm per year was observed during the period of 1961–2003.[3]

Historical records and projection of future climate in Malaysia

In Malaysia, an analysis of the temperature records has also revealed warming trends (0.18 °C per decade) from 1951–96.[4] On the other hand, the sea level had risen over the last two decades (based on 20 years of records since 1986 at a southern coastal site in Peninsular Malaysia) at an approximate rate of 1.25mm per year.[5]

The temperature in Peninsular Malaysia is predicted to get warmer by the mid and end of this century. Comparing to the average level in 1984–93, NAHRIM[6] predicted an increase of approximately 1.5°C by 2041–50 in Peninsular Malaysia; whilst the ensemble modelling in Wan Azli et al.[7] forecast a 2.8°C and 2.6°C rise in average temperature in Peninsular Malaysia and Sabah/Sarawak respectively, by end of the century, relative to the baseline 1961–90. In addition, a substantial increase in monthly rainfall over the northeast coastal region and a decrease in monthly rainfall on the west coast of Peninsular Malaysia may be expected.[8] Simulations of future river flows in several watersheds on the east coast of Peninsular Malaysia indicated increases in hydrologic extremes, that is, higher high flows and lower low flows when compared with their historical levels.[9] While for the Borneo states, a more significant change in the annual rainfall may be expected in the western regions by 2090–99.[10]

Malaysia's physical and economic vulnerabilities to climate change

As a country rich in natural resources, Malaysia's economy is inevitably linked closely to land, water, forestry and biodiversity as well as coastal and marine. Many socioeconomic development activities are dependent on climate conditions. The change in climate may impinge on the climate-sensitive socioeconomic development activities, including agriculture, potable and irrigation water supply, ecological and ecosystem services, coastal infrastructure and marine resources. Insights into such potential implications were gained during the preparation of Malaysia's Initial National Communication, where the sensitivity of several key economic and resource sectors was assessed against a range of plausible future climates.[11]

Every 1°C temperature rise may cause 10 per cent reduction in rice yields and prolonged drought conditions may adversely impact on the current flooded rice ecosystem, putting national food security at greater risk.[12] The oil palm plantation may be negatively affected in two scenarios: temperature rise that causes drought or increased rainfall that leads to flooding.[13] The increase in flood intensity and frequency would incur additional costs on water resource management due to the need to adjust future flood mitigation plans as well as the existing flood mitigation schemes and drainage systems.[14] The rise in sea level will lead to tidal inundation, shoreline erosion, increased wave action and saline intrusion, causing submergence of corals, loss of fisheries resources, plantation lands, and mangrove forests, and possible relocation of coastal infrastructure.[15]

While Malaysia recognizes that climate change is a global challenge, where the threats historically stem from the emissions of greenhouse gases from developed countries, it also faces challenges arising from international socio-political obligations. As a rapidly industrializing economy with relatively higher per capita emission among developing countries, the country may be required to play a greater role in the near future and to face potential trade barriers on high carbon footprint products.

Climate change responses in Malaysia

Malaysia is a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, since 1994 and 2002 respectively. Two national committees were established, including the National Steering Committee on Climate Change (NSCCC) for guiding national responses on climate change and the National Committee on Clean Development Mechanism (NCCDM), which was set up to manage the country's activities on clean development mechanism (CDM). With growing concerns about the impacts of climate change, a Cabinet Committee on Climate Change was formed in early 2008.[16]

Under the stewardship of the NSCCC, Malaysia submitted its Initial National Communication, which is a national report and an inventory of greenhouse gases for the year 1994, adaptation and mitigation measures, information research and systematic observation as well as relevant education and awareness initiatives, to the UNFCCC in 2000. Although Malaysia has no mandatory obligation to reduce greenhouse gas emissions under the Kyoto Protocol, the country is involved actively in the CDM activities and has the greatest number of CDM projects registered, with the highest average annual certified emission reductions, with the CDM Executive Board among the ASEAN countries as of November 2008.[17]

Awareness on climate change

Despite the currently high level of political commitment on the climate change issues, a survey conducted in 1998, during the preparation of Malaysia's Initial National Communication, found that the awareness of the public on climate change was low, with some ordinary Malaysians not even being aware of the existence of the UNFCCC.[18]

Notwithstanding this, politicians and government officials are more aware of the issue, given their participation in the negotiation process. The level of awareness with respect to climate change mitigation and adaptation has increased given the current discourse on the future climate regime. The Ministry of Natural Resources and Environment, as the National Focal Point, has been playing significant role in steering efforts to enhance awareness of different stakeholders through public events held on their own initiatives or through joining forces with others. The high level of political commitment is reflected by the organization of a series of national and regional conferences in 2007 and 2008, at the behest of the Cabinet of Malaysia, to better understand the science of climate change, identify vulnerability and understand the socioeconomic impacts of climate change, to harness the opportunities arising from mitigation responses and to mainstream health concerns into climate change discourse.[19] Public awareness has since improved as was evident in the AXA Retirement Scope Survey of 2008, which revealed that Malaysians display higher-than-average concern about the subject of climate change, ranking sixth among the countries surveyed.[20]

National initiatives relevant to climate change

Since the Third Malaysia Plan (1976–80) the environmental concerns are progressively being emphasized in development plans.[21] Since then, several policies developed by many ministries took environmental aspects into consideration to different extents, based on sectoral-specific contexts and needs. Although sectoral in nature, these policies also contribute indirectly

to addressing climate change. The reviews of the Ninth Malaysia Plan (2006–10), the currently ongoing development plans, and several national policies reveal the programmes that directly address or indirectly contribute to managing issues of climate change adaptation and mitigation.

There are several sectoral-specific programmes in the plan that contribute to addressing climate change adaptation, including Coastal Vulnerability Index study, coastline protection programme, Integrated Coastal Zone Management and Integrated River Basin Management, as well as mitigation measures such as the 350MW renewable energy target, clean development mechanism (CDM) programme, energy efficiency in industrial, building and transport sectors and sustainable forest management to maintain forests as carbon sinks. These programmes are acknowledged in the recent mid-term review of the plan and will be continued to achieve intended targets.[22]

Development of a national policy on climate change

Climate change is cross-sectoral in nature, transcending traditional takes on environmental issues, as it affects human well-being and economic growth. Given the scale of issues and options, the Ministry of Natural Resources and Environment in collaboration with the Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia, is currently conducting a Policy Study on Climate Change, with a view to formulating a strategic policy framework to ensure concerted holistic responses to climate change challenges. Critical reviews of the UNFCCC and Kyoto Protocol requirements are carried out in tandem with comparative analysis of selected countries' policy on climate change, assessment of related past and ongoing plans and policies as well as extensive stakeholder participation and consultative processes.[23]

Review of the UNFCCC and Kyoto Protocol decisions

Decisions of the UNFCCC Conference of Parties and those from the Kyoto Protocol were reviewed to flag key decisions that have a bearing on Malaysia as a non-Annex I Party. The decisions were streamed into ten main clusters, which were further sub-divided into specific issues. The ten main clusters are vulnerability, impacts and adaptation; mitigation; technology; financial mechanism; research and systematic observation; capacity building; awareness, training and education; future global climate regime; reporting; and institutional arrangements.

The decisions related to each specific issue were then reviewed in order to be earmarked for consideration when formulating the national policy and for identifying gaps in national initiatives within the context of the UNFCCC and its Kyoto Protocol. This will be a useful input for formulating

a Malaysian policy on climate change. The decisions were also being earmarked for continual monitoring in the negotiation processes. Selected decisions were also earmarked in order to trace their evolution over 12 years and better understand the negotiation processes. Decisions related to the modus operandi of the UNFCCC and Kyoto Protocol were also earmarked.

Review of other national policies

Insights were gained from the comparative assessment of national climate change policy from selected developing countries and developed countries, including approaches in addressing the challenge of climate change and an appreciation for the need for the adoption of different strategies, based on specific national circumstances and respective levels of responsibilities as well as capabilities, towards increasing development resilience in the light of climate change and promoting a low-carbon emitting society.

Climate change related programmes under the Ninth Malaysia Plan

The Ninth Malaysia Plan, published by the Economic Planning Unit of the Prime Minister's Department in 2006, sets out the country's development plan for the period 2006–10. It is also the first 5-year plan of the 15-year National Mission and outlines policies and programmes towards becoming a developed nation by 2020. The plan was developed based on the five thrusts of the National Mission. Each thrust will be realized through programmes that are elaborated in several chapters in the plan. Most programmes relevant to climate change are covered under Thrust 4 (To Improve the Standard and Sustainability of Quality of Life), although there are also several initiatives from other thrusts. It is crucial to take stock of the plan before a national strategy that specifically tackles climate change is formulated.

The assessment of the Ninth Malaysia Plan revealed activities or programmes in the plans that either directly address the issues on climate change (such as impact of and adaptation to climate change, reduction of emission or enhancement of sink of greenhouse gases, development and/or transfer of technology, and others); or indirectly contribute to the management of climate change issues (such as reducing vulnerability and/or enhancing adaptive capacity to climate change, contributing to reducing emission or enhancing sink of GHG, and others). These programmes could be categorized into vulnerability, impacts and adaptation; mitigation; technology; research and systematic observation; capacity building, awareness, training and education; future global climate regime; reporting; and financial mechanisms.

Relevant climate change provisions in selected national policies

A number of national policies have been formulated and implemented over the last decade, which may have addressed directly and indirectly the issues of concern regarding climate change. A review of these documents will enable common areas to be identified in order to avoid duplication in the national strategy on climate change.

The Third National Agricultural Policy, formulated and implemented by the Ministry of Agriculture, primarily aims to maximize income through the optimal utilization of resources in the sector. It endeavours to enhance food security while encouraging sustainable management and utilization of resources in agricultural development. The National Forestry Policy was formulated in 1952, officially adopted as the National Forest Policy in 1978 and revised in 1992 in the light of current issues and developments within the context of national aspirations. The policy aims to conserve and manage the nation's forest via sustainable forest management practices that protect the forest by ensuring favourable climatic and physical conditions in the country, the safeguarding of water resources, soil fertility, environmental quality, conservation of biological diversity and minimization of damage by floods and erosion to rivers and agricultural lands.

The energy policy was first developed in 1979 and has been subsequently revised or updated several times since then. Its ultimate objective is to ensure an efficient, secure and environmentally sustainable supply of energy in the future. Over the years initiatives were developed to minimize dependence on fossil fuels and promote renewable energy and energy efficiency. The National Policy on Environment was formulated in 2002 by the then Ministry of Science, Technology and Environment (now the Ministry of Natural Resources and Environment) for continuous economic, social and cultural progress and enhancement of the quality of life of Malaysians, through environmentally sound and sustainable development. It encourages energy conservation and the use of energy efficient technology, cleaner fossil fuels and alternative fuel sources for continuous economic, social and cultural progress and enhancement of the quality of Malaysian life. The National Urbanisation Policy was developed in 2006 to provide the management for government agencies to plan, implement and manage urban services. It promotes the use of innovative technology in urban planning, development and urban services management that encourage the construction of environmentally friendly building under the concept of green building and the use of efficient energy as well as the utilization of renewable energy.

Stakeholder consultations in the policy formulation

Stakeholder viewpoints gathered at national and regional meetings, interviews and peer-review sessions provided crucial input to refining the

recommendations on a national climate change policy. In the Policy Study on Climate Change undertaken by LESTARI, the stakeholder consultation was carried out in four phases.[24] Phase 1 was done through 12 meetings over a period of four years from 2005–08, focused on documenting viewpoints of over 500 participants. Stakeholders were kept informed of the policy formulation during Phase 2 and referrals were made throughout the process in seven meetings with over 300 participations in the last two years (2007–08). Once the initial policy framework was derived in mid-2008, it was subjected to stakeholders' reviews; this was during Phase 3 of consultations, and the activities covered seven meetings. The input was then reviewed to refine the national policy framework. At present the draft policy is undergoing the Fourth Phase of stakeholder scrutiny, prior to its finalization for adoption by the Cabinet Committee on Climate Change.

Key elements of the draft policy

Initial research findings reveal the need for strategic responses to fortify the nation's resilience to the implications of climate change on development and economic growth. While the past and existing policies and initiatives may indirectly address climate change concerns under the context of sustainable development, the consulted stakeholders, be it government agencies, business and industrial groups or non-governmental organizations, supported the need to formulate a dedicated climate change policy.[25]

The policy on climate change should steer towards the mainstreaming of climate change measures, the integration of balanced adaptation and mitigation responses, and the strengthening of institutional and implementation capacity. Prioritization is needed on enhancing the country's adaptive capacity to actual or expected impacts of climate change. Nationally appropriate mitigation actions should be approached to enhance adaptation and sustainable development.[26] Stakeholders also agreed that concerted holistic response is necessary as climate change impacts transcend all levels, sectors, stakeholders and major groups, whilst effective collaborative participation, grounded on indigenous and scientific knowledge, should serve as a mainstay for institutional capacity building.[27] The policy will facilitate the integration of climate change considerations in development and decision-making processes, to foster sustainable economic and human development as well as environmental conservation. It should also complement existing policies and be aware of international conventions on global concerns.

The Draft National Policy on Climate Change consists of several key elements that include objectives, principles, strategic thrusts and key actions, and is aimed at ensuring a climate-resilient development and low-carbon economy that fulfils national aspirations for sustainability.[28] Table 23.1 summarizes briefly the objectives, principles and strategic thrusts of the draft policy.

Table 23.1 The Draft National Policy on Climate Change – Objectives, principles and strategic thrusts

Objectives	Principles	Strategic Thrusts
1. Mainstreaming of measures to address climate change challenges through strengthened economic competitiveness, wise management of resources, environmental conservation and enhanced quality of life for sustainable development. 2. Integration of responses into national policies, plans and programmes to strengthen the resilience of development from arising impacts of climate change. 3. Strengthening of institutional and implementation capacity to better harness opportunities in reducing negative impacts of climate change.	1. Development on a Sustainable Path: Integrate climate change responses in national development plans to fulfil the country's aspiration for sustainable development.	1. Facilitate the harmonization of existing policies to address climate change adaptation and mitigation in a balanced manner. 2. Implement measures to make development climate-resilient through low-carbon economy in order to enhance global competitiveness and attain environmentally sustainable socioeconomic growth. 3. Support climate-resilient industrial development and investment in pursuit of sustainable socioeconomic growth.
	2. Sustainability of Environment and Natural Resources: initiate actions on climate change issues that contribute to environmental conservation and sustainable use of natural resources while enhancing energy efficiency and sufficiency as well as water and food security.	1. Adopt balanced adaptation and mitigation measures to climate-proof development, strengthen environmental conservation and promote sustainability of natural resources.
	3. Integrated Planning and Implementation: integrate planning and implementation to climate-proof development.	1. Implement measures to integrate cross-cutting issues in policies, plans, programmes and projects in order to increase resilience to, and minimize negative impacts of, climate change. 2. Support knowledge-based decision-making through intensive climate related research and development and capacity building of human resources.
	4. Effective Participation: improve participation of stakeholders and major groups for effective implementation of climate change responses.	1. Improve collaboration through efficient communication and coordination among all stakeholders for effective implementation of climate change responses. 2. Increase awareness and public participation to promote behavioural responses to climate change.
	5. Common but Differentiated Responsibility: international involvement on climate change will be based on the principle of common but differentiated responsibility.	1. Strengthen involvement in international activities on climate change based on the principle of common but differentiated responsibility.

Source: J. J. Pereira, 'National Policy on Climate Change (Draft 1–10 September 2008)' in the *Consultation Workshop on the Draft National Policy on Climate Change*, 24–25 September 2008, Putrajaya.

Next steps

Further to several rounds of consultations with stakeholders, the viewpoints gathered are being reconciled and consolidated. While the policy formulation is entering its final stage, details on its implementation are also being deliberated. While the strategic thrusts and their key actions have been derived bearing in mind the new framework of the Cabinet Committee on Climate Change and the existing government structure, particular attention will be given on determining key implementers and other partner agencies as identified through the stakeholder consultations. A timeline for action, in terms of the short, medium and long term, will be suggested, along with appropriate performance indicators that can be assigned to each action in order to facilitate measurement, reporting, verification and reviewing during the execution stage. Once all these aspects are completed, the draft final policy will be presented to the Cabinet Committee on Climate Change for consideration with a view for adoption.

Conclusions

Malaysia is committed to addressing climate change. Internationally the country has participated actively, not only in the negotiation processes and by ratifying the UNFCCC and Kyoto Protocol, but also in implementing national responses within and in addition to the commitments of these agreements. The national responses at the early stage were implicit in national policies, plans and programmes where climate change is being indirectly addressed in tandem with the country's pursuance of sustainable development.

As awareness and capacity to act on the concerns of climate change grow through participation in international climate change discourse and national activities, the need for a concerted holistic policy on climate change is manifested. Climate change is cross-sectoral in nature, involving more than merely environmental issues, but also affecting economic growth and human well-being. Despite the existence of several relevant sectoral policies, a National Policy on Climate Change is necessary and currently being drafted with a view to steering strategic responses to fortify the nation's resilience to the implications of climate change on development and economic growth.

The draft policy consists of several key elements that include objectives, principles, strategic thrusts and key actions, and is aimed at ensuring a climate-resilient development and low-carbon economy that fulfils national aspirations for sustainability. Its formulation, which is still ongoing, involves extensive stakeholder consultations. Finalization of the draft policy is currently underway before it is presented to the Cabinet Committee on Climate Change for adoption.

The drafted policy, building upon other sectoral policies, will help safeguard security in supply of resources, water and energy in particular, for the continuous and growing needs of economic sectors, as well as the provision of basic societal needs, notably food and water, for sustainable livelihood. Nevertheless, when the certainty and understanding on climate change improve, it would be pertinent to consider security implications as the internal or trans-boundary population movements are impacted on by long-term and abrupt climatic changes.[29] Threats on security can be minimized if the vulnerabilities are identified and addressed. Research is needed to understand the present adaptive capacity of the most vulnerable groups, especially the poor ones that lack financial capital, skills, knowledge and capacities, in order to formulate and implement programmes that enhance resilience and facilitate access to opportunities.

