Environmental Justice and Federalism

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Dennis C. Cory

Professor of Environmental Law and Economics, University of Arizona, USA

Tauhidur Rahman

Associate Professor of Economic Development and Applied Econometrics, University of Arizona, USA

With Satheesh Aradhyula, Melissa Anne Burns and Miles H. Kiger

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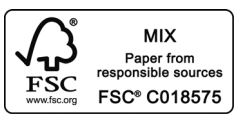

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Preface

Environmental justice (EJ) is concerned with the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Many of the goals of environmental justice are promoted through complex agreements between the US Environmental Protection Agency and state environmental agencies based on cooperative federalism. Utilizing detailed case studies, this book provides a comprehensive introduction to the legal, economic, and philosophical issues involved in jointly promoting EJ in this federalist system, both in the context of siting and in the context of regulating potentially polluting facilities. The volume is designed to serve as a supplementary text for undergraduate and graduate courses concerned with environmental policy, as well as a reference for interested professionals in a wide variety of disciplines including law, economics, environmental sciences, philosophy, and political science.

Acknowledgments

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1. Federalism and the pursuit of environmental justice

ENVIRONMENTAL JUSTICE IN THE US

While there is no universally accepted definition of environmental justice (EJ), there is general unanimity that the central concern revolves around the idea that minority and low-income individuals, communities, and populations should not be disproportionately exposed to environmental hazards. That is, low-income and minority communities should not be exposed to greater environmental risks than other communities through the siting of locally undesirable land uses (LULUs), the enactment of environmental and land use regulations, the enforcement of those regulations, and the remediation of polluted sites (Rechtschaffen et al., 2009). Unfortunately, in the context of environmental quality, a wide variety of empirical studies has documented that disparate impacts do, in fact, exist since minority and low-income communities are at disproportionate risk for environmental harm from the siting, regulation, and remediation of polluting activities. In December 2005, for example, the Associated Press released a major study of air pollution risk based on 2000 Environmental Protection Agency (EPA) and census data that found that black Americans were 79 percent more likely than whites to live in heavily polluted neighborhoods (Pace, 2005). Similarly, in a 1987 report, and a 2007 follow-up study, the United Church of Christ's Commission on Racial Justice concluded that, nationwide, people of color are far more likely to live close to hazardous waste facilities, and that race is a significant and robust predictor of commercial hazardous waste facility locations (United Church of Christ, 1987; and Bullard et al., 2007). More comprehensively, Hird and Reese (1998) examined 29 indicators of environmental quality throughout the nation and concluded that pollutants tend to be distributed in a way that disproportionately affects people of color, even across different model specifications, different pollutants, and when many other confounding characteristics are taken into account.[1]

[1] Mohai and Bryant (1992) reviewed 15 studies conducted between 1971 and 1992 that attempted to provide systematic information about the distribution of

While there is significant disagreement among researchers regarding the extent to which race- and class-based environmental inequities exist in the United States, distributive equity concerns have quite naturally arisen over the documentation of disproportionate exposure of minority and low-income communities to land, air, and water contamination. In response to these concerns, the EJ movement has become an attempt to equalize the burdens of pollution, noxious development, and resource depletion (Shrader-Frechette, 2002). That is, the EJ movement has largely organized around the effort to redress the harms arising from disproportionate exposure to environmental risk.

The Federal Response

On February 11, 1994, President Clinton recognized the significance of environmental equity issues by issuing Executive Order 12898, which requires all federal agencies to collect data about the health and environmental impact of their actions on minority groups and low-income populations, and to develop policies to achieve EJ to the greatest extent practicable and permitted by law.[2] In addition to collecting data, the order requires agencies to take a number of practical steps to avoid discriminatory actions and to promote environmental equity.

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such environmental hazards as air and noise pollution, solid and hazardous waste disposal, pesticide poisoning and toxic fish consumption. The results of these investigations were strikingly consistent. Regardless of the environmental hazard, and regardless of the scope of the study, in nearly every case the distribution of pollution was found to be inequitable by income and race. A 1992 study by the EPA concurred, providing evidence that minorities (e.g., African Americans, Appalachians, Pacific Islanders, Hispanics, and Native Americans) who are disadvantaged in terms of education, income, and occupation bear a disproportionate share of environmental risk and death (US EPA, 1992). A third study conducted in 2004 examined monetary penalties assessed against petroleum refiners for violation of federal environmental law and concluded that refineries situated within the boundaries of Hispanic and low-income zip codes tended to receive smaller penalties than refineries located in non-Hispanic and more affluent zip codes (Lynch et al., 2004). Finally, a 2004 study conducted by the Natural Resources Defense Council concluded that a large percentage of US Latinos live and work in urban and agricultural areas where they face heightened danger of exposure to air pollution, unsafe drinking water, pesticides, and lead and mercury contamination.

[2] See Appendix 1. For a detailed discussion of Executive Order 12898 and its impact on federal regulatory policy, see Mank (2008b).

The US EPA has been the lead agency in implementing Executive Order 12898. In fact, the agency has consistently pursued integrating EJ concerns into its policies, programs, and activities since 1994, and in 1997 the EPA established the following definition of EJ, a definition that continues to guide US federal environmental policy (US EPA, 2003a):[3]

> Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.
>
> What is meant by fair treatment and meaningful involvement?
>
> - **Fair treatment** means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies
> - **Meaningful Involvement** means that:
>   1. people have an opportunity to participate in decisions about activities that may affect their environment and/or health;
>   2. the public's contribution can influence the regulatory agency's decision;
>   3. their concerns will be considered in the decision making process; and
>   4. the decision makers seek out and facilitate the involvement of those potentially affected.

For the past 30 years, the EPA has invested heavily in developing institutional, legal, and policy frameworks in the US for promoting EJ. The EPA's commitment to EJ began in 1992 when the agency created an Office of Environmental Justice (OEJ) with a broad mandate to ensure that minority and low-income communities receive protection under environmental laws. The OEJ is charged with providing oversight on these concerns to all parts of the agency.[4] In 1993, the agency then established the National Environmental Justice Advisory Council (NEJAC) in order to obtain independent advice and recommendations from all stakeholders involved in EJ conflicts.[5] The NEJAC has been instrumental in making recommendations to the EPA on how to integrate

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[3] See http://www.epa.gov/environmentaljustice/basics/index.html. Background information on EPA's EJ program can also be found on this website. EPA's definition of EJ was informed by President Clinton's Executive Order 12898, which is presented in Appendix 1.

[4] See http://www.healthfinder.gov/orgs/HR2673.htm.

[5] See http://www.epa.gov/compliance/environmentaljustice/nejac/index.html. Also see US EPA, 2010b, available at http://www.epa.gov/environmentaljustice/resources/publications/factsheets/fact-sheet-nejac-2009.pdf.

EJ into the agency's policies, programs, and activities, addressing topics as diverse as permitting, pollution prevention, cumulative risk, and stakeholder involvement. In 1994, partly based on NEJAC recommendations, the EPA initiated the Environmental Justice Small Grants Program. The grants are designed to support communities working on solutions to local environmental and public health issues.[6] As of 2011, the program had awarded $21 million in funding to 1,200 community-based organizations. Six years later, an important legislative milestone was reached with the publication of the EPA's Draft Title VI Guidance for EPA Assistance Recipients Administering Environmental Permitting Programs.[7] The Guidelines provide a framework for the EPA's Office of Civil Rights (OCR) to process complaints filed under Title VI of the Civil Rights Act of 1964 that allege discriminatory environmental and health effects from environmental control permits issued by EPA financial assistance recipients. The Draft Guidance was written at the request of states for recipients of EPA financial assistance who implement environmental permitting programs, and describes procedures EPA staff may use to perform investigations of Title VI administrative complaints. In that same year, the NEJAC developed a Model Plan for Public Participation as a tool to guide the public participation process in ensuring that decisions affecting human health and the environment embrace EJ.[8] In the model plan, core values for the practice of public participation are identified, and a public participation checklist for governmental agencies is developed.

Much of the early effort on promoting EJ culminated in 1995 with the EPA's adoption of a Final Environmental Justice Strategy. The purpose of the strategy is to ensure the integration of EJ into the agency's programs, policies, and activities consistent with Executive Order 12898. The strategy was designed to be a broad framework intended to be a 'living document,' subject to continuous updating and refinement, and heavily relying on public participation to achieve the agency's stated EJ goals. In that spirit, the EPA has more recently developed two noteworthy initiatives. In 2007, the Environmental Justice Strategic Enforcement Tool (EJSEAT) was introduced for use by the EPA Office of Enforcement and Compliance Assurance (OECA) to consistently identify areas with

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[6] See http://www.epa.gov/compliance/ej/grants/ej-smgrants.html.

[7] *Federal Register*, V.65, N.124, June 2000, pp. 39650–39201. For more information about the EPA draft guidance documents, see the EPA Office of Civil Rights Website at http://www.epa.gov/civilrights.

[8] See http://www.epa.gov/projctxl/nejac.htm.

potentially disproportionately high and adverse environmental and public health burdens.[9] The EJSEAT uses 18 select federally recognized or managed databases and a simple algorithm to identify such areas. Finally, in 2011, the EPA developed Plan EJ 2014, named in recognition of the 20th anniversary of President Clinton's issuance of Executive Order 12898 on EJ. The plan is a roadmap to more fully integrate EJ into the agency's decision making, highlighting cross-agency cooperation, tool development, and program initiatives.[10] While not a rule or regulation, Plan EJ 2014 is designed to promote meaningful engagement with communities in the pursuit of three goals: (1) protect health in communities over-burdened by pollution; (2) empower communities to take action to improve their health and environment; and (3) establish partnerships with local, state, tribal and federal organizations to achieve healthy and sustainable communities. Similar, but less extensive, implementation efforts have been made by a variety of federal regulatory agencies including the Departments of Transportation, Defense, Energy, Justice, and Interior (Mank, 2008b).

State-Initiated Responses

EJ conflicts vary widely in terms of their origins, frequency, duration, natural resource involvements, geographical extent, jurisdictional considerations, and resolvability. As a result, a complex set of state and issue-specific initiatives has evolved over time in response to emerging EJ concerns. Fortunately, a comprehensive survey of state EJ laws, policies, and legal cases is presented in Bonorris (2010). The survey is the result of an ongoing collaboration between the University of California's Hastings College of Law and the American Bar Association. The project is designed to highlight the breadth of regulatory and policy approaches implemented by states to address EJ concerns. The survey is published periodically, and relies on a review of legal and public databases, as well as in-depth discussions with state environmental agency personnel, for accuracy. Federal law and policy is not reviewed in the survey, but cooperative federal-state arrangements and documents are included. The result of these efforts is to comprehensively document state-initiated EJ programs for each of the 50

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[9] See http://www.epa.gov/environmentaljustice/resources/policy/ej-seat.html.
[10] See http://www.epa.gov/compliance/ej/plan-ej/index.html.

states.[11] Additionally, ongoing EJ concerns and emerging trends are identified.[12]

EJ and siting potentially polluting facilities

Numerous studies have shown that the siting of potentially polluting activities can have major implications for EJ. It is well documented that a variety of environmentally risky facilities have been disproportionately concentrated in low-income and minority communities.[13] As a result, several states have passed laws and initiated programs to insure that environmental equity is considered when reviewing permit applications that will impact EJ neighborhoods.

Environmental agencies are able to address EJ and siting concerns through state enabling legislation. In Kentucky, for example, the Regional Integrated Waste Treatment and Disposal Facility Siting Board is required by statute to consider the social and economic impacts of a proposed hazardous waste facility on the affected community.[14] In Minnesota, the Pollution Control Agency is required by statute to introduce EJ considerations into the permitting process for any facility in Minneapolis that emits air contaminants.[15] Similarly, the Washington Energy Site Facility Evaluation Council established that it is a permit

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[11] Investments by states in EJ programs vary dramatically. Some states have virtually no, or at best nascent, programs, including Iowa, Maine, Mississippi, Nebraska, North Dakota, Oklahoma, South Carolina, South Dakota, Utah, and Texas. In stark contrast, California has the most comprehensive set of EJ policies and programs, addressing conflicts that arise from climate change, water management, air contaminants, transportation, landfill sitings, brownfields, children's health, and pollution cleanup (Bonorris, 2010).

[12] The description of state EJ programs presented here is taken from the report summarizing the results of the 50-state survey conducted by the Hastings College of Law in collaboration with the American Bar Association (Bonorris, 2010). This report covers a great deal beyond the programs highlighted in this section, including state initiatives addressing EJ and climate change, agricultural chemicals, diet, housing, mining, and transportation.

[13] See, for example, United Church of Christ (1987) for an early examination of EJ and the siting of treatment, storage, and disposal facilities (TSDFs); Downey (2006) for an evaluation of EJ and the siting of toxic release inventory facilities (TRIs); Mohai and Saha (2006) for an assessment of race and socioeconomic disparities in EJ research; and Ringquist (2005) for a meta-analysis of 49 environmental equity studies addressing EJ and facility siting.

[14] Ky. Rev. Stat. Ann. §§ 224.46–505, et seq.

[15] See MPCA, 'Community Air Improvement Project,' available at http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-emissions-and-monitoring/community-air-improvement-project-caip.html.

applicant's responsibility to involve the public even before submitting an application for a new energy facility.[16] Other states address the siting and EJ issue by restricting the location of potentially polluting activities. Alabama's Hazardous Wastes Management and Minimization Act, for example, mandates that only one commercial hazardous waste treatment facility or disposal site may be located within a single county.[17] The Environmental Equity Act in Arkansas is similarly restrictive, creating a rebuttable presumption against permitting the construction or operation of any high impact solid waste management facility (SWF) within 12 miles of any existing SWF facility.[18] Still other states account for EJ considerations in permitting decisions through comprehensive planning on EJ policies. In 2006, the Office of Planning in the District of Columbia revised its Comprehensive Development Plan, and these revisions have become a part of the District's Municipal Regulations.[19] EJ objectives are promoted by addressing the over-concentration of industrial uses, the amelioration of adverse effects, and the direct involvement of at-risk communities in planning, permitting, and development processes. This general approach to accounting for EJ concerns in permitting is also reflected in Pennsylvania's Environmental Justice Public Participation Policy. Under this policy, if approval of a proposed permit affects an area with demographics of either 20 percent below the poverty rate or 30 percent minority population, enhanced public participation is required as part of the permitting procedures.[20]

EJ and the enforcement of environmental statutes and policy

A second area of ongoing EJ concern involves compliance with and enforcement of environmental laws. Empirical studies have documented that environmental laws may be enforced in a variety of ways that disadvantage at-risk communities. Violations of environmental laws in areas that are disproportionately minority or low income may tend to be penalized less than violations elsewhere. Implementing more stringent environmental standards may be complicated by the fact that failing to enforce compliance with the standards may deny EJ communities the health benefits of a less contaminated environment, while forcing compliance may secure health benefits but at prohibitive cost. Cleanups may

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16 Wash. Admin. Code §463–60–101 (2004).

17 Ala. Code § 22–30–5.1(c) (2005).

18 Ark. Code. Ann. § 8–6-1501 (2008).

19 D.C. Mun. Regs.tit.10 (2008).

20 Pennsylvania Dept. of Environmental Protection, 34 Pa.B.2237 (Apr. 24, 2004), modified by 35 Pa.B.68 (Jan. 1, 2005).

occur more rapidly and thoroughly for contaminated sites in non-minority communities. Clearly, the implementation and enforcement of environmental policies has significant implications for EJ.[21]

An aggressive EJ program designed to address enforcement issues has been developed by the Department of Environmental Protection (DEP) in New Jersey. Enforcement sweeps are organized by the DEP, utilizing a large enforcement team from its various units, to facilitate environmental enforcement in urban areas with large EJ populations. DEP enforcement sweeps have addressed a wide array of EJ issues, ranging from the regulation of medical waste, to integrated pest management, to wetlands restoration.[22] Illinois, on the other hand, has addressed EJ and enforcement concerns through the establishment of an Environmental Justice Complaint Process. The Illinois Environmental Protection Agency administers a grievance procedure that handles complaints from submission, to investigation, to resolution of the matter.[23] Particularly complex EJ investigations are explicitly addressed in Connecticut. The position of EJ administrator has been established within Connecticut's Department of Environmental Protection to address, among other things, complicated EJ complaints involving multiple jurisdictions and services of different state, local, and/or federal agencies.[24] More generally, several states have addressed EJ and enforcement issues through Supplemental Environment Projects (SEPs). Colorado's program is illustrative. Violators of environmental laws and regulations are allowed to reduce the amount of their fines by funding an approved project benefiting the environment as part of the settlement of an enforcement action.[25] These projects are known as SEPs and address the environmental priorities of the community or

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[21] See, for example, Hird (1993) for an investigation of EJ and the enforcement of EPA's Superfund program; Cory and Rahman (2009) for an evaluation of the EJ implications of compliance with the Safe Drinking Water Act (SDWA); and Lynch et al. (2004) for a study of EJ and the level of monetary fines imposed on petroleum refineries across the Clean Air Act (CAA), the Clean Water Act (CWA), and the Resource Conservation and Recovery Act (RCRA).

[22] New Jersey Dept of Environmental Protection, 'Enforcement in Action – Special Projects,' available at http://www.nj.gov/dep/enforcement/special projects.html.

[23] Illinois Environmental Protection Agency 'Grievance Procedure,' http://www.epa.state.il.us/environmental-justice/grievance-procedure.html.

[24] See Bonorris (2010), p. 45.

[25] Colorado Department of Public Health and Environment, 'Final Agency-wide Supplemental Environmental Projects Policy,' Revised 5/5/08 ['CDPHE SEP Policy'], available at http://www.cdphe.state.co.us/wq/enforcement/SEP-Policy.pdf.

communities involved. EJ is promoted by addressing historic patterns of disparate impact with new resources.

EJ and the reclamation of contaminated sites

Abandoned or underutilized sites with the presence of hazardous substances, pollutants, or contaminants can present formidable EJ challenges since these sites tend to be disproportionately located in EJ communities. Cleaning up and reinvesting in these properties protects the environment and reduces blight while potentially contributing to economic development, infrastructure repair, and better health outcomes. Additionally, during the course of remediating hazardous waste sites, opportunities arise to provide employment and training to community residents and businesses. Reinvestment and remediation coupled with extensive community involvement can help to promote the health, safely, and quality of life within impacted neighborhoods.

A principal vehicle for addressing the reclamation of hazardous waste sites and brownfields is the EPA's Comprehensive Environmental Response and Liability Act (CERCLA) program, commonly known as Superfund. CERCLA provides protocols for both identifying contaminated sites and orchestrating remedial response actions. Several states have developed their own complementary land reclamation programs as well.[26] To ensure consideration of EJ in the reclamation of sites, states have developed and implemented specialized EJ initiatives. Rhode Island's Industrial Property Remediation and Reuse Act requires the Department of Environmental Management to consider the effects of remediation on the surrounding population, particularly for low-income and racial minority populations. Community involvement programs have been developed to ensure notification to affected residents throughout the investigation and remediation of contaminated sites.[27] New Jersey's Environmental Justice Petitions and Action Plans established a process for petitioning the state's Department of Environmental Protection on reclamation issues.[28] Past petitions have concerned, among other things, health effects from an incomplete assessment and cleanup of contamination by the US

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[26] See, for example, the Water Quality Assurance Revolving Fund (WQARF) program in Arizona, which supports hazardous substance cleanup efforts in the state, available at http://www.azdeq.gov/environ/waste/sps/program.html.

[27] R.I. Gen.Laws § 23–19.14–5(a) (2003).

[28] New Jersey Dept of Environmental Protection, 'Environmental Justice Task Force Advances Petitions to Address Community Environmental and Public Health Concerns,' available at http://www.state.nj.us/dep/newsrel/2005/05_0083.htm.

EPA at former superfund sites in EJ communities. In listing contaminated sites, the Kansas Department of Health and Environment has a Brownfield Targeted Assessment program that prioritizes properties that have EJ issues.[29] Lastly, the Wisconsin Department of Natural Resources provides low-cost loans for brownfield remediation projects at landfills, sites or facilities where contamination has affected or threatens to affect ground water or surface water.[30] Priority is given to loan applications that improve EJ in the process of reclamation.

EJ and community involvement

The EPA strongly advocates involving affected communities in their siting, regulatory, and reclamation decision making.[31] In developing community involvement programs, EPA has adopted a set of core values for public participation, as identified by the National Environmental Justice Advisory Council.[32] Specifically, EPA bases its interactions with communities on the idea that people should have a say in decisions about actions that affect their lives; that the public participation process should provide participants with the information they need to participate in a meaningful way; and that public participation should include the promise that the public's contribution will influence final decisions.[33]

State environmental agencies have developed a comprehensive set of community involvement programs as well, initiatives that address the

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[29] Kansas Dept of Health and the Environment, 'Kansas Brownfields Program,' available at http://www.kdheks.gov/brownfields/targeted_assess_prog.html.

[30] Wisconsin Dept of Natural Resources, 'Land Recycling Loan Program,' available at http://www.dnr.state.wi.us/org/caer/cfa/EL/section/brownfield.html.

[31] These ideas are particularly well developed within EPA's Superfund program. See US EPA (2005), *Superfund Community Involvement Handbook*, Office of Emergency and Remedial Response, EPA 540-K-05–003 (April), Washington, DC, available at http://www.epa.gov/superfund/community/cag/pdfs/ci_handbook.pdf.

[32] For a general discussion, see US EPA, 'Environmental Justice Program and Civil Rights,' at http://www.epa.gov/region01/ej/index.html.

[33] Community involvement objectives under CERCLA, for example, include keeping the public well informed of ongoing and planned activities; encouraging and enabling the public to get involved; listening carefully to what the public is saying; identifying and dealing responsibly with public concerns; changing planned actions where public comments or concerns have merit; and explaining to citizens how EPA considered their comments, what EPA plans to do, and why EPA reached its decision (US EPA, 2005, pp. 5–6).

entire lifecycle of polluting activities, from the permitting and siting of facilities, to the regulation of facilities while they are in operation, to site reclamation after facilities have ceased to operate. In California, for example, landfill developers must solicit low-income and minority communities' opinions when proposing new sites.[34] In Pennsylvania, an Environmental Justice Work Group was established to promote greater community involvement in the monitoring of facilities, and to encourage the creation of additional means to ensure the adequate enforcement and appropriate assessment of penalties.[35] In Arizona, Community Advisory Boards advise the Department of Environmental Quality on Superfund cleanup issues, and provide feedback from government agencies to affected communities.[36] In fact, viewed as a whole, community involvement can be fairly characterized as the implementation backbone of EJ initiatives across the 50 states.

ENVIRONMENTAL FEDERALISM IN THE US

Federalism is a founding political principle of the US Constitution. Technically, federalism is defined as the principle of federal organization of any group of more or less autonomous units. More pragmatically, federalism is about assigning government authority to the correct level of government in our constitutional structure. In determining the appropriate allocation of authority between the federal government, on the one hand, and state, regional, and local governments, on the other, the risks of decentralization and hampering needed federal initiatives must be weighed against the costs of centralization and the potential for stifling novel social and economic experiments by the states.[37]

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[34] CAL.PUB.RES.CODE §§ 40912, 41701, and 71114.

[35] Pennsylvania Dept of Environmental Protection, 'Environmental Justice Work Group Report to the Pennsylvania Department of Environmental Protection (2001),' available at http://www.depweb.state.pa.us/portal/server.pt/community/office_of_environmental_advocate/14049.

[36] See Waste Programs Division: Superfund/Water Quality Assurance Revolving Fund (WQARF): Community Involvement, available at http://www.azdeq.gov/environ/waste/sps/community.html.

[37] To quote Justice Louis D. Brandeis (New State Ice v. Liebmann, 285 US 262, 311 (1932), dissenting), 'To stay experimentation in things social and economic is a grave responsibility. Denial of the right to experiment may be fraught with serious consequences to the nation. It is one of the happy incidents to the federal system that a single courageous state may, if its citizens choose,

Within the context of regulation, federalism is typically cooperative, acknowledging a need for cooperation between state and federal governments. Environmental federalism in the US is generally cooperative, and addresses the appropriate scope and division of power, responsibilities, and authority among the federal and state governments in environmental management. For the past 15 years, Congress has encouraged devolution of responsibility and authority from the federal government to the states in environmental protection.[38]

The National Environmental Performance Partnership System

The EPA and states share responsibility for protecting environmental and human health. In 1995, the EPA initiated the National Environmental Performance Partnership System (NEPPS) to improve the efficiency of EPA–state partnerships within a cooperative federalism system (US EPA, 2010e). Performance partnerships are explicitly designed to foster devolution by taking best advantage of the unique capacities of each partner, achieving targeted environmental benefits at minimum cost. In promoting devolution, NEPPS gives states more flexibility in achieving environmental results so that states can serve as the primary delivery agent, managing their own programs, adapting to local conditions, and testing new approaches for delivering more environmental protection for less (Scheberle, 2004).

One of the main ways that the EPA and individual states implement the principles of performance partnerships on the ground is by negotiating Performance Partnership Agreements (PPAs). Elements of a PPA typically include a description of environmental conditions, performance measures for evaluating progress, a process for joint state–EPA evaluation, mutual accountability, and a clear specification of environmental priorities (US EPA, 2010f). Each state–EPA partnership negotiation takes into account the particular capacities, needs, and interests of the state.

Individual PPAs are typically multi-program documents that frequently include a dispute resolution process as one of several general topics. A wide variety of program areas are addressed across state PPAs, ranging from air quality, to drinking water, to brownfields and Superfund. About half of recently negotiated PPAs address EJ as well. Over the period from

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serve as a laboratory, and try novel social and economic experiments without risk to the rest of the country.'

[38] See President Clinton's Exec. Order No. 13132, 64 Fed. Reg. 43, 255 (Aug. 4, 1999).

2000 to 2008, 32 states on average had negotiated PPAs.[39] The continued popularity of PPAs can be attributed to the fact that the negotiated outcome emerges from joint planning and priority setting, and clearly specifies the extent of EPA oversight.