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23. J. J. Pereira, 'National Policy on Climate Change (Draft 1–10 September 2008)' in the *Consultation Workshop on the Draft National Policy on Climate Change,* 24–25 September 2008, Putrajaya.
24. *Ibid*.

25. Institute for Environment and Development (2008) *Policy Framework on Climate Change: Stakeholder Viewpoints*.
26. Institute for Environment and Development (2008) *National Policy on Climate Change (Draft 1: 10 September 2008): Stakeholder Viewpoints*.
27. Institute for Environment and Development (2008) *Policy Framework on Climate Change: Stakeholder Viewpoints*.
28. J. J. Pereira, 'National Policy on Climate Change (Draft 1–10 September 2008)' in the *Consultation Workshop on the Draft National Policy on Climate Change*, 24–25 September 2008, Putrajaya.
29. A. Dupont and G. Pearman (2006) *Heating up the Planet: Climate Change and Security* (Australia: Lowy Institute for International Policy). B. P. Resurreccion, E. E. Sajor and E. Fajber (2008) *Climate Adaptation in Asia: Knowledge Gaps and Research Issues in South East Asia* (Nepal: Kathmandu).

24

Thailand Environmental Policies: Mitigation and Adaptation to Climate Change and Implications for Human Security

Keokam Kraisoraphong

Introduction

For over a decade, since Thailand ratified the Kyoto Protocol[1] and the UNFCCC,[2] the Ministry of Natural Resources and Environment (MONRE) has been the designated focal point for its implementation. Consequently, climate change concerns have always been identified with MONRE, and have come to be addressed mainly as an environmental issue. This has also led to Thailand's climate change policy focus on mitigation. The establishment of entities such as the recent Thailand Greenhouse Gas Management Organisation (Public Organisation),[3] also the Designated National Authority for Clean Development Mechanisms (DNA-CDM), reflects such a focus and further places climate change within an environmental policy framework.

When Thailand submitted its Initial National Communication in the year 2000, it stated then that the nation's process of understanding climate change-related vulnerability and adaptation had just begun.[4] After almost a decade, while adaptation is now widely acknowledged by the international climate community, Thailand has just seen the first sign of recognition for the need to adapt to a changing climate through the launch of Thailand's National Strategy on Climate Change (2008–2012) by MONRE. Such attention towards adaptation needs have also only recently occurred among those within the research community and academic arena, who have been active in climate research but heavily focused on mitigation-related studies.

According to the UNFCCC,[5] the main sectors affected by climate change generally include agriculture, water resources, human health, terrestrial ecosystems and biodiversity and coastal zones. Adaptation to climate

change thus involves decisions which must increase multi-sector resilience and coping capacity, matters of which are cross-cutting issues, much like those identified within the development context. Most literature on adaptation has in fact pointed out that planning and implementation of adaptation to climate change must be done within the context of sustainable development so that adaptation could be integrated into policy at all levels.[6] Integration of adaptation policies and measures between different sectors has also been identified by the United Nations Development Program's (UNDP) Adaptation Policy Framework as an important step in the process of formulating options.[7] This implies that within the development context, there should be efforts to ensure that policies in both climate and non-climate sectors 'facilitate rather than hinder adaptive decisions'.[8] Applied to the case of Thailand, such requirements pose a major challenge as climate change issues have thus far been addressed under the directives of MONRE, and as a result, have mainly been confined to an environmental policy context. This approach coupled with the existing institutional structure and process, makes cross-sectoral integration of adaptation in the wider policy context seem a far-reaching goal.

This chapter reveals how Thailand's current climate policy approach has constrained its effort to integrate thinking about climate change into its wider context of public policymaking. It points out why the national environmental policy alone will be unlikely to lead to the necessary climate policy integration, and how this has been exacerbated by the existing institutional structure and process. Based on findings from a research study, commissioned by the National Economic and Social Advisory Council,[9] to assess the implementation of Thailand's Tenth National Economic and Social Development Plan, specifically the section of Natural Resources and Environment, the chapter discusses what may be needed to overcome these obstacles.

Thailand's position and approach to climate change

Thailand's initial national communication,[10] submitted to the UNFCCC in the year 2000, reported that Thailand's greenhouse gas emissions in 1994 stood at 286,373 Gg, with carbon dioxide (CO_2),[11] methane (CH_4),[12] and nitrous oxide (N_2O)[13] as the main components, the agricultural sector being the major source. Overall, Thailand's GHG emissions were reported to amount to only 0.6 per cent of the world's total, equivalent to a per capita rate of 2.5 tons.[14] This estimate remains the only source of reference officially accepted up to today. However, mitigation options were then identified in the energy,[15] forestry,[16] agriculture[17] and waste[18] sectors. Presently, it is notable that policies enabling mitigation measures within the energy sector have proved most effective and by far outperformed any other sector.[19]

Following the designation of MONRE as the national focal point, Thailand's commitment to the Convention has clearly been to heavily address climate change by way of mitigation. Thus overall, Thailand's past approach to climate policy integration has been to focus on mitigation measures at the national level, with energy policy as the entry point for mitigation. This approach has also been notable within the Thai research community and academic arena where the majority of climate change-related research tends to be concentrated within single natural science disciplines, with adaptation as but only a part of the impacts research in the mitigation context.

Also with MONRE as the national focal point, issues of climate change tend to have been viewed and treated within the environmental context. But there are evident limitations in addressing climate change issues mainly as environmental issues, now that linkages between the need to adapt to a changing climate and sustainable development have come to be widely acknowledged.

Fundamentally, issues of climate change extend far beyond the scope that can be handled through environmental policies alone. On recognizing this, Klein et al. note that important development issues are threatened by climate change, thus adaptation must be considered within the broader context of sustainable development.[20] Issues of food security, human health, water supply as well as other natural resources and environmental protection are but a few examples of development issues subject to climate change impacts. Furthermore, when these development issues are viewed with the focus on the downside risks to human lives, human security naturally becomes pivotal to this equation. The demands on responsive policy measures are therefore multidimensional, requiring sectoral planning and management outside the confines of environmental policy boundaries.

Although the recently launched National Strategies on Climate Change (NSCC, 2008–2012) does reflect an effort to break through the confines of such boundaries, inevitable challenges are foreseeable. Such challenges are twofold. First, there are obvious difficulties in translating strategy into action, as strategies set out by the NSCC are relatively abstract. Much has been left to the implementing agencies' discretion to specify concrete action. But as long as the overarching approach to climate change remains to be structured by MONRE's role as the national focal point, there is very little room to integrate a climate change dimension into other areas of policy-making, much less for agencies outside of MONRE's domain to sufficiently understand the relevance of climate change to their line of work, to translate anything into action. Secondly, while implementing agencies are left to translate 'abstract' strategies into action, their implementation success is dependent on the coordination and cooperation among multi-agencies of a much wider circle, beyond environmental agencies. But, as is the case today, multi-agency coordination and cooperation is unlikely to occur outside the

circle of MONRE, unless climate policy integration is realized. Realistically, implementing agencies under the present situation are working in their capacity, long structured by non-climate policies. To undertake NSCC would mean stretching the existing capacity to accommodate more unfamiliar tasks of new climate-related initiatives – a move for change, known to not bode well with Thai bureaucracy.

The research community, on the other hand, has begun their attempt to determine the magnitude of anticipated climate change impact. Research studies of extreme weather events to identify hot spots across the country are among several attempts under way.[21] However, most research studies have so far taken the approach of a single natural science discipline and continue to lack an integrated, multidisciplinary perspective. Lack of socio-economic analysis has been noted to be a discrepancy in most past research studies. The much-needed scientific database from where knowledge could be drawn to support climate policy decision-making is still insufficiently developed.

At this point, the research community, while aware of the need to generate and provide more climate policy-relevant knowledge, is at a juncture where it must transcend its past approach to single natural science discipline research, which has thus far served environmental policy demands focused on climate change mitigation. For Thai climate change research and policy to advance into adaptation, the challenge is to recognize the linkage between climate change and development so as to establish the policy understanding that, while on the one hand we are witnessing impacts of climate change on human and natural systems brought about by socioeconomic development patterns that generate greenhouse gas emissions, we need to realize that 'socio-economic development patterns [on the other hand, also] determine vulnerability to climate change and the human capacity for mitigation and adaptation.'[22]

However, the failure of past policies to address climate change issues within a broader sustainable development context can be attributed only partially to the general misconception of an environment versus development approach, which has confined climate change issues within the environmental arena. More fundamental to the matter is the wider policy context under which adaptation decisions are expected to occur. Here, Thailand's existing political system exhibits an institutional structure and process[23] which nurtures policies that have been in place long before climate change became an issue. The policy context under which new policies need to be designed and formulated to support adaptive responses thus exemplifies a process established for non-climate policies, often non-conducive to climate policy integration. As such, the situation has generated an undue gap in Thai policy planning where the crucial dimensions of vulnerability and adaptation to a changing climate have not received the deserved attention.

Adaptation to climate change constrained by institutional structure

Characterized by the governance structure once described as 'bureaucratic polity'[24] and more recently as 'electoral polity',[25] Thailand's policy system has institutionally evolved into a system which is non-conducive to either holistic policymaking or implementation.

For nearly five decades Thailand's national development has been shaped significantly by five-year National Development Plans. Since 1961 these five-year plans have established the overall priorities and policy framework for the country's development. The five-year National Development Plans thus provide grounds for Thai policy system analysis. They are the focal point for reflecting on the approaches Thai environmental policies have taken and for explaining as to how and why Thailand's policy moves in reaction to climate change impacts are what they are today. Just as Thailand's environmental policies have always been identified with the five-year national development plans, so have climate change policies in the past decade.

Throughout their history, the National Development Plans have been influential in Thailand's actual development to differing degrees, depending on the political climate which determined the role of the core agency responsible for their drafting, the National Economic and Social Development Board (NESDB).

In Thailand's modern economic development, for several decades under the technocratic leadership, the bureaucracy was seen as a key actor in the policy process, because of their annual budget planning authority, within the relatively abstract framework of the National Development Plans.[26] Thailand was then described as a bureaucratic polity.[27] In this respect, while the degree of the bureaucracy's influence may have varied in relation to the political situation, their leverage lies in their budgeting authority and their official duty to oversee the implementation of the policies.

During the past decade when the need for climate policies has been most prevalent, Thailand has also undergone notable changes in the context of public policy decision-making. Such changes are seen through the grand scale of populist policies launched since 2001 by a major political party at the time. As Thai governments since then (with only the exception of the brief interim government from the September 2006 coup) have come to justify their legitimacy through the system of representative democracy that brought them to power, 'electoral polity'[28] therefore became the defining term of the present Thai governance and policy system. Under this new policy system, political officials have turned to utilizing budget control from central government to support those developments they deem fit to the policy at their discretion. This has signalled to the policy implementing agencies the policy priority to which they should respond in formulating their Operational Plans. In such cases, no matter how well the National

Development Plan has been formulated, the political reality establishes the fact that only those project proposals in line with the political officials' choice, as stated in the Government Administration Plan, would receive budget allocation.

Under today's institutional structure and process,[29] the NESDB must disseminate the role and tasks of development planning to other government agencies. More importantly, it has had to provide more opportunities and space for politicians to set the directions for the implementation of those strategies in accordance with their party's or party leader's policy. This has reduced the necessity of a five-year development plan from being the national guiding plan – which it had been for several decades. The NESDB's role has thus shifted from being the planner to being the supporting agency in the implementation of the strategic plans determined by the political officials. In recent years, the government agency that has been most influential in the practical determination of project contents and activities is the Budget Bureau. It has been entrusted with the authority to review and approve the plans and budget requests of the various government agencies. In this review and approval of work plan and budget, the Budget Bureau has a tendency to use the framework provided by the national strategic plans and the government's policies proposed within the Government Administration Plan, more than the National Development Plan.

Adaptation: Implications for human security within the Thai context

Now that the need to adapt to a changing climate is widely acknowledged, and linkages between climate change and development are increasingly recognized, human security naturally becomes a crucial dimension of this equation. As one of the underpinning elements of the human security concept is a reasonable concentration on the downside risks to human lives,[30] the threat which climate change poses on development issues such as food security, human health, water supply, and other natural resources, and environmental protection clearly has implications for human security.

Viewed within the broader context of sustainable development, there are human security concerns which need to be addressed as Thailand begins on its path of adaptation to climate change. Through the past five decades of modern economic development, Thailand's development path has been marked by mixed experience of failures as well as potential success stories. One which carries tremendous implications for issues of human security today is the fact that all along, Thailand's development has been dependent on the overexploitation of the country's natural resource base. This issue was addressed only after more than a decade of rapid economic growth, in Thailand's Fourth National Economic and Social Development

Plan (1977–1981). However, the beginning of a ten-year economic boom[31] in 1986 had overshadowed such emerging environmental concerns, as Thai governments, so enthralled in the economic pursuit of wealth, never put environmental policy initiatives to the top of their development agenda.

The outcomes of natural resource overexploitation and environmental degradation revealed themselves over the decade. This damage includes increase in frequency as well as severity of natural disasters as a result of deforestation and soil erosion, low productivity in the agricultural sector from prolonged and excessive use of farm chemicals, conflicts over natural resources, including land, water, forest and fishery resources due to inappropriate land use and ineffective land use planning.[32] As such rapid deterioration in the country's resource base became ever so evident the national development emphasis shifted during the second half of the boom decade towards more balanced and sustained development, and less on growth per se. The passage of the Enhancement and Conservation of National *Environmental Quality Act, B.E. 2535* in 1992, specified the powers and duties of the National Environment Board, the Pollution Control Committee, and the Environmental Fund Committee in the control, prevention, and solution of environmental problems. However, while the act is noted for its support of people participation in the maintenance of environmental quality, it had not yet addressed the core of Thailand's environmental problems, which are inextricably linked to its development pattern.

More recent debates concerning Thailand's development impact, as witnessed by natural resource overexploitation and environmental degradation, have identified the core problem to be the issue of access and control.[33] This has had tremendous implications in matters of human security, as access to and control of natural resources remain an unresolved issue and continue to be insufficiently addressed by most Thai environmental policies. An example given by Parichart Siwaraksa and Decharut Sukkumnoed[34] succinctly reflects this phenomenon:

> At present, about 460,000 rural poor families are regarded as 'illegally' encroaching and living in conservation forests. At question is whether the people invade the forests, or the other way around, as a large part of the conservation forests were extended into lands that had been traditionally, but not legally inhabited by local communities for generations. Community forest is introduced as a new arrangement by which the forest and the people can live in harmony. This much awaited law has been intensely debated and is pending further deliberation at the National Assembly. Meanwhile, these people still live in constant fear of arrest and eviction.

Interestingly, the 1997 Asian financial crisis was a wakeup call. While it was a traumatic period for Thailand, it is also seen by some to be the catalyst

for positive political changes which brought about the passage of the new people-based 1997 Constitution.[35] This was the Constitution drafted through a participatory drafting process by an independent Constitution Drafting Committee representing civil society whose role emerged prominently in 1992. The 1997 Constitution is known to have brought the concept of human security to the forefront, in response to the many forms of downside risks, which came as a consequence of the 1997 crisis and affected those least equipped to cope.[36] Human security has since come to signify change for both policy makers and the public. Rights such as community rights and right of individuals in cooperation with the state and the community to protect the environment have been the much-noted stipulation of the Constitution. Bureaucratic reform[37] in 2002 also brought about the establishment of the Ministry of Social Development and Human Security. All this has been carried over to the present 2007 Constitution, along with other stipulations addressing the need to promote people's participation in relation to environmental protection; the need to decentralize; the need to distribute income; the need to have appropriate possession of land and land use systems.

But despite all this, the challenge to operationalize the concept of human security in connection to the state's exercise of power remains the key test for Thailand. This would in turn depend on responsive laws, policies, programs, mechanisms, resources, and effective practices at the national and local levels.[38] In this respect, Thai policy and practice have been known to lag behind the letter of the law, as is evident in the case of local community rights in natural resource and environmental management.[39] Two cases in the study[40] from the Mae Tang watershed exemplify development that infringes upon community rights in the forms of large controversial development projects: the water diversion project from Mae Guang River to Mae Ngad River, and the lignite mining project in the Wieng Hang district, Chiang Mai Province. In both cases, petitions on the grounds of community rights violation had been brought to the attention of the National Human Rights Commission (NHRC) to investigate the case and propose the appropriate remedial measures and action to take to the agency committing such acts of violation.

Implications which development projects such as these have had on human security hinge on the state's regard for 'national interests' over the people who already live in security with nature but are made to sacrifice their way of life in order to make way for development. Rather than reflect a 'people-centred' approach, Thailand's development has thus far been marked by cases which consistently illustrate a 'state-centred' approach, where the state imposes large development projects upon local communities without adequate compensation and proper arrangement to ensure long-term security for their lives and those of their children.[41] In cases such as these, environmental policies serve only to ensure that the conduct of

Environmental Impact Assessments (EIA) meets the checklists required by law, to provide the evidence that decisions taken to approve the projects are legitimately supported.

Based on Thailand's development pattern, adaptation to climate change under the present rather state-centric Thai approach is unlikely to be accommodating to issues of human security, the essence of which is most crucial in dealing with social vulnerabilities and its level of coping capacity. Human security thus stands as a concept that is impressively embraced by Thailand's letter of the law but that has yet to be witnessed in policy and practice.

Discussion and conclusions

Presently, Thailand's climate policy approach is characterized mainly by its past focus on climate change mitigation. Although recently signs of awareness for the need to adapt to a changing climate are notable among Thai climate research and policy circles, adaptation is still very much a new terrain with major challenges.