The Scope of Performance Partnership Agreements

Recently negotiated agreements between the EPA and state environmental agencies illustrate the adaptability of PPAs in addressing EJ concerns. Some of the agreements are quite detailed in delineating documentation, policy implementation, community involvement, and oversight responsibilities, while other contracts emphasize a general commitment to addressing EJ issues without particularized elaboration. Additionally, PPAs address a wide range of topics including the siting, regulation, and reclamation of polluting activities as they impact the provision of clean air and water, land use, and public health.

The versatility of PPAs in addressing EJ concerns is well documented. In Washington, for example, the PPA between the state's Department of Energy and US EPA Region 10 committed both agencies to monthly phone calls to facilitate the identification of EJ issues in the state, to increase agency knowledge about the nature and extent of EJ concerns, and to promote interagency collaboration.[40] The siting of waste sites in EJ communities is addressed by a PPA between the Utah Department of Environmental Quality and US EPA in which a commitment is made to identify these sites and to address disparate impacts of permitting and enforcement.[41] Regulatory compliance and enforcement is emphasized in Virginia's most recent PPA where both the Virginia Department of Environmental Quality and US EPA have agreed to pursue ozone non-attainment and toxics in communities of concern.[42] The regulatory

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[39] See '2008 Program Implementation Summary: National Environmental Performance Partnership System (NEPPS),' available at http://www.epa.gov/ocir/nepps/pdf/fy08-pp-statustrends-report.pdf.

[40] Department of Ecology, 'Environmental Performance Partnership Agreement for July 1, 2007 to June 30, 2009,' available at http://www.ecy.wa.gov/biblio/0701028.html.

[41] Utah Dept of Environmental Quality, 'Division of Solid and Hazardous Waste RCRA Program – Performance Partnership FY 2009,' formerly available at http://www.deq.utah.gov/About_DEQ/Planning/PPA/2009_PPA_PDFs /2009_dshw_final.pdf. (Last visited Aug. 29, 2009.)

[42] Virginia Dept of Environmental Quality, 'Performance Partnership Agreement (2005),' formerly available at http://epa.gov/ocirpage/nepps/pdf/vadeq-ppa-100105–093007.pdf. (Last visited Jul. 5, 2009.)

element in the PPA between Pennsylvania and US EPA is more general with both agencies agreeing to identify and address areas with elevated occurrences of infections and chronic disease related to environmental exposure.[43] On the land reclamation front, Connecticut's PPA commits the state's Department of Environmental Protection and US EPA to community-based initiatives, targeting enhanced federal Resource Conservation and Recovery Act (RCRA) activities within identified environmental equity communities.[44] The PPA negotiated by the Rhode Island Department of Environmental Management (RI DEM) is similar in that increasing public participation in site remediation and brownfield projects is emphasized through the implementation of RI DEM's EJ policy recommendations.[45] Finally, a variety of PPAs concentrate explicitly and exclusively on community involvement. The agreement negotiated between the Minnesota Pollution Control Agency and US EPA supports and encourages community-based environmental protection while enabling equal access to the environmental decision-making process.[46] Indiana's PPA also emphasizes community involvement by committing to increasing meaningful public input on environmental decisions, and facilitating dispute resolution among parties to environmental decisions.[47]

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[43] Pennsylvania Association of Conservation Districts, 'PACD News,' formerly available at http://www.pacd.org/news/October percent252002/p.3.htm+percent22performance+partnership+agreementpercent22&hl=en&ct=clnk&cd=1&gl=us&ic=utf-8. (Last visited Feb. 27, 2009.)

[44] Connecticut Dept of Environmental Protection, 'Environmental Performance Partnership Agreement between Connecticut Department of Environmental Protection and US Environmental Protection Agency, Region 1 for Federal Fiscal Years 2008 and 2009,' at 2, available at http://www.ct.gov/dep/lib/dep/ppa/ppa fy0809.pdf and Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 et seq. (1976).

[45] Rhode Island Dept of Environmental Management and US EPA, Performance Partnership Agreement (FYS 2008–2010), at Tab A, 132, available at http://www.dem.ri.gov/pubs/ppa0810.pdf.

[46] Minnesota Pollution Control Agency, 'Environmental Performance Partnership Agreement between US EPA Region 5 and MPCA for October 1, 2008–September 30, 2012,' available at http://www.epa.gov/r5water/stpb/pdfs/mpcappafy2009–2012.pdf.

[47] Indiana Dept of Environmental Management, 'Indiana Environmental Performance Partnership Agreement, Section 2: State/Federal Relationship, Part III: Environmental Justice,' formerly available at http://www.in.gov/idem/enppa/enppa.pdf. (Last visited Aug. 10, 2003.)

OVERVIEW OF THE BOOK

In the following chapters, issue-specific recommendations are developed for the appropriate role of environmental federalism in addressing EJ conflicts. Drawing on EJ case studies, an empirically based introduction to the interactions between EJ and environmental federalism is provided. The analysis proceeds in three stages. In stage one, a documentation assessment of EJ is conducted. For each case study, a careful empirical investigation establishes the nature and extent of the EJ conflict under consideration. In addition, data needs, along with statistical and analysis requirements, are determined as they relate to successfully conducting the evaluation. In stage two, a policy assessment is conducted. For each case study, the policy response of the Arizona Department of Environmental Quality (ADEQ) is evaluated, along with complementary initiatives by the EPA. Finally, based on the two assessments, recommendations for cooperative federalism are suggested. In particular, two specific aspects of addressing EJ concerns and federalism are evaluated: (1) documenting the current or expected existence of EJ conflicts; and (2) developing, implementing, and enforcing appropriate policies to address EJ conflicts once documented. In doing so, the analysis addresses the central environmental federalism question of whether the state or federal government should take the lead in documentation and policy development designed to address EJ conflicts, while systematically tailoring recommendations to the issues of siting and regulating polluting activities.

EJ and environmental issues are addressed in the following chapters by discussing the legal, economic, and policy implications of two case studies in Arizona. In Chapter 2, a brief overview of the legal framework, institutional requirements, and documentation challenges involved in establishing an EJ discrimination claim is provided as background for the case studies reported in the following two chapters. In Chapter 3, the results of a case study involving clean air and siting potential polluting activities in the Phoenix Metropolitan Area are presented. The documentation and policy challenge here is to evaluate both the emissions and economic development implications of permit approval. In Chapter 4, a second case study is presented involving the provision of safe drinking water and regulatory enforcement of the Safe Drinking Water Act (SDWA). The policy question here is whether minority and/or low-income communities will be disproportionately denied the health benefits of treated water owing to a failure to enforce SDWA requirements, or will be disproportionately required to bear onerous treatment costs per household owing to mandated compliance. In Chapter 5, a federalism

policy assessment is conducted and the implications for federalism in support of EJ explored. The assessments evaluate the state agency's policy response to the EJ conflicts documented in the case studies. In each section, the empirical results of the case study are summarized, the policy initiatives of the state environmental agency described, and the conformance between those policy initiatives and the nature and extent of the EJ conflict examined. Recommendations for how federalism can best serve EJ objectives emerge from the combined case study results and policy assessments for the siting and regulation of polluting activities. As shown in the case studies, both ADEQ and the EPA rely heavily on community involvement in promoting EJ goals. In Chapter 6, the case is made that this reliance is well justified, promoting the twin goals of distributive equity and allocative efficiency. Finally, in Chapter 7, future directions of EJ policy design are discussed.

2. Establishing an EJ claim of disparate-impact discrimination

INTRODUCTION

Somewhat surprisingly, efforts to formally address EJ concerns have been largely frustrated.[1] The source of this frustration can be partly explained by legal requirements for establishing an EJ claim based on discrimination, and partly on procedural considerations under the EPA's administrative complaint process. Legal and institutional factors impacting the establishment of EJ claims are briefly discussed in the following two sections.

The principal obstacle to establishing a cogent EJ claim, however, concerns methodological debates over appropriate procedures for documenting disproportionate risk and the subsequent interpretation of study results.[2] Methodological considerations are addressed in the fourth section of this chapter as background for the case studies presented in Chapters 3 and 4 on the existence of disproportionate environmental risk in low-income and/or minority communities in Arizona.

Based on the survey of legal, institutional, and methodological issues, it is argued in the concluding section that addressing EJ conflicts through Performance Partnership Agreements (PPAs) is both feasible and desirable. PPAs are negotiated agreements between the EPA and state environmental agencies. These agreements can be carefully crafted to address the documentation, policy, implementation, administration, compliance and enforcement, and oversight responsibilities of both parties. Moreover, PPAs can be tailored on an issue-specific basis to complex siting and regulation disputes. This approach, based on cooperative federalism, is feasible since a sophisticated and well-established set of estimation techniques is available to identify the nature and scope of EJ conflicts,

[1] In fact, it was not until 1997 that plaintiffs began winning cases on environmental justice grounds, mostly through emerging doctrines that did not require proof of intent (Gerrard, 2003).

[2] For a discussion of methodological issues, see Burns (2005) and Rechtschaffen et al. (2009).

allowing either the EPA or state agencies to assume primacy in documentation based on their comparative advantage. It is desirable since the alternative of resolving EJ conflicts through the courts is not only ineffective, but also counterproductive, while the EPA's administrative complaint process is protracted to the point of being moot with very few EJ complaints being resolved on the merits.[3]

LEGAL FOUNDATIONS FOR EJ CLAIMS

The constitutional basis for EJ challenges to governmental discrimination lies in the equal protection clause. The Fourteenth Amendment expressly provides that the states may not 'deny to any person within [their] jurisdiction the equal protection of the laws.'[4] Establishment of EJ claims on constitutional grounds is circumscribed by a series of Supreme Court decisions requiring that (1) a governmental action must be involved for the equal protection clause to be violated; (2) private discrimination does not constitute a denial of equal protection; (3) the clause applies to local, state and federal levels of government; (4) only insidious or unjustifiable discrimination is prohibited; and (5) denial of equal protection requires proof of intent to discriminate (Weinberg, 2008, pp. 3–4).

Pursuit of EJ legal claims based on an appeal to equal protection has been frustrated by the proof of intent requirement. In principle, intent can be established by showing that a law was enacted with a discriminating purpose or that a neutral statute has been applied in a discriminatory manner. Alternatively, circumstantial proof of intent can be provided by documenting a greatly disparate impact on an EJ community, implied by

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[3] Readers concerned with environmental justice and federalism come from diverse backgrounds. Environmental lawyers and legal scholars, for example, may be well acquainted with the obstacles confronting the establishment of an EJ claim through litigation (discussed in the next section). Similarly, EPA and state environmental agency personnel may be thoroughly familiar with the poor track record of the administrative complaint process in addressing EJ conflicts (discussed in the third section), while EJ researchers may be comprehensively versed in the immanent empirical challenges in documenting disparate-impact discrimination (discussed in the fourth section). While an understanding of the legal, institutional, and documentation challenges inherent in addressing EJ disputes is extremely useful in considering the case studies and federalism assessments presented in subsequent chapters, selected sections of this chapter may be omitted without loss of continuity. For convenience, a summary-and-conclusion discussion is presented in the final section.

[4] US Constitution, amendment XIV, § 1.

deviations from normal governmental procedures, or documented by statements evincing an intent to discriminate.[5] The most common procedural vehicle for the assertion of equal protection claims is a suit under 42 U.S.C. § 1983. In practice, the burden of establishing discriminatory intent, as opposed to discriminatory impact, has proven to be so onerous that only the most egregious EJ cases have been successful using this line of argument.[6] As a result, EJ legal complaints have increasingly turned to Title VI of the Civil Rights Act to contest and litigate decision making.

Title VI of the Civil Rights Act (1964)

Title VI, which forbids discrimination by programs receiving federal financial assistance, offers the best opportunity for private citizens to bring EJ challenges against state or local agencies (Mank, 2008a).[7] Because virtually every state environmental agency receives some funding from the EPA,

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[5] For discussion of intent issues and illustrative cases, see Weinberg (2008, pp. 6–17).

[6] Discriminatory intent continues to play an important role in EJ cases despite the inherent evidentiary burdens. For example, the Rhode Island Superior Court found that the state Department of Environmental Management failed to make EJ reviews as required by state law in siting a public school, but found no racial discrimination motivating the siting process (see Hartford Park Tenants Association v. Rhode Island Department of Environmental Management, CA. No. 99–3748, 2005 R.I. super. LEXIS 148 (Sup.Ct. R.I., Providence Oct. 3, 2005). Similarly, a community group in a predominately white area of Dallas argued that the decision by the Dallas Housing Authority to put public housing in their neighborhood was racially motivated and violated their equal protection rights under the Fourteenth Amendment. The federal district court, however, held that the selection was not based on racial criteria (see Walker v. City of Mesquite, 402 F. 3d 532 (5th Cir. 2005)). In another Dallas case, a federal court held that there was no intentional discrimination by the City of Dallas in allowing illegal dumping at a landfill in an African American community since there was no evidence that the city acted differently toward this community than towards others (see Cox v. City of Dallas, 2004 US Dist. LEXIS 18968 (N.D. Tex. Sept. 22, 2004)). For an overview of relevant EJ cases generally, see the American Bar Association's update service on the law of EJ at http://www.abanet.org/environ/committees/envtab/ejweb.html.

[7] Civil Rights Act of 1964, Pub.L.No.88–352§§78 Stat.24P, 252–253, 42 U.S.C. § 2000d. For discussions of the basic structure of Title VI as a vehicle for pursuing EJ claims, see Cole (1994a), Colopy (1994), and Hammer (1996).

almost all state permitting and regulating decisions are potentially subject to Title VI's jurisdiction.[8]

Section 601 of Title VI expressly states that 'No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.'[9] However, like the EJ challenges based on the equal protection clause, section 601 has been ineffective at addressing environmental inequities because the Supreme Court has held that proof of discriminatory intent is required (Mank, 2008a).

Under section 602 of Title VI, federal agencies are required to promulgate regulations that specify when the agency is engaging in racially discriminatory practices. The intent of the statute is that recipients of federal funds not engage in activities that have the *effect* of promoting disparate-impact discrimination. A particularly contentious issue under section 602 is whether private rights of action exist under the EPA's Title VI regulations. For quite some time, it was unclear whether agency regulations based on section 602 of Title VI created private rights of action allowing plaintiffs to file suit in federal courts (Mank, 1999). Recently, however, the Supreme Court has ruled in Alexander v. Sandoval (2001) that private individuals can sue in cases where there is intentional discrimination, but that there is no private right to file a lawsuit concerning disparate-impact regulations. That is, the ability of individuals to enforce federal laws only exists when Congress provides for those rights. Private parties cannot enforce the duty of an environmental agency to engage in disparate-impact analysis (Lieberman, 2001).[10] This ruling

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[8] In 1986, the federal government provided 46 percent of the funding for state air pollution programs, 33 percent of the funding for state water pollution programs, and 40 percent of the funding for state hazardous waste programs (see Lazarus (1993) for a discussion). By 1996, the EPA provided several billion dollars of federal funding under 44 different programs to about 1,500 recipients, including virtually all state or regional siting or permitting agencies (see US Commission on Civil Rights, Federal Title VI Enforcement to Ensure Nondiscrimination in Federally Assisted Programs (June, 1996) for a discussion). Over the ten-year period from 1997 to 2006, EPA's enforcement funding to the regions increased from $288 million in fiscal year 1997 to $322 million in fiscal year 2006, but declined in real terms by 8 percent (US GAO, 2007).

[9] 42 U.S.C. § 200d.

[10] In a recent case this principle was reaffirmed by the Court of Appeals for the D.C. Circuit, rejecting the argument that EJ claims can be based on Executive Order 12898 or a Department of Transportation Order since neither allowed for a private right of action (Communities Against Runway Expansion, Inc. v. Federal

has had a chilling effect on pursuing EJ complaints in federal court since judges have subsequently followed this precedent in consistently rejecting EJ cases (Hill, 2009).

In theory, litigation is a promising way of addressing EJ concerns. In practice, however, federal judges have systematically resisted granting EJ plaintiffs relief, either by requiring proof of an intent to discriminate, or by denying a private right of action.[11] As a result, the EPA administrative complaint process has become the principal means of addressing EJ conflicts since a private right of action does exist under section 602 and the emphasis is on discriminatory impacts or effects as opposed to discriminatory intent.[12]

THE EPA ADMINISTRATIVE COMPLAINT PROCESS

The Supreme Court has stated that Title VI authorizes agencies to adopt implementing regulations that prohibit discriminatory effects, effects that have an unjustified adverse disparate impact.[13] Under the EPA's Title VI implementing regulations,[14] agencies receiving EPA financial assistance are prohibited from using criteria or methods of administering its program that have the effect of subjecting individuals to discrimination because of their race, color, or national origin.[15] In implementing the mandate provided by recent court decisions and Executive Order 12898,[16] the EPA has been developing a detailed framework for

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Aviation Administration, No.02–1267, 2004 US App. LEXIS 1403 (D.C. Cir. Jan. 30, 2004)).

[11] Some analysts have argued that a better litigation strategy is to have plaintiffs use traditional environmental laws to ensure that they are applied and enforced equally to pursue EJ claims of disparate impact (Cole, 1994b). However, based on his review of the case law, Hill (2009) concludes that federal and state courts are reluctant to use existing environmental laws to redistribute environmental risks and harms. Moreover, a cogent case can be made that EJ litigation is not only ineffective, but also counterproductive, given more compelling political, economic, community, and jurisprudential considerations.

[12] For an exhaustive survey of legal issues involved in environmental justice, see Gerrard and Foster, 2008.

[13] See Alexander v. Choate, 469 US 287, 292–94 (1985); Guardians Ass'n v. Civil Service Comm'n, 463 US 582, 589 (1983).

[14] 40 CFR part 7.

[15] 40 CFR 7.35 (6).

[16] There are several basic differences between EPA's responsibilities under Title VI and under Executive Order 12898. See Appendix 2.

addressing EJ concerns for the past 25 years (Mank, 2008b).[17] In 1995, the EPA issued its final EJ strategy with the following five EJ mission topics: (1) public participation, (2) health and environmental research, (3) data collection and analysis, (4) Native American and indigenous environmental protection, and (5) enforcement, compliance assurance, and regulatory reviews. Mission five on enforcement is particularly important in identifying and addressing violations in communities disproportionately impacted by environmental problems. At approximately the same time, the EPA established the Office of Environmental Justice (OEJ) to provide assistance to other EPA departments and to coordinate a large number of activities within the agency,[18] and the National Environmental Justice Advisory Council (NEJAC), to provide advice to the agency through the OEJ on matters related to EJ.[19] More recently, the EPA is developing a revised Environmental Justice Strategic Plan to integrate its EJ efforts more fully into the agency's programs and operations as part of the EPA's Strategic Plan for Fiscal Years 2006–11.[20]

At the very heart of the EPA's EJ strategy is the administrative complaint process. Through the EPA's Office of Civil Rights (OCR), Title VI complaints are processed by OCR to determine whether a recipient of federal financial assistance has implemented programs or activities that have resulted in an unjustified adverse disparate impact. That is, the OCR assesses whether the impact is both adverse and borne disproportionately by a group of persons based on race, color, or national origin, and, if so, whether the impact is justified (Revesz, 2008).[21] The Title VI complaint process is illustrated in Figure 2.1; as shown in the flow chart, a complaint can be resolved in a variety of ways based on jurisdictional considerations,

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[17] As early as 1994, EPA Administrator Carol Browner had made environmental justice an important agency priority, pledging to integrate EJ concerns fully and consistently into the agency's policies, programs, and activities [see Office of the Administrator, US Environmental Protection Agency, Pub. No. EPA 200–2-94–001, the New Generation of Environmental Protection: A Summary of EPA's Five-Year Strategic Plan 6 (1994); No. supra note 26 at 387].

[18] For a description, see *Environmental Justice Fact Sheet, National Environmental Justice Advisory Council*, available at http://www.epa.gov/compliance/environmentaljustice/resources/publications/factsheets/fact-sheet-nejac-2009.pdf.

[19] EPA Environmental Justice Fact Sheet, supra note 16.

[20] EPA, Environmental Justice Strategic Plan Framework and Outline, 70 Fed. Reg. 36, 167 (Jun. 22, 2005), available at http://www.epa.gov/compliance/resources/publications/data/planning/strategicplan/ej/index.html.

[21] 40 CFR part 7.30, 7.35 and section VI and VII of the Draft Revised Guidance for Investigating Administrative Complaints Challenging Permits.

voluntary compliance, informal resolution, dismissal or rejection of the complaint, or funding termination for the recipient agency

In principle, the EPA's administrative complaint process seems to be a well-designed, transparent, and effective means of challenging environmental decision making as discriminatory in effect; in practice, the process has been a disappointment. As of November 2003, only 17 of the 143 administrative complaints received over the previous 10 years satisfied the criteria to launch a preliminary investigation and only one went on to be adjudicated by the EPA (Faerstein, 2004).[22] In fact, as of 2003, the OCR had denied claims of discrimination in all complaints that had been decided (Gerrard, 2003). In that same year, the US Commission on Civil Rights issued a highly critical report regarding the agency's compliance with Executive Order 12898 and Title VI (US Commission on Civil Rights, 2003). The commission found that the agency lacked any comprehensive assessments or accountability measures for its EJ activities.

Since 2003, the EPA's administrative complaint process has had two salient characteristics. First, the complaint process itself is protracted. This fact was exhaustively documented in a recent court case. In 'Rosemere Neighborhood Association v. EPA,' the US Court of Appeals for the 9th Circuit found that the petitioner's struggle with the EPA to respond to its Title VI complaint – alleging that Vancouver, WA, had misused EPA grant funds – appeared typical of those who appeal to OCR to remedy civil rights violations.[23] In fact, the EPA failed to process a single complaint from 2006 to 2007 in accordance with its regulatory deadlines, convincing the Court that the petitioner's action should go forward.[24]

The second salient characteristic is that the EPA actually decides whether there are adverse or disparate impacts in only a small minority of cases. For example, as of December 20, 2005, the EPA had closed 133 cases. In seven of the closed complaints, no adverse impacts were found

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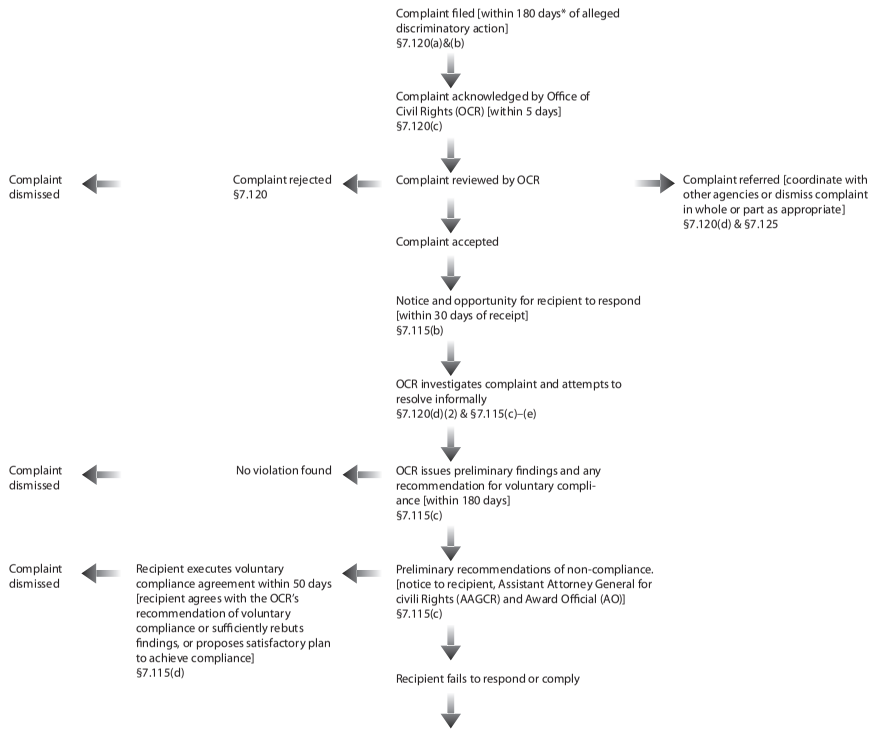
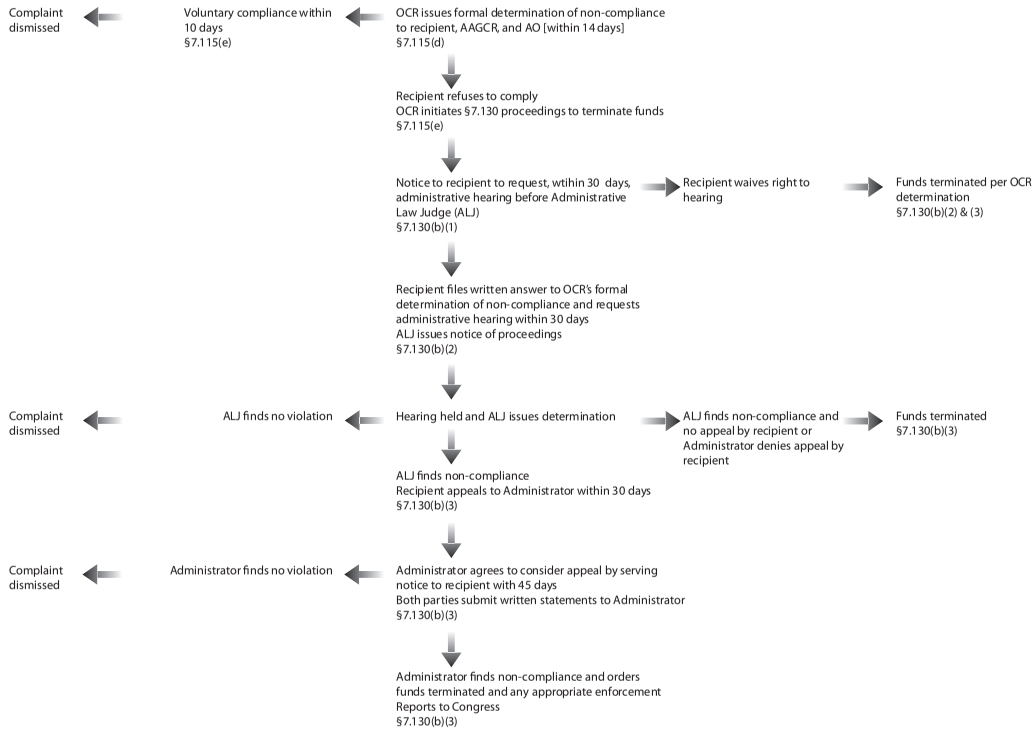
[22] The single case that was adjudicated involved the Select Steel facility in Flint, Michigan. The complaint was dismissed by the EPA stating that the recipient was in compliance with Title VI and even exceeded the requirements for public notice and participation. See Letter for Ann E. Goode, Director, EPA's Office of Civil Rights, Re EPA File No. 5R-98-R5 (Oct. 30, 1998).