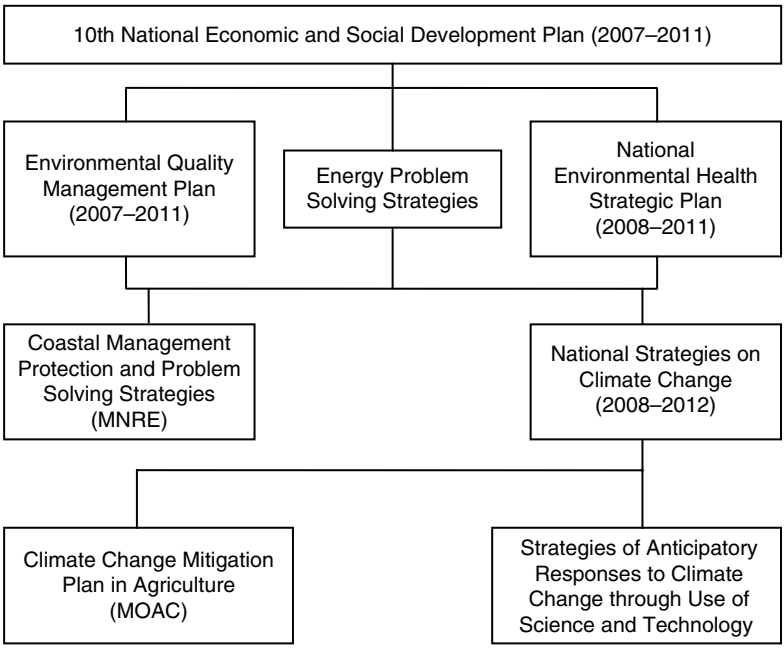

Figure 24.1 Linkages among Thailand's present climate change related policies
Source: Translated and Adjusted from *Research Community*, vol. 79 May–June 2008, p. 29.

Thailand's current approach in addressing issues of climate change has been one which treats climate change as an environmental issue rather than as an issue within the broader context of development. This can be illustrated in Figure 24.1 which depicts Thailand's present climate policies according to the research community's attempt to take stock of their linkages. Here, the Tenth National Economic and Social Development Plan stands as the overarching policy framework, and policies which are to some degree related to climate change are considered to be linked within this framework.

By addressing issues of climate change as an environmental challenge, the Tenth Plan focuses on mitigation policies in support of Clean Development Mechanisms (CDM), and stresses the need for capacity building in mechanisms to set Thailand's strategic position regarding the Kyoto Protocol and to strengthen Thailand's negotiating capacity.[42] From this, climate change policies are naturally seen to be mainly within the domain of the Ministry of Natural Resources and Environment (MONRE), Thailand's focal point in relations to the UNFCCC.

However, when issues of climate change are addressed in the broader context of development, the difference of adaptation from mitigation becomes apparent in terms of actors and policy types for their implementation. For adaptation, the challenge stems from the variety of actors representing various sectoral interests involved, and the spatial and temporal scales on which adaptation responses could be effective – usually found to be on the local scale of an impacted system.[43] At issue here, in terms of policy, is a matter of a top-down versus bottom-up approach, or in other words, national versus local adaptive response. This dilemma, though not novel, is still an unresolved matter in many of Thailand's policy decisions, since decentralization and public participation became the language of Thai policy planning to signify the transition attempt from top-down administration to more bottom-up processes.

On this issue, studies have shown that neither a top-down nor bottom-up approach alone offers a complete picture that would enable effective future adaptive planning. Rather, when considered together, they provide new perspectives on climate policy integration.[44] In Thailand's case this suggests the necessity for a two-tier policy system consisting of a top-down, integrated national policy framework, which offers a broad perspective of collective interests, and bottom-up measures which sufficiently reflect the local context, tailored to area-specific needs. The effectiveness of the system would also depend on interfaces between the two tiers, where informed local authority decision-making must rely on information that it may be beyond their local capacity to acquire. Therefore, capacity building and knowledge sharing is necessary to help establish the local actors' ability to carry out such transitions. More specifically, in order for the two-tier policy system to achieve its purpose, an implementing mechanism is needed to bridge the gap and facilitate interface between the process of national policymaking

and area-specific decision-making. Such an implementing mechanism would generate the connection between a holistic national approach and the practical, on the ground adaptive decision for action.

However, in identifying the need for a two-tier policy system, one must also take the wider policy context into account, where non-climate policies have been in place long before climate change became an issue. Related to this, Urwin and Jordan[45] point to the concept of policy interplay, whereby policy linkage, policy overlap, and policy interconnection are considered. Their study, from both horizontal and vertical dimensions, indicates that there are policy interplays that constrain adaptive planning for climate change. At issue here is the need to ensure that new policies in both climate and non-climate sectors are designed to facilitate rather than hinder adaptive decisions – a process Urwin and Jordan[46] refer to as 'climate proofing'. This evidently applies to the case of Thailand, where it would need to undergo the process of climate proofing new policies in order to move forward from the present situation towards climate policy integration and, ultimately, a two-tier policy system.

Currently, some ministries in their capacity as implementing agencies have started to formulate policies which address climate change. But most are separately planned, and appear to lack cross-agency and multi-agency coordination, partly as a result of the approach which confines climate change policy to environmental matters and partly due to limitations in Thailand's existing institutional structure and process. Within the present institutional structure and process, political actors are encouraged to seek short-term gains through national strategic plans and government policies proposed within the Government Administration Plan. On the other hand, the timescales of the existing policy planning cycle, evident in most development plans, such as the National Development Plans and Provincial Development Plans, generally address action over a period of four to five years, which is much too short to accommodate effective adaptation plans.

Despite the changes that have taken place within the political and thus policy system, the five-year National Development Plans continue to be the source of reference for Thai government agencies, especially for their annual budget plan. Therefore, as long as the National Development Plans continue to exist, Thailand's policies and strategies on climate change will likely still be officially drafted based on their broad frameworks, under the umbrella of environmental policies. However, in terms of implementation, as the Government Administration Plan carries more weight and has become the determining factor of the bureaucracy's Plan of Operations, climate change policies, regarding adaptation, are unlikely to be high on the political agenda due to their expected long-term results.

Recently, the NESDB has launched Thailand's Vision towards 2027, which is a move from the regular five-year national development plan to a longer, 20-year vision towards development. This is an indication of an effort to

re-calibrate policy instruments with respect to timescales. But whether it will ultimately help overcome constraining policy interplays and positively lead to climate policy integration will still largely remain dependent on political will. Unfortunately, the fact that the existing institutional structure and process places the task of adaptive policy design within the bureaucratic sphere confines adaptive decisions to political discretion. Attempts to introduce and further drive adaptation policies must therefore take this political and policy context into account.

Given that climate change poses risks to multiple systems and sectors, where the magnitude of impact will differ according to their vulnerabilities and levels of coping capacity, climate policy has a role '... to address development and equity issues'.[47] From this perspective, climate policy clearly has implications for human security in that the vulnerabilities and downside risks of those with different levels of coping capacity are the core concern of policy decisions. On this human security front, Thailand has made impressive progress in embracing the concept in the letter of its law. However, it still has yet to meet the key test of operationalizing the concept, particularly in connection to policy integration towards achieving adaptation to climate change. Otherwise, so well-intended adaptation strategies and measures will remain written in plans and policies but fail to bring about any meaningful implementation.

Overall, the approach to climate change that Thailand has taken, together with the political and institutional barriers, embedded in the existing Thai policy process, has been non-conducive to climate policy integration. Under the present policy process, decision-making lies with the bureaucratic machinery, which is highly dominated by politician's priorities. The bureaucracy has partly contributed to the confined approach within which climate policy issues are treated as environmental rather than developmental issues. On the other hand, dominant political priorities have made it unattractive to tread new grounds on issues such as adaptation, which can offer only long-term results. Therefore, any hope of a shift from the current approach would have to depend on initiatives and actors outside of the bureaucratic sphere. This implies that for Thailand to overcome this obstacle, it must bring issues of climate change to the attention of those within the public sphere, beyond the confinement of the bureaucratic system. Within the public sphere, the climate research community, those within the academic arena along with climate policy community actors, could collectively develop and generate the much-needed information base that is relevant for climate policy integration within the wider policy context. Under the assumption that the once natural science-dominated research community now takes a more cross-discipline approach to work in collaboration with the social science disciplines, broader base participation towards establishing a knowledge-based

climate policy community would be the potential approach for Thailand's sustainable effort towards adaptation.

Notes

1. Thailand signed the Kyoto Protocol in February 1999, and ratified it on 28 August 2002.
2. Thailand ratified the UNFCCC (United Nations Framework Convention on Climate Change) in March 1995.
3. Thailand Greenhouse Gas Management Organization's tasks in greenhouse gas (GHG) emission reduction include promoting: low-carbon activities; investment and marketing on GHG emission reductions; establishment of GHG information centre; review of CDM projects for approval; provision of capacity development and outreach for CDM stakeholders.
4. OEPP (Office of Environmental Policy and Planning) (2000) *Thailand's Initial National Communication under the United Nations Framework Convention on Climate Change* (Bangkok: Ministry of Science, Technology and Environment).
5. United Nations Framework Convention on Climate Change (UNFCCC) (2007) *Climate Change: Impacts, Vulnerabilities and Adaptation in Developing Countries* (Bonn: Climate Change Secretariat (UNFCCC)), p. 6.
6. Examples of literature on climate change which point out the linkages between adaptation and development issues include those by R. J. T. Klein, E. L. F. Schipper and S. Dessai (2005) 'Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions', *Environmental Science & Policy*, 8, 583; K. Urwin and A. Jordan (2008) 'Does Public Policy Support or Undermine Climate Change Adaptation? Exploring Policy Interplay across Different Scales of Governance', *Global Environmental Change*, 18, 180–191; I. Burton, E. Malone and S. Huq (2004) *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures*, I. Bo and E. Spanger-Siegfried (eds) (Cambridge: Cambridge University Press). United Nations Framework Convention on Climate Change (UNFCCC) (2007) *Climate Change: Impacts, Vulnerabilities and Adaptation in Developing Countries* (Bonn: Climate Change Secretariat, UNFCCC).
7. United Nations Development Program (UNDP) (n.d.) *UNDP Adaptation Policy Framework (APF)* (New York: UNDP).
8. K. Urwin and A. Jordan (2008) 'Does Public Policy Support or Undermine Climate Change Adaptation? Exploring Policy Interplay across Different Scales of Governance', *Global Environmental Change*, 18, 180–191.
9. The research was commissioned by Thailand's National Economic and Social Advisory Council (NESAC), created by the provision of Article 89 of the 1997 Constitution and enacted by the provisions of the National Economic and Social Advisory Council Act of 2543 (A.D.2000), then supplemented by the amended National Economic and Social Advisory Council of 2004 [the 2nd Issue]. NESAC is an organization chartered to provide advice and suggestions to the Cabinet with regards matters related to economic and social issues. It provides comments on plans such as National Economic and Social Plans, required by laws to preview before their legal enactment. NESAC is a national governmental body created to bring to the Cabinet's attention all economic and social problems. It is thus an organization that supports people's participation in the country's economic and social development. Although NESAC's advice and suggestions to the Cabinet is

not binding, they are important in that they provide the facts derived from the people's participation process.

10. Thailand's *Initial National Communication under the United Nations Framework Convention on Climate Change* was submitted in the year 2000 by its focal point, the Office of Environmental Policy and Planning, Ministry of Science, Technology and Environment. It documented the 1994 inventory of greenhouse gases and the steps being taken by Thailand to address climate change.
11. As reported in Reported in Thailand's *Initial National Communication under the United Nations Framework Convention on Climate Change (2000):* CO_2 emissions from forestry and land use changes declined while those from the energy supply sector increased.
12. As reported in Thailand's *Initial National Communication under the United Nations Framework Convention on Climate Change (2000).* Approximately 91 per cent of emissions were from agriculture.
13. As reported in Thailand's *Initial National Communication under the United Nations Framework Convention on Climate Change (2000).* Almost all emissions came from agriculture: agricultural soils, manure management in the livestock sector. Other minor sources were the energy supply sector and land use change and forestry.
14. IEA (2006) International Energy Agency Statistics Division, http://data.iea.org/ieastore/default.asp (accessed 1 February 2009).
15. Programs to mitigate CO_2 emissions in Thailand's energy sector include demand-side management, an energy conservation program, fuel switching, IPP and SPP schemes, renewable energy.
16. The forestry sector's mitigation scheme includes forest preservation, reforestation and afforestation activities to enhance carbon sinks.
17. While technical options to reduce GHG emission in the agricultural sector include improved management of water, farm residues and chemical fertilizers, the selection of appropriate rice cultivars, and changes in cultivation techniques and practices, it is unclear whether these mitigation options have been put into practice in Thailand.
18. Options identified to mitigate potential emissions from domestic and industrial wastes include recycling, reduction of wastes produced, and conversion of waste into energy. The application of economic instruments as measures to enhance recycling and reduce waste generation was proposed.
19. DAEDE, Department of Alternative Energy Development and Efficiency (2009), http://www2.dede.go.th/dede/cdm/process.htm (accessed 1 February 2009).
20. R. J. T. Klein, E. L. F. Schipper and S. Dessai (2005) 'Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions', *Environmental Science & Policy*, 8, 583.
21. S. Limjirakala, T. Sriburi and U. Limsakul (2007) Progress Report of the Research Study on the *Assessment of Thailand's Extreme Climate Events: Analysis of Risk and Precipice of Geographical Hot Spots*, submitted to TRF-Climate Change.
22. R. J. T. Klein, E. L. F. Schipper and S. Dessai (2005) 'Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions', *Environmental Science & Policy*, 8, 584.
23. Institutions are defined according to O. R. Young, H. Schroeder and L. A. King (eds) (2008) *Institutions and Environmental Change: Principle Findings, Applications, and Research Frontiers* (Cambridge: MIT Press) as '... clusters of rights, rules, and decision-making procedures that give rise to social practices, and organizations,

construed as material entities that typically have personnel, offices, equipment, financial resources, and often legal personality ...'

24. F. W. Riggs (1966) *The Modernization of Bureaucratic Polity* (Honolulu: East-West Centre Press).
25. V. Somboon (2008) Final Report of the Research Study on the *Implementation of the Tenth National Economic and Social Development Plan in Natural Resource, Environment and Biodiversity through Creating Cooperation Processes for the Development Alliances in Their Compliance to the Plan,* submitted to Thailand's National Economic and Social Advisory Council.
26. R. J. Muscat in (1994) *The Fifth Tiger: A Study of Thai Development Policy* (Tokyo: United Nations University Press) noted that although there was a brief interruption by the period of political uncertainty during the Third and Fourth Plan, when the government distracted, had little interest in the plans or planning machinery, technocratic leadership was revitalized in the Fifth Plan (1982–1986). It was then that the Fifth Plan was put forth as a '... policy plan with directions that would be translated into ministerial operational plans ...' according to the policy priorities determined by the technocratic leadership.
27. F. W. Riggs (1966) *The Modernization of Bureaucratic Polity* (Honolulu: East-West Centre Press).
28. V. Somboon (2008) in his analysis for the evaluation of the Tenth National Economic and Social Development Plan described the Thai political and policy system as having developed from a bureaucratic polity into an electorate polity characterized by the present regime of representative democracy.
29. Changes in the political and public administrative systems of this past decade have significantly affected the NESDB's role and authority in administering the National Development Plan. Most importantly, the enactment of the Public Administration Regulations Act, B.E.2545 (2002) and the Royal Decree on Criteria and Procedures for Good Governance, B.E.2546 (2003) has stipulated that agencies comprising of the NESDB, the Office of the Secretariat to the Cabinet, the Office of the Secretariat to the Prime Minister, and the Budget Bureau collectively formulate a Government Administration Plan to be proposed to the Cabinet within 90 days after the government's policy announcement to Parliament. The change in NESDB's role also resulted from the public sector reforms which drew the lines more clearly among the roles and tasks of the central agencies. The NESDB was assigned the main task to oversee the long term strategies of the National Development Plan, while the Budget Bureau, under the budget planning process reform, was to oversee strategic budget planning. Project analysis was to be transferred from the NESDB to the Ministries that were the host of the project. Public enterprise investment budget analysis and foreign loan project planning were transferred to the Ministry of Finance. Another change in the political and public administration structure that affected the implementation of the National Development Plan by the NESDB was the decentralization of budget and development planning, whereby local authorities are entitled to formulate their own budget and development plan without being restricted to conform to the NESDB's framework.
30. A. Sen, 'Basic Education and Human Security', *Workshop on Education, Equity and Security,* Kolkata, 2–4 January 2002, http://www.humansecurity-chs.org/activities/outreach/Kolkata.pdf (accessed 15 January 2009).
31. The actual average annual (real) GDP growth rate of 10.5 per cent, more than twice the targeted 5 per cent at the time of Thailand's boom decade (1986–1996),

provided a climate conducive for the liberal pursuit of wealth though at the expense of environmental concerns.