[23] For a summary of the case, see http://caselaw.findlaw.com/us-9th-circuit/1151697.html.

[24] See http://www.ca9.uscourts.gov/datastore/opinions/2009/09/17/08–35045.pdf. In March 2010, the EPA and Rosemere entered into a settlement agreement that requires the EPA to take action on subsequent complaints in accordance with regulatory timelines (see http://www.lawyerscommittee.org/projects/environmental_justice/page?id=0008).


Complaint filed [within 180 days* of alleged discriminatory action]
§7.120(a)&(b)
Complaint acknowledged by Office of Civil Rights (OCR) [within 5 days]
§7.120(c)
Complaint reviewed by OCR
Complaint rejected
§7.120
Complaint dismissed
Complaint referred [coordinate with other agencies or dismiss complaint in whole or part as appropriate]
§7.120(d) & §7.125
Complaint accepted
Notice and opportunity for recipient to respond [within 30 days of receipt]
§7.115(b)
OCR investigates complaint and attempts to resolve informally
§7.120(d)(2) & §7.115(c)–(e)
OCR issues preliminary findings and any recommendation for voluntary compliance [within 180 days]
§7.115(c)
No violation found
Complaint dismissed
Preliminary recommendations of non-compliance. [notice to recipient, Assistant Attorney General for civil Rights (AAGCR) and Award Official (AO)]
§7.115(c)
Recipient executes voluntary compliance agreement within 50 days [recipient agrees with the OCR's recommendation of voluntary compliance or sufficiently rebuts findings, or proposes satisfactory plan to achieve compliance]
§7.115(d)
Complaint dismissed
Recipient fails to respond or comply



Note: *All days are measured by calendar days

Source: Revesz (2008), Appendix B: Title VI Complaint Process Flowchart II-64

Figure 2.1 Title VI complaint process

as a result of the challenged decisions, and in two cases, no disproportionate impacts on minority communities were documented. In the remaining 124 (93 percent) complaints, an investigation of disparate-impact discrimination was not conducted.[25] In fact, in a recent evaluation requested by the EPA, it was documented that only 6 percent of 247 Title VI complaints submitted between 1993 and 2010 have been accepted or dismissed within the Agency 20-day time limit, and that the OCR's backlog of Title VI cases stretches back to 2001 with numerous cases having been in the queue for more than 8 years (Deloitte, 2011). Moreover, the EPA has never exercised its civil rights authority to rescind federal financial assistance to a recipient agency, agencies typically responsible for implementing anti-pollution programs, owing to discrimination (*Inside E.P.A.*, Oct. 23, 2009c). Based on EPA's 25-year history of handling hundreds of administrative complaints, the likelihood of defunding sanctions being imposed on environmental agencies is negligible.[26]

The EPA has recently made resolving hundreds of stalled discrimination complaints pending in the OCR a top priority in addressing EJ, partly in the hope of restoring the agency's credibility with minority and other community groups. EPA staff have been directed to reform and expedite the process for resolving Civil Rights Act discrimination claims.[27] To the extent that reforms are implemented effectively, plaintiffs can expect to have complaints of disparate-impact discrimination evaluated more frequently on the merits, and in a more timely and transparent fashion.

Once an administrative complaint has been accepted for investigation, the evidentiary burden placed on complainants is quite significant and clearly enumerated. The framework used by the OCR for documenting an adverse disparate impact involves six steps: (1) documenting that the contested permit meets the jurisdictional criteria provided in the EPA's

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[25] See EPA, Table 1, Status Summary Table of EPA Title VI Administrative Complaints (12/20/2005), formerly available at http://www.epa.gov/civilrights/docs/tbstdec2005.pdf. (Last visited Apr. 2005.)

[26] As of the end of 2008, the EPA had processed a total of 211 Title VI complaints since 1995. Of those complaints, 40 (19 percent) were still pending and 171 (81 percent) had been closed. Of the closed cases, 127 (74 percent) had been rejected and 44 (26 percent) had been dismissed (Rechtschaffen et al., 2009).

[27] For a review of past performance and recommendations for future reforms, see Deloitte (2011), available at http://www.epa.gov/epahome/pdf/epa-ocr_20110321_finalreport.pdf.

Title VI regulations;[28] (2) defining the scope of the investigation, including the nature and sources of stressors as well as the impacts cognizable under the recipient's authority; (3) conducting impact assessment; (4) determining whether the risk or measure of impact is, in fact, adverse; (5) determining the characteristics of the affected population in terms of race, color or national origin; and (6) evaluating whether the disparity is significant. For EJ complainants seeking a remedy[29] under the EPA's administrative complaint process, failure to exhaustively document the existence of adverse disparate impact as outlined by the EPA's OCR virtually guarantees the complaint's dismissal.

Finally, it should be noted that documenting adverse disparate impacts associated with the administration of an environmental policy is not sufficient to prevail with an EJ complaint under the EPA's administrative complaint process. It must also be shown that the impacts are 'unjustified.'[30] The recipient has the opportunity to justify the decision to implement policy notwithstanding the adverse disparate impact.[31] This can be accomplished by showing that the challenged activity is necessary to meet a goal that is legitimate, important, and integral to the recipient's institutional mission.[32] Providing public health or environmental benefits, or providing for economic development, are examples of acceptable justifications that the OCR may consider. Thus the ultimate disposition of an EJ complaint that challenges agency decision making will rest on

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[28] 40 CFR 7.120. See also section III.A.

[29] Title VI provides for a variety of options in the event that EPA finds a recipient in violation of the statute or regulations. The primary administrative remedy described in the regulations involves the termination of EPA assistance to the recipient (40 DFR 7.130 cal). Alternatively, EPA may issue other means authorized by law to obtain compliance (e.g., referral to the Department of Justice for judicial enforcement).

[30] See Revesz (2008), section VI, II 45–57. To say that an agency decision is 'justified' is *not* to assert that the decision is just, right, or even reasonable. Justification in the context of Title VI guidelines simply shows that the agency decision had a sufficient legal reason.

[31] Title VI guidance does not concern justifications for any violation of environmental law.

[32] See Donelly v. Rhode Island Bd. of Governors for Higher Education, 929 F. Supp. 583, 593 (D.R.I. 1966), Aff'd on other grounds, 110 F. 3d 2 (1st Cir. 1997).

establishing that an unjustified, adverse, and disparate impact exists.[33] That is, resolution depends on a showing of disparate-impact discrimination.[34]

DOCUMENTING DISPARATE-IMPACT DISCRIMINATION

There is a substantial body of research over the past 30 years that has attempted to document disparate-impact discrimination.[35] As a result of these efforts, significant progress has been made in addressing the methodological challenges encountered in documenting that the environmental impacts associated with agency decisions may result in unjustified, adverse, and disparate impacts on minority and/or low-income

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[33] The 'Draft Revised Guidance for Investigating Title VI Administrative Complaints' is intended to provide a framework for the EPA to process complaints filed under Title VI of the Civil Rights Act of 1964. The guidance provides for agency discretion in implementation since it is not intended to comprehensively address every scenario that may arise in environmental agency decision making (Revesz (2008), II 29–30).

[34] The importance of convincingly documenting disparate impacts has been highlighted in recent litigation as well. For example, in 2005, the Sierra Club challenged a license issued by the Federal Energy Regulatory Commission (FERC) allowing construction of an 800-kilowatt power plant in Alaska. In reviewing and rejecting the challenge, the FERC found that the Environmental Impact Study (EIS) showed no significant impacts to subsistence use of Glacier Bay National Park by Native Alaskan groups. More generally, the FERC found it doubtful that there would be *any* material impact on the Native Alaskan groups (In the matter of Gustavus Electric Co., Proj.No.11659–003 (DERC Order Denying Rehearing March 24, 2005)). In contrast, plaintiffs prevailed in a case involving the City of Jacksonville when it was clearly established that predominantly minority neighborhoods were disproportionately exposed to toxic incinerator ash. The incinerator ash exposed 4,500 residents, mostly African Americans, to lead, arsenic, dioxins and PCBs. The City of Jacksonville agreed to pay $25 million to settle claims and to relocate some residents in neighborhoods near one contaminated site (Daily Envt. Rep. (BNA), p. A-2 (Sept. 6, 2005)). These and similarly situated cases illustrate that prevailing in EJ challenges has increasingly come to depend on empirically establishing disparate-impact discrimination, not on establishing discriminatory intent.

[35] An annotated bibliography of studies about racial and income disparities in environmental harms can be found in Cole and Foster (2001). Surveys of the empirical literature are presented in Mohai and Bryant (1992), Pastor et al. (2006), and Rechtschaffen et al. (2009).

communities.[36] This body of research has played a prominent role in focusing public attention on environmental justice issues and has helped shape legal responses as well. Unresolved, however, remains the issue of whether apparent disparities are better explained by other demographic factors (Rechtschaffen et al., 2009). As a result, there is still significant disagreement among academics, activists, and policymakers regarding the presence of race- and class-based environmental inequities in the United States. This is partially explained by the sensitivity of EJ results to the type of contaminant being considered, its geographical location, the associated regulatory environment, and the spatial unit of analysis.

Documenting an Adverse Impact

The *adverse* impact of siting decisions has been extensively documented in a variety of ways.[37] Early studies such as those by Bullard (1983) and the US General Accounting Office (1983) found a consistent and high correlation between race and the location of treatment, storage, and disposal facilities (TSDFs).[38] The landmark study on race and environmental quality was conducted by the United Church of Christ's (UCC) Commission for Racial Justice (1987). The UCC study, covering 27 commercial hazardous waste facilities nationwide and approximately 10,000 uncontrolled hazardous waste sites (by zip code), came to the conclusion that more than half of all blacks and Hispanics in the United States lived in communities having at least one closed or abandoned hazardous waste dump site.[39]

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[36] A number of articles discuss methodological issues involved in environmental justice research including Boerner and Lambert (1995), Pulido (1996), Been and Gupta (1997), Downey (1998), Mohai and Saha (2006), Pastor et al. (2006), and Rechtschaffen et al. (2009).

[37] Asch and Seneca (1978) and Gianessi et al. (1979) were among the earliest studies to document inequities in the spatial distribution of environmental quality.

[38] The Bullard study found that 21 of Houston's 25 solid waste facilities were located in predominately African American neighborhoods, even though African Americans made up only 28 percent of the Houston population in 1980. The GAO study found that three of the four major offsite hazardous waste facilities in the southern region (EPA Region IV) were located in predominately African American communities, even though African Americans comprised only about one-sixth of the region's population.

[39] The United Church of Christ (1987) found in a national level study that race proved to be the most significant explanatory factor among variables tested in association with the location of commercial hazardous waste facilities.

More recent studies have corroborated these findings (Bullard, 1983; Bullard and Wright, 1987; Bullard and Wright, 1989; Goldman, 1991; Nieves and Nieves, 1992; Hamilton, 1993; and Hamilton, 1995). In surveying the literature, Mohai and Bryant (1992) reviewed 15 studies on the topic of EJ and concluded that there is clear and unequivocal evidence that income and racial biases in the distribution of environmental hazards exist. In a comprehensive study, Ringquist (2005) conducted a meta-analysis of 49 environmental equity studies. The goal of the study was to resolve some of the disagreements on the existence of environmental inequity. The author concluded that, while there is ubiquitous evidence of environmental inequities based upon race, existing research does not support the contention that similar inequities exist with respect to economic class.

The practice of establishing an adverse impact by measuring proximity of EJ communities to waste facilities, however, was subsequently criticized since it fails to account for the actual elevated levels of exposure (Boerner and Lambert, 1995). To account for exposure, more recent studies have used data from the Toxic Release Inventory (TRI) compiled and maintained by the EPA since 1981.[40] In a 1997 study, Ringquist (1997) accounted for the distribution of TRI facilities, the density of TRI facilities, and the associated concentration of emissions. The results supported the proposition that communities with large shares of African Americans and Hispanics suffer from significantly higher levels of TRI emissions. Similar results were reported in a study by Brooks and Sethi (1997) and for Hispanic communities in a study by Burns (2005).

Two notable studies build on TRI exposure studies by evaluating the health effects of disparate exposure to environmental hazards. In a 1999 study, the Institute of Medicine's Committee on Environmental Justice found that minority and low-income communities not only experience higher levels of exposure but also are less able to manage them by obtaining adequate health care. Similarly, a study by Morello-Frosch et al. (2001) estimated lifetime cancer risks for communities at risk and found that the likelihood of a person of color living in a high cancer risk

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Subsequently, it was pointed out that 78 percent of the hazardous landfills surveyed in the UCC study were located in areas with a larger proportion of whites than minorities, a finding that casts doubts about the cogency of the UCC's conclusions on environmental racism (Rees, 1992).

[40] Over 75,000 companies are required to report their emissions to the EPA by chemical, medium in which it is released, and amount released. Polluting facilities listed on the TRI outnumber waste facilities by almost 40 to 1 (see www.epa.gov/tri).

community in Southern California was one in three as compared to approximately one in seven for predominantly white communities.

In addition to siting studies, several studies have investigated EJ in the context of policy implementation and enforcement. For example, Hird (1993) analyzed the equity implications of the EPA's Superfund program by examining the geographical distribution, funding sources, and pace of remediation for contaminated sites. To analyze equity implications, the author used data on the socioeconomic characteristics and the number of sites on the proposed and final National Priorities List (NPL), the list of sites considered hazardous enough to warrant federal expenditures, for each county in the US. The study concluded that the pace of the EPA's cleanups depended mostly on the sites' potential hazard, and was not motivated by the localities' socioeconomic characteristics or political representation. Atlas (2001) analyzed the environmental equity implications of US EPA enforcement actions, and found that there was no evidence that violations of environmental laws in areas that were disproportionately minority or low-income tended to be penalized less than violations elsewhere. Lynch et al. (2004) examined whether monetary penalties assessed against petroleum refineries for violation of the Clean Air Act, Clean Water Act, and/or Resource Conservation and Recovery Act differed depending upon the racial, ethnic, and income characteristics of communities surrounding the penalized refineries. Using a sample of all monetary penalties assessed between April 2001 and April 2003, mixed results were found. That is, the racial, ethnic, and income characteristics of census tracts surrounding the penalized refineries were not related to penalty amounts. However, refineries situated within the boundaries of Hispanic and low-income zip codes tended to receive smaller penalties than refineries located in non-Hispanic and more affluent zip codes. More recently, Cory and Rahman (2009) investigated the EJ implications of enforcing the Safe Drinking Water Act (SDWA) in Arizona. The results provided no support for the contention that implementation and enforcement of the revised SDWA arsenic standard is likely to disadvantage minority or low-income groups disproportionately in Arizona.

Documenting a Disparate Impact

The most contentious issue involved in documenting that environmental policy decisions result in a *disparate* impact on minority or low-income communities is delineating the geographical extent of the impacted

area.[41] An illustrative study in this regard is Cutter et al. (1996). The study was conducted in South Carolina and found a negative association at the county level between the percentage of black and low-income populations and the number of hazardous waste facilities. When the community was redefined by the geographical extent of the census tract, the correlation disappeared.

Several studies have suggested that geographical scale and aggregation effects are important methodological issues for environmental equity analysis. Baden et al. (2007) examined how EJ results can be influenced by the choice of the spatial scale and scope of analysis. It was concluded that evidence concerning environmental justice is sensitive to the geographical scale and scope chosen, which partly explains the observed inconsistency in the empirical literature. Anderton et al. (1994) compared race, income, housing value and age, and employment in tracts with and without commercial facilities for treatment, storage, and disposal of hazardous wastes, and concluded that tracts containing these facilities are not more likely to have higher concentrations of minorities, and that the aggregation of tracts around these facilities affects the results. Bowen et al. (1995) found little evidence on behalf of an aggregated association between disamenities and minority concentration. When spatial associations were viewed at the state level (using counties as the spatial unit of analysis), the authors found high correlations between minority concentration and toxic release amounts. Their metropolitan-area census-tract analysis, however, indicated that minority densities were inversely correlated with toxic chemical releases onsite and offsite. Mohai and Saha (2007) conducted a national assessment of racial inequality in the distribution of hazard waste facilities. By applying distance-based methods, greater racial disparities were revealed in the distribution of the nation's commercial hazardous waste treatment and storage and disposal facilities (TSDFs) than suggested by prior studies using traditional unit-hazard coincidence methods. As Baden et al. (2007) point out, EJ results can be influenced by the choice of the spatial scale and scope of analysis. The authors argue that, in identifying the sensitivity of EJ

[41] The issue of defining the attributes that classify a person as 'minority' or 'low-income' can in itself become a debatable, even contentious issue. As a practical matter, the decennial census conducted by the US Bureau of the Census remains the most widely used source of data to characterize populations based on race or ethnicity. Low-income populations are generally defined in relation to poverty thresholds such as the annual statistical poverty thresholds from the US Bureau of the Census current population reports series P-60 on income and poverty (see Warren, 2008).

evidence to choices of scale and scope, no claims are made, based on theory or otherwise, about which choices (if any) are correct, unbiased, appropriate or relevant for policy. Arguably, environmental equity at *any* scale is evidence of injustice and motivates policy to correct the injustice.

As an applied matter, empirical studies have been conducted at the county level (Cutter, 1996), the zip code level (US General Accounting Office, 1983), the census tract level (Been and Gupta, 1997), and the census block level (Cameron and Crawford, 2003). Other studies have even employed complex definitions of community based on radial distanced from TRI sites using geographical information systems and block level census data (Banzhaf and Walsh, 2008).[42] The common estimation problem for all studies attempting to document disparate impact is that the use of large geographic units may create aggregation errors by grouping neighborhoods with high minority composition together with neighborhoods of low minority composition. On the other hand, use of small, refined definitions of community may significantly increase estimation cost and data requirements. More importantly, if units are too small, the area that is adversely impacted may extend well beyond the boundaries of the unit. In practice, delineating the geographical extent of the impacts will be a matter of judgment, tailoring the definition of community to the environmental justice issue being investigated (Mohai, 1995; Fahsbender, 1996).[43]

Documenting an Unjustified Impact

In challenging a decision made by the EPA or a state environmental agency, complainants have four basic inquiries that require substantive judicial review.[44] The first avenue of review is an *ultra vires*[45] question challenging the agency's authority to act. For environmental concerns, this question is typically moot since federal or state enabling legislation confers on the EPA or a state environmental agency both the right and the

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[42] See Fahsbender (1996) for a survey of the social scene literature on various approaches to community definition.

[43] For a comprehensive discussion of the statistical issues, see Bowen (2001), pp. 105–30.

[44] See Plater et al. (1992), Chapter 9, for an informative discussion of constitutional challenges to government actions requiring substantive judicial review.

[45] *Ultra vires* is the Latin term for an act performed without any authority to act on the subject. The phrase refers to acts beyond the scope of the powers of a government agency as enumerated by law.

responsibility to determine appropriate action over a wide range of concerns, including the provisions of safe drinking water, clean air, and the reclamation of contaminated land.[46] The second category of challenges addresses the *proper public purpose* test. This inquiry is the central concern of the justification requirement in the administrative complaint process. The justification defense asserts that the agency's objective in decision making is to promote defensible, worthwhile goals of environmental policy. In economic terms, the issue is whether the decision can reasonably be expected to result in meaningful expected benefits.[47] The third line of inquiry is a *merit review*. In this case, agency decision making can be challenged as not having a rational relationship of the means to the end. Here the policy objective is not questioned, but the coherence or efficiency of the means selected by the agency to achieve the stated objective is challenged as indefensible.[48] The fourth and final line of inquiry is concerned with *private burden*. As Plater et al. (1992, p. 428) assert, '[…] the degree of burden imposed on the individual is often the emotional heart of substantive review.' Determining the extent to which individuals can be burdened by agency decision making in the pursuit of a proper public purpose involves a difficult judicial balancing analysis, trading off private harms for public benefits.[49]

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[46] A notable exception to this general state of affairs is the recent controversy over the EPA's authority to regulate isolated wetlands. See Rapanos v. United States, 126 J.Ct.2208 (2006).

[47] Examples of agency decision making concerned with a proper public purpose would be those involved with reviewing and approving TRI siting applications (see Chapter 3) and those involved with providing safe drinking water (see Chapter 4). A recent Supreme Court controversy involving proper public purpose involved the propriety of taking private property from one individual through eminent domain to transfer it to a private company for development purposes. See Kelo v. City of New London, 545 US 469 (2005).

[48] Perhaps the most widely discussed case of substantive judicial review involving a merit review involved a small community in Michigan. The case involved the condemnation of an entire neighborhood, a neighborhood of 465 acres with 4,200 homes, 144 businesses, 14 churches, and 2 schools, through the use of eminent domain to allow for the development of a Cadillac production plant. See Poletown Neighborhood Council v. City of Detroit, 304 N.W. 2d455, 410 Mich. 616 (1981).

[49] A notable Supreme Court case involving a government agency's decision making and private burden involved a private landowner in South Carolina. The landowner invested nearly $1,000,000 in lots on the Isle of Palms and then was

A majority of the empirical EJ literature evaluates the private burden inquiry into agency decision making. The salient issue in these investigations is whether agency decision making resulted in an adverse and disparate impact on a protected group, such as low-income, minority, or elderly populations. Empirical work on the justification issue is also concerned with adverse and disparate impacts, but goes further to investigate to what extent the pursuit of a proper public purpose resulted in significant benefits, and to what extent affected EJ populations shared in those benefits. One example is the empirical study presented in Chapter 3 where approval of a Toxic Release Inventory (TRI) siting application in the Phoenix Metropolitan Area generated both heightened environmental risks for host communities as well as economic development benefits for the region. A second example is the empirical study presented in Chapter 4 where low-income water customers of small public water companies were faced with disproportionately large increases in water rates, or denial of health benefits through selective enforcement as the revised arsenic standard was implemented.

Been and Gupta (1997) examined the issue of whether an adverse disparate impact was unjustified both retrospectively and prospectively. The empirical challenge was to determine if the adverse disparate impact revealed in the study was attributable to agency siting decisions or to subsequent changes in the minority/income composition of the host communities in response to land market forces. Retrospectively, the study provided no support for the proposition that TSDFs were sited in communities that had disproportionately high percentages of African Americans at the time of the siting, but did support the claim that the siting process was affected by the percentage of Hispanics in potential host communities.[50] Prospectively, the study found no support for the theory that the presence of a TSDF makes the host neighborhood less desirable because of the nuisance and risks the facility poses, which causes property values to fall, making the community more affordable for low-income and minority populations. To the contrary, the analysis indicated that the areas surrounding the TSDFs tend to be growth areas

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denied the right to develop them for residential purposes. See Lucas v. South Carolina Coastal Council, 505 US 1003, 112 S.Ct. 2886, 120 L. Ed. 2d798, 1992.

[50] The analysis also provided no support for the notion that neighborhoods with high percentages of poor are disproportionately chosen as sites. Working class or lower middle class neighborhoods located near industrial activity tend to bear a disproportionate share of TSDFs facilities. Similar findings were reported by Boer et al. (1997).

suggesting that the costs of the TSDF may be offset to some extent by economic development benefits.[51]

A more recent study reported in Chapter 3 evaluated the EJ implications of siting decisions in Phoenix, Arizona. The study area was Maricopa County in Arizona, which is home to the major metropolitan areas of Phoenix, Mesa, and Tempe as well as the Gila River and Salt River Pima-Maricopa Indian Communities. Maricopa County has over 3 million residents with Hispanic communities accounting for more than 25 percent of the total county population. In the study, a simultaneous equations model was developed to jointly explain firms' siting decisions and minorities' decisions to relocate. Two conclusions emerge from the analysis. First, Toxic Release Inventory (TRI) facilities have been disproportionately located in areas with high minority concentrations; that is, the hypothesis that TRI facility siting has resulted in an adverse and disparate impact on minority communities cannot be rejected. Second, the results support the proposition that areas surrounding TRI facilities tend to be growth areas generating economic development benefits. That is, the assertion that the adverse disparate impacts generated by TRI siting were justified can also not be rejected.

Finally, Cory and Rahman (2009) evaluated the justification issue in light of public health objectives. Arizona is in the process of implementing the EPA's new drinking water standard for arsenic, which lowers the maximum contaminant level from 50 parts per billion (ppb) to 10 ppb. Arsenic is a common pollutant in Arizona's groundwater and decreasing concentrations in drinking water from 50 ppb to 10 ppb will be costly, particularly for small public water systems. EJ concerns may be encountered in the process of implementing and enforcing the revised arsenic standard. Failure to enforce compliance with water quality standards may deny consumers the health benefits associated with less contaminated water, while forcing compliance may secure benefits but at prohibitive cost for minority or low-income communities. The estimation results, however, provided no support for the contention that implementation and enforcement of the revised arsenic standard is likely to disadvantage minority or low-income groups disproportionately in Arizona.

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[51] Other studies have offered alternative explanations for host neighborhoods becoming disproportionately populated by the poor and by minorities. Pastor et al. (2001) argue that demographic shifts in these communities are better explained by general population trends. Banzhaf and Walsh (2008) found evidence that Tiebout sorting and differential migration best explain this phenomenon.