32. Environmental degradation in Thailand for the past decade has been cited by Parichart Siwaraksa and Decharut Sukkumnoed, 'Human Security through a Thai Kaleidoscope: Ideas, Situations, and Actions', presented at the *International Public Symposium Challenges to Human Security in a Borderless World*, organized by Commission on Human Security and Chulalongkorn University, 11 December 2002. Bangkok: The Health Systems Research Institute, as poor air quality in urban areas; although the situation has improved significantly due to the switch to unleaded gasoline, but air quality in the industrial areas has deteriorated. Household and industrial waste management is another problem. Among the most alarming concerns is the fact that only 15 per cent of hazardous waste is treated; the rest is illegally dumped in unidentified places.
33. P. Siwaraksa and D. Sukkumnoed, 'Human Security through a Thai Kaleidoscope: Ideas, Situations, and Actions', presented at the International Public Symposium *Challenges to Human Security in a Borderless World*, organized by Commission on Human Security and Chulalongkorn University, 11 December 2002, Bangkok: The Health Systems Research Institute.
34. *Ibid*.
35. V. Muntrabhorn (n.d.) *Human Rights and Human Development: Thailand Country Study, Occasional Paper 36,* http://hdr.undp.org/docs/publications/ocational_papers/oc36.html (accessed 15 January 2009).
36. *Ibid*.
37. Two bureaucratic reform laws: the National Administrative Regulations Act and the Restructuring of Government Agencies Act took effect on 3 October 2002 after they were endorsed by His Majesty the King and announced in the Royal Gazette on 2 October 2002. The Ministry of Social Development and Human Security was one among six ministries set up under the new government structure.
38. V. Muntrabhorn (n.d.) *Human Rights and Human Development: Thailand Country Study, Occasional Paper 36,* http://hdr.undp.org/docs/publications/ocational_papers/oc36.html (accessed 15 January 2009).
39. P. Siwaraksa and D. Sukkumnoed, 'Human Security through a Thai Kaleidoscope: Ideas, Situations, and Actions', presented at the International Public Symposium *Challenges to Human Security in a Borderless World*, organized by Commission on Human Security and Chulalongkorn University, 11 December 2002, Bangkok: The Health Systems Research Institute.
40. V. Somboon (2008) Final Report of the Research Study on the *Implementation of the Tenth National Economic and Social Development Plan in Natural Resource, Environment and Biodiversity through Creating Cooperation Processes for the Development Alliances in Their Compliance to the Plan,* submitted to Thailand's National Economic and Social Advisory Council.
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44. K. Urwin and A. Jordan (2008) 'Does Public Policy Support or Undermine Climate Change Adaptation? Exploring Policy Interplay across Different Scales of Governance', *Global Environmental Change*, 18, 180.
45. K. Urwin and A. Jordan (2008) 'Does Public Policy Support or Undermine Climate Change Adaptation? Exploring Policy Interplay across Different Scales of Governance', *Global Environmental Change*, 18, 182.
46. *Ibid*., p. 188.
47. R. J. T. Klein, E. L. F. Schipper and S. Dessai (2005) 'Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions', *Environmental Science & Policy*, 8, 583.

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25

Climate Change and Human Security in the Philippines: Government Policies, Assessments and Public Opinion

Pia Bennagen Raquedan

Climate change and human security in the Philippines: An overview

The Philippines, located in Southeast Asia, is an archipelagic country comprising some 7100 islands with three main island groups, namely, Luzon, Visayas and Mindanao. It has a total land area of 300,000 square kilometres and a national population of around 88.6 million (2007). In terms of land area, the Philippines is about the same size as Italy while population-wise, it ranks 12th behind Mexico. Geographically, the country is located along typhoon and earthquake belts and this makes it highly vulnerable to natural hazards such as typhoons, floods, landslides, droughts, volcanic eruptions, and earthquakes. The World Bank (WB) and the National Disaster Coordinating Council (NDCC) of the Philippines estimate that these natural hazards cost the country around US$300 million and claim about 850 lives every year. In addition to these, the country also experiences so-called smaller hazard events that impact heavily on households, particularly those belonging to the poorest of the poor.

The Global Climate Risk Index 2008 reports that the Philippines was the world's top climate victim in 2006 as a result of the number and gravity of the storms, floods, and extreme weather events it experienced that year.[1] And for the period 1998 to 2007, the Philippines ranked tenth out of 169 countries for which a Climate Risk Index (CRI) may be computed as the country recorded an average total loss of US$698 million PPP (or about 0.33 per cent of its GDP) as a result of extreme weather events.[2] More recently, the Economy and Environment Program for Southeast Asia (EEPSEA) classified all regions in the Philippines as among the most vulnerable areas in Southeast Asia. In particular, Metro Manila, Southern Tagalog, Cagayan

Valley, the Cordillera Administrative Region, and Bicol are highly vulnerable to the adverse impacts of climate change.[3]

Aggravating the situation is the widespread poverty in the country, with about 29.5 per cent of the population or 25.4 million Filipinos living on US$1.35 every day (2006) and seven in ten Filipinos (70 per cent) considering themselves to be very poor/poor (2008).[4] Most of the poor, especially those residing in the rural areas, rely heavily on resource-extractive means of livelihood for their daily survival. As such, as they contribute to the degradation of the country's already fragile ecosystems, they also find themselves falling into a life of worsening poverty. Deforestation, air and water pollution, loss of biodiversity, poor solid waste management, landslides and soil erosion, and coral reef degradation are only some of the problems plaguing the different ecosystems in the Philippines, thus resulting in the 'plunder of paradise'.[5]

Of late, increasing attention has been given to climate change and its impact on the Philippines. While the Philippines does not contribute as much as other countries to global climate change, it is one of the countries most vulnerable to the adverse consequences of climate change. It has been noted that 'a mere one meter rise in sea level will submerge 700 million square meters of land in 64 of the Philippines' 80 provinces and 20 of the most vulnerable provinces will likely disappear from the map'. Already, the effects of climate change are being felt by Filipinos through the more frequent occurrence of severe El Niño and La Niña events, deadly and damaging typhoons and storms, floods and flash floods, landslides, drought, and even forest fires. Additionally, not only has the Philippines become warmer in recent decades but it has also become drier, even with sea levels rising over the years.[6] It is the poorest of the poor – farmers, fisherfolks, upland dwellers, and informal urban settlers – who are most vulnerable to the effects of climate change, while the country's agricultural and food security sectors are most adversely affected by this development.[7]

All these effects of climate change impact greatly on human security. According to the United Nations Development Program (UNDP), human security has to do with people's 'safety from chronic threats like hunger, disease, and repression ... and protection from sudden and hurtful disruptions in the patterns of daily life – whether in homes, in jobs, or in communities'. This definition emphasizes the multidimensional nature of the concept of human security. The concept can be broken down into different components namely, economic security, food security, health security, environmental security, personal security, community security, and political security. Human security is achieved only once these different components are attained in a society.[8] Here, the referent of security – defined in terms of its human dimension – is no longer the state, as in the traditional concept of security, but the human being as an individual and as part of a larger community or society.

The impacts of climate change on human security have certainly been felt in the Philippines. For instance, in terms of the economic dimension,

the increased occurrence of natural disasters in the country has led to losses amounting to as much as 1.2 per cent of the country's gross domestic product (GDP) and 4.2 per cent of its total agricultural production annually. Data from Greenpeace-Philippines show that from 1975 to 2002, the country incurred losses amounting to nearly P 4.6 billion – which includes damage to agriculture reaching P 3 billion – due to damage caused by tropical cyclones.[9] As regards the environmental aspect, huge agricultural losses due to extreme drought and weather disturbances have been reported in major rice and corn-producing areas in the Philippines. In turn, this impacts negatively on the livelihood of the country's farmers, who are among the poorest of the poor. Additionally, in Albay, an increased incidence of pests and diseases has been observed. The Philippine coastal ecosystem has not been spared. In Palawan, rising tides have led to a decline in fish productivity which, in turn, has made life even more difficult for the province's landless fisherfolks who are already living in generally poor conditions.[10]

Climate change also has political repercussions. A November 2007 report released by International Alert identified the Philippines as one of the 46 countries with 'a high risk of violent conflict as a consequence of climate change'.[11] Already, environmental degradation and resource depletion have worsened social tensions in the country – particularly those having to do with issues of resource allocation and ownership. Moreover, resource extractive activities such as logging, mining, and illegal fishing have resulted in political conflict, causing the division and forced migration of communities and tribes. Health-wise, the WB claims that the Philippines loses about US$430 million in health costs due to air pollution – and this amount refers only to four urban areas in the country (Metro Manila, Baguio City, Cebu City and Davao City). Air pollution also adversely impacts on Filipinos' long-term productivity and lowers their quality of life.[12]

Government policies on climate change

Given the grave consequences of climate change for the Philippines, the government has devoted more attention and resources to addressing this problem in recent years. Official policies and institutional arrangements that focus on the issue of climate change may be traced back to the creation of the Inter-Agency Committee on Climate Change (IACCC) in May 1991, based on Administrative Order 220 signed by then President Corazon C. Aquino. With the formation of the IACCC, the Philippines became one of the first countries to embark on an institutional response to the problem of climate change. The IACCC was established even before the Philippines signed the United Nations Framework Convention on Climate Change (UNFCCC) in June 1992.[13]

The IACCC is headed by the Secretary of the Department of Environment and Natural Resources (DENR), co-chaired by the Secretary of the

Department of Science and Technology (DOST) and also represented by the Department of Foreign Affairs (DFA), Environment Management Bureau (EMB), National Mapping and Resources Information Authority (NAMRIA), and Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAG-ASA). The IACCC – the government body which leads efforts to advance the country's climate change agenda – is mandated to:

- Formulate policies and response strategies related to climate change;
- Determine the national information requirements relevant to negotiations for the adoption of a central instrument at the UNCED (1992);
- Establish working groups to monitor and assess local climate change and its environmental and socioeconomic impact in coordination with international agencies; and
- Designate a focal point to serve as the link between the Philippines and the Secretariat of the UNEP and WMO.

Furthermore, the IACCC performs a key role in formulating national positions in the different international negotiations that seek to mitigate the effects of climate change. The IACCC also sees to it that the Philippines complies with the mandates and principles embodied in the UNFCCC and the Kyoto Protocol. For instance, it took the lead role in drafting the country's Initial National Communication on Climate Change.

In 2007, President Gloria Macapagal-Arroyo established the Presidential Task Force on Climate Change (PTFCC) through Administrative Order 171. The creation of the PTFCC stemmed, in part, from the government's recognition of 'the urgent need to confront the issue of climate change and decisively address its adverse effects on the people and the production sectors'.[14] Originally, the PTFCC was chaired by the DENR Secretary but the leadership was transferred to the DOE Secretary later on. However, President Arroyo reorganized the PTFCC and appointed herself as its head in December 2008, through Executive Order 774.[15] Members of the PTFCC include the Science and Technology Secretary, Agriculture Secretary, Interior and Local Government Secretary, and representatives coming from the private sector and civil society. The DENR serves as the PTFCC's secretariat while its technical arm is the IACCC. The mandate and functions of the PTFCC include the following:

- Conduct rapid assessment on the impacts of climate change, particularly on the most vulnerable sectors/areas of water resources, agriculture, coastal areas, terrestrial and marine ecosystems, among others;
- Ensure strict compliance to air emission standards and act with urgency to combat deforestation and environmental degradation and apprehend violators;

- Undertake/initiate strategic approaches and measures to prevent or reduce GHG emissions including fuel efficiency, energy conservation, use of renewable energy, waste management, and others;
- Conduct a massive and comprehensive public information and awareness campaign nationwide to educate the public on the climate change situation and its adverse impacts and mobilize multi-sectoral action in climate change;
- Design concrete risk reduction and mitigation measures and adaptation responses, especially to address short-term vulnerabilities, on sectors and areas where climate change will have the greatest impact;
- Collaborate with international partners at the bilateral, regional, and multilateral levels to support a global front to stabilize GHG emissions and institute mitigating and adaptive measures, especially for developing countries; and
- Cause the integration and mainstreaming of climate risk management into the development policies, plans, and program of government.

In October 2007, the PTFCC submitted the Philippine Climate Change Response Action Plan (PCCRAP) to President Arroyo, which discussed the different strategies that the country would implement to address the problem of climate change. PTFCC Chairperson Angelo T. Reyes, concurrently the Energy Secretary, explained that the activities of the Task Force in general and the PCCRAP in particular are based on the following principles: (1) they should be aligned with the global action agenda on climate change; (2) they should be holistic and comprehensive in the sense that they involve all stakeholders; (3) they should synchronize currently disparate climate change initiatives; and (4) they should emphasize local efforts and intervention particularly in the areas of program initiation and implementation.[16]

At the core of the PCCRAP is a balance between mitigation and adaptation measures to address climate change. Some of the objectives outlined in the PCCRAP are to: (1) achieve a climate-friendly energy supply mix; (2) lobby for the passage of the Renewable Energy Bill; (3) design adaptation responses to address vulnerabilities of specific sectors and areas to climate change; (4) give local communities access to climate-friendly technologies; (5) introduce farmers to technologies for producing drought-resistant crops; and (6) focus on social mobilization to achieve the critical mass necessary to ensure the success of the country's climate change policy.

A few other government bodies have been created to contribute to the country's climate change initiatives. DENR Administrative Order 2006–787 created the Inter-Agency Working Group (IAWG) and DENR Program Steering Committee for the Adaptation to Climate Change.[17] Headed by the DENR Assistant Secretary for Foreign-Assisted and Special Projects and with the DENR, DA, DAR, PAG-ASA, PHIVOLCS, and NAMRIA as members, the IAWG is tasked to: (1) review the agencies' program proposals on adaptation

and (2) integrate the various proposals into one for submission to the GEF. On the other hand, the DENR Program Steering Committee is chaired by the DENR Undersecretary for the Environment. Serving as vice-chair is the DENR Assistant Secretary (FASP) and the respective directors of the FMB, EMB, MGB, and PAWB are members. The body provides policy guidance in the development of the program on adaptation.

Furthermore, the DENR also issued Special Order 2007–653 on 25 September 2007, which established the Advisory Council on Climate Change Mitigation, Adaptation, and Communication.[18] The Council is led by DENR Secretary Jose Atienza with Presidential Adviser on Global Warming and Climate Change, Heherson Alvarez, serving as vice-chair. Serving as members are six experts coming from academic life and civil society. Among the functions of the Council are:

- Advise on and recommend policies to the DENR and the IACCC pertaining to climate change mitigation, adaptation, and communication;
- Review proposed Philippine positions on certain issues considered by the UNFCCC;
- Identify and assess vulnerabilities and propose courses of action on climate change mitigation and adaptation for implementation at all levels; and
- Engage all sectors in the dissemination of climate change mitigation and adaptation information.

Over the years, several programs and projects related to climate change mitigation, adaptation, and communication have been implemented by the Philippine government and its partners from the private sector and civil society. Among the mitigation-related programs are the: (1) institutionalization of the greenhouse gases (GHG) inventory process and public awareness, which began in 2001 and involved the training of representatives from the regional offices of the Environmental Management Bureau (EMB) to do GHG emissions inventory; (2) Capacity Development for Clean Development Mechanism (CD4CDM) under the *Klima* Climate Change Center, which seeks to generate a multi-sectoral understanding of the opportunities offered by the CEM and to develop the necessary institutional and human capabilities to allow formulation and implementation of CDM projects; (3) Integrated Capacity Strengthening for CDM (ICS-CDM) Program, which aims to enhance institutional and human capacity to fully engage in and benefit from the CDM among developing countries in Asia; and (4) JICA Study on Capacity-Building to Promote CDM Projects in the Philippines, which involves providing assistance in sustainable development through the formulation of CDM promotion measures, establishment of a helpdesk and clearinghouse, implementation of workshops at the local level, and formulation of recommendations for further CDM promotion.[19]

As regards climate change adaptation, the DENR, DA, NIA, and PAG-ASA are collaborating on the implementation of the Climate Change Adaptation Project under the World Bank. The primary goal of the project is to develop and demonstrate the systematic diagnosis of climate-related problems and the design of cost-effective adaptation measures, while at the same time integrating climate risk awareness and responsiveness into economic and operational planning, particularly in agriculture and natural resource management. The project has four building blocks which are to: (1) improve coordination of adaptation policy by the DENR; (2) implement climate risk reduction in key productive sectors; (3) strengthen proactive disaster management within the NDCC; and (4) enhance provision of scientific information for climate risk management.

Currently on the table is a program designed to strengthen the country's institutional capacity to adapt to climate change. This involves several government agencies, higher-level educational institutions, civil society groups, and donor partners. The program seeks to help the Philippines address key strategic issues involving vulnerability and coping mechanisms to deal with the effects of climate change. At various levels, the program is an attempt to mainstream climate risk reduction (CRR) into national and local development plans and processes as well as to enhance national and local capacity to develop, manage, and administer projects addressing climate change risks.

There have also been several initiatives in the area of education, training and public awareness. The government and its partners have embarked on information and awareness raising campaigns on climate change and these have been done through public briefings, radio and television interviews with climate change experts, roundtable discussions, and publication of news and feature articles in print media. Information and education campaign materials have also been developed to let more Filipinos know about climate change, its consequences, and what can be done to deal with the problem. Furthermore, the government has also conducted and coordinated capacity-building activities to enhance understanding of the issues on climate change and to strengthen the capacity of decision makers to design and implement appropriate climate change policies. For their part, the PFTCC, DepEd and civil society partners are developing training modules and lesson guides for public school teachers at the elementary and secondary levels in preparation for the inclusion of lessons on climate change in school curricula. This initiative is part of the government's efforts to fulfil its international commitments under the Kyoto Protocol to combat climate change and reduce GHG emissions.[20]

Assessments of government climate change initiatives

Despite the different initiatives that the government has embarked on to address the issue of climate change, there are still some critics who continue

to call on the national leadership to do more to help the country and its people deal with the adverse consequences of climate change. One problem has to do with the institutional arrangement that has been established in the Philippines to deal with climate change. Since the creation of the IACCC in 1991, several other governmental bodies have been established to address various aspects of the issue of climate change. This has resulted in, among others, problems having to do with lack of coordination and redundancy in the implementation of programs and projects as well as questions having to do with representation of national interests in international conferences on climate change.[21] For instance, during the Bali Conference in 2007, the issue had to do with whom or which body should represent the Philippines in the gathering. The appointment of a Presidential Adviser on Global Warming and Climate Change[22] and the President's reorganization of the PTFCC might create further confusion as regards the issue of national representation at international climate change conferences.