In documenting whether the adverse disparate impacts that result from a siting decision are justified, the policy issue is prospective in nature. Title VI plaintiffs who prove discriminatory effects discrimination are limited to prospective relief (Mank, 2008a).[52] Compensatory relief is available only to plaintiffs who prove intentional discrimination. In EJ cases alleging disparate-impact discrimination, prospective relief will be sufficient only to veto or revise a proposed siting, regulatory, or reclamation policy and to prevent future harm to complainants. Thus the estimation issue is not just whether past policy decisions were discriminatory. The issue is whether there is evidence that public health or economic development benefits compensated for environmental risks in host communities, and whether such a trend can be expected to continue.

SUMMARY AND CONCLUSIONS

One way of addressing EJ concerns is through litigation in the federal courts. The constitutional basis for EJ claims involving governmental discrimination lies in the Fourteenth Amendment's equal protection clause, which expressly provides that the states may not deny to any person within their jurisdiction the equal protection of the laws. While this seems like a logical starting point for claims of a denial of environmental justice, the legal requirement of proving an intent to discriminate has proven to be an insurmountable obstacle in pursuing EJ litigation. That is, claims can rarely, if ever, be supported by proof of an intent to discriminate based on race (Weinberg, 2008).

An alternative litigation strategy is to pursue EJ complaints under Title VI of the Civil Rights Act of 1964 that prohibits discrimination by programs receiving federal financial assistance. The appeal of pursuing this line of litigation is that virtually all significant state environmental agencies receive federal funding, and under section 602 of Title VI a showing of disparate impact, as opposed to intentional discrimination, is all that is required to prevail (Mank, 2008a). While promising in theory, in practice federal district court judges have systematically resisted granting relief under Title VI. In 2001, the Supreme Court in Alexander v. Sandoval concluded that no private right of action exists under section 602 of Title VI. Based upon that decision, the federal courts have subsequently followed this precedent in rejecting EJ claims (Hill, 2009).

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[52] Prevailing Title VI plaintiffs are also entitled to reasonable lawyers' fees. See Civil Rights Attorneys' Fees Awards Act of 1976, 42 U.S.C. § 1988(6).

In the near term, pursuing EJ litigation in the courts is mostly a judicial dead end. Federal judges have systematically resisted EJ plaintiff relief, either by requiring proof of an intent to discriminate or by denying a private right of action. Moreover, a cogent case can be made that EJ litigation is not only ineffective, but also counterproductive, given more compelling political, economic, community, and jurisprudential considerations (Cole, 1994b). As a result, the EPA administrative complaint process has become the principal means of addressing EJ conflicts.

The EPA has been developing a detailed framework for addressing EJ concerns for the past 25 years. At the heart of the EPA's EJ strategy is the administrative complaint process. Through the EPA's Office of Civil Rights (OCR), Title VI complaints are processed to determine whether a recipient of federal financial assistance (e.g., state environmental agencies) has implemented programs or activities that have resulted in an unjustified, adverse, and disparate impact. In principle, the process was designed to be a transparent and effective means of challenging agency environmental decision making as discriminatory in effect; in practice, the process has been a disappointment. The complaint process is protracted to the point of being moot; very few complaints are resolved on the merits since disparate-impact analysis is seldom conducted; and the EPA has never exercised its civil rights authority to rescind federal financial assistance to a recipient agency.

EPA staff have been recently directed to reform and expedite the process for resolving discrimination claims, making resolution of claims more timely, more transparent, and evaluated on the merits more frequently (US EPA, 2012). In the interim, or even alternatively, state environmental agencies may be well positioned to assume a leadership role in resolving EJ complaints regarding siting and regulatory conflicts. A sophisticated set of statistical techniques has been developed over the past two decades to document whether agency decision making has resulted in disparate-impact discrimination. These empirical tools can be applied by agency staff or outside consulting personnel in cooperation with complainants to establish the existence, nature, and extent of discriminatory impacts. Once established, appropriate remedies can then be tailored on a case-specific basis.

To date, the EPA has assumed primacy in addressing EJ complaints alleging disparate-impact discrimination. An alternative to this policy would be to have state agencies themselves assume primacy in these matters. Under this policy reform, state environmental agencies, in partnership with the EPA, would assume enhanced authority and responsibility in both empirical documentation and in remedy development and implementation when appropriate. Since EJ complainants cannot seek

damages, only prospective relief, state agencies have diminished incentives to stall or falsify the process. By delegating much of the complaint process to the states, the EPA can expedite the resolution of hundreds of stalled discrimination complaints pending in the OCR in the hope of restoring the agency's credibility with minority and other community groups. Additionally, transparency, timeliness, and fairness can be promoted by the EPA exercising their oversight and approval authority.

To explore the possibility of state environmental agencies assuming a leadership role in addressing EJ concerns, two case studies were conducted for the state of Arizona. The case studies evaluate the EJ implications of siting air polluting facilities and of implementing and enforcing more stringent safe drinking water standards. The case studies are reported in the following two chapters and illustrate the usefulness of careful empirical work for successfully resolving EJ disputes. The policy implications of the case studies for environmental federalism are then discussed in Chapter 5.

3. Clean air, EJ, and facility siting in the Phoenix Metropolitan Area

AIR QUALITY IN THE PHOENIX METROPOLITAN AREA

As in virtually all large urbanized areas in the US, air quality in the Phoenix Metropolitan Area (PMA) is largely determined by the mix of six common pollutants in the atmosphere: ground-level ozone, particulates, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead. Air pollution is a mixture of these contaminants and is a major environmental risk to health (see Table 3.1).[1]

Ground-level ozone results from a chemical reaction between pollutants such as nitrogen oxides and volatile organic compounds (VOCs) in the presence of heat and sunlight. Exhaust from vehicles, industrial emissions, gasoline vapors, and chemical solvents are major sources of nitrogen oxides and VOCs. Ozone (O_3) is a major constituent in smog. *Particulates*, or *particulate matter (PM)*, include dust, soot, dirt, smoke, and liquid droplets suspended in air. Some particulates occur naturally, originating from volcanoes, dust storms, forest and grassland fires; others are manmade, originating as a result of human activities such as the burning of fossil fuels in vehicles, power plants, various industrial processes, fertilizer production and livestock operations.[2] *Carbon monoxide* is a colorless, odorless gas generated from vehicle exhaust, wood burning, forest fires, and manufacturing processes. *Nitrogen oxides* are a group of highly reactive gases. Of particular concern is nitrogen dioxide,

[1] The World Health Organization (2006) estimates that air pollution causes approximately 2 million premature deaths worldwide per year.

[2] Nationally, the concentrations of fine PM (PM2.5) and coarse PM (PM10) have decreased 27 percent and 38 percent respectively over the 2000 to 2009 period (http://www.epa.gov/airtrends/pm.html). Similarly, US concentrations of ground-level ozone have decreased by 30 percent on average from 1980 to 2009 (http://www.epa.gov/airtrends/ozone.html).

Table 3.1 Air quality in the Phoenix Metropolitan Area, 2010

Air Pollution Component[a]	Health Effects[b]	National Ambient Primary Air Quality Standards[c]	Air Quality by Pollutant[d]	Regional Air Quality
Ozone. Chemical reaction between pollutants such as nitrogen oxides and volatile organic compounds in the presence of heat and sunshine.	Breathing problems, trigger asthma, reduce lung function and cause lung disorders.	8-hour Average: 0.075 ppm (2008 Standard) [1] 8-hour Average: 0.08 ppm (1997 Standard) [2] 1-hour Average: 0.12 ppm [3]	4.2	*1.1 ~ Air Quality Grade for the Phoenix Metropolitan Area.[d] *The Phoenix Metropolitan Area (PMA) has averaged 30 days per year with an AQI score greater than 100 over the 1990 to 2007 period.[e]
Particulates. Dust, soot, dirt, smoke and liquid droplets suspended in the air.	Increased risk of cardiovascular and respiratory diseases and lung cancer.	PM 10 Particulate Matter 24-hour Average: 150 µg/m^3 [4] PM 2.5 Particulate Matter Annual Arithmetic Mean: 15 µg/m^3 [5] 24-hour Average: 35 µg/m^3 [6]	1.2 for PM10 3.0 for PM2.5	*PM10 monitoring sites in Southwest-Phoenix averaged 25 violations per year over the 2005–2007 period.[f] *PMA is the most polluted urbanized areas in the U.S. for year-round PM2.5 particle pollution, placing 493,850 elderly and 110,000 children at risk.[b]

Air Pollution Component[a]	Health Effects[b]	National Ambient Primary Air Quality Standards[c]	Air Quality by Pollutant[d]	Regional Air Quality
Carbon Monoxide. Colorless, odorless, non-irritating gas from vehicle exhaust, wood burning, forest fires, manufacturing processes and cigarettes.	Headache, loss of consciousness, difficulty performing complex tasks, aggravation of heart problems.	8-hour Average: 9 ppm (10 mg/m^3) [7] 1-hour Average: 35 ppm (40 mg/m^3) [7]	3.0	*PMA is the 11th most polluted urbanized area in the U.S. for ground-level ozone placing 564,558 individuals living below poverty line at risk.[b]
Nitrogen Dioxides. Highly reactive gases emitted from burning of fuels by vehicles and industrial plants.	Increased symptoms of bronchitis in asthmatic children, increased response to allergens.	Annual Arithmetic Mean: 53 ppb [8] 1-Hour Average: 100 ppb [9]	1.2	* EPA finds that Arizona failed to make a state implementation plan submittal required under the Clean Air Act for the PMA non-attainment area for PM10.[g]
Sulfur Dioxide. Colorless gas with a sharp odor primarily from burning petroleum and coal.	Respiratory tract inflammation, coughing, mucus secretion, aggravation of asthma and chronic bronchitis.	Annual Arithmetic Mean: 0.03 ppm 24-hour Average: 0.14 ppm (365 µg/m^3) [7] 1-hour Average: 75 ppb 0.50 ppm (1,300 µg/m^3) [10]	6.1	
Lead. The main sources of lead emissions are metals-processing facilities.	Damage to liver, kidneys, brain and other organs.	Rolling 3-Month Average: 0.15 µg/m^3 [11] Quarterly Average: 1.5 µg/m^3 [8]	NA	

Notes:

(1) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008).
(2) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(3) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.
(4) Not to be exceeded more than once per year on average over 3 years.
(5) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.
(6) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^{(3}$ (effective December 17, 2006).
(7) Not to be exceeded more than once per year.
(8) The official level of the annual $N0_2$ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
(9) To attain this standard, the 3-year average of the 98th percentile of the daily maximum l-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).
(10) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum l-hour average at each monitor within an area must not exceed 75 ppb.
(11) Final rule signed October 15, 2008

Sources:

(a) Source: http://www.epa.gov/oaqps001/urbanair/. (b) Source: American Lung Association, 2010, available at http://www.lung.org/assets/documents/publications/state-of-the-air/state-of-the-air-report-2010.pdf. (c) Source: http://www.epa.gov/air/criteria.html. Units of measurement for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, milligrams per cubic meter of air ($mg/m^{(3}$), and micrograms per cubic meter of air ($\mu g/m^2$). (d) Source: http://www.homefacts.com/airquality/Arizona/Maricopa-County/Phoenix.html. Rankings are based on a comparison of each specific pollutant, reported at measuring stations across the U.S., where zero is breathable and 10 is outstanding. (e) Source: http://www.greenenvironmentnews.com/State/Arizona/AirQualityIndex. The Air Quality Index (AQI) is calculated by the EPA for reporting daily air quality based on readings from multiple monitoring sites. An AQI score of 100 corresponds to compliance with primary standards; higher scores correspond with increasingly severe health effects. (f) Source: Arizona Department of Environmental Quality, 2008, available at http://www.azdeq.gov/function/forms/download/2008/2008air.pdf. (g) Source: http://www.federalregister.gov/articles/2011/02/14/2011–3027/finding-of-failure-to-submit-state-implementation-plan-revisions-for-particulate-matter-pm-10.

emitted from the burning of fuels by both vehicles and industrial plants, and accounting for the reddish brown layer over many urban areas. *Sulfur dioxide* is another colorless gas, but with a strong noxious odor. The main source of sulfur dioxide is the burning of sulfur-containing fossil fuels like petroleum and coal for domestic heating, power generation and motor vehicles. Finally, *lead* is both naturally occurring and in manufactured products. The main source of lead emissions is metal-processing facilities and motor vehicles.[3]

O_3 and PM are the most widespread air pollutants, and among the most dangerous. In fact, recent evidence shows that the health risks posed by exposure to O_3 and PM are significantly greater than previously thought (American Lung Association (ALA), 2010).[4] Four groups of people are especially vulnerable to the effects of breathing ozone: children and teens, the elderly, people who work or exercise outdoors, and people with respiratory diseases. In their Annual State of the Air Assessment, the ALA (2010) surveyed the latest scientific information and concluded that there is strong evidence that chronic exposure to O_3 leads to premature death, shortness of breath, chest pain when inhaling, asthma attacks, increased susceptibility to respiratory infections and pulmonary inflammation, as well as more frequent use of emergency medical treatment. Similarly, particle pollution is very dangerous to respiratory health. Breathing PM may trigger illness requiring hospitalization, and also result in premature death. In fact, PM can damage the body in ways similar to cigarette smoking, increasing the risks of heart attacks, strokes, and decreased lung function, as well as resulting in reproductive and developmental harm (ALA, 2010). Particularly alarming to both the EPA and state environmental agencies is the potential impact of O_3 and PM on children. Children may be more strongly affected by air pollution because their lungs and bodies are still developing.[5]Additionally, children

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[3] Source: http://www.epa.gov/oaqps001/urbanair/; summary taken from http://www.lifemojo.com/lifestyle/air-pollution-and-health-37464257.

[4] A variety of sources have documented the health consequences of exposure to air pollutants. For a discussion of the Arizona experience, see Arizona Public Health Association (2007).

[5] In a California study of children's health (Peters et al., 1999), initiated in 1992, the authors concluded that children living in communities with higher concentrations of PM had lungs that developed and grew more slowly; children with asthma who were exposed to higher concentrations of PM were much more likely to develop bronchitis; children living in high ozone communities, who actively participated in several sports, were more likely to develop asthma than children in these communities not participating in sports; and days with higher

are also more exposed to air pollution than adults since they breathe faster and spend more time outdoors in strenuous activities.[6]

The Clean Air Act (CAA), which was last amended in 1990, requires the EPA to set national air quality standards (40CFR Part 50) for pollutants considered harmful to public health and the environment. Primary standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly (see Table 3.1). The ambient standards are required by statute to be determined without any consideration given to the cost of compliance. Primary standards are supposed to be set at a level sufficient to protect even the most sensitive members of the population. While the EPA is responsible for defining the ambient standards, the responsibility for ensuring that the ambient air quality standards are met typically falls on state environmental agencies. In Arizona, monitoring networks for ambient air quality have been established to sample pollutants in a variety of representative settings to assess health effects and to assist in determining air pollution sources (Arizona Department of Environmental Quality (ADEQ), 2008). The ambient monitoring networks cover both urban and rural areas of the PMA, and are operated by government agencies and regulated companies. The EPA specifies the monitoring objectives that define the parameters by which health exposure is assessed. All six of the primary criteria pollutants listed in Table 3.1 are monitored.

An air quality grade (AQG) can be constructed by comparing the amounts of criteria pollutants recorded at measuring stations across the US.[7] Grades can vary from 0.0, meaning breathable air quality, to 10.0, indicating outstanding quality. AQGs for the PMA ranged from 1.2 for PM10 to 6.1 for sulfur dioxide (see Table 3.1, column 4). An AQG of 1.2 indicates that 88 percent of the stations around the country are measuring lower amounts of PM10 than in the PMA. Similarly, an AQG of 6.1 indicates that approximately 39 percent of the stations around the country are measuring lower amounts of sulfur dioxide than in the PMA. AQG

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ozone concentrations resulted in significantly higher school absences owing to respiratory illness.

[6] See, for example, the American Academy of Pediatrics Committee (2004) on air pollution and health hazards to children; Woodruff et al. (2008) on air pollution and post-neonatal infant mortality; Gent et al. (2003) on ozone and respiratory symptoms in children with asthma; and Bayer-Oglesby et al. (2005) on air pollution and respiratory health in Swiss children.

[7] See http://www.homefacts.com/airquality/Arizona/Maricopa-County/Phoenix.html.

scores for ozone, carbon monoxide, and nitrogen dioxide were 4.2, 3.0, and 1.2 respectively.

By almost any metric, overall air quality in the PMA is poor. Overall air quality received an AQG score of 1.1 out of 10; that is, based on a comparison of measurements across the nation, 89 percent of monitoring stations are reporting lower amounts overall than in the PMA. Similarly, the EPA calculates an Air Quality Index (AQI) for ozone, particulates, carbon monoxide, sulfur dioxide, and nitrogen dioxide based on readings from multiple monitoring stations in Arizona.[8] From 1990 to 2007, the PMA averaged 30 days per year with an AQI score greater than 100, ranging from a low of 9 days in 2004 to a high of 47 days in both 1998 and 1999.[9] An AQI = 100 implies acceptable air quality. As the AQI rises, a larger percentage of the population is likely to experience increasingly severe adverse health effects. These high-AQI days pose particular risks for sensitive groups, including the elderly, individuals with respiratory illnesses, and children. The ADEQ documents in its 2008 air quality annual report (ADEQ, 2008) that annual exceedances of the PM10 primary standards occurred an average of 24.7 times over the 2005 to 2007 period, reaching a high of 38 times in 2005 in Southwest Phoenix.[10] The ALA in its 2010 state-of-the-air report ranks the PMA as the most polluted urbanized area in the US for year-round PM 2.5 particulate pollution, placing 493,850 elderly and 110,000 children at risk (ALA, 2010, p. 12). Additionally, the report ranks the PMA as the 11th most polluted urbanized region in the US for ground-level ozone, placing 564,558 individuals living below the poverty line at risk (ALA, 2010, p. 11).[11]

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[8] For a discussion of the AQI, see http://en.wikipedia.org/wiki/Air_Quality_Index#United_States.

[9] Source: http://www.greenenvironmentnews.com/state/Arizona/AirQualityIndex.

[10] ADEQ has recently challenged EPA's characterization of year-round particulate levels in the PMA, arguing that reliance on a monitoring site in nearby Pinal County, south of Phoenix, biased the result (see http://ryngargulinski.com/2010/05/04/tucson-tops-list-of-clean-air-cities-phoenix-chokes-at-bottom/).

[11] ADEQ disagrees with this assessment of overall air quality, arguing that O_3 concentrations have shown slight decreasing trends in Metropolitan Phoenix despite O_3 concentrations proving difficult to curb owing to relatively high background levels (ADEQ, 2009, p. 90), and that the PM10 primary standard was met the vast majority of the time with the exception of those cities affected by localized dense emissions on an episodic basis (ADEQ, 2008, p. 91).

Officially, the EPA has classified the PMA as a non-attainment area for coarse PM that measures up to 10 microns in diameter (PM10). For regulatory purposes, the non-attainment area consists of the eastern portion of Maricopa County and includes the cities of Phoenix, Mesa, Scottsdale, Tempe, Chandler, and Glendale as well as 17 other jurisdictions and unincorporated county lands. On February 14, 2011, the EPA took final action to find that Arizona failed to make a State Implementation Plan (SIP) submittal as required under the CAA for the Phoenix non-attainment area for PM10.[12] This action triggers an 18-month clock for mandatory application of sanctions, and a 2-year clock for a federal implementation plan under the Act. Sanctions are designed to ensure an adequate SIP for bringing PM10 emissions into compliance with standards under the CAA.[13] Similarly, the ozone primary standard was revised downward on May 27, 2008 from 0.085 ppm for a three-year, eight-hour ozone concentration to 0.075. Based on ozone trends at monitoring stations in the PMA non-attainment area, compliance with the original standard occurred in every year from 2004 to 2008, but non-compliance was the norm for the new revised standard over the same period.[14]

Clearly, the PMA faces significant challenges in providing clean air in the future, particularly as effective controls relate to both mobile and stationary sources of PM and O_3.[15] In 2005, the top 20 permitted

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[12] Published in the *Federal Register*, available at http://www.federalregister.gov/articles/2011/02/14/2011–3027/find-of-failure-to-submit-state-implementation-plan-revisions-for-particulate-matter-pm-10.

[13] Sanctions can be punitive, allowing the EPA the power to halt the construction of major new or modified pollution sources and to deny federal sewage and transportation grants. Both Senator John McCain and Senator Jon Kyl have expressed in writing to EPA Administrator Lisa Jackson their concern over EPA's disapproval of the plan proposed by the Maricopa Association of Governments to assure compliance, and their denial of the state of Arizona's request regarding PM10 exceptional events (Aug. 30, 2010, formerly available at http:www.azrockproducts.org/wp-content/uploads/2010/08/EPA-letter_Maricopa-Nonattainment_09_30_10.pdf).

[14] Formerly available at http://www.azdeq.gov/environ/air/plan/download/OzoneStakeholderMtgs02–09.pdf. (Last visited Nov. 2010.)

[15] Rule effectiveness (RE) studies are methods designed to assess the success of regulatory rules at controlling their targeted emissions. RE studies incorporate compliance history at regulated facilities and sources, along with agency programs and policies, to ascribe a percentage rate at which the subject rule(s) attains the intended emissions reductions. RE rates in the PMA non-attainment area varied from a low of 49.62 percent for non-metallic mineral processing to a high of 90.94 percent for Title V permitted activities, based on 2008–2009 in section data (2008 Maricopa Co. PM10 Emission Inventory at A3–1, Jun. 2010,

facilities alone released 95,292 pounds of carcinogens into the air across Maricopa County.[16] The PMA also has a large and rapidly growing Hispanic population. As of 2008, population in the PMA had increased to 4,023,132 individuals with Hispanics accounting for 31 percent of the total (Hedding, n.d.). Inevitably, a structural EJ question arises: to what extent, if any, are minority communities disproportionately exposed to hazardous air pollutants owing to the siting of air polluting facilities?

ASSESSING DISPARATE-IMPACT DISCRIMINATION IN THE PMA

A successful EJ administrative complaint provides evidence that a minority or low-income community is suffering from an adverse, disparate, and unjustified impact as the result of facility siting.[17] In documenting a claim of disparate-impact discrimination, however, the intent of facility owners or state agencies is not a determinative issue. Discriminatory impact, not discriminatory intent, is the legal standard. As a result, much of the existing literature on facility siting in minority communities has not addressed the 'intent' issue.[18]

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available at http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx).

[16] See http://scorecard.goodguide.com/ranking/rank-facilities-in-county.tcl?how_many=100&drop_down_name=Total+environmental+releases&fips_state_code=04&fips_county_code=04013&sic_2=All+reporting+sectors.

[17] As explained in Chapter 2, the 'Draft Revised Guidance for Investigating Title VI Administrative Complaints' provides a framework for the EPA to process complaints filed under Title VI of the Civil Rights Act of 1964 (see Revesz, 2008). Under the guidelines, establishing a claim of disparate-impact discrimination requires empirical documentation that an adverse, disparate, and unjustified impact has occurred in an EJ community as the result of state agency decision making. In establishing an adverse impact, attention must be paid both to the proximity to and toxicity of facility exposure (see Ringquist, 1997; and Brooks and Sethi, 1997). In documenting a disparate impact, careful consideration must be given to delineating the geographical extent of the impacted area. Large geographical units may create aggregation errors by grouping neighborhoods with high minority composition together with neighborhoods of low minority composition (see Cutter et al., 1996; and Banzhaf and Walsh, 2008). In evaluating the justification issue, the possibility that agency decision making was necessary to further a public health or economic development goal must be considered (see Been and Gupta, 1997; and Cory and Rahman, 2009).

[18] In a significant departure from preceding studies, Wolverton (2009) provides a careful analysis of the 'intent' issue in plant location decision making.

The present analysis of EJ and disparate-impact discrimination in the PMA proceeds in four steps. In step 1, potential factors influencing the location of TRI facilities in the PMA are explored to determine if a disproportionate number of facilities were sited in or near minority communities. In step 2, the possibility is examined that the siting of TRI facilities partially explains the share of minorities in the surrounding neighborhoods, suggesting that areas surrounding TRIs tend to be growth areas with offsetting economic development benefits. That is, factors influencing the concentration of minority population are examined to infer if adverse disparate impacts from TRI siting, if any, are unjustified. The estimation results generated from steps 1 and 2 shed light on the nature of potentially interdependent relationships between concentrations of TRI sites and minority populations. If these relationships are indeed interdependent, additional challenges are encountered for obtaining correct estimates of respective feedback effects. That is, simultaneous feedbacks between TRI sites and minority concentrations must be examined; otherwise the estimated strengths of associations will be biased, inefficient and inconsistent, leading to potentially misleading conclusions. Thus, in step 3, a simultaneous model, specifying the interdependent relationship between TRI siting and minority population location decisions, is estimated. Finally, from a prospective perspective, the shift in the population is estimated to determine if the minority population in Maricopa County actually migrated toward these TRI sources from 1990 to 2000.