Another critique has to do with the failure of government to incorporate its climate change agenda into its key national development policies. In part, this may be attributed to the observation that Philippine policymakers currently do not see climate change as a priority issue and as such, the government's climate change policy is not yet integrated into its national development plans, this despite the growing realization that 'the way to address climate change is to "mainstream" it (which refers) to the full integration of climate change adaptation policies into national development programs ... the most effective way to address climate change impacts on the poor is by incorporating adaptation measures into sustainable development and poverty reduction strategies'.[23]

A survey of the country's major development policies attests to the lack of government attention to the issue of climate change. The Medium-Term Philippine Development Plan (MTPDP) for 2004–2010 of the Arroyo administration cites climate change only once, in the chapter on energy independence, within the context of the Clean Development Mechanism (CDM). Nonetheless, the MTPDP, particularly its chapter on the environment and natural resources, has a longer discussion on the impact of natural disasters and the strategies that might be undertaken to address their adverse consequences. The Philippines' progress report on the Millennium Development Goals (MDGs) also fails to deal with adaptation to climate change, despite international recognition that climate change threatens the ability of the global community to attain the MDGs. Even Philippine Agenda 21, the embodiment of the country's commitment to the goal of sustainable development, mentions climate change only once, in the context of freshwater ecosystems. In part, the lack of attention devoted to climate change in Philippine Agenda 21 may be explained by the fact that at the time the document was being made, climate change was not yet as 'big' an issue as it is today.[24]

The president's recent State of the Nation Address (SONA), delivered in July 2008, also supports the observation that climate change is still not a priority concern of the current dispensation. In her speech before Congress, President Arroyo mentioned climate change only once when she cited the role of forests in mitigating the effects of climate change which, she explained, is 'a key factor in increasing the frequency and intensity of typhoons and cost the country 0.5% of the GDP'.[25] Even as the president enumerated several environmental laws that were passed under her watch such as the Solid Waste Management Act, Wildlife Act, Protection of Plant Varieties, Clean Water Act, Biofuels Act and several laws declaring protected areas, those expecting a stronger call to action from the president as regards climate change were disappointed by her speech.

Even government (or its agencies) itself is cognizant of the various factors hampering its ability to implement its commitments under the UNFCCC. The government has to deal with such problems are the availability and reliability of data on GHG emissions, institutionalization of linkages among government agencies conducting the inventory of GHG emissions, affordability of technologies to be used in mitigating the effects of climate change, and lack of studies on how the country can best develop appropriate adaptation measures and actions. To help meet its international obligations, the Philippine government recognizes the need for international assistance, especially financial and technical support.

To contribute to the mainstreaming of climate change in government's development policies, it is critical to increase the level of climate change awareness, not only among the general population but even among policymakers. Since it appears that many policymakers continue to see climate change as secondary only to more basic concerns like poverty reduction and economic growth, information and education campaigns on climate change should also include them as target beneficiaries. In this way, appreciation for the interrelated nature of these issues may be developed among Filipinos in general and policymakers in particular.

For Senator Loren Legarda, the proponent of a bill creating the Climate Change Commission, the recent natural disasters that hit the country are indicative of the fact that the government has not been doing enough to address climate change and its impacts. The Philippines is often unprepared to deal with natural calamities which have adverse consequences for the country's vulnerable groups. The lawmaker adds that the country 'can improve its ability to prevent loss of lives and destruction of properties in the face of disasters, and incorporate an analysis of the chronic economic impact of catastrophes into its growth equation and planning process'. This would *entail* developing clearly defined strategies dealing with the impacts of climate change on food security, environment, water resources, economy, public health, and human security, all of which affect the quality of life of Filipinos.

Those in civil society have also been critical of the government's climate change initiatives. Greenpeace Southeast Asia, for instance, questioned the motives behind the reorganization of the PTFCC and called EO 774 'ridiculous' given that the programs covered by the president's order are already provided for in existing laws. Instead, what the government should focus on, according to the group, are more 'wide-ranging and lasting solutions to the problem of climate change such as the phasing out of coal-fired power plants and the implementation of a shift to renewable energy and energy-efficient technologies'.[26] For its part, the Philippine Climate Watch Alliance (PCWA) expressed concern over government actions that contribute to environmental degradation and climate change. These include the continued issuance of Timber License Agreements (TLAs), Forest Management Agreements (FMAs) and mining permits to large-scale operators despite the massive deforestation and land degradation these activities caused in some provinces across the country.[27] Meanwhile, while experts from the *klima* Climate Change Center[28] acknowledged that there has been some progress, especially with respect to institutional mechanisms in the country for addressing climate change and its impacts, there is still a need to do more since:

> ...the current situation requires a more proactive and comprehensive strategy that will enable the country to effectively chart a more sustainable future that takes into account significant contributions towards mitigation and ensure that the country can well adapt to the impacts of climate change. Such a mindset necessitates the establishment of a clear institutional mechanism by which the challenge of climate change can be addressed. This includes the elimination of ambiguities in the government institutions tasked to deal with climate change issues. It also underscores the imperative to establish a long-term and authoritative government institution that will be in charge of climate change.[29]

Public opinion on environment and human security

Since climate change affects the security of every individual, it is critical to get every one's cooperation in any effort to combat the adverse consequences of climate change. Policies, whether local, regional or global, will succeed only if there are enough warm bodies to ensure their efficient and effective implementation, beginning at the grassroots level. Whatever climate change initiatives are decided on by policymakers should be properly supported by the people, who are the ones who will give life to these policies. Given the central role that the people play in addressing the problem of climate change, it is important to devote attention to their views and sentiments about environment-related issues and how these are linked to their sense of security (or insecurity).

A survey[30] done by Pulse Asia in July 2008 included several probes related to the environment in general and climate change in particular. Survey findings show that most Filipinos say they know about climate change to some degree. When asked regarding the extent of their knowledge about climate change, almost the same percentages of Filipinos report having either sufficient (42 per cent) or little (32 per cent) knowledge about the issue. On the other hand, while 13 per cent claim to have wide knowledge, only 6 per cent say they have almost no or no knowledge at all about climate change.

Furthermore, in the assessment of 58 per cent of Filipinos, the climate in their area has changed much in the last three years, a view articulated by small majorities (57 per cent to 58 per cent) across all geographic areas and socioeconomic groupings. In contrast, 14 per cent believe there has been little climate change in their area during this period and around three in ten Filipinos (29 per cent) express indecision on the matter. Meanwhile, sizeable majorities of Filipinos view climate change as being dangerous for the environment (61 per cent) as well as for their families and themselves (62 per cent). In contrast, 11 per cent of Filipinos do not think climate change is dangerous for the environment or themselves and their families while public ambivalence on the matter is expressed by 27 to 28 per cent.

In connection with the recent calamities in the Philippines and other parts of the world, 54 per cent of Filipinos say people have only themselves to blame for these events. On the other hand, 23 per cent of Filipinos say these calamities are a form of punishment from a superior being for countries who have erred in their ways. In addition, 18 per cent attribute these calamities to natural processes that occur regularly across the world while only 5 per cent are unable to express any view on this matter.

In July 2007, Pulse Asia probed into people's perceptions regarding their personal sense of security/insecurity. Only 17 per cent said having a good environmental quality and abundant natural resources gives them a sense of security. Having a good job and good health top the list of Filipinos with 62 and 57 per cent respectively, saying these things make them feel secure.[31] On the other hand, three in ten Filipinos (30 per cent) say environmental destruction and the abuse of natural resources do not give them a sense of security, nearly or exactly the same percentages as those citing ineffective governmental management (31 per cent) and lack of education (30 per cent). The most often-cited factors that weaken Filipinos' sense of security are lack of peace and order, non-recognition and lack of protection of people's rights, and poverty.

Overall, survey data from the Philippines lead to the following general observations:

- Awareness of environmental issues as well as level of concern for such problems varies across issues, geographic areas, and socioeconomic classes, among others. For instance, Filipinos are more aware of problems that they

experience on a daily basis, such as air and water pollution, as opposed to problems that they might perceive as not affecting them directly every day, like loss of biodiversity. More specifically, Metro Manilans are more aware of and concerned about the problem of air pollution because they have to live with it on a daily basis, but for those in the rural areas of the country where there are less vehicles and factories, other environmental problems preoccupy them such as loss of lands for agricultural purposes, lack of water supply/irrigation and the like. With regard to one's socio-economic status, the general trend is that those who are better-off report a higher level of awareness regarding environment-related issues than those who are poorer.

- Despite the warnings issued by scientific and technical experts over the decades regarding the rapidly dwindling natural resources in the Philippines, there is still a very low level of concern for the environment. Only a minority of Filipinos (that is, not more than 18 per cent since 1999) considers environmental degradation as a national issue that must be prioritized by government. Many continue to be most worried about economic matters as these are seen as having a more immediate impact on their daily survival. Such a perception may be attributed partly to the slow-motion nature of most environmental problems, as their effects are often felt only after several years or even decades after authorities issue a warning. Filipinos' failure to show appreciation for environmental problems in a similar vein as they regard economic matters could also reflect their failure to grasp the intricate relationship between the economy and the environment, as explained in the concept of sustainable development.[32] Nonetheless, the view that climate change is dangerous for the environment and their families is supported by majorities of Filipinos. This can be a good starting point for any effort to convince Filipinos to do more at the individual level to address the problem of climate change.
- A corollary to this is the low percentage of Filipinos who consider having good environmental quality and abundant natural resources as strengthening their sense of security, as well as those who say that environmental degradation weakens their sense of security. For the most part, the top indicators of Filipinos' sense of security are economic in nature, employment, poverty, and health status.[33] This parallels Filipinos' views regarding the most urgent national concerns needing the immediate attention of the government, which are inflation, graft and corruption, poverty, economic recovery and low pay of workers.
- A positive survey finding has to do with the self-reported participation of Filipinos in different activities geared to protect the environment and conserve the country's natural resources. While the top activity on the list, tree-planting, is often a one-off thing, the other activities cited by Filipinos (for example, waste segregation, recycling, abiding by environmental laws

and educating family members on environment-related matters) require more time and effort and are often undertaken on a sustained basis. And while only 6 per cent of Filipinos say they have not done anything to protect the environment, on average, however, Filipinos undertook only two of the 11 activities included in the survey instrument. With regard to the future, only 3 per cent of Filipinos say they are not willing to embark on any activities to take care of the environment. Therefore, the challenge is to translate this high level of willingness on the part of Filipinos to do more for the environment into actual activities that would have positive consequences for the environment.

Next steps for the Philippines

Some of the recommendations that have been put forward to address climate change in the Philippines are:

- Aggressive yet systematic information, education, and communication campaign about climate change, climate variability, and risks;
- Participatory and multi-sectoral/multi-stakeholder approach;
- Climate change technology and policy impact assessment;
- Regular fund source and intensified fund generation for climate change-related activities;
- Factor in climate change issues into the national stream of policymaking and development;
- Conduct of municipal-level vulnerability assessments on sea-level rise, agriculture, water resources, health and coastal and marine resources;
- Improve the accuracy and effectiveness of the tropical cyclone warning and climate change monitoring systems;
- Enhance the preparedness, prevention and mitigation aspects of disaster management;
- Actively participate in the CDM; and
- Adopt a target in generating power from new, renewable sources of energy.[34]

At the Philippine Senate, there is a pending bill proposed by Senator Legarda, entitled Philippine Climate Change Act of 2007. Among other things, the bill seeks to: (1) establish and implement a Framework Program on Climate Change Mitigation, Adaptation, and Communication that would enable climate planning, research and development, extension, and monitoring of activities for protecting vulnerable communities from the damage to lives, property and the environment of extreme climate impacts and the reduction of GHG emissions from energy, power, transport and manufacturing sectors and (2) create a Climate Change Commission to be

supervised by the DENR. The objectives of the proposed government body are to:

- Monitor the implementation of the Philippine Clean Air Act of 1999;
- Recommend legislation, policies, programs, and budgets on global warming or climate change adaptation and mitigation;
- Disseminate climate change information to the general public and government;
- Represent the government in all international and regional meetings, conferences, and/or conventions concerning climate change; and
- Keep under review all unratified international environmental treaties pertaining to climate change and make recommendations for ratification and compliance.[35]

Under the proposed bill, the head of the Climate Change Commission is automatically a member of the National Security Council (NSC) and is tasked to report directly to the President as regards sensitive environmental information on climate change. The NSC is the country's main policymaking and advisory body when it comes to issues related to national defence. Executive Order 115, issued by President Aquino on 24 December 1986 to reorganize the NSC, provides that the membership of the NSC shall include 'the President, the Vice-President and Minister of Foreign Affairs, the Executive Secretary, the Minister of Labor and Employment, the Minister of Local Government, the National Security Director, the Chief of Staff of the New Armed Forces of the Philippines, and such other government officials and private citizens as the President may designate from time to time'.[36] The inclusion of the head of the proposed Climate Change Commission may indicate policymakers' acceptance of a broader concept of security and the realization of the security implications of climate change.

Senator Legarda's proposed legislation also calls for the creation of a Climate Adaptation Fund for the purpose of providing financial assistance for priority adaptation projects to be identified and approved by the Climate Change Commission. The amount of P 1B is to be allocated as seed money for the Climate Adaptation Fund to be used for, among other things, supporting the research, development, demonstration and promotion of technologies for adaptation and mitigation as well as the conduct of climate vulnerability assessment and resources inventory for mitigation and adaptation. Under the proposed bill, the management and administration of the Climate Adaptation Fund are the tasks of the DENR.

The Senate Sub-Committee on Climate Change presented its committee report to the plenary on 2 September 2008. After this, the bill is then deliberated upon by members of the Senate on the floor. Thus, there is still a long way to go before the bill is finally approved and signed by the President

as law. Hopefully, the country's legislators will cross party lines and show unanimous support for this bill. However, one critical development that has to be taken into consideration in examining the future of this bill is the May 2010 presidential elections. Will those running for the presidency in May 2010 as well as the electorate consider climate change a priority issue? Will they be supportive of the creation of a Climate Change Commission? Or will the environment be a marginal issue in the next presidential race?

Overall, there is no lack of climate change initiatives, both in terms of adaptation and mitigation, in the country. Institutionally, the Philippines was one of the first to respond to the issue of climate change by establishing the IACCC back in 1991. Since then other governmental bodies have been created to deal with climate change. The president's most recent act has been to appoint a Presidential Adviser on Global Warming and Climate Change. Policy-wise, the Philippines signed the UNFCCC in June 1992 and ratified it in August 1994. The country is also a signatory to the Kyoto Protocol (April 1998), with the DENR being the Designated National Authority (DNA) for CDM. The Philippines' Initial National Communication on Climate Change was submitted in 1999, and this year the PTFCC submitted the PCCRAP to President Arroyo.

However, despite these efforts, climate change is still not part of the country's mainstream development agenda. Very little mention of climate change may be noted in key development policies such as the MTPDP, Philippine MDG Progress Report and PA 21. Even the president has not given much attention to climate change in her key speeches. While there is recognition that the Philippines is highly vulnerable to the harmful effects of climate change, and even though existing climate change policies do highlight the negative impacts of climate change on the economy, the plight of the people, and the environment, among others, for the most part climate change initiatives in the country are still not framed within the context of human security. Like climate change, human security has not been mainstreamed in Philippine government policies. Evidence of this is the fact that what is referred to as the 'Human Security Act of 2007' is actually Republic Act 9372 entitled 'An Act to Secure the State and Protect our People from Terrorism'. And nowhere in this document is climate change mentioned. Hence, while the present policies of the Philippine government do put emphasis on the vulnerability of Filipinos to climate change, these are not explicitly articulated within the framework of human security.

In the years ahead, mainstreaming the climate change agenda in the Philippine's development policies is key. This will clearly operationalize the country's commitment to the various international climate change documents that it has already signed and ratified. Additionally, efforts to consolidate various government climate change initiatives into a coherent national policy must be undertaken. Even the confusion resulting from the existence of various bodies dealing with climate change must be addressed. Increasing

awareness of climate change as well as appreciation for the urgency of dealing with the issue, not only among the general population but even among policymakers themselves, must also be put on the agenda and acted upon accordingly.

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Part V
Conclusions

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26

The Politics of East Asia's Environmental Crisis: The Coming of Environmental Authoritarianism?

Mark Beeson

Introduction

East Asia presents us with something of a paradox. On the one hand, the region is associated with an unparalleled rise in the living standards of millions of people. On the other hand, the very success of East Asia's economic 'miracle' looks unsustainable as it wreaks an increasingly heavy toll on the natural environment. This is a troubling enough prospect for any part of the world; it is especially worrying for East Asia's political elites because their legitimacy and authority has generally been tightly bound up with their ability to continue delivering high growth. If the high-growth paradigm begins to unravel for some reason, the prospects for social cohesion and political stability will also become less certain.

One country in particular highlights the contradictions inherent in the potentially incompatible goals of economic development and environmental sustainability: China. The scale of China's rise is without precedent in human history, and so is its impact on the natural environment. There has already been significant social unrest in China as a direct consequence of the deteriorating environment,[1] and this threatens to destabilize a government whose authority is highly dependent on the continuation of its remarkable growth. It is, however, becoming painfully apparent that this growth paradigm is having an increasing impact on the health of the population, suggesting that there may be inescapable limits to future economic development. In such circumstances, the options for governments may become increasingly constrained and unpalatable.

It is at this point that there is an important and potentially explosive intersection of environmental and political forces. East Asia's natural environment is being rapidly degraded and this may reinforce a long-standing regional proclivity for authoritarian rule.[2] One of the central contentions in what follows is that environmental pressures and degradation will encourage

a return to the patterns of authoritarian rule which were such a feature of East Asia's high-growth phase during the Cold War, and which in some cases have never been replaced by democratic rule at all. Indeed, this helps to explain the double significance of China: not only is China the biggest direct contributor to the long-term problems of resource exploitation and pollution in the region, but it employs a model of development and political rule that may provide an increasingly influential and attractive template for other countries facing similar challenges.[3] The so-called 'Beijing consensus' of state-dominated, 'pragmatic' development and politics may resonate with the region's besieged political elites as they grapple with the inexorable dilemmas of rapid climate change and environmental degradation.

The claim that East Asia is likely to revert to a pattern of environmentally driven authoritarian rule is developed in the following way: first, I outline the scale of the environmental changes that currently confront the region. Second, I sketch the distinctive historical circumstances in which East Asia generally and China in particular embarked on their rapid economic development and industrialization. The key argument here is that transnational geopolitics and domestic politics intersected to encourage the sort of authoritarian rule that has been such a distinctive feature of the region's political development. Finally, I consider the likely responses to the environmental challenges at both a national and regional level. The sobering conclusion I come to is that the region's environmental problems are already of such a magnitude that democratic regimes will struggle to cope and a return to authoritarianism seems increasingly likely.

East Asia's environmental nightmare

East Asia is hardly unique in confronting environmental problems, if not potential catastrophe. What is different about East Asia is that environmental pressures have been exacerbated as a direct consequence of what has hitherto been the region's greatest claim to fame: rapid economic development and industrialization. As we shall see, this remarkable success story has been associated with, and helped to legitimate, distinctive patterns of authoritarian rule – patterns which seem set to assume renewed importance as a consequence of intensifying environmental pressures. It is worth detailing just how widespread these problems are as they have the potential to derail what many see as an otherwise likely, if not inevitable, transition to democracy in the region and the wider world.[4]

The claim that East Asia might be facing massive environmentally driven dislocation is not as outlandish as it once may have been. On the contrary, one of the most noteworthy developments in both international and domestic politics across the region and the world more generally has been the increased acceptance of some of the central claims of the environmental movement. The principal reason for this shift in the terms of the debate

has been the confirmation by mainstream science of hitherto controversial issues like global warming. The publication of the Stern Report in Britain and the US-sponsored International Panel on Climate Change (IPCC) have arguably done more to transform the debate than anything else. Many of their conclusions are frankly alarming and have attracted widespread attention as a consequence, but they merit repetition because there is a growing consensus about their validity and about the possible security implications that flow from them.[5]

The causes and effects of global warming and climate change are, of course, complex, and this is why it has taken so long to gain acceptance of their underlying dynamics, let alone the possible strategic or political implications that might flow from them. However, there is little doubt that population expansion and resource-intensive patterns of industrialization have significantly contributed to the current situation.[6] The overall population of the Asia-Pacific region is growing by something like 16 million per year and is expected to continue increasing significantly for the next 20–30 years. As Steele observes, given expectations that 'the level of affluence, and therefore consumption, of the rapidly growing middle classes will rise even more quickly, total environmental impact must inevitably increase greatly'.[7] Before detailing the extent of the problems globally and in East Asia in particular, it is worth emphasizing that although environmental degradation is not exclusively a consequence of capitalist economics, the undirected efforts of market forces may be especially ill equipped to deal with such problems. As the Stern Review points out, 'climate change is the greatest market failure the world has ever seen'.[8] As we shall see, this implicit condemnation of neoliberal, Anglo-American style market-oriented capitalism may mean that the attractions of the currently more robust-looking forms of illiberal capitalism may become even more compelling for many developing nations.[9]

The potential scale and impact of global environmental problems have, alas, become all too familiar. The Stern Review suggested that in the absence of a massive and rather unlikely 80 per cent reduction in greenhouse gases, inevitable consequences will follow. The most dramatic possible impacts include 5–12 metre rises in sea levels, declining agriculture yields and more catastrophic 'weather events'. Not only might we expect to see maritime Southeast Asia's major population centres especially badly affected, but these governments generally have only have a modest capacity to deal with such problems, as the recent tsunami in Indonesia reminds us.[10] Even more soberingly, perhaps, Stern has subsequently argued that his original, highly alarming forecast was, in fact, much too optimistic about the time frame in which his predictions might unfold.[11]

Yet despite the overwhelming emerging consensus on the causes and consequences of global warming, CO_2 emissions have continued to rise in the ensuing period and there is little prospect of this changing in the foreseeable

future. On the contrary, American policymakers have steadfastly refused to contemplate enacting any legislation that might be seen to affect domestic growth or employment levels,[12] while emerging economies like India and China have continued to utilize their abundant coal stocks as a key source of cheap energy, despite the well-known implications for global warming.[13]

Climate change and the East Asian region

Unsurprisingly, China's sheer scale means that it is having a greater impact on a range of indicators than any other country on earth. Some of these indicators, it needs to be recognized, are unambiguously good: one reason why China continues to attract such attention is that it has defied expectations about the prospects for widespread development on a monumental scale. One reason why global indicators of global poverty levels have improved significantly over the past couple of decades is largely because of the dramatic rise in living standards that has occurred in China. The big question, of course, is whether China can sustain this legitimacy- and stability-enhancing paradigm, especially when it has been predicated on a fairly ruthless exploitation of the natural environment. The indicators at this stage are increasingly discouraging.

As far as China is concerned two aspects of the rapidly escalating environmental crisis are likely to make the persistence of authoritarianism more likely. At one level, China is becoming locked in a struggle to secure the sort of energy supplies that are essential components of continuing growth. China's gargantuan appetites for resources and energy have been widely noted,[14] as has its concomitant impact on its relations with other states. In the short term, at least, China's growth has had a stimulatory economic impact on its neighbours and the wider world, and helped to transform its diplomatic position as a consequence. For example, no matter how closely the strategic policies and cultural proclivities of countries like Australia may coincide with those of the United States, the simple reality is that China has become so economically important to Australia that its foreign policy must adjust accordingly.[15] In other parts of the world, like sub-Saharan Africa where the ideational influence of the United States is more uncertain anyway, China's relative influence advances at the same time as its economic and environmental footprint expands.[16]

Not only does China's rise have the potential to contribute to a long-term changes in the extant geopolitical order as a consequence of the sheer scale and importance of its economic growth, but also the possible transition from an international order centred on the United States to one in which power is either more diffuse, or which shifts unambiguously to East Asia – a prospect many think is increasingly likely[17] – is fraught with potential dangers. A zero-sum scramble for rapidly diminishing resources would not only have the potential to ratchet up geopolitical tensions to an

alarming degree, but it would also encourage China to place even greater reliance on domestic sources of energy, especially the highly polluting coal reserves which it has in abundance. A new coal-fired power station comes online in China every week, giving a graphic reminder of the scale of the transformation underway in China and that country's contribution to the global environmental crisis.

Although increased attention has been paid to the external impact of China's transformation, the other level at which these changes are being felt is domestically. Here the impact of rapid industrialization, economic transformation and the reliance on coal as a principal source of energy is, if anything, even more dramatic and potentially explosive. As Elizabeth Economy points out, the 'reliance on coal is devastating China's environment. The country is home to 16 of the world's most polluted cities'. The rapid increase in car ownership is set to make things rapidly worse and 'despite Beijing's aggressive reforestation efforts, one quarter of the entire country is now desert'.[18] China's growing shortage of water is an even more pressing and implacable problem. Government studies show that '70 percent of the country's lakes and waterways are polluted ... a vice minister for water resources estimated that 360 million rural residents lacked safe drinking water'.[19] What is of greatest significance here is that, despite the fact that the CCP leadership is paying increased lip service to environmental issues and discourse, they are simultaneously cracking-down on independent activists and strenuously trying to curb growing popular unrest over environmental degradation.[20]

A similar tale can be told in Southeast Asia, where the problems may be of a different magnitude but seem likely to impose an even more devastating long-term toll. In this context, Southeast Asia is suffering from a double blow: not only is it susceptible to the same sorts of population pressures and developmental impacts that are currently afflicting China, but many Southeast Asian economies find themselves in a subordinate economic relationship with their northeast Asian neighbours. The pattern of economic and environmental integration pioneered by Japan, which saw its multinationals ruthlessly exploit the natural resources of Southeast Asia in particular, is being replicated by China as its enormous appetite for resources and energy reshapes the region. Paradoxically, Japan has been one of East Asia's great environmental success stories, cleaning up domestic industry and actually increasing the extent of domestic forests. It has done so, however, at the expense of its neighbours' natural resources, as Japan's 'ecological footprint' has expanded relentlessly across the region.[21] China seems certain to follow suit, as its growing demand for resources like timber contributes to the rapid elimination of the region's once massive forests.[22]

The net impact on Southeast Asia of its own populations and developmental pressures in tandem with external demand has been to exacerbate environmental problems to the point where 'resources have been depleted

and the environment polluted to the extent that so-called renewable resources and environmental services such as a clean air and water are being exhausted in much the same way as non-renewable resources'.[23] Southeast Asia has additional problems that flow from its still rapidly rising populations: there is a potentially destabilizing population bulge which leaves many Southeast Asian countries vulnerable to social dislocation and the problems that potentially flow from unrealizable expectations about rising living standards and employment.[24] This would be problematic enough on its own, but predictions about the impact of climate change in Southeast Asia all point toward major environmental and *political* consequences.

Many Southeast Asian governments are especially vulnerable in this regard because of their limited state capacity on the one hand,[25] and because of the way in which environmental problems exacerbate and complicate growing 'non-traditional' security problems on the other hand. Southeast Asia has long been affected by secessionist movements, piracy, people smugglers and other 'grey area' phenomena. Climate change is likely to exacerbate these problems and intensify old ones like a propensity to diseases such as dengue fever as temperatures rise and diseases spread. The region's limited ability to respond to the so-called SARS crisis is indicative of just how challenging new threats could be.[26] Jasparro and Taylor have detailed the manner in which climate change is placing additional pressure on already fragile state structures in places like Indonesia and the Philippines in particular, which are already plagued with significant domestic instability, susceptibility to natural disasters, and a profoundly challenging developmental agenda. The net effect of this is, they suggest, that 'predicted climate change impacts are likely to strengthen or help revive the propensity of sub-state networks that have traditionally responded to environmental change and pressure via violence, crime, smuggling, banditry, trafficking, terrorism and other such activities'.[27]

The logic of environmental exploitation

It might be supposed that when the impacts of climate change and environmental degradation are becoming increasingly apparent, governments would be doing everything in their power to ensure that they are mitigated. However, not only are the governments of Southeast Asia especially handicapped in this regard because of their limited state capacities, but the dynamics of developmentalism and growth make it difficult to overcome powerful vested interests or, as some would argue, the very logic of capitalist accumulation.[28] Whether 'socialism' is actually any better in this regard is a moot point given the historical record of countries like China and the Soviet Union, but there is little doubt that the overall development project and the desire for economic expansion is at the centre of many of Southeast Asia's current environmental problems.

Unfortunately for much of Southeast Asia, the manner of its incorporation into the global and regional political economies has not been optimal, to say the least. The impact of imperial rule on colonial states has been extensively documented,[29] but in Southeast Asia's case it has had striking environmental impacts, too. The actual physical appearance of large parts of the region has been profoundly changed as a consequence of the region's importance as a source of key commodities like rubber.[30] More recently, the voracious demand for Southeast Asian timber has seen a dramatic decline in the amount of native forest cover across the region. The pattern of economic subordination established during the colonial period, which saw economic and social development in the region 'distorted' to meet the needs of the 'core' economies of Western Europe, has been replicated more recently on a regional basis as a consequence of East Asia's rapid industrialization. First Japan and more recently China have encouraged the fairly ruthless exploitation of the region's rapidly diminishing old growth forests.[31]

Again, it might be supposed that given the dramatically obvious negative consequences that flow from forest clearing for timber and palm oil plantations, there would be serious efforts made to halt such practices before it is too late. After all, forest clearing has led to chronic problems with flash flooding and erosion in places like the Philippines and the politically embarrassing, potentially deadly, 'haze' problem in Indonesia. And yet there is little chance of serious remedial action being taken. The forces ranged against conservationist forces are powerful and not easily overcome. It is not hard to see why: in Indonesia, for example, rampant forest clearing is often illegal, and driven by corrupt networks of power and interest, frequently involving public officials and even the military.[32] Indonesia's limited state capacity means that the government has relatively little ability to control such activities even if the political will to do so was unambiguously evident.

Consequently, it is expected that Indonesia's original forest resources will be exhausted by the 2020s. A similar tale can be told in the Philippines where the extent of destruction is already almost complete, and only 7 per cent of primary forests remain.[33] The point to emphasize is that similar political and economic dynamics are at work in the Philippines and contribute to an inability to address pressing environmental problems. Despite the existence of a vibrant civil society, the reality is that the state has a very limited capacity to impose its authority and – in the Philippines case in particular – has been little more than a vehicle for personal enrichment for the country's economic elites.[34] Indeed, the sobering reality as far as the Philippines is concerned is that the military remains a major threat to civilian authorities who appear to be unable to guarantee social stability, much less continuing economic development.[35]

In short, what the Philippines experience suggests is that there is no inevitable or necessary relationship between political liberalization, economic development or state capacity. On the contrary, the major lesson that seems

to emerge from the region's historical experience is that 'strong', even authoritarian, states are likely to be positively associated with development and stability. It is this possibility that underpins the much of the region's proclivity for authoritarianism. Given the importance and distinctiveness of this political and economic nexus, it is worth spelling out just how it has worked, why it remains attractive, and why it may become more prominent as a consequence of intensifying environmental problems.

East Asia's authoritarian heritage

One of the most distinctive features of the East Asian developmental experience has been the prominence of authoritarian rule. This section identifies the principal factors that contributed to this tradition. It will be suggested in what follows that the imperatives presented by a deteriorating natural environment are likely to encourage a return to authoritarian practices, or make the transition to democratic rule more problematic. One reason for thinking that East Asia's past may help us to understand the reaction of regional states to environmental degradation is because 'path dependency' is likely to limit and shape future outcomes.[36] Put differently, future crises will be mediated by extant patterns of formal and informal institutions, delimiting possible options, and imparting a degree of directionality to political, economic and social developments as a consequence.

For much of the post-war period, academic interest in East Asia focused single-mindedly on its remarkable economic development and the institutions which appeared to have underpinned it. Two factors were especially important in helping to define both the style and the extent of the economic development that occurred in East Asia in the period following the Second World War. First, much of East Asia followed a pattern of state-led economic development that had been pioneered by Japan, which saw powerful state bureaucracies guiding the course of economic expansion in close collaboration with domestic industry. Even in countries that lacked the sort of 'state capacity' that distinguished Japan, where the competence of public officials was not as assured, and where links with local businesses may have been more corrupt and self-serving, the basic orientation toward development was very different from that of the West. In short, the 'developmental state' became the template for rapid development across much of the region, even if it was generally realized much less successfully than it had been in Japan itself.[37]

One of the most distinctive aspects of the developmental state was not just the prominence of the state as a legitimate part of economic expansion, but the generally circumscribed nature of political participation that accompanied it. In the aftermath of the Second World War the entire region was either attempting to resurrect economies that had been devastated by war, or trying to throw off the shackles of colonial rule and build independent

nation states where none had existed before. Or both. Either way, it is hardly surprising that economic development and social stability might be privileged over political emancipation. In a pattern that endures until this day, much of the region's population appeared to be willing to make a conscious or unconscious trade-off between political emancipation and economic development.[38]

The second key feature of this period was the role played by the United States in particular and the over-arching geopolitical situation more generally. Because the United States prioritized its unfolding Cold War struggle with the Soviet Union above all else, it was prepared to turn a blind eye to political practices which it did not like, but which it was prepared to tolerate if it helped to curb communist expansion in the region. Again, Japan provides the template for such practices: Japanese neo-mercantilism and 'soft' authoritarianism was the price to be paid for ensuring that Japan was the successful, capitalist, strategic lynchpin of the Cold War geopolitical architecture in East Asia.[39]

While the overall geopolitical situation in the region has plainly changed following the Cold War's end, it is important to recognize its enduring legacy. The distinctive 'hub and spokes' architecture of bilateral alliances established by the Americans in the region remains largely intact, and its underpinning logic has been reinforced recently by the 'war on terror'.[40] As a consequence, the sort of reformist pressure that we might have expected to see coming from the United States as part of its self-appointed 'mission' to spread democracy and political reform has been significantly diminished.[41] Indeed, the United State's relations with some of its most difficult regional partners like Malaysia have significantly improved as a result of the new geopolitical imperatives that emerged in the aftermath of September 11.[42] In other words, precisely the same sort of political and strategic imperatives that underpinned the emergence of authoritarianism during the Cold War period are beginning to re-emerge now. Equally importantly, perhaps, the thawing of the Cold War did not lead to an outbreak of political liberalism and reform. On the contrary, in the case of what is now the region's most important strategic and economic actor, even without the additional pressure of environmental degradation, the prospects for democratic transition in China already looked remote.

The rise of China and its implications

There is a general point to make about the Cold War period as far as countries like China were concerned: for those countries that found themselves on the wrong side of the ideological divide during the Cold War, developmental prospects were fairly bleak. Unable to take advantage of either direct American aid or the more general benefits that flowed from the US-led globalization project, countries like China saw their development fall behind

the key American allies like South Korea and, most gallingly of all, Taiwan. The declining importance of strategic factors and China's subsequent embrace of the market help to explain China's dramatic recent economic development. They also explain, of course, the devastating impact that China's rapid economic development has had on the natural environment. Given China's importance as a source of environmental problems and as a potential role model for other would-be developing nations, it is worth spelling out just how it has managed to transform itself.

The first point to emphasize about China's economic development is that it has not led to the sort of political transformation that much political theory might lead us to expect.[43] In some ways, perhaps, the persistence of non-democratic forms of political rule should not surprise us. After all, China's economic transformation has occurred as a consequence of initiatives undertaken by the Communist Party of China (CCP); political power in China remains centred on this thoroughly undemocratic institution.[44] Deng Xiaoping's decision to 'open' China's economy to the West and integrate into the global economy was a pragmatic calculation that may have recognized the limits of socialist economics, but which had no desire to embrace political liberalism. On the contrary, one of the most striking features of the Chinese model of economic development is that it continues to occur under 'communist' auspices despite the fact that the Party now presides over an economy that is increasingly capitalist in all but name.

What is especially noteworthy about the emergence of China's capitalist class is that they are often either direct products of the former regime, or actively co-opted by the ruling elite into extant political structures. Not only is China's business class increasingly accepted into the Communist Party itself, but it has also established mutually rewarding, symbiotic relationships with political actors that have ensured the continuation, rather than the transformation, of the existing system.[45] In such circumstances, the dynamics of political activity continue to revolve around economic development, rather than the pursuit of political pluralism or the growth of civil society.[46] It is, of course, precisely in such emergent institutions that we might expect to see social movements that support environmental reform. This is not to say that there is no concern with environmental problems in China; plainly there is. But the mechanisms through which such concerns may be expressed are generally underdeveloped, making spontaneous, poorly organized protests one of the few outlets for discontent.[47]

The second point to make, therefore, is that welcome as China's rise may be in many ways, it has not been associated with political transformation and has frequently come at the expense of the natural environment. Much the same can be said about other parts of the region, albeit on a smaller scale. China is significant in this context as well, though, because it is serving as a developmental role model for other parts of the region and beginning to exert a more direct influence over the region's economic and

political practices as a consequence. China's experience is at odds with Western scholarship and history, and there is often a failure to appreciate that civil society is relatively underdeveloped in much of East Asia, and so are institutions of governance outside the state.[48] The reality is that the impact of developmental or authoritarian states remains strongly felt in East Asia, and there has been comparatively little political development outside state auspices. These assumptions are important to highlight because they may obscure the trajectory of possible political development in the region and lead to implausible assumptions about East Asia's capacity to manage the challenges that flow from a rapidly deteriorating natural environment.