Modeling the Effect of Minority Population on TRI Siting

The goal is to estimate the extent to which siting of TRI facilities (EXPOSURE), defined as emission levels weighted by toxicity (EMISSIONS), is determined by the share of minority population (SHMIN). In this case, the dependent variable of interest is a dichotomous variable, representing the presence or absence of a TRI facility in the community. Given that the EXPOSURE could be determined by a variety other

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It is concluded that race variables are not significant determinants of plant location in Texas, while low income in a community is a significant factor, but acting as a deterrent to facility siting. For systematic surveys of the existing research on facility siting in minority communities, see Mohai and Bryant, 1992; Goldman, 1991; Ringquist, 2005; and Bullard et al., 2007. For studies evaluating EJ, air quality, and siting, see Morello-Frosch et al., 2001; Asch and Seneca, 1978; Boerner and Lambert, 1995; Kriesel et al., 1996; Sadd et al., 1999; and Arora and Carson, 1998.

factors, in order to obtain a reliable estimate of the effect of SHMIN on the EXPOSURE, medium income (INCOME), housing characteristics represented by median rent (RENT) and the share of owned housing units (OWN), educational attainment levels (NO_DIPLOMA, DIPLOMA, DEGREE), population density (DENSITY), and occupation proxy variables to reflect if residents work in the same community where they live (MANUFCTG, COMMUTE), are used as control variables. More formally, the regression model can be written as:

$$EXPOSURE^{*}_{it} = b_0 + b_{00} \cdot DUM2000_{it} + b_1 \cdot MANUFCTG_{it} + b_2 \cdot INCOME_{it} + b_3 \cdot RENT_{it} + \gamma_1 \cdot SHMIN_{it} + u_{1it},$$

Where

$$EXPOSURE_{it} = \begin{cases} 0 \text{ if } EXPOSURE^{*}_{it} \leq 0 \\ 1 \text{ if } EXPOSURE^{*}_{it} > 0 \end{cases} \tag{3.1}$$

Since the dependent variable in (3.1) is binary in nature, it can be estimated as a probit model.[19]

Modeling the Effect of TRI Siting on Minority Location Choices

Here the goal is to estimate the extent to which SHMIN in the community is explained by the presence or absence of a TRI facility (EXPOSURE), while controlling for a variety of community characteristics (namely, the median house value (HV), RENT, OWN, DENSITY, MANUFCTG, and COMMUTE) that may affect minority location choices. More formally, the regression model can be written as:

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[19] A generalized formulation of the probit proposed by Harvey (1976) is used, which includes a correction for heteroscedasticity. This version of the probit accounts for a non-constant variance by specifying the variables, x, suspected to cause heteroscedasticity, z, so that the variance of the error term becomes $Var[\epsilon \mid x, z] = [\exp(z'\gamma)]^2$ (Greene, 2003, p. 680). When $\gamma = 0$, there is no heteroscedasticity and the standard probit model is obtained. Additionally, in an attempt to mitigate the simultaneous equations bias, right-hand-side variables are lagged. The binary dependent variable, EXPOSURE, measures the presence-(Exposure = 1) or absence of exposure from 1995 and the explanatory variables are from 1990.

$$SHMIN_{it} = c_0 + c_{00} \cdot DUM2000_{it} + c_1 \cdot OWN_{it} + c_2 \cdot DENSITY_{it} + \gamma_2 \cdot EXPOSURE^*_{it} + u_{2it}, \quad (3.2)$$

Where i represents households ($_i$ = 1, 2, … , 2105), t represents year ($_t$ = 1990, 2000), b_0, b_{00}, b_1, b_2, b_3, c_0, c_{00}, c_1, c_2, γ_1, γ_2 are parameters to be estimated, u_{1it} and u_{2it} are disturbance terms, and $DUM2000$ is an indicator for year 2000.

Since the dependent variable in (3.2) is continuous, it can be estimated as a linear regression model.[20, 21]

Estimating equations (3.1) and (3.2) separately provides the basic framework for the empirical piece of the EJ argument, but, given that the relationship between TRI siting and minorities may be interdependent, a joint (or simultaneous) estimation of both equations will produce unbiased estimates of the parameters.[22] Thus, the structural model given in equations (3.1) and (3.2) is simultaneous with an unobservable endogenous variable

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[20] Usually when the dependent variable is bound between 0 and 1, as it is here, a log of odds ratio model would be best. However, since in this sample there are communities that have both 0 and 100 percent minority populations, the log of odds ratio model is undefined. An alternative is to use a two-limit Tobit model. A total of 296 block groups, representing 7 percent of the sample, have no minorities. Additionally, 38 block groups, representing 0.90 percent of the sample, are inhabited only by minorities. A two-limit Tobit model is not used because it severely complicates the estimation of the simultaneous model presented later and the benefits of using a Tobit in this case may not be high.

[21] Heteroscedasticity is a likely problem in cross-sectional data like that used in the present study. To check for heteroscedasticity, Bruesch-Pagan-Godfrey LM test statistics are calculated. The calculated test statistics of 274.47 and 190.17 for 1990 and 2000 data, respectively, are bigger than the critical value of $X^2_{.05}$ (3) = 7.815 indicating the presence of heteroscedasticity. Therefore, a Feasible Generalized Least Squares (FGLS) procedure is used for estimating model parameters. As in the probit model, potential endogenous variables, EXPOSURE and EMISSIONS, are lagged to mitigate problems of simultaneous bias. The dependent variable, SHMIN, is the minority shares for year 2000 and EXPOSURE and EMISSIONS are for year 1995.

[22] Using least squares to estimate the parameters in the equations separately could result in inconsistent estimates because the variables on the right-hand side are endogenous and correlated with the disturbance terms (Greene 2003). The use of lagged variables in the previous two models does mitigate the effect of endogeneity; however, the joint model better addresses the endogeneity problem while also accounting for contemporaneous correlation between u_1, and u_2.

on the right-hand side of (3.2).[23] Therefore, estimation of these equations must account for simultaneity bias and possible correlation between u_1 and u_2 in order to obtain consistent and efficient parameter estimates.[24]

Modeling the Migratory Effects of Pollution

A fourth and final model is estimated to measure the shifts in population from 1990 to 2000 in an attempt to answer the question posed by Been and Gupta (1997) and also explored by Banzhaf and Walsh (2008): Are racial and ethnic minorities migrating toward the pollution? Changes in community composition are examined by regressing the change in the minority population from 1990 to 2000 (DMIN) on the change in pollution from 1990 to 1995 (DEMISSIONS, ENTRANCE, EXIT, EXPOSURE90), while controlling for the effects of the changes in the housing values (DHV, DRENT), population density (DDENSITY) and employment variables (DMANFG, DCOMMUTE).[25] The regression model is estimated by a Feasible Generalized Least Square (FGLS) method. A list of all variables and their definitions is presented in Table 3.2.

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[23] A simultaneous model with observed binary variable, EXPOSURE, instead of unobservable EXPOSURE*, on the right-hand side of (3.2) is internally inconsistent and cannot be estimated unless $\gamma_1 = 0$ or $\gamma_2 = 0$. See Maddala, 1983, pp. 117–18.

[24] Appendix 3, developed by Professor Satheesh Aradhyula in the Department of Agricultural and Resource Economics at the University of Arizona, provides the interested reader with details of this estimation procedure. Also see Greene, 2003, pp. 378–82.

[25] Again the Breusch-Pagan-Godfrey LM test is conducted; the test statistic is 16.73 and the critical value for $X^2_{.05}$ (3) = 7.815; therefore, reject the null of homoscedasticity and proceed with FGLS as an OLS model would be misspecified. Additionally, as Banzhaf and Walsh (2008) note, if polluters are indeed making discriminatory siting decisions, measuring a shift in the minority population that is spurred by pollution may cause endogeneity problems; therefore, the pollution variables for 2000 (DEMISSIONS, ENTRANCE, EXIT) are lagged to 1995 levels. Although the lagging will not completely eliminate the problems of endogeneity, it does mitigate the effects of endogeneity on the parameter estimates.

Table 3.2 Variables definitions

COMMUTE	Percentage of people in a community who commute 15 minutes or less to work.
DEGREE	Share in each community whose highest level of education is a bachelor's degree.
DELTA "D"	Calculated by subtracting the 1990 data from the 2000 data.
DENSITY	Total population for each block group divided by the total square miles for each block group.
DIPLOMA	Share whose highest level of education is a high school diploma.
EMISSIONS	The hazard score is calculated by the EPA's RSEI model and weights emissions by multiplying the annual pounds released by a risk score.
ENTRANCE	A dummy variable taking the value of "1" if a community has gone from not exposed in 1990 to exposed in 1995.
EXIT	A dummy variable taking the value of "1" if the block group has gone from exposed in 1990 to not exposed in 1995.
EXPOSURE VARIABLES	A dummy where a "1" indicates the community is exposed to a TRI within one mile and a "0" otherwise for 1990, 1995, and 2000.
HV	Median self-reported house value for each community.
INCOME	Median household income for each block group.
MANUFCTG	Share of people in the workforce in each community who work in the manufacturing industry for both durable and non-durable goods.
NO_DIPLOMA	Share of people in each block group over the age of 25 who have completed some high school but have not received a diploma.
OWN	Percentage owning their home out of total occupied housing units.
POVERTY	Percentage of people living below the poverty level in a block group.

RENT	Median rent paid for renter occupied housing in a block group.
SHMIN	Share of each minority (African American, Native American, and Hispanic) is summed for each block group for 1990 and 2000.

Note: DINCOME, DHV, and DRENT are calculated using the implicit price deflators for GDP as provided by the Bureau of Economic Analysis using Table 1.1.9. Formerly available at http://www.bea.gov/bea/dn/nipaweb/TableView.asp?SelectedTable=13&FirstYear=1988&LastYear=2006&Freq=Qtr. (Last visited on Jul. 16, 2006.)

Source: Burns (2005).

The Data

Data on demographic and socioeconomic characteristics at the block group level for the PMA has been obtained from the US Bureau of the Census (1990 and 2000), and environmental quality data comes from the TRI compiled and maintained for the public by the EPA. While EJ is concerned with both racial and ethnic minorities as well as low-income communities, race is the principal focus of this chapter since it is highly correlated with poverty and is consistent with much of the EJ literature. Also, since Hispanics comprise almost all of the minority population in Maricopa County where Native Americans and African Americans account for only 2 percent and 3 percent respectively, the three populations are grouped together to represent the overall minority population share.

Community definitions

In this study, a community is defined as a US census block group. The use of larger geographic units such as census tracts runs the risk of creating aggregation error by grouping neighborhoods with high minority composition together with neighborhoods of low minority composition. Analysis at the block group level is preferable since the refined definition of community will provide more precise estimates of the structural parameters in equations (3.1) and (3.2).[26]

[26] One drawback of using either block group or census tract as a community definition is variation in size. For example, in Maricopa County in 2000, the block groups range from about 0.08 square miles to 1,675 square miles, making it difficult to account for the 'large degree of heterogeneity when estimating

One problem with using block groups is the shifting of block group boundaries from decennial census to decennial census, making it difficult to compare community characteristics across time periods. To solve the problem, Geolytics developed the Neighborhood Change Database (NCDB),[27] which aggregates the 1990 US census block group and census tract boundaries to the 2000 levels. Using Geolytics' NCDB package, there are a total of 2,113 block group communities for both 1990 and 2000 in Maricopa County after the boundary adjustment.

Figures 3.1 and 3.2 provide maps of Maricopa County including the block group boundaries aggregated to the 2000 levels. The maps are overlaid with the mean percentage of Hispanics per each block group for 1990 (Figure 3.1) and 2000 (Figure 3.2), and the top 25 polluting TRI facilities for each time period.[28] It is clear from the maps that communities with high percentages of Hispanics also tend to be in close proximity to a major TRI facility. Interestingly, a comparison of the maps suggests that the areas with TRI facilities became more Hispanic from 1990 to 2000.[29]

TRI and emission levels

The EPA's TRI is used in this study as a measure of environmental quality. The TRI was developed by the EPA in 1987, under the umbrella of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA).[30] The EPCRA requires facilities releasing significant amounts of various chemicals each year to report to the EPA. A database on these releases was subsequently initiated that is available to the public. Since the TRI is not a static program, new chemicals and industries have been added to the list of reporting requirements since its inception in 1987. For the empirical work that follows, only the 1988 required core chemicals were used as a measure of pollution to maintain consistency in reported

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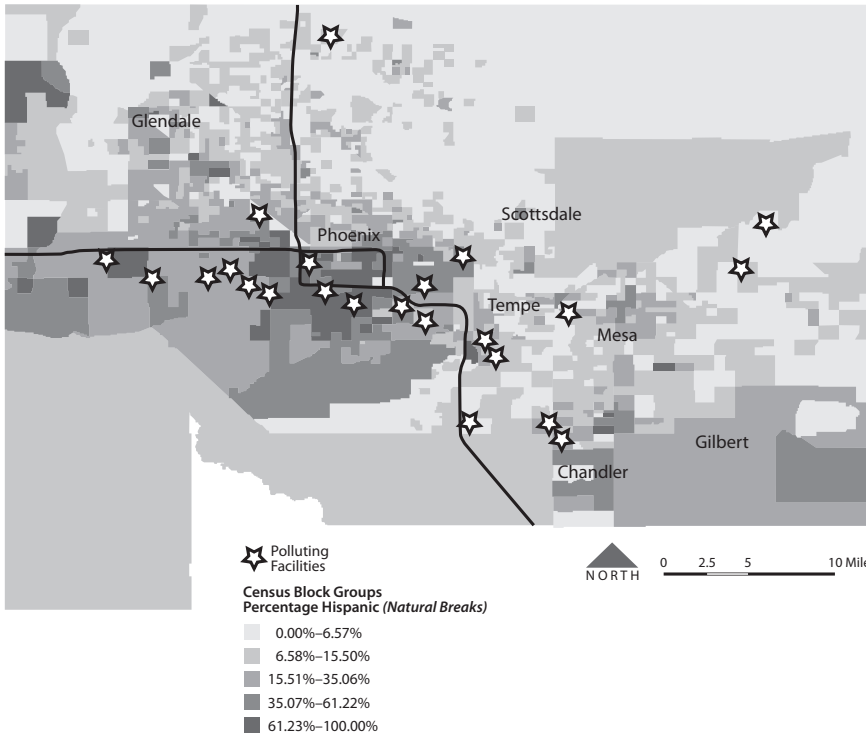
migration models' (Banzhaf and Walsh, 2008, p. 10). In 2000, population ranged from 0 to 14,658 people per block group with a mean of 1,454.

[27] For more information on the NCDB see http://www.geolytics.com. (Last visited Jul. 16, 2006.)

[28] There were 125 TRI facilities in Maricopa County in 1990 and 122 in 2000. Hazard scores, explained later, are used to identify the top 25 polluting facilities.

[29] Among only the 'exposed' communities, the share of Hispanics increased from 1990 to 2000 by about 15 percent, a rate 5 percent higher than the rest of the county. In 2000, the mean income among exposed communities was $42,029, 13.7 percent below the county mean, and the share of people living below the poverty level was 5 percent above the county average.

[30] See http://www.epa.gov/tri/triprogram/whatis.htm for a link to a fact sheet.



Source: Burns (2005)

Figure 3.1 Top 25 TRI facilities, 1990

chemicals from 1990 to 2000. There were 125 TRI facilities in Maricopa County in 1990, 99 facilities in 1995, and 122 facilities in 2000.

In order to measure a facility's impact on communities more accurately, emissions have been weighted by toxicity using the EPA's Risk-Screening Environmental Indicators[31] (RSEI) model, which works in conjunction with the TRI. The RSEI assigns a 'hazard score' to a facility's emissions by accounting for not only the amounts of chemicals released, but also for the environmental concentrations resulting from releases, doses that people receive from those concentrations, the relative chronic toxicity of those doses and the number of those affected.

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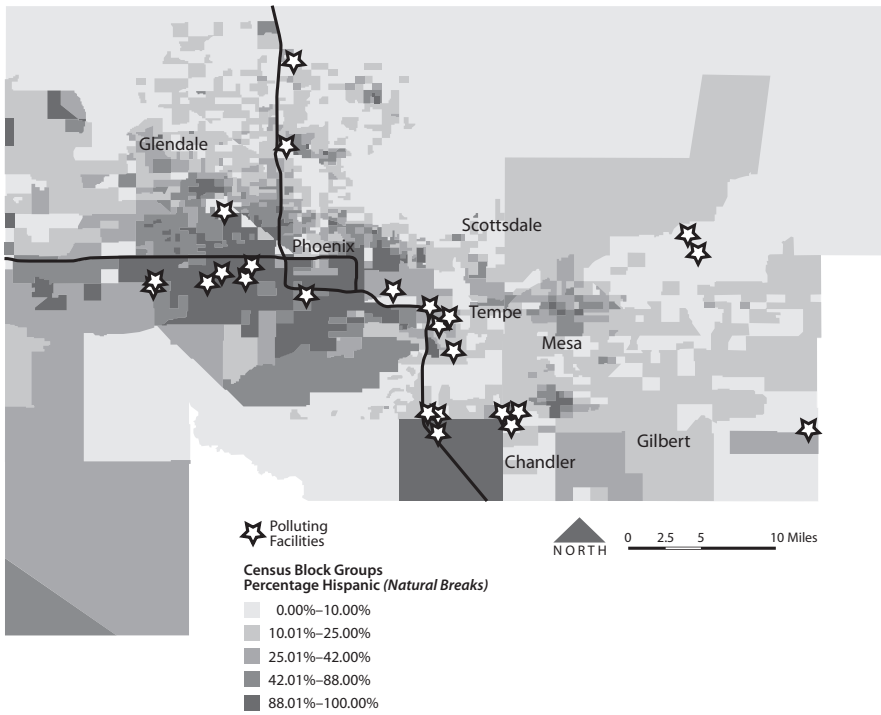
[31] Information on the RSEI model can be found at http://www.epa.gov/oppt/rsei/.



Source: Burns (2005)

Figure 3.2 Top 25 TRI facilities, 2000

In order to measure exposure not only of the communities hosting a TRI facility, but also of the surrounding communities that may also be exposed, a one-mile radius is constructed around each TRI facility.[32] To construct the buffers around each facility, first, using Geolytics' software, the latitude and longitude coordinates are entered for a facility.[33] Then a one-mile radius is drawn around that point source of pollution. This is done one facility at a time for 1990, 1995,[34] and then again for 2000. Any

[32] Banzhaf and Walsh (2008) similarly use a one mile then half mile radius 'buffer' around facilities and found no significant difference between the two.

[33] The longitude and latitude coordinates are provided for each facility on the TRI and they have been cross-checked and corrected for the RSEI model.

[34] Exposure at the 1995 level was calculated to capture a lagged effect when examining the population change from 1990 to 2000.

block group that is captured in that radius is considered 'exposed' and assigned a '1' for the exposed indicator variable.

Next, emissions levels are assigned to each community. In order to 'weight' the emissions for each community so that communities that are only exposed by a fraction are assigned fewer emissions than one that is entirely exposed, a variation of the above method is used. This time, instead of using the block *groups* that are captured in the one-mile radius, the smaller units of blocks are used. Since blocks are typically much smaller than block groups, when the radius is constructed around the facility many blocks are captured in that radius, as opposed to only three or four block groups. Each block can then be matched to its block group. Exposure at the block group level is then calculated by summing the total square kilometers for each block exposed in the group and dividing it by the sum of the area of all exposed blocks within the radius of the facility. That fraction is then multiplied by the hazard score for that facility. This is repeated for each facility and for each time period. Hazard scores are summed for block groups exposed to multiple sources, so that the emissions for block group m (B_m) is given by:

$$B_m = \sum_{i=1}^{125} \left(T_{mi}/T_i\right) \cdot S_i; \quad m = 1, 2, \ldots, 2105 \tag{3.3}$$

Where T_{mi} equals the total area of blocks in group m exposed to facility i, T_i equals the total area of all blocks exposed to facility i, and S_i equals the hazard score for facility i.

Table 3.3 presents the descriptive statistics of the community characteristics discussed in the preceding sections.

Results

The estimation results for equation (3.1) are presented in Table 3.4. The estimation reveals that the concentration of minority population (SHMIN) is positively and significantly related to EXPOSURE, which is consistent with much of the EJ literature.[35] There is also a positive and significant association between the share of the workforce employed in the manufacturing industry and TRI siting, indicating that TRI plants may use the existence of the manufacturing industries as an indicator of the general acceptability of TRI sitings in the community. Also, the existence of a

[35] The estimation results presented in this section were first reported in Burns (2005).

Table 3.3 Descriptive statistics for 1990 and 2000 block groups

Label	Summary for 1990		Summary for 2000	
	Mean	Std Dev	Mean	Std Dev
SQKILO	11.28	137.79	11.28	137.79
POPULATION	2007.66	46,137.3	2906.48	66793.43
DENSITY	4472.75	3572.3	5738.33	4307.70
SHWHITE	.833	.222	.764	.205
SHBLACK	.031	.068	.036	.055
SHNATIVE	.017	.060	.019	.054
SHASIA	.015	.026	.022	.0333
SHHISP	.152	.189	.249	.247
SHMIN	.200	.231	.303	.276
INCOME	33.5	18.18	47.8	23.9
POVERTY	.118	.135	.121	.130
OWN	.645	.300	.669	.295
RENT	5.27	2.59	7.43	3.65
HOUSEVALUE	85.1	54.6	122.8	92.2
EMISSIONS	731	26,613	34,298	538,719
EXPOSURE (0,1)	0.20	0.40	0.25	0.44
MANUFCTG	.138	.080	.112	.071
COMMUTE	.251	.139	.236	.119
NO_DIPLOMA	.118	.085	.108	.083
DIPLOMA	.266	.115	.232	.097
DEGREE	.151	.113	.155	.109
Delta Variables 1990–2000				
DMIN			.089	.161
DDENSITY			1266	2119
DRENT			.391	4.11
DHV			9.21	64.56
DMANFG			–.026	.091
DCOMMUTE			–.015	.149
DEMISSIONS			16287	354,035
ENTRANCE			0.04	0.20
EXIT			0.07	0.25

Note: Block groups (BGs) are the next level above census blocks in the geographic hierarchy. A BG is a combination of census blocks whose numbers begin with the same digit in a given census tract or BNA; for example, BG 3 includes all census blocks numbered in the 300s. The BG is the smallest geographic entity for which the decennial census tabulates and publishes sample data. It has now largely replaced the earlier enumeration district (ED) as a small-area geographic unit for purposes of data presentation (see http://www.census.gov/geo/www/GARM/Ch11GARM.pdf.).

Source: Burns (2005).

Table 3.4 Maximum likelihood estimates of probit model for TRI siting impacts

Variables	Estimates	Standard error	t value	Marginal effects
SHMIN	0.673**	0.267	2.520	0.423
OWN	–0.2180*	0.121	–1.800	–0.137
RENT	0.126**	0.058	2.160	0.079
RENTSQ	–0.007	0.005	–1.430	–0.004
INCOME	–0.003	0.003	–1.010	-0.002
DENSITY	–0.003	0.006	–0.420	–0.002
NO_DIPLOMA	0.200	0.327	0.610	0.126
DIPLOMA	0.228	0.255	0.890	0.143
DEGREE	0.878*	0.515	1.710	0.552
MANUFCTG	1.129**	0.577	1.960	0.710
COMMUTE	0.248	0.148	1.670	0.156
CONSTANT	–1.345**	0.378	–3.560	

Note: The dependent variable is EXPOSURE for year 1995 **Statistically significant at the 5% level or better. *Statistically significant at the 10% level. The explanatory variables are for 1990 to mitigate possible simultaneous equation bias.

Source: Burns (2005).

higher rate of employment in manufacturing is positively and significantly related to TRI siting, indicating that firms may be taking advantage of agglomeration economies in the labor pool.

The relationship between low-income communities and TRI siting is suggestive but not demonstrative. As expected, income has a negative relationship with a facility's presence, but the relationship is statistically insignificant. Regarding the role of rent in the determination of TRI siting, evidence is in favor of a linear but positive relationship. That is, the median rent in a community has a statistically significant positive effect on the likelihood of TRI siting in a community. This result is contrary to Been and Gupta's (1997) finding that TSDFs were often sited in working class neighborhoods but were actually repelled by very poor areas that lack the infrastructure to support such a facility.[36]

[36] Another interesting and unexpected result comes from the educational attainment variables. A 5.5 percent increase in residents with college degrees increases the probability of exposure by 10 percent; whereas the other educational attainment variables proved to be insignificant predictors of exposure.

Since there are many considerations taken into account when siting a facility, and they are not all represented here, it is inappropriate to conclude that these siting decisions were made in a discriminatory fashion, either by the owner/operators of the facility or by the relevant permitting agencies. The results do suggest, however, that the relationship between high concentrations of minority residents and TRI siting is statistically significant and positive, even when controlling for income, occupation, and education.

The results of estimated equation (3.2) are presented in Table 3.5. An adjusted R^2 of 0.446 for a model based on cross-sectional data is relatively high, suggesting that the concentration of minority population in a community is well explained by the selected explanatory variables.[37] The results in Table 3.5 support the contention that the presence of a facility is a statistically significant and positive factor in the determination of the share of minorities in a community since the presence of a TRI facility is associated with approximately a 9.5 percent increase in the minority population share. Interestingly, the level of emissions is not significant, indicating that the mere presence of a facility, regardless of the hazard level or amount it is emitting, is a predictor of a higher-minority share in a community.[38] The share of people working in communities or neighboring communities (COMMUTE) is also a significant predictor of increased minority share just as it predicted TRI siting decisions in the probit model. Additionally, the share of those in manufacturing jobs is positive and significant, which provides support for the proposition that those jobs are close to home for minority residents. These results provide further evidence for conclusions posited by Been and Gupta (1997) who argue that the employment benefits of a TSDF may offset some of the costs.[39]

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[37] The R^2 could be improved with the addition of variables capturing other attributes of a community that make it attractive to racial and ethnic minorities like proximity to bilingual schools and churches, or to public transportation. A survey of people in the region would best capture other reasons for choosing one community over another like sentimental attachment, family connections, or common language among community residents.

[38] Banzhaf and Walsh (2008) found similar results in their California study.

[39] As expected, housing values, rent, and share of homeowners in a neighborhood (HOUSEVALUE, RENT, OWN) are all negative and significant indicators of minority share, indicating that there is a significant relationship between community property values and minority location decision making.

Table 3.5 FGLS estimation reversing the causality

	2000		
Variables	Estimates	Standard error	t value
EXPOSURE	0.096**	0.012	8.13
EMISSIONS	–1.92E-12	1.30E-11	–0.15
HOUSEVALUE	–3.43E-04**	4.83E-05	–7.11
RENT	–0.022**	0.001	–19.1
OWN	–0.100**	0.019	–5.18
MANUFCTG	0.534**	0.057	9.38
COMMUTE	–0.123**	0.035	–3.49
DENSITY	0.015**	0.001	13.24
CONSTANT	0.391**	0.020	19.7
R-Squared			0.4461
Observations			2105

Note: The dependent variable is SHMIN. ** Statistically significant at the 5% level or better.

Source: Burns (2005).