Institutional failure and the limits of reform

There are a number of reasons for scepticism about the possible emergence of transnational discourses of emancipation or reform in East Asia. First, the region has generally remained remarkably impervious to reformist agendas that outside agencies and actors have attempted to encourage – as the limited up-take of the 'Washington consensus' reminds us.[49] While there may have been compelling geopolitical and domestic reasons for the limited embrace of neoliberal reform, it is a telling reminder of just how different the trajectory of political development has been in the region. More pertinently of late, however, has been the dramatic emergence of China and the promotion of a new, state-oriented, 'pragmatic' developmental paradigm subsumed under the rubric of the 'Beijing consensus'.[50] Whatever we may think of the merits of the Chinese model as a recipe for political and economic development, the significant point to emphasize here is that China's growing influence is likely to entrench forms of politics that are illiberal, and patterns of economic development that privilege growth over sustainability.

The possible influence and attractions of an illiberal developmental discourse are even more evident when we consider the record of East Asia's emerging institutional architecture. There is a good deal of optimism about the potential of transnational institutions and 'global civil society' to act as forces of progressive reform and emancipation. However, not only is civil society underdeveloped at the national, let alone the transnational, level in East Asia, but inter-governmental institutions have often proved either ineffective or have actually been designed to insulate non-democratic regimes.[51] The most telling example of the limited impact of an indigenous transnational institution is the Association of Southeast Asian Nations (ASEAN). ASEAN is distinguished primarily by a very limited record of achievement, other than the development of the so-called 'Asean way' of consensus, consultation and voluntarism. In reality, critics argue, ASEAN is about issue avoidance, not resolution, and has been consciously designed to

reflect the lowest common denominator, with the intention of doing nothing to infringe on the sovereignty of member states.[52]

The net outcome has been to render ASEAN almost entirely ineffective when it comes to either influencing the environmental or political policies of its members. ASEAN has proved completely incapable of addressing the 'haze' problem mentioned earlier, despite the attention given to the environment in much of its rhetoric.[53] Likewise, despite the notorious human rights abuses that have occurred at the hands of the thuggish regime in Burma, ASEAN has been unable to influence the regimes behaviour or 'socialize' it into good behaviour in the way that the organization and its supporters had once hoped. Indeed, the importance of Burma's natural resources, which its more powerful neighbours India and China are competing to exploit, helps to explain its apparent indifference to external criticism.[54]

Indeed ASEAN's failure to provide effective leadership with which to address some of the key drivers of environmental degradation in Southeast Asia, such as illegal logging, is emblematic of a more general inability to address the roots of the environmental-economic-political nexus at the heart of the region's problems. As Schloenhardt observes,

> ASEAN's cooperation on environmental issues has produced a large number of documents but no framework of useful law or enforceable policies about trafficking in timber and timber products. For fear of interference with domestic issues of national sovereignty, ASEAN, whose members are home to the majority of tropical forests in the region, has been unable to come up with comprehensive plans and mechanisms to prevent and suppress illegal logging and the illicit trade in timber in the region.[55]

There is little reason to think that any of the other emerging regional organizations will be any more effective. On the contrary, the so-called 'ASEAN Plus Three' grouping – which includes China, South Korea and Japan, in addition to the original ASEAN states – not only has little effective institutional capacity thus far, but is also largely driven by China and likely to reflect that country's normative preferences and the pragmatism of the Beijing consensus, rather than the liberal-pluralism of the Anglo-American countries.[56]

The coming of environmental authoritarianism?

It is hard to exaggerate the scale of the environmental crisis the world currently faces. The only scrap of comfort to be derived from this situation is that debate about the causes of the crisis is effectively over; all that remains is to decide the scale of its impact and the potential for mitigation.[57] The prospects in this regard are not good and East Asia is likely to be a major

contributor to, and victim of, the unfolding crisis. The region's institutional architecture is weak and its record of effective cooperation is unimpressive. In such circumstances the pessimists appear to have the most compelling arguments.

Given this unprecedented, unrelentingly bleak scenario, it is, of course, impossible to know quite how individuals, let alone states or entire societies, might behave. We can, however, consider the historical record and attempt to extrapolate. East Asia has deeply embedded and institutionalized patterns of authoritarian rule which have been closely associated with both its economic rise and some of its most traumatic political and strategic convulsions. This is, after all, a region that has been shaped by powerful historical and geopolitical forces, something that helps to account for the prevalence of authoritarian rule in the region. What is especially noteworthy now is that some observers think that the scale of the global environmental crisis and the intensity of its impacts may mean that authoritarian responses to impending crises are not only likely to be more attractive to political elites where such practices have been common, but they may be the only means of dealing with some issues.[58]

Politicians – especially democratically elected ones – are understandably reluctant to impose the sorts of reforms and regulations that many feel are vital if we are to have any chance of collectively warding off the worst effects of climate change. This helps to explain why politicians in the West continue to place such faith in market mechanisms and carbon-trading schemes – despite their apparent failure in much of Europe.[59] Indeed, one of the most deflating aspects of the current inter-linked environmental and economic crisis is that even those countries with significant state capacity appear unable to address the scale of the problems that currently face policymakers everywhere. How much less likely, then, that the governments of East Asia, which face even greater challenges, are going to be able to cope successfully. Whether it is driven by an effort to compel environmentally sustainable behaviour in the face of business and consumer opposition, or simply as a desperate effort to maintain social stability in the face of the coming ecological devastation, the coming of environmental authoritarianism may be upon us.

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27

Environmental Challenges, Conflict Prevention and Human Security

Antonio Marquina

Introduction

Conflict prevention needs to be fitted in to a pragmatic and cooperative vision of international relations. The perceptions and decisions of politicians are influenced by their concepts, preferences and intellectual viewpoints. The point of view that has Hugo Grocio as a point of reference will emphasize pragmatism and cooperation, as opposed to the idealistic and normative vision proper to the concepts of those who follow Immanuel Kant, or the narrow, realistic and militaristic vision of Thomas Hobbes's followers.

After the Cold War, conflict prevention became top priority on the world, and particularly European, security agendas. In contrast to the Cold War security vision, centred on military alliances, preparations to tackle a possible military attack and the management of potential crises, now it's a question of how to avoid armed conflict. It's not about trying to eliminate conflicts, that would be a chimera, but about creating a culture and an art of dealing with conflicts that allows one to tackle a potential conflict early enough to avoid it happening, moderating the parties' interests, or if it has already started, to avoid it spreading and, finally, if it has finished, to avoid its recurrence.

The objective of conflict prevention is not conflict resolution but to contribute to that resolution. It's a question of gaining time with prevention, creating a better atmosphere and conditions so that conflicts don't arise or so that solutions can be developed between the parties.

Conflict prevention is an art and a technique. Conflict prevention cannot exist unless there is sufficiently early warning that focuses on possible alternatives for action and the scale of the potential problem.

Conflict prevention and environment

With respect to the environment, the principle question is that the knowledge that we have about global warming and climate change is insufficient,

which noticeably complicates the whole prevention process and demands also, in consequence, greater cooperation between the various actors involved in prevention and an exchange of experiences about impacts of global warming on distinct zones and regions.

In spite of the existence of a certain scepticism about climate change and its principle causes, nowadays in the scientific community there is a noticeable consensus about the impact of human activity on the increase of greenhouse gases in the atmosphere, and about the causes that produce climate change (Chapter 1) and, in consequence, about trying to tackle those causes early and to prevent undesirable results if it is feasible and possible.

Another question is to evaluate the importance that each of the effects of climate change will have on people's lives and on international relations.

It will be deduced from the chapters of this book that the effects of a rise in temperatures and of climate change are not progressive and linear in many cases, some phenomena, such as typhoons, cyclones, heavy rains, flooding and tropical storms, will happen suddenly, other effects will happen progressively, such as sea-level rise. Besides, it must be pointed out that not every part of planet Earth will be affected negatively by all of these effects. Some regions will be positively affected and others negatively. In the case of Europe, countries in southern Europe, especially the Mediterranean states, will be very negatively affected by temperature rises and lower rainfall, while central and northern European states could see an improvement in their lifestyle and well-being. In the case of Asia, all of the regional zones will suffer impacts that are mainly negative. Even for the Southeast Asian states, which are those that apparently enjoy higher rainfall, climate change will have significant consequences.

Another aspect to point out is the lack of reliable data in many areas. Apart from this, regional studies are usually quite general and the data recovered doesn't differentiate between impacts on different ecosystems in the same zone or doesn't include the distribution of rainfall in space and time. This is important because, for example, the predictions tend to be macro and not micro (see for instance Chapters 11 and 12, which deal respectively with environmentally induced migration in the Mediterranean and in Southeast Asia).

There are also questions about which there is a lot of uncertainty (Chapter 1) and a notable diversity of opinion among scientists, such as, for example, the magnitude of sea-level rise, or where and when tropical storms, cyclones, typhoons and heavy rains will occur, and what impact they will have.

Finally, we must point out that the Mediterranean doesn't exist as a research zone in the majority of major studies. It stands between research about Europe and about Africa, even though it is an entity with its own identity. In Asia we find that a large part of the research has centred on the south of Asia, China and the northeast of Asia, there are relatively few relevant studies on Southeast Asia.[1]

Security implications of climate change

The security implications of climate change are relevant. Although it is not possible to establish close causal relations between environmental change and conflicts, we can stress that the negative impact of climate change is important in many states, especially in many developing states. The German Advisory Council on Climate Change identified four 'conflict constellations' in which critical developments can be anticipated as a result of climate change:

1. Climate-induced degradation of freshwater resources
2. Climate-induced decline in food production
3. Climate-induced increase in storms and flood disasters
4. Environmentally induced migration.[2]

This book deals with these four factors in the first part, developing them according to the specific objective of the book, the visions from Asia and Europe.

Climate change predictions for half of the twenty-first century are serious in terms of water availability and food production in southern Europe and north Africa, as they are also for India and China, not so much for Southeast and northeast Asia. However, water resources in Indonesia, Vietnam and Thailand are projected to be most vulnerable to climate change, affecting more than 12 million of people by 2050.[3] Increasing pollution of water has also to be added. Food production in this region is likely to decline, according to the recent report of the Asian Development Bank, but the IPCC projects an increase of 20 per cent in Southeast Asia by the middle of this century.[4]

If one joins strong population growth on the periphery of southern Europe and a large part of Asia with the ageing population in Europe and in countries such as South Korea and Japan, the possibilities for socio-political destabilization in different regions at the interface of environmental and socio-political conditions are high.

Increasing scarcity in an environment of increasing demand is a recipe for disaster. This will lead to competition over resources in different zones and regions in the world, to increasing poverty and lack of employment opportunities if crucial and decisive adaptation and mitigation policies are not implemented. Food insecurity will increase depending on the resources the country can mobilize to buy food in foreign countries, the state's fragility, good governance, equity, poverty and social cohesion. Most of these social, economic and political qualifications are problematic in southern Mediterranean countries and in the majority of developing countries in Asia.

However if, as a result, incompatible positions are likely, environmental factors are not seen as factors that tend to directly increase the likelihood

of conflict. They are considered as trigger events or threat multipliers which exacerbate existing trends, tensions and instability, and can intensify the existing social, economic and political problems. Many other factors have an impact on the probability of conflict, for instance, economic development and poverty, reliance on natural resources, ethnic and religious divisions, good governance and good management, regional diplomacy, or previous conflict cycles between the people. Unfortunately, these kinds of divisions and factors are abundant in developing countries in the southern Mediterranean and in Asia. In north Africa the continuous rivalry between Morocco and Algeria and the erratic policies of Libya prevent the needed close collaboration for facing daunting regional problems.

The impact of natural disasters and sea-level rise has to be added to this. Frequent typhoons, floods and storms will affect Asia very negatively. In Europe natural disasters are increasing but impacts are less pronounced. In the southern Mediterranean the impacts of natural disasters such as drought, flooding, heavy rains and sea-level rise will substantially increase during this century, affecting arable land and crops, urban populations and millions of people.

Thus, water availability in quantity and quality, food security, arable land, forests and fisheries will be significantly affected by global warming and climate change in parts of Asia, in particular south Asia and China, and in southern Europe and the Mediterranean.

These three 'conflict constellations' will configure the last one, environmentally induced migration. Migration is projected to potentially increase, destabilizing the political regimes of different developing countries and leading probably to more authoritarian regimes (Chapter 26). In the case of the southern Mediterranean, the rise of Islamic fundamentalism is likely, given the strong influence of these movements and parties in the region and the increasing lack of attraction of current authoritarian political regimes, which are widely discredited.

Even in developed countries receiving migration flows, the capability to absorb and integrate increasing migration flows is also problematic. For instance, Spain is seriously asking itself how it can manage to integrate the flows once the emigrants, after a rapid growth in the last decade, reached 10 per cent of the population. The case of Italy is another good example. These two countries are the principal receivers of irregular emigrants coming from Africa.

Developing countries that receive mass migration flows from neighbouring countries will also be seriously affected if these flows are from different cultural extractions and if integration capabilities are lacking. That is the present situation in north African countries receiving increasing sub-Saharan migration flows. However, differentiating among the socioeconomic flows and environmentally induced migration flows is not easily done, especially in countries and regions with a tradition of migration. Convincing data on

environmentally induced migration in the Mediterranean and in Southeast Asia is not available.

The questions are: will climate change induce an era of unstable peace? How can the countries in Europe and Asia manage this new situation?

Global warming and climate change in the EU and the ASEAN regional forum. Approaches to conflict prevention

If a few years ago there was less importance attributed to environmental questions, important recent studies have contributed to the fact that more attention will be paid to environmental factors in the near future. As it is said, the European Union is committed to the development of conflict prevention with a systematic effort to address the root causes of potential conflict and violence.[5]

On environmental issues, the European Union launched the Cardiff process in June 1998, requiring different Council formations to integrate environmental considerations into their respective activities, putting article 6 of the Amsterdam Treaty into practice. This article states that 'environmental protection requirements must be integrated into the definition and implementation of the Community policies ... in particular with a view to promoting sustainable development'.

More recently, the paper 'Climate Change and International Security' from the High Representative and the European Commission to the European Council draws attention to the impact of climate change on international security, explaining from the beginning that 'a temperature increase will pose serious security risks that would increase if warming continues. Unmitigated climate change beyond 2°C will lead to unprecedented security scenarios as it is likely to trigger a number of tipping points that would lead to further accelerated, irreversible and largely unpredictable climate changes. Investment in mitigation to avoid such scenarios, as well as ways to adapt to the unavoidable should go hand in hand with addressing the international security threats created by climate change; both should be viewed as part of preventive security policy'.[6]

In Asia, the ASEAN Regional Forum (ARF), as the principal forum for security dialogue in Asia, has focused on confidence building and preventive diplomacy. Non-traditional security issues have increased in importance, but global warming and climate change has not been considered as a major security issue yet.

Since 2006, an additional ARF activity has been the development of regional capacities to respond to disasters. A 'Shepherds' Group' was created to take forward work on disaster relief capabilities. In May 2008, Australia and Indonesia co-hosted a disaster relief desktop exercise in Indonesia. And in May 2009 the United States and the Philippines will co-host a field exercise on relief in the Philippines.[7]

Early warning systems in the European Union and Asia

The European Union has been developing important early warning systems in recent years[8] given their critical importance for conflict prevention. Early warning is a precondition for conflict prevention.

On disaster prevention there is an exchange of information and experiences on issues of wide common concern among European countries, non-European countries and international organizations using the Global Disaster Alert System (GDAS) and United Nations Disaster Assessment and Coordination (UNDAC) system. The Commission's Joint Research Centre (JRC) supports the GMES (Global Monitoring for Environment and Security), GMES will produce Earth observation data collected from space and ground-based infrastructure. On drought, the European Commission (JRC) is developing the prototype of the European Drought Observatory (EDO) for drought forecasting, detection and monitoring in Europe.

In 2005, the Commission encouraged regional and subregional organizations to play a part in the implementation of early warning and alert systems by adopting a multi-hazard approach.[9] More recently, the Commission communication on EU disasters, caused by natural[10] and technological hazards, explained that an EU disaster-prevention strategy is needed because disasters have increased both in frequency and intensity, disasters hit developing countries hardest and also divert substantial national resources from development to relief, recovery and reconstruction, depriving the poor of the resources needed. The communication on EU disasters was accompanied by an annex explaining how EU current and planned action can help developing countries deal with disasters, improving their early warning systems and disaster preparations.[11]

On floods, the European Flood Alert System (EFAS) was launched in 2003 by the European Commission. On forest fires, the European Commission (JRC) has developed the European Forest Fire Information System (EFFIS), officially established in 2003. On wind storms, Meteoalarms was created. More than 20 European States coordinated by EUMETNET, the network of European Meteorological Services, created in 2007 the web 'www.meteoalarm.eu', that informs on extreme weather events in all of Europe. On earthquakes, the European-Mediterranean Seismological Centre (EMSC) was created in 1975.

At a more global level, linking climate change with security, in the paper from the High Representative and the European Commission to the European Council, entitled 'Climate Change and International Security', it is clearly stated that the EU is in a unique position to respond to the impacts of climate change on international security, given its leading role in development, global climate policy and the wide array of tools and instruments at its disposal.

As it is said, a critical precondition for conflict prevention is early warning. The EU in the above-mentioned paper has clearly stated the importance

of monitoring and early warning including in particular 'situations of state fragility and political radicalization, tensions over resources and energy supplies, environmental and socio-economic stresses, threats to critical infrastructures and economic assets, border disputes, impact on human rights and potential migratory movements'.[12] The current EU early warning instruments will thus focus more on climate change and environmental degradation.

And on possible actions to be developed, other critical factors in early warning and conflict prevention are included in the paper: an enhanced 'international cooperation on the detection and monitoring of the security threats related to climate change, and on prevention, preparedness, mitigation and response capacities'; promoting 'the development of regional security scenarios for different levels of climate change and their implications for international security'; reinforcing EU cooperation and political dialogue instruments, giving more attention to the impact of climate change on security, integrating adaptation and resilience to climate change into EU regional strategies and sharing analyses with third countries, and examining the security implications of climate change.

In the follow-up recommendations the secretary of the Council emphasized early action to address the security implications of climate change, explaining that 'current EU early warning instruments must focus more on climate change and environmental degradation, alongside other relevant variables such as governance, demographic pressures or regional conflicts'. The recommendations include the enumeration of data to assist in identifying potential dangers and areas at particular risk:

- food production
- extreme weather events, such as cyclones, storm surges, flooding and other extremes
- drought, rainfall, desertification
- retreat of glaciers, sea ice
- water supply
- migration related to environmental factors
- global factors, such as commodity prices.

To obtain information the following means were mentioned: the EU Satellite Centre at Torrejon, national and European meteorological agencies, Member States' national administrations and embassies, Commission delegations, EU Network of Energy Correspondents, and the Joint Research Centre (JRC), as well as third countries and international organizations.

In this context of early warning, it is underlined that new analytical methods and tools have to be developed and reinforced co-ordination with the EU crisis management structures has to be established for ensuring adequate strategic planning and capability development.[13]

But one question to be resolved is that all the EU countries have a national strategy for risk assessment and early warning. Hazards are different for every EU Member State and responsibility lies at different levels. In Asia, early warning systems are in a process of consolidation. Japan and South Korea have invested, both financially and technologically, in climate change research and climate observation systems.

China has also realized the importance of climate change on development and the economy and has invested in modern observation systems.

In India satellite weather warnings give villagers a chance to react and respond before the disaster strikes. World space radio technology connects early warning centres together, able to submit messages as well as send computer files.

The present focus of attention is in upgrading the early warning systems for disaster prevention. The region, with the support of the international community, invested in tsunami early warning systems, and Japan is helping to upgrade the meteorological alert systems in the Philippines to prevent damage caused by tropical storms and typhoons. In Vietnam, the Central Committee for Flood and Storm Control gathers data, monitors possible flood and storm events, issues official warnings and coordinates disaster response and mitigation measures (Chapter 9). In Southeast Asia, the importance of monitoring climate change has been recognized.[14] But efforts made so far are still inadequate to enable proper, long-term planning policies. Nevertheless, the launching of the ASEAN Regional Programme on Disaster Management (ARPDM) in Bali, Indonesia in May of 2004 implied the development of a joint framework for establishing a Disaster Information and Communication Sharing Network, or DISCNet.

Japan, as a disaster-prone country, has put a sophisticated Disaster Management Operation Plan in place (Chapter 6). In India a National Disaster Management Authority was constituted in 2006 (Chapter 8), and in South Asia the SAARC Meteorological Research Centre (SMRC) was established as a regional organization that concentrates primarily on the research aspects of weather forecasting and monitoring.

In China, apparently, there is a poor awareness of disaster and a lack of sense of preparation and risk avoidance (Chapter 7). But Chinese authorities have build up a three-dimensional natural disaster monitoring system, including land monitoring, ocean and ocean bed observation, and space-air-ground observation. According to the recently published white paper on 'China's Actions for Disaster Prevention and Reduction', a disaster monitoring, early warning and forecasting system has taken initial shape.[15]

In conclusion, in Europe we can find early warning systems for disaster preparation and early warning systems for conflict prevention. In Asia, only early warning systems for disaster preparation are available. Thus, the linkage between climate change, conflict and security is not yet established in Asia, even taking into account the role of the Armed Forces in Asia in

disaster management and mitigation.[16] In Europe, dealing with natural disasters and civil emergency planning is one of the new roles of the Armed Forces (Chapter 10).

Other points to be underlined are the following:

- early warning systems for dealing with climate change must be people-centred in addition to being technically sound.
- rapid dissemination, cooperation with third countries and sharing data are fundamental in early warning. That is an incentive for closer cooperation in Asia.
- duplication has to be avoided, but it is necessary not to lose sight of the multiplicity of hazards. A multi-hazards early warning is in theory desirable, avoiding fragmentation, but the technical means for a tsunami early warning system or for a drought are very different.
- it is useful to integrate all the means, both civilian and military. In this respect, the European Union has made some important steps.

Mitigation and adaptation policies

For early action, the emphasis is on adaptation and mitigation strategies at the European level. Nevertheless, the EU traditionally focused on measures to reduce greenhouse gas emissions and tried to convince other states to reach a deal to address global warming.

Mitigation

On mitigation the EU has adopted ambitious commitments. The objective is to achieve a world with a global climate no warmer than 2°C above pre-industrial levels. Beyond this, impact and adaptation costs may be substantial and very difficult, almost impossible to manage.

During the German presidency, in the spring 2007 Council meeting, the European Council agreed to a very ambitious and comprehensive plan for climate protection and energy policy. The binding agreements established a target of cutting the collective greenhouse gas emissions by 20 per cent from the 1990 level by 2020, and to 30 per cent if there is an international agreement committing other developed countries to comparable emissions reductions and policies. A 20 per cent increase in energy efficiency and a 20 per cent share of renewables in energy consumption by 2020 (Chapter 13 and Chapter 15) were also established.

These targets will require the EU to cut emissions by a further 12 per cent between 2010 and 2020, within only eight years. The problem is that the EU, at the beginning of 2007, had only managed to achieve 1.2 per cent of the 8 per cent reductions agreed under the Kyoto Protocol.

In Asia, Japan announced a new proposal on climate change issues in May 2007, called 'Cool Earth 50'. The proposal contains the long-term target

of 'halving greenhouse gas emissions by 2050' as a common global goal (Chapter 19), but Japan has not set any targets for 2020 and its emissions, business as usual, will increase in 2020 by 6 per cent from the 1990 levels.[17] Prime Minister Taro Aso has stated that a cut of 25 per cent from 1990 levels by 2020 would be hard to accept during a period of economic recession.[18] China is reluctant to admit emissions quotas (Chapter 17) and has recently stated the principle of common but differentiated responsibilities. In terms of mitigation it implies that developed countries as a whole shall reduce their greenhouse gas emissions by at least 40 per cent below their 1990 level by 2020.[19] India will not commit to reducing its greenhouse gas emission targets unless developed nations agree to pay for it (Chapter 21). South Korea has formulated and implemented action plans since 1999 encompassing three areas: reduction of greenhouse gas, adaptation to climate change and international cooperation. A consensus on green growth has been reached in the governmental and civil sectors but there is a discrepancy between the goals of green growth and its implementation plan (Chapter 20). ASEAN countries are a little behind, in 2000 they contributed to 12 per cent of global greenhouse gas emissions. The main sources of greenhouse gas carbon emissions in ASEAN are largely from the burning of peatland and forest fires (Chapter 22), deforestation alone accounts for more than three quarters of Indonesia's greenhouse emissions. With about 200 million ha of forests (about 5 per cent of the world total) Southeast Asia has great mitigation potential for CO_2 emissions reduction through forest management. But, there still is not a common approach for reduction of greenhouse gas emissions, although more emphasis is given to reducing carbon emissions.

The Asian Development Bank is also implementing a programme on mitigation dealing with four fundamental elements:

1. advancing energy efficiency and use of low-carbon energy sources
2. enabling sustainable transport policies and applying efficient systems
3. promoting improved urban sanitation and reduction of fugitive methane emissions
4. promoting sustainable land use and forestry.[20]

Adaptation

Adaptation is a fundamental part of early action on climate change, though it can involve reactive policies. Preventive action implies anticipating potential impacts and thus reducing risks and costs.

In the case of the EU, extreme weather events attracted EU attention first in order to define policies and strategies for adaptation to climate change. In June 2007, a Green Paper was published by the Commission and in April 2009 a White Paper entitled 'Adapting to Climate Change: Towards a European framework for Action' was published by the Commission. The White Paper summarizes the likely impacts of global warming, explaining

that the planet will take time to recover from the greenhouse gases deposited in the atmosphere and the impacts of climate change will be with us at least during the next 50 years. Given this prognosis, the EU considers as imperative the implementation of policies to adapt to a new environment.

The framework set up by the Commission is designed to evolve as further evidence becomes available, it will complement the policies approved by Member States and support the international efforts to adapt to climate change, in particular in developing states.

Adaptation, it is recognized, cannot be left to individuals or business.

The proposed framework adopts a phased approach.

Phase 1

1. Building solid knowledge on the impacts and consequences of climate change for the EU.
2. Integrating adaptation in EU key policy areas, increasing the resilience of health and social policies, of agriculture and forests, of biodiversity, ecosystems and water, of coastal and marine areas, and of production systems and physical infrastructure.
3. Employing a combination of policy instruments, in particular financing, to ensure adaptation is achieved effectively.
4. Stepping up international cooperation on adaptation and supporting adaptation in developing countries.

To be successful, it is stated, the EU, national, regional and local authorities must cooperate closely. A review of the progress in implementation of this Phase 1 will take place in order to prepare the ground for a more comprehensive strategy in 2013.[21]

Regarding Asia, financial, technological and institutional barriers usually hamper the implementation of adaptation measures to mitigate climate change in many Asian countries, particularly in developing countries. In these countries, adaptation has to be integrated in a comprehensive approach in the context of development policies, such as poverty reduction, agricultural development, water resources development and disaster prevention. A realistic approximation to adaptation is still a task for numerous Asian countries.

Only four Asian countries, Bangladesh, Bhutan, Laos and Cambodia, have submitted their National Adaptation Programmes of Action (NAPAs) to the UNFCCC. Other developing countries in Asia are finalizing their NAPAs. The levels of assessment of impacts, vulnerabilities and adaptation to climate change and reporting vary widely by region and country, due to differences in approaches, institutional capacity and economic strengths (Chapters 22–25).

In Japan adaptation measures are focused mainly on coastal areas, social infrastructure, and agricultural production. The Japan International Cooperation Agency promotes adaptation measures to mitigate climate change in developing countries where serious impacts are expected.[22]

In China, the government published, in October 2008, a document entitled 'China's Policies and Actions for Addressing Climate Change' in which the policies and actions to adapt to climate change in agriculture, forestry and other natural ecological systems, water resources, coastal zones and coastal regions are explained. They correspond with the key areas for adaptation established in the 2007 document, 'China's National Climate Change Programme'.[23]

In South Korea, the Third Governmental Comprehensive Plan on Countermeasures to Climate Change focuses on agriculture, forestry, fisheries, water resources and health. Different adaptation programs have been promoted depending on the region and field and their implementation takes socioeconomic development into account to avoid fragmentation and separation.[24]

In India, the main challenge is to integrate adaptation efforts with sustainable development and poverty reduction. Several important initiatives have been taken on agriculture, water resources, coastal regions, the forestry sector and disaster management. But direct spending on pure adaptation projects is limited.[25]

Southeast Asian countries have also made some efforts to implement adaptation action in key sectors, including water resources, agriculture, forestry, coastal and marine resources, and health. But most of the policies implemented to date have been reactive not proactive, autonomous and not well-planned, and developed to address climate variability not change.[26] Much more is needed. Few countries have developed adaptation plans while others are still in the process of finalizing them (Chapters 22–25); the main problem is that many countries lack the resources and the financial capacity to adequately prepare their own plans, even while recognizing the urgency.[27]

Dealing with adaptation, the principal questions are not only that the practice of adaptation is something new, but what the cost and the priorities are. Cost assessments are complicated. Neither the World Bank nor the EU knows what the cost of adaptation and mitigation in Africa will be, for instance. Areas of greatest risk and greatest uncertainty coincide. On mitigation there are broad assessments. In general, few global studies exist on the financial damage climate change could cause. Lacking a clear perspective of costs and with the many uncertainties that exist on the impact of climate change, early action is problematic. That is the aspect that should be emphasized regarding the recent report by the Asian Development Bank on Southeast Asia. The report figures out the losses in GDP.[28] International funding and technology transfer are essential for

the success of adaptation and mitigation action in developing countries in Asia, but during a recession big investment and big donations for adaptation and mitigation are not realistic. Both adaptation and mitigation are managed differently and the chapters of this book show the different importance that the European Union and governments in Asia have given to policies for dealing with mitigation and adaptation. Coordinated action, integrating adaptation and mitigation policies and measures are needed.

Another point to underline is the distinction between short-term measures and long-term measures. Many adaptation strategies are short term. Thus, it is difficult to integrate the aspects of conflict that are foreseen for the medium-long term in the adaptation programmes, given that the political priorities of many governments are short term.

The best approach is probably a bottom-up approach that can reflect the local context, and an incremental approach. The problem is that time for adopting effective solutions is running out. Dedicating huge resources to long-term processes are not decisions that would be easily made by our current politicians. The world needs real statesmen.

Linking conflict prevention and human security

Prevention is one of the four essential characteristics of what are considered 'human security issues'. Another question is to clarify the links between climate change and human security. The challenges climate change poses on access to natural resources and human health have clear implication for human security. In the book, several chapters emphasize the linkage between climate change and human security (Chapters 1, 12, 22, 24, 25) explaining that people-centred approaches are crucial for dealing with social vulnerabilities to climate change and coping capacity for mitigation and adaptation. The linkage between development and climate change is also emphasized. But, as is explained (Chapter 24), people-centred approaches and the need to promote people's participation in relation to environmental protection are still subordinated to state-centred approaches.

The UNDP has identified five key transmissions mechanisms through which climate change could delay and reverse human development and that can be applied to the regions we study:

1. Agricultural production and food security will be affected, inducing important losses and undermining the efforts to diminish rural poverty. This will affect in general all the people living in some parts of Europe and in many countries in Asia, in particular in rural areas.
2. Water stress and water insecurity will affect millions of people in Europe and Asia with very serious implications for economic, health and community security.

3. Rising sea levels and exposure to climate disasters will have grave economic security consequences and serious implications for health and community security in Europe and Asia.
4. Transformation of ecosystems and biodiversity will affect the environmental security of millions of people in Europe and Asia.
5. Impacts on human health, with the expansion of dangerous diseases, will particularly affect people living in developing countries in Asia and will exacerbate global inequalities.

These can be included in human security as 'freedom from want'. But we also presented climate change from the angle of acting as a trigger event that can have a decisive impact on tensions and crises, and as a conflict multiplier when it disrupts or destroys livelihood systems. From this angle we have to link climate change with 'freedom from fear' and with hard security issues, given the implications in relations between states, the weakening process of some states, state failures, possible mass migrations, the rise of radical movements, more authoritarian governments, the weakening of global governance and legitimacy of international institutions.[29]

Thus, we cannot draw a clear line between human security and traditional security issues. In the end, the security providers are the states.

All this brings other consequences, for instance, the responsibility to protect and the legitimacy of states. This concept was born out of the conflicts and killings in the Balkans and Rwanda. States are responsible for protecting civilians from mass atrocities or humanitarian disasters. This is a consequence of state sovereignty that implies responsibility and the primary responsibility for the protection of its own people lies with the state itself. In this conceptualization[30] priority is given to prevention, through measures for building state capacity, remedying grievances and ensuring the rule of law.

Until now, the division between supporters of the right to humanitarian intervention and those that argue in favour of state sovereignty and non-intervention in internal affairs precluded any intervention in internal matters, but if the consequences of climate change and disasters increase in magnitude, populations are in serious danger and states are unwilling or unable to act – a good example was the Myanmar government after Cyclone Nargis – the principle of intervention will yield to the international responsibility to protect. The UN accepted the concept and the Security Council can authorize military intervention as a last resort in the event of genocide and other large-scale killing, ethnic cleansing or serious violations of international humanitarian law when governments have proved powerless or unwilling to prevent them.[31] At present, population displacement or environmentally induced migrations are not contemplated, but a heated debate can be predicted in the coming years with important consequences for state sovereignty, for more intrusive diplomacy, for international security and global security architectures and for human security approaches.

Again, states will remain centre stage but the approaches will tend to be more people-centred.

Notes

1. This explains the interest of the government of the United Kingdom in calling attention to the consequences of climate change in Southeast Asia. The recently published study (April 2009) by the Asian Development Bank on the economics of climate change in Southeast Asia, funded by the United Kingdom, is the first study on the impacts of climate change in Southeast Asia.
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5. See the process for the adoption of the EU programme for the prevention of violent conflict (2001) or Göteborg process in A. Marquina (2003) 'La Unión Europea y la Prevención de Conflictos', *UNISCI Discussion Papers*, No. 1, http://www.ucm.es/info/unisci/revistas/marq1.pdf (accessed 20 May 2009).
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7. Australian Government, Department of Foreign Affairs and Trade, *ASEAN Regional Forum (ARF)*, http://www.dfat.gov.au/arf/ (accessed 10 May 2009).
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{SEC(2009) 217} {SEC(2009) 218}, http://www.preventionweb.net/files/8653_SEC2009220ENDOCUMENTDETRAVAILf.pdf (accessed, 10 March 2009).
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27. Asian Development Bank (2009) *The Economics of Climate Change in Southeast Asia: A Regional Review,* p. 118, http://www.adb.org/Documents/Books/Economics-Climate-Change-SEA/PDF/Economics-Climate-Change.pdf (accessed 12 May 2009). According to the Asian Development Bank it will be important to prioritize investments. Appropriate adaptation measures may require investments in inshore coral rehabilitation, watershed reforestation, river levees, wetlands nourishment, and the introduction of hardier and more resistant crops. Over the longer term, coastal sea groves may be required for small islands, and dams may need to be raised or reinforced to withstand increased runoff from glacial melt and unseasonal flooding an ability to build and facilitate concerted action among all players at every level.
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