The results from the joint model, shown in Table 3.6, confirm many of the results from the previous two models. Additionally, there is statistically significant evidence of an interdependent relationship between the minority community and TRI facilities. Exposure is a strong, positive predictor of minority share at the 99 percent level, and minority share is also a positive, significant predictor of exposure. Homeownership and rent maintain their negative relationship with minority share, as does income with exposure – all at the 5 percent level of significance. High shares of manufacturing jobs continue to be positively correlated with exposure, again at the 5 percent level of significance, and minorities maintain a positive relationship with population density. These results support the contention that the decision to build a plant and the decision to reside in a particular exposed community are not isolated, but an interdependent system of preferences that influence each other.

Results from the migration equation are presented in Table 3.7. The results provide evidence that when a facility entered a community in 1995 that was previously not exposed, the share of minorities subsequently increased by nearly 3 percent in 2000. The opposite is true if a

Table 3.6 Maximum likelihood estimates of the simultaneous model

Variable	Estimate	Standard error	t value
TRI siting equation (probit model, dependent variable: EXPOSURE):			
INTERCEPT	–9.295E-01**	1.071E-01	–8.676
DUM2000	2.293E-01**	1.044E-01	2.196
MANUFCTG	1.100E-02**	5.492E-03	2.004
INCOME	–4.614E-03**	2.333E-03	–1.977
RENT	–1.461E-04**	7.430E-05	–1.966
SHMIN	9.237E-03**	4.532E-03	2.038
Share of minorities equation (dependent variable: SHMIN):			
INTERCEPT	5.631E+01**	4.268E+00	13.194
DUM2000	–6.485E-01	3.084E+00	–0.210
OWN	–3.740E-02**	1.767E-02	–2.117
DENCITY	5.233E-04**	2.291E-04	2.284
EXPOSURE*	4.481E+01**	5.454E+00	8.215
Value of Log-likelihood	–17151.9		
Sample Size	4226		

Note: ** Statistically significant at 5% level.

Source: Burns (2005).

community switched from exposed to not exposed – when a TRI facility exited a community in 1995, the share of minorities in that area decreased over 3 percent by the year 2000. Given exit or entry into a community, the share of minorities in a community tended to decrease as the level of emissions adjusted for toxicity increased, while lower housing values and rents were negative and significant indicators of a change in minority share. Finally, employment variables were positive as expected but not significant. Recall from the first two models that a high percentage of manufacturing jobs and a high percentage of workers with a short commute in a community were significantly correlated with both TRI facilities and high concentrations of minorities. When modeling the change in community composition, however, these employment considerations exert a statistically insignificant influence on location decision making.

Table 3.7 FGLS estimation of the migration effects

Variables	Estimates	Standard error	t value
DEMISSIONS	–1.64E-06**	4.54E-07	–3.610
ENTRANCE	2.804*	1.651	1.700
EXIT	–3.344**	1.557	–2.150
EXPOSURE90	4.086**	0.989	4.130
DHV	–0.027**	0.006	–4.630
DRENT	–0.654**	0.136	–4.820
DDENSITY	2.284**	0.160	14.260
DMANFG	2.988	3.684	0.810
DCOMMUTE	1.314	2.146	0.610
CONSTANT	5.752**	0.441	13.050
R-squared			0.1082
Observations			2105

Note: The dependent variable is DMIN. **Statistically significant at the 5% level or better. *Statistically significant at the 10% level.

Source: Burns (2005).

Conclusions

This chapter uses a simultaneous equations model for jointly examining the EJ implications of TRI facility siting and concentrations of minority population. Two conclusions emerge from this empirical work. First, TRI facilities in Maricopa County have been disproportionately located in areas with high minority concentrations; that is, the hypothesis that TRI facility siting has resulted in an adverse and disparate impact on minority communities cannot be rejected. Second, the presence or addition of a TRI facility increased the minority share in a community by nearly 10 percent. Additionally, communities with TRI facilities tended to have a higher share of people in the workforce who worked in the manufacturing industry for both durable and non-durable goods, and had a higher percentage of people who commuted 15 minutes or less to work. These results support the proposition that areas surrounding TRI facilities tend to be growth areas with the costs of increased exposure being offset to some extent by economic development benefits. That is, the assertion that the adverse disparate impacts generated by TRI siting are justified

(i.e., that TRI siting promoted the proper public purpose of economic development) can also not be categorically rejected. The extent of this offset, whether partial or total, is not addressed.[40]

POLICY IMPLICATIONS

A central theme of environmental justice is concern over the disproportionate exposure of low-income and minority communities to environmental risks. In the context of siting potentially polluting facilities, complainants can seek prospective relief through the EPA's administrative complaint process. To prevail, it must be shown that approval of a siting application would subsequently result in adverse, disparate, and unjustified impacts on surrounding community residents. In the case of the PMA, the available evidence suggests that recent TRI facility siting has resulted in adverse, disparate, but justified environmental impacts on surrounding Hispanic communities. To the extent these findings are representative of siting impacts elsewhere,[41] a comprehensive policy challenge exists: How should siting applications be evaluated when both heightened environmental risks and economic development benefits are likely to be created? In Chapter 5, the response to this policy challenge by both the EPA and ADEQ is documented and evaluated, and the implications for cooperative federalism explored.

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[40] Data is not available to fully evaluate minority decision making with respect to locating in TRI areas since literally hundreds of considerations could potentially play a role. Nevertheless, it is clear from the evidence presented here that the 'justification' issue in establishing an EJ claim cannot be ignored in this setting since the promotion of economic development is a proper public purpose for complaint purposes. See Chapter 2 for a discussion of documenting an unjustified impact.

[41] Banzhaf and Walsh (2008) in their detailed and site-specific analysis of TRI sites in California, as well as Been and Gupta (1997) in their national and census tract analysis of TSDF sites, report similar findings that suggest benefit/risk tradeoffs may characterize many facility-siting proposals. For a case-study discussion of a siting controversy in Louisiana involving economic development benefits and environmental risk tradeoffs, see Shrader-Frechette (2002, pp. 74–92).

4. Environmental justice and enforcement of the Safe Drinking Water Act: the Arizona arsenic experience*

INTRODUCTION

The process of implementing and enforcing environmental standards is complex. Regulatory agencies are simultaneously monitoring the behavior of hundreds of potential violators; determining which violators to prosecute and whether to pursue violations at the administrative, civil, or criminal levels; and constantly adjusting monitoring and prosecutorial procedures to changing economic and technological conditions. Somewhat surprisingly, it has been well documented that enforcement is selectively exercised; that is, enforcement is exercised in ways that vary dramatically from the conventional prescriptions of economic deterrence theory. Violators are frequently not pursued at all or are pursued with expected penalties that are inconsequential compared to the cost of compliance (Harrington, 1988). This reliance on selective enforcement is now well understood. By realistically accounting for institutional and resource constraints, efficiency justifications for selective enforcement can be cogently established. Both dynamic enforcement considerations and penalty leveraging (Harrington, 1988),[1] as well as spatial enforcement considerations and regulatory

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[1] One efficiency justification for selective enforcement is based on the idea of creating 'penalty leverage' to encourage the regulated community to comply with environmental requirements. The rationale is based on a dynamic game-theoretic model of enforcement and compliance when penalties are restricted. The strategy is to divide the regulated community into two groups: a group that was in compliance with the last inspection and a second group that was not. This state-dependent enforcement regime then creates additional compliance leverage. Agents in the non-compliant group now have two incentives to come into

dealing (Heyes and Rickman, 1999),[2] provide an efficiency basis for allowing regulatory agencies' wide latitude in sanctioning violations of environmental law.

The provision of safe drinking water provides a dramatic example of the inherent complexity involved with the implementation and enforcement of new environmental standards.[3] The SDWA requires the US EPA to set national standards that protect human health and then requires public water systems (PWSs)[4] to meet these standards. More than 160,000 PWSs must implement these standards whether they supply

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compliance: (1) avoiding the maximal sanctions imposed on repeat offenders; and (2) receiving possible reinstatement into the compliant group. In essence, prosecutors use a 'carrot-and-stick' approach to enforcement, the threat of harsh sanctions coupled with the bribe of reinstatement.

[2] Prosecutors must also be concerned with the spatial dimensions of enforcement. Frequently a regulatory agency interacts with regulated agents in more than one enforcement context. Examples would include multi-plant firms, firms with branches in several geographical regions, or firms that are subject to multiple regulatory regimes such as air, water, and noise requirements enforced simultaneously. Given restricted penalties and limited enforcement resources, maximal enforcement will not necessarily result in maximal compliance. That is, in regulating 'repeat players,' strategic tolerance of non-compliance in selected areas may improve aggregate performance. Such an approach to enforcement is known as 'regulatory dealing', the policy of tolerating non-compliance in some contexts to induce increased compliance in others. As a result, the infrequent imposition of significant sanctions is not necessarily a sign of lax enforcement. Bargaining between regulatory officers and polluters is a necessary component of efficient enforcement when both enforcement penalties and resources are constrained. In fact, having the discretion to not maximally sanction a violation may become a major enforcement resource (Babbitt et al., 2004).

[3] For an overview, see Scheberle (2004).

[4] A PWS is defined as having at least 15 service connections or serving at least 25 people per day for 60 days annually. A PWS can be publicly or privately owned, but the SDWA applies to all systems that satisfy the basic definition of a PWS. In addition to PWSs, there are a number of other classifications of water systems that are regulated under the SDWA. A community water system (CWS) is a PWS that serves the public on a year-round basis. There are roughly 54,000 CWSs in the US. A non-community water system (NCWS) is a PWS, but does not serve the public on a year-round basis. A non-transient non-community water system (NTNC) is a PWS that serves the public for at least six months of the year, but not year-round. There are roughly 20,000 NTNCs in the US. Finally, a transient non-community water system (TNC) has fewer than 15 service connections or serves fewer than 25 residents for six months or more annually, but not year-round. There are roughly 89,000 TNCs in the US. See http:// http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm.

drinking water to a few dozen taps or a few million. According to data from the Safe Drinking Water Information System, 42,000 health-based or significant monitoring violations of the SDWA occurred in 2000 (US EPA, 2000a).

Though the law provides for civil and criminal penalties, rarely do states move to formal sanctions. Instead, a series of warning letters, visits, or telephone calls is used to remind drinking water suppliers of regulatory obligations.[5] This process of selective enforcement is neither surprising nor covert. The regulated community has consistently argued for flexibility in the design of enforcement activities, arguing for such options as authorizing formal enforcement action only when a water system is in significant non-compliance; giving states exclusive enforcement authority; establishing compliance provisions that reflect the analytical error associated with each contaminate; enabling water systems to raise affordability as an affirmative defense in an enforcement action; and making variances or exemptions more compatible with the needs of water suppliers facing legitimate economic or technological impediments to achieving compliance (Regnier, 2002). In response to these concerns, the EPA has highlighted the need for strong flexible partnerships with state and local governments for implementation in recognition of the cumulative cost burden that SDWA regulations are placing on PWSs.[6]

Over the past decade, concerns over EJ have made the enforcement of environmental law even more complex.[7] In the context of selective enforcement of the SDWA, EJ concerns may arise in one of two ways:

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[5] In fact, several General Accounting Office (GAO) studies have identified ongoing deficiencies in state programs, including a finding of failure to take timely and appropriate enforcement actions against significant non-compliers (see for example, US GAO, 1990).

[6] In 1995, EPA estimated that total infrastructure need nationwide for the next 20 years was $200.4 billion (adjusted to 2007 dollars). Four years later, the EPA projected the need at more than $198.2 billion (2007 dollars). In 2007, the EPA conducted the fourth *Drinking Water Infrastructure Needs Survey and Assessment* (US EPA 2009a). The results indicated a 20-year capital investment need of $334.8 billion. (Fact sheet available at http://water.epa.gov/infrastructure/drinkingwater/dwns/factsheet.cfm.)

[7] President Clinton signed Executive Order 12898 on February 11, 1994, officially acknowledging the gravity of an environmental issue that had been stirring in the media and public policy community over the past decade. The Executive Order required federal agencies to develop a plan within the year 'that identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies and activities affecting minority and low-income communities.'

(1) failure to enforce compliance with water quality standards may deny consumers the health benefits associated with less contaminated water;[8] or (2) forcing compliance may secure health benefits but at prohibitive cost.[9] The extent to which EJ considerations further complicate SDWA enforcement depends directly on the extent to which minority and/or low-income populations are disproportionately served by PWSs struggling to comply with new water quality standards.[10]

THE REVISED ARSENIC DRINKING WATER STANDARD

The SDWA was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply.[11] The SDWA authorizes the EPA to set national health-based standards for drinking water to protect against both naturally occurring and manmade contaminants that may be found in drinking water. These standards are referred to as National Primary Drinking Water Regulations (NPDWRs). The SDWA applies to all PWSs in the US.

The responsibility for implementing and enforcing the regulations of the SDWA falls to the EPA if a state has not applied for and received primacy. State primacy, in turn, is the authority to implement the SDWA within their jurisdictions, if states can show that they will adopt standards at least as stringent as the EPA's and ensure that water systems will

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[8] Specifically, according to the EPA, the value to consumers of a reduction in the risk of adverse health effects (of arsenic exposure) includes the following components: (1) the avoidance of medical costs and productivity loss associated with illness; (2) the avoidance of pain and suffering associated with illness; (3) the losses associated with risk and uncertainty of morbidity; (4) the reduction in risk of premature mortality (US EPA, 2000a).

[9] The cost per household of safe drinking water is almost four times higher for small systems than for large systems. Small systems lack the economies of scale that allow large systems to spread the costs associated with infrastructure improvements or SDWA regulations among their many customers. Each household serviced by a small system could pay more than $3,000 in addition to its regular water bill, and EPA reports that as a conservative estimate because it does not include proposed or recently promulgated regulations (Scheberle, 2004).

[10] Selective enforcement has been empirically documented in Arizona (Rahman et al., 2010).

[11] For a description of the SDWA including laws, regulations, policy, guidance, and fact sheets, see http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm.

comply with these standards. Only Wyoming and the District of Columbia have not received primacy in the management of the SDWA.

Ensuring safe drinking water is the SDWA's primary objective and it achieves this through source water protection, treatment, distribution system integrity, and public information. Despite its laudable mandate of ensuring safe drinking water, the SDWA is quite controversial. Its most controversial element is the treatment component, precisely because it relates to the standard setting process conducted by the EPA for the treatment of contaminants.[12] The idea of having enforceable, health-based drinking water standards is well accepted, but the underlying benefit–cost considerations that accompany the development of new standards are frequently the subject of intense debate. The recently revised arsenic standard is no exception in this regard.

As part of the 1996 amendments to the SDWA, the EPA was required to promulgate an updated arsenic standard by January 1, 2001, in order to replace the existing standard of 50 parts per billion (ppb), which had been law since 1942 (Natural Resources Defense Council, 2000). Following a detailed and protracted assessment process,[13] a final rule was issued

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[12] It is essential to note that although 49 of the 50 states have primacy in the implementation and enforcement of SDWA regulations, the EPA has the sole authority to set the regulatory standards to which states and water systems will be subject.

[13] There are five steps to setting an enforceable, health-based standard under the SDWA. First, the EPA determines whether to regulate a contaminant based on the available science addressing the health effects of exposure. Second, the EPA sets a maximum contaminant level goal (MCLG) (i.e., the level of contaminant in drinking water below which there is no known or expected health risk allowing for a margin of safety), which is not enforceable but simply most protective of human health. Third, the EPA proposes an enforceable maximum contaminant level (MCL) (i.e., the maximum amount of a contaminant allowed in water delivered to a user of any PWS), which is set as close to the MCLG as feasible. Feasible is defined as the level that may be achieved with the use of the best technology, treatment techniques, and other means that the EPA finds (after examination for efficiency under field conditions) are available, taking cost into consideration. Following the determination of the MCL, the EPA conducts an economic analysis to determine whether the benefits of that standard justify the costs. If not, the EPA may adjust the MCL for a particular class or group of systems to a level that maximizes health risk reduction benefits at a cost that is justified by the benefits. Fourth, the EPA sets an MCL, considers public comments submitted during the MCL proposal process, and finalizes the new MCL by outlining testing procedures and reporting schedules. Last, during the exemption period, states can grant variances and exemptions to small systems (fewer than 3,300 customers), and medium systems (3,301 to 10,000) can apply

by the EPA that established an enforceable MCL of 10 ppb for all community water systems (CWSs) and non-transient, non-community water systems (NTNCs). The effective date for the new standard of 10 ppb was February 22, 2002, and all water systems subject to the final rule were compelled to comply by January 23, 2006.

Both the EPA benefits and cost estimates for the arsenic rule were sharply criticized.[14] Attacks ranged from faulty science and misinterpretation of key economic data to political agendas.[15] In part, the contentious reaction to the proposed rule was owing to the EPA's own admission that the final rule does not pass a quantified benefit–cost test (i.e., benefits greater than costs). Even for the alternative MCL scenario of 20 ppb, where compliance costs are lowest, and using the upper bound estimate for benefits, expected net benefits are still negative. For the MCL scenario of 10 ppb, at which the standard was promulgated, estimated net benefits range from -$66 million to -$7.9 million dollars per year (in 1999 dollars).[16] However, the EPA argued that there were substantial 'non-quantifiable' benefits of arsenic reduction that would make actual benefits exceed costs at the 10 ppb MCL;[17] hence the EPA's decision to finalize the proposal of a new arsenic standard of 10 ppb.[18]

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for variances or exemptions from the EPA, but these systems must install a variance technology prescribed by the EPA. Variances and exemptions do not apply for microbial MCLs: after the exemption period expires, the PWS must be in compliance and the terms of variances and exemptions must ensure no unreasonable risk to public health. (See http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm.)

[14] In fact, the EPA originally proposed a revised standard of 5 ppb on June 22, 2000 but increased this MCL to 10 ppb on January 22, 2001, ostensibly owing to opposition from water authorities encountered during a requested comment period on alternative MCLs (US EPA, 2001).

[15] Some organizations criticized the EPA's health-benefit estimates as being overestimates and others criticized them as underestimates. For overestimation critiques, see Burnett and Hahn (2001) and National Research Council (1999); for underestimation critiques, see the Natural Resources Defense Council publication (2000) and Wilson (2001).

[16] US EPA, 2000a.

[17] Quantifiable benefits used in the economic analysis were limited to avoided cases of bladder and lung cancer. Some of the non-quantifiable benefits included avoided cases of skin, kidney, liver, and prostate cancer, and other cardiovascular, pulmonary, neurological, and endocrine effects (US EPA, 2000a).

[18] The constitutionality of the EPA's decision has been challenged by the state of Nebraska in Nebraska v. Environmental Protection Agency (331 F. 3d 995). The D.C. Circuit Court of Appeals issued their opinion on the Nebraska case on June 20, 2003 (available online at http://www.cadc.uscourts.gov/internet/

Because of estimation uncertainties, it is ambiguous at best as to whether the adoption and implementation of the revised arsenic standard would constitute a potential Pareto improvement for the state of Arizona.[19] The distributional implications, however, are clear and challenging.

ARSENIC EXPOSURE AND ENVIRONMENTAL EQUITY IN ARIZONA

Arsenic is a common pollutant in Arizona's groundwater (Hendricks, 1985). It is a naturally occurring chemical element in rock and soil and is present in trace amounts in groundwater. Nearly all communities in Arizona extract groundwater for domestic water uses, and many communities are entirely dependent on groundwater. Much of southern Arizona is underlain by thick deposits of basin-filling sand and gravel that form large aquifers containing enormous quantities of high-quality groundwater. In other communities, especially in the northern half of Arizona, groundwater is pumped from fractured or porous bedrock. Arizona groundwater generally contains arsenic in concentrations of 1 to 50 ppb. It is not well understood, however, where this arsenic came from or how it was transported into aquifers. It seems likely that some of it was derived from Arizona's abundant sulfide mineral deposits, but it is not known if most arsenic in groundwater was derived from sulfide mineral grains that were carried by streams from sulfide deposits to basins, or from the very low levels of arsenic present in virtually all sand and gravel. Some arsenic in groundwater was likely leached from sulfide

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opinions.nsf/ and search for June 20, 2003), denying the state any exemption from the mandates of the arsenic regulation. Interestingly, the state of Nebraska lost on procedural grounds (it failed to tell the EPA about its constitutional objections during the comment period), not because the Court believed the federal government acted within its prescribed authority under the Commerce Clause or the Tenth Amendment. However, the Court did allow Nebraska to challenge the SDWA itself, though the Court rejected the challenge on the grounds that Nebraska could not show that the SDWA would be constitutional under 'no set of circumstances.' Despite the Court's decision, Nebraska could once again challenge the SDWA if and when the EPA takes an enforcement action against a public water provider deemed in violation of the arsenic rule.

[19] Implementation of the revised arsenic standard would constitute a Pareto improvement for Arizona if the benefits of implementation exceed costs. See Appendix 4 for details of the EPA's arsenic benefit–cost analysis.

minerals within bedrock and transported to aquifers by surface or subsurface flow (Hendricks, 1985).

Naturally occurring arsenic in groundwater has exigent implications for the provision of safe drinking water in Arizona. Chronic exposure to elevated levels of arsenic in drinking water has been linked to a variety of ailments including bladder and lung cancer, as well as cardiovascular and neurological disorders.[20] To be protective of human health, the EPA has determined that the MCL for arsenic in drinking water should be lowered from 50 ppb to 10 ppb. The impact of this revised arsenic standard on Arizona is dramatic where roughly 334 PWSs need to take corrective action, 80 percent of which are small water systems (i.e., PWSs with fewer than 3,300 connections) facing significant treatment costs per household to comply. To put the impact on Arizona into perspective, the total number of systems in Arizona affected by the revised standard represents roughly 10 percent of the nation's total number of PWSs needing to take corrective action. Additionally, the EPA estimates that nationwide roughly 13 million people will be affected by the arsenic regulation. In Arizona, almost 4.5 million people are affected by the new standard, accounting for approximately 35 percent of the national population estimated to be affected by the new standard and 75 percent of Arizona's population (US EPA, 2006b).

On the demand side, PWS customers reflect the diversity of the state in terms of race and income. From the standpoint of population in Arizona in 2000, whites accounted for 75.5 percent of population, black or African American accounted for 3.1 percent, 25.3 percent of the population was reported to be of Hispanic or Latino origin, and 5.0 percent was reported to be American Indian.[21] In 2000, white households had a median income of 49,682 dollars while black or African American households had a medium household income that was 16.4 percent less than the overall median income of the state, with a reported median of 39,689 dollars. Hispanic households in Arizona reported a median household income of 37,057 dollars, 21.9 percent less than the state's median income for all households. Among racial/ethnic groups, American Indians experienced the highest poverty rate at 36 percent while whites had the lowest at 10.1 percent. The poverty rate among the black population was 18.1 percent, almost double the white poverty rate; while

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[20] See Clark et al., 1982; Majumdar and Miller, 1984; Grisham, 1986; Andelman and Underhill, 1987; and Greschwind et al., 1992.

[21] These percentages add to more than 100 percent because individuals may report more than one race.

the poverty rate among the Hispanic population was 24 percent, approximately two and a half times the poverty rate of the white population (US Bureau of the Census, 2000).

Implementation of the revised arsenic standard for drinking water inevitably gives rise to EJ concerns since arsenic is naturally occurring and widespread; the health implications of arsenic ingestion are serious and hundreds of PWSs will have to take corrective action; and water customers are racially diverse and poor in large numbers. At issue is whether minority and low-income communities will be disproportionately denied the health benefits of treated water owing to a failure to enforce SDWA requirements, or will be disproportionately required to bear onerous treatment costs per household owing to mandated compliance. That is, the underlying implementation question is whether EJ concerns will further complicate the already complex process of selective SDWA enforcement in Arizona.[22]

ARSENIC CONCENTRATIONS AND PUBLIC WATER SYSTEMS IN ARIZONA: DATA CONSTRUCTION AND DESCRIPTIVE STATISTICS

Data on arsenic compliance for 1,006 PWSs was obtained from the Arizona Department of Environmental Quality (ADEQ). Each observation in the data set is recognized by a PWS's unique identification number (SYSID). Corresponding to each PWS, information regarding the date of a MCL violation (date can be anything between January 1999 and January 2004) is available. Since the effective date for the new arsenic standard was February 22, 2002 and all PWSs were required to comply with it by January 2006, the data includes the arsenic compliance of PWSs after the enforcement of the new arsenic standard was initiated in 2002 by ADEQ. Also available are information on each system's characteristics, such as the number of people serviced by the system, the type of server (e.g., community or non-community), the source of water provided (e.g., groundwater or surface water), the ownership of the PWS

[22] This issue potentially applies to other environmental hazards in Arizona. Arizona occupies the third rank in the nation in terms of total hazardous environmental releases (328.68 million pounds in 2002); third rank in the releases of: (1) cancer hazards from manufacturing facilities (measured by pounds of Benzene-equivalents; 270 million pounds); and (2) reported releases of TRI chemicals to land (US EPA, 2006b).

(e.g., public, private or mixed), and the location of its wells (e.g., urban or non-urban).

The first step in a geographic analysis is to determine the appropriate area to be used as the unit of analysis. The unit of analysis should reflect the purpose of study. For example, for an epidemiological study the area used as a unit of analysis should correspond to the area that a particular etiology suggests may be exposed to risk. For questions concerning the equitable distribution of environmental disamenities, however, no particular area definition is appropriate to the analysis. In this study, zip code is used as the unit of analysis.[23]

The second step in constructing the database was to identify PWSs by their zip code locations. In total, 1,006 PWSs serve 359 zip codes in Arizona. Consequently, some zip codes are served by more than one PWS. Corresponding to each PWS, information on the level of arsenic concentration was available from ADEQ. To arrive at the measure of arsenic concentration at a given zip code level, if a given zip code was served by more than one PWS, the average of arsenic concentrations of all PWSs serving that given zip code was taken. Then, based on the numerical value of average arsenic concentration at zip code level, a determination was made as to whether a particular zip code exceeded the new arsenic MCL standard. More specifically, if a particular zip code had average arsenic concentrations greater that 10 ppb it was assigned the value of 1; otherwise it was assigned the value of 0.[24] Of the total 359 zip code geographic areas, 121 zip code areas were identified to be exposed to arsenic levels greater than the revised MCL standard, while the remaining 238 were not exposed. The third step in constructing the

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[23] See Chapter 2 for a survey of studies addressing the issue of specifying the geographical unit of analysis. (See, for example, Baden et al., 2007; Banzhaf and Walsh, 2008; and Cutter et al., 1996.)

[24] In approximately 70 percent of the zip codes that were served by more than one PWS, all the respective PWSs in the zip code exceeded the arsenic standard. The remaining 30 percent of the zip codes that were served by more than one PWS had mixed results: i.e., some PWSs were in compliance. Thus, by taking the average of arsenic concentrations of all PWSs serving a given zip code, the arsenic concentration of only 30 percent of the zip codes was consolidated. Potentially, the results could be sensitive to this aggregation. To test the sensitivity of the results to averaging of arsenic concentration of PWSs serving a given zip code, an alternative model was estimated, where 1,006 PWSs serving 359 zip codes were treated as zip code observations, and similar results were found. In this case, many zip codes entered the sample more than once, and the dependent variable was defined by whether a given PWS in a given zip code exceeded the new arsenic standard.

database was to compile the desired census data for 359 zip codes in Arizona. Data on socioeconomic characteristics at zip code level was obtained from the 2000 US Census.

Figure 4.1 shows the distribution of PWSs throughout the state, as well as their average EPDS arsenic concentrations and system size (i.e., number of customers served).[25] As illustrated in Figure 4.1, there is wide spatial variation in the extent of arsenic exposure across Arizona. It raises the question of whether there is any relationship between geographic location and MCL exceedance. Do systems in Yavapai and Maricopa Counties tend to exceed the arsenic MCL more than in other counties? If so, what is the racial/ethnic composition of the population of these counties? Is it the case that arsenic-affected areas are disproportionately located in minority and low-income areas? Essentially, Figure 4.1 gives a spatial sense of the incidence of arsenic exposure in Arizona and helps to identify some of the associations between averaged arsenic concentrations and concentrations of low-income and minority population groups that warrant further examination.

Table 4.1 shows the distribution of PWSs by whether they are arsenic affected PWSs (with arsenic concentration ≥ 10 ppb) and their associated characteristics. One-third of all PWSs in the state have an arsenic issue based on this definition. An important characteristic of water systems is their system size, or the number of customers they serve. Table 4.1 shows the distribution of system size categories within the entire group of 1,006 Arizona PWSs, as well as within the affected and non-affected groups. Notice the predominance of very small and small systems. These two size categories account for 87 percent of the entire population of PWSs.

Examination of the affected PWS column in Table 4.1 reveals that very small and small systems account for about 80 percent of the total number of affected Arizona systems, and large and very large systems account for about 12 percent of the total number of affected systems. The proportion of affected systems that is large and very large is twice the proportion of those systems in the entire group (12 percent to 6 percent) and all eight very large systems are part of the affected group of PWSs.

PWSs are also characterized by their ownership type, that is, whether they are privately or publicly owned and operated. In Arizona, a PWS can have private, public, or mixed ownership status. Table 4.1 displays the distribution of ownership among the entire population of Arizona PWSs. Roughly half of all Arizona PWSs are privately owned and

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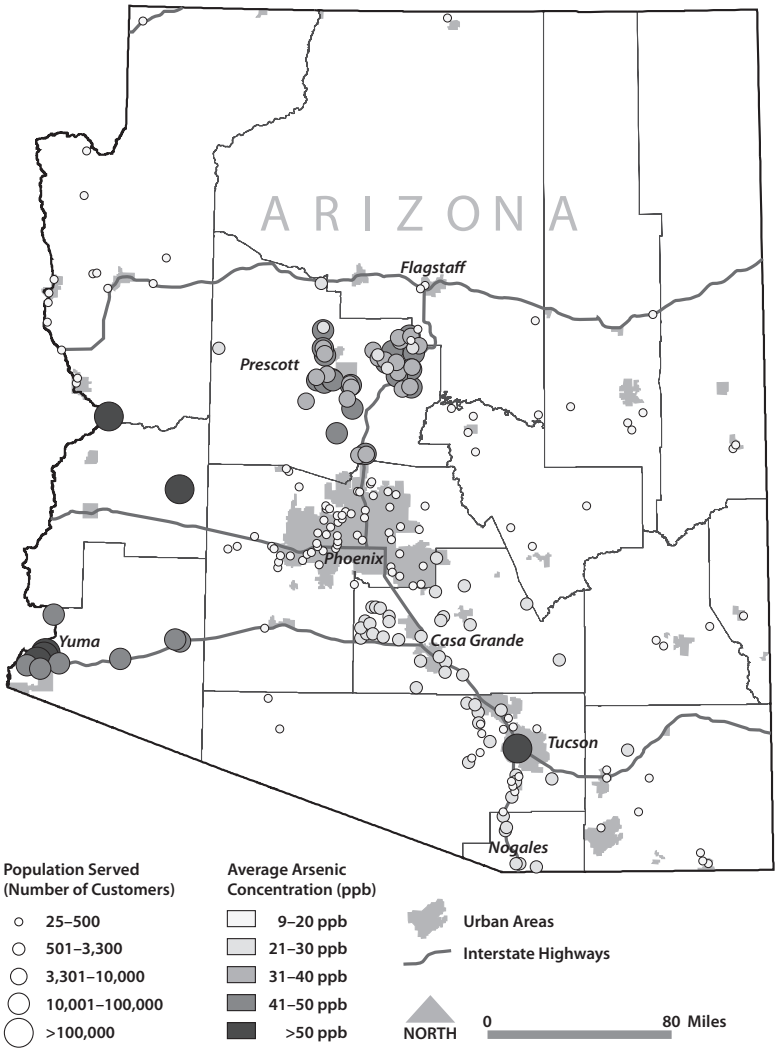
[25] EPDS refers to entry points to the distribution system.



Notes: Notice the cluster of very small systems (serve 25–500) with average contaminate EPDS arsenic concentrations between 9 and 20 ppb in the urban area surrounding Phoenix in Maricopa County. Also notice the clusters of medium (serve 3,301–10,000) and large (serve 10,001–100,000) systems with average EPDS arsenic concentrations of 41–50 ppb and greater than 50 ppb in Yavapai County, north of Maricopa County.

Source: Kiger (2007)
Data sources Arizona Land Resource Information System (ALRIS, 2007)
Arizona Department of Environmental Quality (ADEQ, 2007)

Figure 4.1 Geographic distribution of Arizona CWSs, their population served, and their average arsenic concentrations in Arizona

Table 4.1 Public water systems in Arizona

			Group		
			All PWSs (1,006)	**Affected PWSs** (334)	**Non-Affected PWSs** (672)
System Characteristics	**Avg. EPDS Arsenic Concentration**	<10 ppb	67% (672)	0% (0)	100% (672)
		≥10 ppb	31% (317)	95% (317)	0% (0)
		>50 ppb	2% (17)	5% (17)	0% (0)
	System Size	Very Small (25–500)	64.3% (647)	57.5% (192)	67.7% (455)
		Small (501–3,300)	23.2% (233)	22.2% (74)	23.6% (159)
		Medium (3,301–10,000)	6.6% (66)	8.7% (29)	5.5% (37)
		Large (10,001–100,000)	5.2% (52)	9.3% (31)	3.1% (21)
		Very Large (>100,000)	0.8% (8)	2.4% (8)	0% (0)
	Ownership Type	Private	50% (503)	52% (174)	49% (329)
		Public	19% (191)	20% (67)	18.4% (124)
		Mixed	31% (312)	28% (94)	32.5% (218)
	System Type	CWS	79% (795)	78% (261)	79.5% (534)
		NTNC	21% (211)	22% (73)	20.5% (138)
	Water Source	GW	93% (936)	95% (317)	92.1% (619)
		SW	7% (70)	5% (17)	7.9% (53)

Notes: **EPDS:** Entry points to the distribution systems. **PWSs**: Public water systems. **System Size**: The number of customers served by a PWS. **Ownership Type**: There are three types of ownership (private: owned by a private entity; public: owned by a municipality; mixed: jointly (private and public) owned). **System Type**: System type can either be community water system (CWS) serving residential areas, or non-transient non-community (NTNC) serving non-transient non-residential areas. **Water Source**: This represents the source of water for a PWS. Source of water can be either groundwater (GW) or surface water (SW).

Source: Kiger (2007).

operated, one-fifth are publicly owned and operated (i.e., municipal systems), and nearly one-third have a mixed ownership status (unclear ownership). Examining the affected PWS column of Table 4.1 shows the distribution of ownership type among the group of affected PWSs, with the same proportions of private, public, and mixed ownership holding for the affected group as for the entire group of Arizona PWSs. Similarly, PWSs can be characterized by whether they are either a community water system (CWS) or a non-transient non-community system (NTNC). Both system types serve at least 25 people or 15 service connections, but CWSs serve their customers on a year-round basis and NTNCs serve their customers for more than six months of the year, but not year-round.

Table 4.1 also presents the distribution of system type among the entire population of Arizona PWSs. Roughly 80 percent of all Arizona PWSs are CWSs and 20 percent are NTNCs. Examining Table 4.1 shows that the distribution of system type among the group of affected Arizona systems is very similar to the distribution among all Arizona PWSs. Roughly four-fifths of affected systems are CWSs and one-fifth are NTNCs.

The last important attribute that can be used to distinguish among water systems is the source water used for their operation. In Arizona, there are two types of water that a system can use: groundwater and/or surface water. Table 4.1 shows the distribution of water source type among the entire population of Arizona PWSs – 93 percent of all Arizona PWSs are classified as using groundwater with the remaining 7 percent being surface water systems. Notice the predominance of groundwater as the source type for these affected systems. Comparing this distribution with the distribution for all Arizona PWSs, it is clear that the ratios of groundwater to surface water are very similar between both the affected and total group of Arizona CWSs and NTNCs, 95 percent/5 percent and 93 percent/7 percent respectively.

In summary, PWSs in Arizona vary significantly in terms of the number of customers served, ownership type, server type, arsenic levels and distribution across the state. Fortunately, ADEQ's database on all 1,006 PWSs in Arizona provides a comprehensive and fully representative sample of Arizona PWSs.

DISPARATE IMPACT OF THE REVISED ARSENIC STANDARD ON MINORITY AND LOW-INCOME COMMUNITIES

To examine potential environmental equity and disproportionate impacts of implementing the new arsenic standard, data was obtained on relevant variables, including racial/ethnic composition of population, household size, per capita income, and latitude and longitude for zip code level communities in Arizona. Standard quantitative methods, including zero-order correlations and a binary regression model, were employed to analyze the spatial distributions of the variables. Zero-order correlations measure the strength of linear association between two variables, ignoring statistical associations with other variables, while logistic regression modeling was used to estimate the likelihood of arsenic contamination in a particular geographical area, and its associated demographic and economic characteristics. The initial concern in this analysis is to determine how geographical (zip code) areas with arsenic contamination differ from those without arsenic contamination.

Table 4.2 provides the variable means for demographic and economic characteristics of geographical areas with and without arsenic contamination, and t-tests of their difference in means. The percentage of black persons in contaminated areas is disproportionately lower (1.25 percent) than the percentage of black population in non-contaminated areas (2.06 percent). The difference between percentages of black persons in contaminated and non-contaminated areas is -0.81 percent, and it is statistically significant at 5 percent level of significance. The percentage of minority persons (black + Hispanic) in contaminated areas is approximately the same (23.77 percent) as in areas without contamination (21.31 percent). The difference between percentages of minority persons in contaminated and non-contaminated areas is 2.34 percent, and it is statistically insignificant. However, the percentage of white persons in arsenic contaminated areas is disproportionately higher (81.22 percent) and statistically significant from the percentage of white persons in non-contaminated areas. The percentage of Hispanic persons in contaminated areas is greater (22.52 percent) than the percentage of Hispanic population in non-contaminated areas (19.25 percent), but the difference between the two is statistically insignificant. Moreover, per capita income, average housing value, and the income per household are each statistically greater in arsenic contaminated areas, as opposed to the corresponding figures in non-contaminated areas. These results suggest that the continued selective implementation and enforcement of the

revised SDWA arsenic standard is not likely to disadvantage minority (i.e., black + Hispanic population taken together) or low-income groups disproportionately in Arizona. In fact, these basic statistics suggest quite the opposite – there is a disproportionate impact of arsenic contamination on non-poor and majority communities in Arizona.

Table 4.2 Summary statistics

Variable	Arsenic affected area	Arsenic non-affected area	t-test of difference in means
White	81.22%	64.51%	16.71 (6.23)[a]
Black	1.25%	2.06%	–0.81 (–3.00)[a]
Hispanic	22.52%	19.25%	3.27 (1.40)
Minority	23.77%	21.31%	2.34 (0.96)
IncomePC	$19,027	$16,891	$ 2,136 (1.70)[b]
AVH	$108,693	$95,516	$13,177 (1.68)[b]
IncomePH	$38,528	$35,618	$ 2,910 (1.68)[b]

Definition of variables:
Arsenic affected area: zip-code area that has been affected by arsenic.
Arsenic non-affected area: zip-code area not affected by arsenic.
White: percentage of white population in a zip-code area.
Black: percentage of black population in a zip-code area.
Hispanic: percentage of Hispanic population in a zip-code area.
Minority: percentage of black and Hispanic population in a zip-code area.
IncomePC: per capita family income in a zip-code area (U.S. Dollars).
AVH: Average value of house in a zip-code area (U.S. Dollars).
IncomePH: Average income per household in a zip-code area.

Note: Bracket values in the third column are t-test statistic of difference of two means: [a] significance at 5%, and [b] significance at 10%.

Table 4.3 contains the zero-order correlations between sociodemographic variables and arsenic exceedance of the MCL standard. Zero-order correlations between demographic and arsenic exposure variables for zip codes in Arizona indicate that arsenic exceedance and two measures of demography – proportions of white and Hispanic populations in the total population of zip code areas – have positive association. While correlation between arsenic exceedance and proportion of white population is statistically significant at 1 percent level of significance, the correlation between arsenic exceedance and proportion of Hispanic population is statistically insignificant. The correlation between locations of arsenic contamination areas and proportion of black population is

negative and statistically significant at 1 percent level of significance. Alternatively, the zero-order correlation between proportion of minority population (populations of black and Hispanics combined) and locations of arsenic contaminated areas has a correlation value of 0.074, a very small correlation coefficient, and it is statistically insignificant. This clearly indicates that there is no evidence of disproportionate drinking water risk in Arizona for minority and low-income population from hazardous levels of arsenic contamination. Variables associated with economic wealth (per capita income and average housing value) exhibit positive and statistically significant associations with locations of arsenic exposure. These findings reaffirm our preliminary observations based on the summary statistics in Table 4.2.

Unfortunately, these basic statistics and zero-order correlations, while suggestive, do not constitute valid statistical tests for disproportionate impacts of arsenic exposure on the demographic and economic groups under consideration.[26] Thus, to extend and refine the analysis, a logistic regression model is used to obtain valid statistical inferences. Table 4.4 presents the estimates of the logistic regression model. Here the dependent variable of interest is arsenic exposure or the exceedance of the revised arsenic MCL standard. This variable is defined to take the value of 1 if the arsenic concentration level in a particular zip code area is greater than 10 ppb; otherwise it takes the value of zero. Six different specifications of logistic regression model are estimated. In specification 1, a binary relationship between the exceedance of arsenic standard and percentages of black and Hispanic persons in zip code areas of Arizona is estimated, controlling only for locations of zip codes (latitude and longitude).[27] Similarly, in specification 4, a binary relationship between the exceedance of arsenic standard and percentage of minority persons in zip code areas of Arizona is estimated. Specifications 2 and 3 present logit models for multivariate test of EJ that include percentages of black and Hispanic persons, per capita income and average housing value, with and without controls for latitude and longitude of zip code areas,

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[26] Zero-order correlation is the relationship between two variables, while ignoring the influence of other variables in prediction. Therefore, these correlations are inadequate representations of the variable's unique ability to predict the dependent variable.

[27] Latitude and longitude of zip code areas are included into the analysis to account for the fact that arsenic in groundwater is a naturally-occurring hazard that gets transported to aquifers by surface or subsurface flow. Latitude and longitude of a given zip code area may proxy for transportability of arsenic contaminations from one place to another.

Table 4.3 Zero-order correlations of arsenic exceedance and socioeconomic variables

Variable	ArsenicEx	White	Black	Hispanic	Minority	AVH	PPH	Income PH	Income PC	Latitude	Longitude
ArsenicEx	1.000										
White	0.264[a]	1.000									
Black	–0.127[a]	–0.029	1.000								
Hispanic	0.074	–0.034	0.311[a]	1.000							
Minority	0.053	–0.036	0.433[a]	0.991[a]	1.000						
AVH	0.091[b]	0.475[a]	–0.005	–0.199[a]	–0.190[a]	1.000					
PPH	–0.174[b]	–0.725[a]	0.041	0.195[a]	0.191[a]	–0.339[a]	1.000				
IncomePH	0.084	0.481[a]	0.050	–0.155[a]	–0.140[a]	0.774[a]	–0.213[a]	1.000			
IncomePC	0.108[a]	0.595[a]	–0.035	–0.258[a]	–0.250[a]	0.821[a]	–0.537[a]	0.842[a]	1.000		
Latitude	–0.084	–0.353[a]	–0.254[a]	–0.53[a]	–0.465[a]	–0.203[a]	0.235[a]	–0.242[a]	–0.221[a]	1.000	
Longitude	–0.212[a]	–0.314[a]	–0.064	–0.153[a]	0.154[a]	–0.082	0.209[a]	–0.110[a]	–0.148[a]	–0.083	1.000

Definition of variables:
ArsenicEx: zip-code area that has been affected by arsenic.
White: percentage of white population in a zip-code area.
Black: percentage of black population in a zip-code area.
Hispanic: percentage of Hispanic population in a zip-code area.
Minority: percentage of black and Hispanic population in a zip-code area.
AVH: average value of house in a zip-code area (U.S. Dollars).
PPH: persons per household in a zip-code area.
IncomePH: average income per household in a zip-code area.
IncomePC: per capita family income in a zip-code area (U.S. Dollars).
Latitude: the latitude of a zip-code area.
Longitude: the longitude of a zip-code area.

Note: [a] indicates significance at 5%; [b] indicates significance at 10%.

respectively. Similarly, specifications 5 and 6 provide the logit models for multivariate test of EJ that include percentage of minority persons, per capita income and average housing value, with and without controls for latitude and longitude of zip code areas, respectively. Estimating models with and without controls for locations of zip code areas allows us to check for the sensitivity of EJ results to the locations of zip code areas.

Table 4.4 Estimates of logit regression model (n = 359) – dependent variable: exceedance of arsenic standard

Explanatory Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Intercept	–37.818[a] (-3.67)	–1.558[a] (-4.72)	–37.465[a] (-3.60)	–37.232[a] (–3.63)	–1.473[a] (–4.51)	–36.934[a] (–3.57)
Black (%)	–0.245[a] (–3.36)	–0.250[a] (–3.37)	–0.269[a] (–3.53)			
Hispanic (%)	0.006 (0.94)	0.022[a] (3.43)	0.014[b] (1.75)			
Minority (%)				–0.004 (–0.75)	0.008 (1.60)	–0.0009 (–0.14)
Per capita income ($)		0.063[a] (2.14)	0.035 (1.10)		0.047 (1.63)	0.016 (0.53)
Average house value ($)		–0.0007 (–0.26)	0.0003 (0.10)		–0.0006 (–0.20)	0.0005 (0.18)
Latitude	–0.274[a] (–2.44)		–0.181 (–1.45)	–0.249[a] (–2.24)		–0.196 (–1.60)
Longitude	–0.417[a] (-4.31)		–0.380[a] (–3.80)	–0.403[a] (–4.18)		–0.381[a] (–3.80)
Likelihood value	–210.892[a]	–216.860[a]	–209.110[a]	–218.577[a]	–225.731[a]	–217.949[a]
P-value	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.061)	(0.0001)

Note: Values in brackets are respective T-values; [a] indicates significance at 5%; and [b] indicates significance at 10%.

A careful inspection of the results in Table 4.4 clearly shows that there is no evidence to suggest an inequitable impact of the new arsenic standard on poor and minority communities in Arizona. The revised arsenic standards were effective from February 22, 2002, and all PWSs were required to comply with it by January 2006. However, the data used in this study includes the arsenic compliance behavior of PWSs from 2002 to 2004. Thus, the lack of evidence for EJ in this study indicates that, even in the absence of any further enforcement beyond 2004, EJ is unlikely a concern. The assumption is that those PWSs that are already in

compliance will not go out of compliance in future. More importantly, this study forecasts whether EJ concerns are likely to be encountered in the continued selective implementation and enforcement of the new arsenic standard. The extent to which EJ considerations further complicate enforcement of the new arsenic standard by ADEQ in Arizona depends directly on the extent to which minority and/or low-income populations are disproportionately served by PWSs struggling to comply with the new arsenic standard. These results suggest that there is no further complication of ADEQ's ongoing implementation and enforcement of the revised arsenic standard by EJ concerns.

What variables, if not the share of minority population, are strongly associated with location of arsenic exposure? First, note that the arsenic exposures are primarily located in the more affluent areas of Maricopa and Pima Counties and that the spatial concentrations of black population are not in these areas of the state. Therefore, the finding that there is no inequitable impact of arsenic exposure on black population is not a surprising result. In contrast, the location of arsenic exposure is positively associated with the percentage of Hispanic persons in Arizona (see specifications 2 and 3, Table 4.4). However, since the percentage of Hispanic persons in arsenic affected areas is not statistically different from the percentage of Hispanic persons in arsenic non-affected areas (see Table 4.2), it suggests that substantial EJ concerns are unwarranted for the Hispanic population of the state.

As shown in Table 4.4, there is a positive and but statistically significant association between the likelihood of a zip code area exceeding the new arsenic MCL standard and the per capita income of the area (see specification 2), but this association is rendered statistically insignificant after controlling for other variables such as the racial/ethnic composition of the population, average housing value, household size, and geographical location of area (as defined by longitude/latitude of the zip code area). This suggests that, while income is positively associated with the exposure to arsenic in drinking water, it is not a robust predictor of a disproportionate impact of the new arsenic regulation on Arizona communities.

CONCLUDING REMARKS

Much of environmental law is selectively enforced, and for good reason. Given institutional, resource, and penalty constraints, efficiency justifications for selective enforcement are well established. It is also well established that enforcement of the SDWA is complex and dependent on

selective enforcement. Frequently violations are not pursued at all or prosecuted with trivial expected penalties. This process has been empirically documented in Arizona as well.

EJ concerns may be encountered in the process of implementing and selectively enforcing the revised arsenic standard for drinking water. Failure to enforce compliance with water quality standards may deny consumers the health benefits associated with less contaminated water, while forcing compliance may secure benefits but at prohibitive cost for minority or low-income communities. The extent to which EJ concerns complicate enforcement depends on the extent to which minority and/or low-income populations are disproportionately served by PWSs struggling to comply with the revised standard. In this chapter, a methodology was developed to forecast whether EJ concerns were likely to be encountered in response to SDWA enforcement, and then applied to the case of the revised arsenic standard.

An issue as complex and controversial as EJ requires research that assesses the spatial coincidence between environmental disamenities and minority or disadvantaged populations prior to any analysis of causation or the role of intent. In this chapter EJ issues were evaluated in the context of the provision of safe drinking water and the revised arsenic standard. The spatial association between the locations of arsenic exposure (arsenic affected areas) and the racial and economic status of surrounding populations was documented and evaluated by focusing on the association between race, income, and hazardous levels of arsenic concentration. That is, the broad equity implications of the new arsenic regulation were analyzed by examining the relationship between community-level exposure to arsenic and socioeconomic and demographic characteristics of the population in Arizona.

Using both ADEQ's data set on MCL compliance of PWSs and socioeconomic data from the 2000 US census, a zip code level data set was constructed to evaluate the potential EJ concerns that might be encountered in the course of implementing and enforcing the revised SDWA standard for arsenic in drinking water. The merger of the two databases resulted in 359 zip code level units of observation with 121 zip code areas requiring corrective action to comply with the revised MCL standard. Zero-order correlations were used to measure the strength of linear associations between census and exposure variables while logistic regression models were utilized to estimate the relationship between the likelihood of arsenic contamination in a particular geographical area and its associated demographic and economic characteristics. Both zero-order correlation analysis and logistic regression estimation support the conclusion that continued selective implementation and enforcement of the

revised SDWA arsenic standard is unlikely to disadvantage minority or low-income groups disproportionately in Arizona. However, a challenging policy question remains: How can ADEQ assist all small public water companies, including systems with a predominantly minority or low-income customer base, comply with current and forthcoming drinking water regulations? In Chapter 5, the response to this policy challenge by both the EPA and ADEQ is documented and evaluated, and the implications for cooperative federalism explored.

5. Environmental federalism and addressing EJ concerns

INTRODUCTION

Over the past several decades, there has been a secular and significant trend in US jurisprudence toward increasing federal authority over a wide range of health, safety and general welfare issues.[1] In fact, there was a nearly complete absence of judicial checks on federal power between 1937 and 1995 (Kramer, 1994). This extension of authority was largely accomplished through an expansive interpretation of the commerce clause,[2] the constitutional provision granting Congress the power to regulate interstate commerce, and, more contentiously, the dormant commerce clause,[3] a judicial restriction prohibiting a state from passing legislation that improperly burdens or discriminates against interstate commerce. Recently, however, more circumspect legal analysis has challenged this trend, beginning in 1995 with the 'Rehnquist Court' and continuing to the present day. By a narrow majority, recent Supreme Court rulings have held that the federal government does not have the authority to regulate activities not directly related to the channels of commerce, the instrumentalities of commerce, or an action that substantially affects interstate commerce.[4] This 'New Federalism' was further

[1] Compare the words of James Madison, 'The powers delegated to the federal government, are few and defined. Those which are to remain in state governments, are numerous and indefinite.' *The Federalist* No. 45, pp. 237–8.

[2] US CONST. art. 1, §8, cl. 3

[3] The Dormant Commerce Clause does not expressly exist in the text of the United States Constitution. It is, rather, a doctrine deduced by the US Supreme Court and lower courts from the actual Commerce Clause of the Constitution.

[4] This narrowed interpretation of commerce clause jurisprudence was largely pioneered by then Chief Justice William H. Rehnquist and Justices Sandra Day O'Connor, Antonin Scalia, Anthony M. Kennedy, and Clarence Thomas, whom some have called the 'Five Friends of Federalism' on the Court. In a series of 5–4 decisions, they concurred on rulings that typically limited federal power (Kendall, 2004).

bolstered by President Clinton's Executive Order[5] reinforcing the deference that should be afforded to state governments, mandating that the federal government grant states the maximum administrative discretion possible, and, where possible, that it defer to the states when establishing regulatory standards.

In determining the appropriate allocation of authority between the federal government, on the one hand, and state, regional, and local governments, on the other, policymakers and the courts face something of a Hobson's choice. By erring on the side of decentralization, Congress may be hampered in enacting needed legislation under the commerce clause.[6] By erring on the side of federal centralization, the ability of states to try novel social and economic experiments,[7] as well as to address pressing health and environmental needs, may be obviated owing to dormant commerce clause concerns.[8] Since the stakes are high, federalism debates are ubiquitous and frequently contentious, particularly as they relate to issues of environmental and natural resource management.[9]

Environmental Federalism

Within the context of regulation, federalism is typically cooperative, acknowledging a need for cooperation between state and federal governments. US environmental federalism is generally cooperative, and addresses the appropriate scope and division of power, responsibilities,

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[5] Exec. Order No. 13132, 64 Fed. Reg. 43, 255 (Aug. 4, 1999).

[6] See, for example, the controversial decisions in Solid Waste Agency of Northern Cook County v. US Army Corps of Engineers (531 US 159, 31 ELR 20382 (2001) and Rapanos v. United States (126 S.Ct. 2208 (2006)) addressing governmental authority over isolated wetlands, or Massachusetts v. Environmental Protection Agency addressing federal authority to regulate carbon dioxide and other greenhouse gases as pollutants.

[7] To quote Justice Louis D. Brandeis (New State Ice v. Liebmann, 285 US 262, 311 (1932), dissenting), 'To stay experimentation in things social and economic is a grave responsibility. Denial of the right to experiment may be fraught with serious consequences to the nation. It is one of the happy incidents to the federal system that a single courageous state may, if its citizens choose, serve as a laboratory, and try novel social and economic experiments without risk to the rest of the country.'

[8] See, for example, Clean Air Markets v. Pataki (194 F. Supp. 2d 147, 151 (N.D.N.Y 2002)) and the discussion by Thompson (2004–05) where the US District Court invalidated New York's attempt to penalize in-state firms that sold sulfur-dioxide emission credits to facilities in upwind states.

[9] For an informative survey, see Oates and Portney (2003).

and authority among the federal and state governments in environmental management. Currently, Congress designates the EPA as the federal oversight agency to set national environmental quality standards and procedures, and then allows the agency to delegate day-to-day programmatic responsibilities to states with approved programs (Scheberle, 2004). Under this partial-preemption regulatory approach, states have flexibility in the implementation and enforcement of environmental laws, provided that outcomes are at least as stringent as applicable federal statutes.

Since the promulgation of President Clinton's Executive Order on federalism in 1999, Congress has encouraged devolution of responsibility and authority from the federal government to the states in environmental protection. This policy trend acknowledges that state governments should be recognized as having critical responsibilities in environmental management, and that federalism-stifling initiatives have serious costs, in terms of both economic efficiency and distributive equity (Bradley, 2004). That is, many government functions should be handled by a branch of government that is closest to the people and most responsive to the citizens' specific needs and desires (Kendall, 2004). In evaluating management alternatives, preferences should be given to the most decentralized structure of government capable of internalizing all externalities, subject to constitutional constraints (Inman and Rubinfeld, 1997). This approach is known as the principle of economic federalism, and clearly characterizes recent federalism initiatives by the EPA in dealing with state environmental agencies.

The National Environmental Performance Partnership System (NEPPS)[10]

The EPA and states share responsibility for protecting human health and the environment. In 1995, the EPA initiated the National Environmental Performance Partnership System (NEPPS) to improve the efficiency of state–EPA partnerships within a cooperative federalism system (US EPA, 2010e). Performance partnerships are explicitly designed to take advantage of the unique capacities of each partner, achieving enhanced environmental protection at lower cost. The NEPPS system of environmental protection promotes careful documentation of environmental

[10] For the sake of continuity and context, some of the description of the NEPPS initiative and its associated Performance Partnership Agreements and Performance Partnership Grants programs, as discussed in Chapter 1, is recounted here as background for constructing a federalism policy assessment.

conditions, devolution of environmental responsibilities when practicable, state-initiated implementation strategies, and the improvement of public understanding and engagement in protection efforts.[11]

In promoting devolution within the existing cooperative federalism system, NEPPS gives states more flexibility in achieving environmental results so that states can serve as the primary delivery agent, managing their own programs, documenting regional environmental impacts, adapting to local conditions, testing new approaches for delivering more environmental protection for less, and encouraging community involvement in decision making (Scheberle, 2004). The emphasis on empirical documentation acknowledges both the need for fact-based policy initiatives, based on an understanding of the nature and extent of environmental conditions, as well as the desirability of the assessment being conducted at the level of government best positioned to account for all relevant policy considerations. Additionally, promoting community outreach and involvement serves the twin goals of developing more effective control policies and increasing public understanding of and support for agency initiatives.

Performance Partnership Agreements

One of the main ways that the EPA and individual states implement the principles of performance partnerships on the ground is by negotiating Performance Partnership Agreements (PPAs). Elements of a PPA typically include a description of environmental conditions, performance measures for evaluating progress, a process for joint state–EPA evaluation, mutual accountability, and a clear specification of environmental priorities (US EPA, 2010f). Each state–EPA partnership negotiation takes into account the particular capacities, needs, and interests of the state. The broad popularity of PPAs with state environmental agencies is at least partially attributable to the fact that the negotiated outcome emerges from joint planning and priority setting, and clearly specifies the extent of EPA oversight.[12]

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[11] In 1995, the EPA's 'Joint Commitment to Reform Oversight and Create a National Environmental Performance Partnership System' document enumerated seven components of the federal-state partnership: increased use of environmental indicators, a new approach to program assessment by states, Performance Partnership Agreements, differential oversight, performance leadership programs, public outreach and involvement, and joint system evaluation (US EPA, 2010e).

[12] Individual PPAs are typically multi-program documents that frequently include a dispute resolution process as one of several general topics. A wide variety of program areas is addressed across state PPAs, ranging from air quality,

Performance Partnership Grants

The EPA also provides direct financial assistance to the states through its grant programs to support the development and implementation of environmental programs. Traditionally, grant funds could only be spent on activities that fell within the statutory and regulatory boundaries of a specific program. To increase the flexibility of the EPA's grant program, Congress authorized the agency in 1996 to award Performance Partnership Grants (PPGs) that can be used to support two or more environmental programs simultaneously (US EPA, 2010g). PPGs are designed to reduce administrative costs and to direct EPA grant funds to priority environmental program needs. For state environmental agencies, significant efficiency gains are realized by being able to allocate limited funding strategically across categories as diverse as water pollution control, hazardous waste management, air pollution control, and pesticide enforcement.[13] The combination of PPA and PPG partnership tools provides for a great deal of flexibility in defining EPA–state responsibilities and authority within their cooperative federalism relationship.

FEDERALISM POLICY ASSESSMENT

The EPA and state environmental agencies interact in a variety of complex ways in managing environmental policies and programs. For purposes of conducting federalism policy assessments, however, Scheberle (2004) has developed a useful typology based on two characteristics, trust and involvement.[14] A high level of trust is realized when personnel at both the EPA and the relevant state agency are dedicated to effectively implementing policy. Under these circumstances, both groups can contribute substantively to documentation, policy development,

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to drinking water, to brownfields and Superfund. About half of recently negotiated PPAs address environmental justice as well. In FY2010, 32 states had negotiated PPAs (see http://www.epa.gov/ocir/nepps/pdf/2010_nepps_program_implementation_summary.pdf).

[13] Over the period from 1999 to 2008, PPG funding levels increased threefold from $130 million to $391 million. In 2008, 40 states had PPGs with 34 addressing the Clean Air Act, 22 supporting the Safe Drinking Water Act, and 3 related to CERCLA/Superfund implementation (US EPA, 2010e). Under NEPPS, PPGs can be pursued in conjunction with or independent of PPAs.

[14] Scheberle's typology has general applicability. The discussion here modifies this discussion of federalism types to fit the specific issue of environmental justice.

administration, and monitoring and enforcement. The second characteristic, involvement, is concerned with the assignment of responsibilities, authority, and oversight in managing environmental programs. A low level of involvement is indicative of the state environmental agency assuming a leadership role in documentation and policy formation with the EPA providing resources and program support while exercising watchful oversight.

Based on the twin distinctions of trust and involvement, four types of EPA–state federalism relationship emerge as related to addressing the issue of environmental justice. The possible outcomes are illustrated in Figure 5.1. When trust between the EPA and a state agency is low, cooperative federalism is undermined and high involvement by the EPA becomes mandatory. President Clinton's Executive Order 13132 (1999) on federalism directed the EPA to be deferential to state environmental agencies when taking action that affects the policy discretion of the states. That is, the EPA was directed to allow state agencies the maximum administrative discretion possible and to encourage each state to develop its own policies to achieve program objectives. When trust is low, however, the state agency's ability to even document EJ concerns objectively and comprehensively is called into question, never mind the agency's capacity to develop effective policies to address EJ conflicts once documented. Under these circumstances, the EPA's mandate to promote devolution under the New Federalism becomes subordinated to its EJ responsibilities.

President Clinton's Executive Order 12898 (1994) on EJ requires federal agencies to make achieving EJ part of their mission by identifying and addressing the disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority communities and low-income populations. When trust between the EPA and a state agency is low, pursuit of EJ in environmental policy cannot be realized when the EPA has low involvement. In fact, the EPA must ensure that appropriate documentation is conducted, effective policies are formulated when necessary, and affected communities are fully involved in the process. The relationship between the EPA and states becomes less about partnering and more about states simply responding to EPA requirements as directed. Dual federalism replaces cooperative federalism with the EPA assuming full responsibility in the EJ sphere of concerns.[15] The state environmental agency may well

[15] An alternative to cooperative federalism is dual federalism, a system of government in which both the states and the national government remain

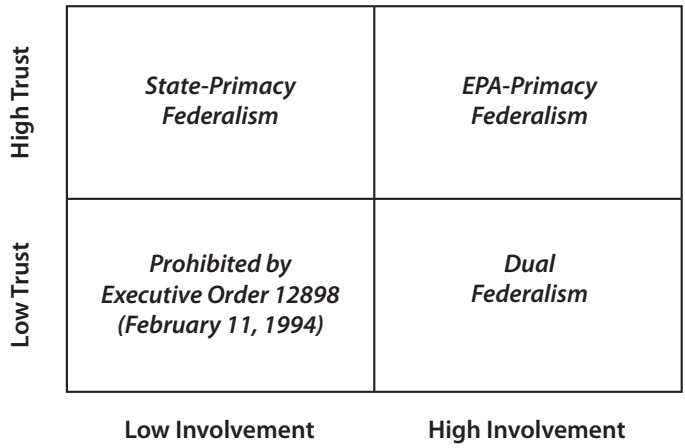

Figure 5.1 Environmental justice and a federalism typology

engage in a partnering relationship with the EPA in other areas of environmental management, but in the EJ arena the relationship is better characterized as employer–employee with the state conducting activities as required, subject to strict EPA oversight. Federalism under a low trust/high involvement relationship typically is characterized by contention, extensive EPA oversight, micromanagement of state personnel, and one-way communication from the EPA to the state environmental agency.

When trust is high, two types of cooperative federalism become possible based on comparative advantage. Trust is earned when a state environmental agency demonstrates competence, integrity, and reliability in the EJ arena of concerns. Once trust is established, the EPA and the state agency are free to enter into PPA and PPG contracts to effectively address EJ concerns based upon recognition by the EPA of the abilities, expertise, and dedication of state personnel.

Cooperative federalism with state primacy approaches the promotion of EJ with the state environmental agency assuming a leadership role in both documentation and policy implementation when appropriate. A federalism relationship characterized by high trust and low EPA involvement involves a careful division of labor. The state is better positioned to document the nature and extent of the EJ concerns, as well as formulate appropriate remedial policy, owing to regional data requirements, access

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supreme within their own sphere, each responsible for some environmental policies. Here the two levels of government would be coequal sovereign governments, but within the limits of their respective constitutions.

to affected communities, and agency documentation and community expertise. The EPA is cast in a supportive role involving provision of supplemental resources when required, guidance documentation, and outcome oversight. In contrast, cooperative federalism with EPA primacy approaches the promotion of EJ with the EPA assuming a leadership role in both documentation and policy implementation. A federalism relationship characterized by high trust and high EPA involvement also involves a careful division of labor. Given the national applicability of the environmental policy under consideration, the EPA is better positioned to document the nature and extent of the EJ concern and must take the lead in policy implementation. Here the state environmental agency accepts the responsibility for addressing public concerns, state implementation, and monitoring and enforcement. Additionally, agency personnel at the state level are likely to play a pivotal role in providing supplemental documentation evidence. The EPA, on the other hand, now assumes primacy in formulating policy and addressing existing and anticipated EJ consequences of its initiatives.

Case Study Assessments

In the next two sections, a federalism policy assessment is conducted and the implications for federalism in support of EJ are explored. The assessments evaluate the state agency's policy response to the EJ conflicts documented in the case studies.[16] In each section, the empirical results of the case study are summarized, the policy initiatives of the state environmental agency are described, and the conformance between the policy initiatives and the nature and extent of the EJ conflict are examined. Recommendations for how federalism can best serve EJ objectives emerge from the combined case study results and policy assessments for the siting and regulation of polluting activities.[17]

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[16] A substantial body of empirical research has investigated various aspects of environmental federalism, other than environmental justice. See, for example, Dinan et al. (1999) on the efficiency cost of uniform water quality standards; List and Gerking (1996) and Millimet (2003) on interstate competition and the 'race to the bottom;' Atlas (2001), Helland (2003), and Sigman (2005) on environmental federalism and enforcement; and Fomby and Lin (2006) and List and Gerking (2000) on devolution and the 'New Federalism.'

[17] While beyond the scope of this book, debates over the jurisprudential and political dimensions of federalism are contentious and fascinating. Some scholars and commentators have lauded the recent trend of the Supreme Court in promoting devolution and a 'New Federalism' as productive and long overdue (Adler, 2005; Calabrisi, 1995), while others have voiced cautionary concerns

CLEAN AIR, EJ, AND FACILITY SITING IN THE PHOENIX METROPOLITAN AREA

Based on the case study evidence presented in Chapter 3, Toxic Release Inventory (TRI) facility siting in the Phoenix Metropolitan Area (PMA) over the 1990 to 2000 period resulted in adverse, disparate, but 'justified' impacts on minority communities.[18] That is, the siting of these facilities increased exposure to toxic emissions disproportionately in minority neighborhoods, but also generated economic benefits by contributing to an overall environment that helped create growth areas in the region. The fact that TRI facility siting has tended to generate both heightened environmental risks and economic development benefits creates a fundamental policy dilemma: How should future permitting applications be evaluated?

In the vast majority of cases, an air quality permit application will be justified since economic development benefits will be generated upon approval. As a result, ADEQ has concentrated on strengthening its permit approval process to ensure that disparate-impact discrimination does not result from agency decision making. Additionally, a variety of programs has been implemented to redress past adverse and disparate impacts. This combination of strengthening the permit approval process *ex ante* and effectively redressing past discriminatory impacts *ex post* strongly supports a state-primacy model of cooperative federalism for evaluating future siting applications. In the following two sections, ADEQ's process of strengthening the permit approval process while redressing past

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about hampering effective federal regulation (Barron, 2001; Klein, 2003). While these debates typically revolve around the scope and applicability of the commerce clause and the dormant commerce clause, other analysts have focused on the interpretation of the supremacy clause, a provision in the US Constitution providing that the Constitution and federal laws are the supreme law of the land binding judges in every state (Austin, 2004). Other federalism scholars escalate the controversies further by arguing that the Constitutional law and public policy dimensions of federalism cannot, and should not, be separated (Greve, 1999). That is, federalism should promote citizen choice and competition among the states, a libertarian view of federalism. In this analysis, federalism is viewed as a neutral principle. That is, federalism is about allocating authority to the level of government that is best suited to address the problem at hand. It is about the critical structural role states play within our federal system.

[18] As described in Chapter 2, justification in the context of Title VI guidelines simply shows that siting decisions were made in the pursuit of a proper public purpose. To say that an agency siting decision is 'justified' is not to assert that the decision is just or that it necessarily promotes economic efficiency.

disparate impacts is documented for the 2001–10 period. This discussion is then followed by an assessment of how to best structure cooperative federalism in the future to address EJ siting concerns.

Issuing Air Quality Permits in the PMA: Recent EJ Initiatives

The Air Quality Division of ADEQ issues air quality permits to industries and facilities that emit regulated pollutants with the purpose of ensuring that these emissions do not harm public health or cause significant deterioration in areas that presently have clean air. ADEQ has sole jurisdiction over permits pertaining to the smelting of ore, petroleum refineries, coal-fired electrical generating stations, cement plants, and air pollution by portable and mobile sources.[19] The review, issuance, administration, and enforcement of all other permits are by county agencies or multi-county air quality control boards when applicable.[20] Under these circumstances, the relevant board of supervisors is delegated the authority to adopt rules as it determines are necessary and feasible to control the release into the atmosphere of air contaminants originating within the territorial limits of the county.[21]

Procedures and documentation requirements are virtually identical for both ADEQ and county siting permits.[22] The information required for a standard permit application is extensive, requiring documentation concerning the production process and its associated products, a flow diagram for all processes, a material balance discussion for all processes (optional), identification of potential emissions of all regulated pollutants from all emission sources, an explanation of any proposed exemptions from otherwise applicable requirements, stock information, site diagrams, air pollution control information, equipment manufacturer's bulletins and shop drawings, the compliance status of each source, a statement that each source will continue to be in compliance with applicable regulations, certification of compliance by a responsible official, a determination of the Lowest Achievable Emission Rule (LAER) for a new major source in a non-attainment area, and a determination of the Best Available Control Technology (BACT) for a new major source in an

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[19] Arizona Revised Statutes § 49–402A.
[20] Arizona Revised Statutes § 49–402B.
[21] Arizona Revised Statutes § 49–479.
[22] Arizona Revised Statutes § 49–480B.

attainment area.[23] Siting requirements for permit approval in South Phoenix, a designated EJ community, are even more comprehensive.

EJ and ADEQ's learning sites policy

South Phoenix has been identified as an EJ community of concern since the mid 1990s.[24] The area has a concentration of industrial facilities, is surrounded by vehicular traffic from US Interstates 10 and 17, and is the lowest point in the metropolitan valley with the highest PM10 readings.[25] Additionally, residents are primarily low-income and minorities with long-standing concerns about their exposure to harmful air pollutants. The South Phoenix Collaborative, a network of researchers from Arizona State University, their students, and community stakeholders addressing health and environmental challenges facing the South Phoenix community, has provided a succinct summary of the EJ concerns:

> South Phoenix has a rich, diverse and changing population that includes historically African American neighborhoods, and is currently around 70 percent Latino with some 30 percent of residents born outside of the US (most in Mexico). These neighborhoods have disproportionate health and environmental burdens compared to others in the city, related to current and historic risk factors such as migrant status, poor quality of neighborhood amenities, lack of access to affordable healthcare and healthy food, erratic income, poor air quality, and excess heat.[26]

Dozens of recent research studies have validated earlier research showing a strong relationship between particle pollution, illness, hospitalization and premature death, particularly in children. A study of school-age children in 12 southern California communities, for example, reported increased cough, bronchitis, and decreased lung function in children living in more polluted areas (Gauderman et al., 2002). In 2006, using funds provided by the EPA, ADEQ engaged researchers at Arizona State University's Ira A. Fulton School of Engineering and the Center for

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[23] Arizona Dept of Environmental Quality, 'Appendix 1. Standard Permit Application Form and Filing Instructions,' last revised February 3, 2010, available at http://www.azdeq.gov/environ/air/permits/index.html.

[24] See http://www.azdeq.gov/function/programs/spco/index.html.

[25] Particulates are tiny subdivisions of solid matter suspended in a gas or liquid. Increased levels of fine particles in the air are linked to health hazards such as heart disease, altered lung function, and lung cancer. The notation PM10 is used to describe particulates of 10 micrometers or less.

[26] See http://shesc.asu.edu/research/south-phoenix-collaborative/.

Health Information and Research to investigate the Arizona connection between elevated levels of PM10 pollution and increased incidences of asthma in children. The study concluded that the incidence of asthma events among children 5 to 18 years old increased by nearly 14 percent when levels of PM10 pollution increased to the 75th percentile in the Phoenix Metropolitan Area.[27] These findings document a much stronger effect for children between the ages of 5 and 17 than previously thought (Fernando et al., 2009).[28] Importantly, the health risks to children in the EJ community of South Phoenix are further exacerbated by the fact that the predominantly Hispanic population has the highest asthma rate in Maricopa County. Approximately 25 percent of the children in the neighborhood's Roosevelt Elementary School District suffer from asthma (Quintero-Somaini and Quirindongo, 2004).

On July 13, 2005, ADEQ announced a new policy to protect Arizona children from exposure to toxic substances and air pollutants from facilities near schools. This 'learning sites' policy provided for increased scrutiny in reviewing air quality permit applications for operations which may impact learning sites. To ensure that the protection of children at these sites is carefully considered, ADEQ requires permit terms that are sufficient to protect children's health, and may deny a permit application or plan approval that is not protective. Learning sites consist of all existing public schools, charter schools and private schools at the K-12 level, and all planned sites for schools approved by the Arizona School Facilities Board.[29]

Implementation of the learning sites policy was partially in response to the documentation of disparate-impact discrimination in past ADEQ siting decisions. Children in the EJ community of South Phoenix are particularly at risk for deleterious health outcomes from heightened exposure to particulate pollution. In response, ADEQ now requires an additional review of potential environmental health impacts. Specifically, each air quality permit application undergoes an air pollutants evaluation prior to permitting. This evaluation consists of air emissions modeling and estimation of maximum ambient concentrations of air pollutants attributable to the facility, as well as predicted ambient concentrations at any impacted learning site. Equally important, proposed permits and plan

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[27] The 75th percentile is roughly the level at which ADEQ issues a health watch but below the benchmark designated for a high-pollution advisory.

[28] Similar findings for Metropolitan Phoenix have been reported by Grineski, 2007.

[29] See http://www.azdeq.gov/ceh/intro.html.

approvals for facilities that may have an impact on learning sites typically undergo expanded public participation to ensure full disclosure to the concerned public.[30]

EJ and ADEQ's disparate-impact assessment policy

To help minimize the occurrence of adverse and disparate impacts from siting decisions *ex post*, ADEQ has committed to assessing possible EJ conflicts *ex ante*. This process of incorporating EJ assessment into the permit approval process is well illustrated by the recent Denison Mines licensing decisions.

Denison Mines Corporation (Denison) is a large international business specializing in the intermediate production of uranium.[31] The company recently submitted licensing requests to ADEQ for three mines in north central Arizona. The Canyon Mine site is located approximately six miles southwest of the village of Tusayan in Coconino County, Arizona. Tusayan is a small resort town five miles south of the Grand Canyon National Park with a population of 562 residents. The local economy revolves around providing accommodation and canyon-related activities for tourists. Denison's Arizona I and Pinenut Mine sites are located approximately 30 miles south of Fredonia, Arizona. Fredonia is the most northern town in Arizona and is a gateway to the north entrance to the Grand Canyon National Park with a population of 1,036 residents. The town's economy also revolves around the tourist industry.

Denison applied for a water quality general aquifer protection permit (APP) to operate a surface impoundment at the Canyon Mine location, an air quality permit (AQP) for the Arizona I Mine, and an APP similar to that of the Canyon Mine for the Pinenut Mine. These mining sites are geographically isolated. No community is located within five miles of the

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[30] See http://www.azdeq.gov/ceh/download/050713–1103.0.pdf.

[31] According to their website, Denison Mines Corp. (TSX: DML) (NYSE AMEX: DNN) is an intermediate uranium producer with production in the US, combined with a diversified development portfolio of projects in the US, Canada, Zambia, and Mongolia. Denison's assets include its 100 percent ownership of the White Mesa mill in Utah and its 22.5 percent ownership of the McClean Lake mill in Saskatchewan. The company also produces vanadium as a co-product from some of its mines in Colorado and Utah. Denison owns interests in world-class exploration projects in the Athabasca Basin in Saskatchewan, including its 60 percent owned flagship project at Wheeler River, and in the southwestern United States, Mongolia and Zambia. See http://www.denisonmines.com/home/home.

Canyon Mine, with Tusayan being the most proximate six miles away. Similarly, no community is located within 5 miles of either the Arizona I or Pinenut Mines, with Fredonia being the closest 35 miles away.[32]

Despite the mining sites' relative isolation, ADEQ received numerous comments from potentially affected communities through the public participation process. The comments were wide ranging, addressing topics as diverse as land and water contamination, public health, impacts on perched aquifers, and the financial capability of Denison for mine remediation and closure. To respond to both written and oral comments involving all three permits, ADEQ conducted an EJ assessment while consulting closely with the Hualapai, Havasupai, and Kaibab-Paiute Tribes. The purpose of the EJ assessment was to ensure that there would be no disparate adverse environmental impacts as a result of ADEQ licensing decisions related to the Canyon, Arizona I and Pinenut Uranium Mines in Northern Arizona.

For purposes of identifying disparate impacts, ADEQ relied on the criteria proposed by the EPA in its Interim Guidance.[33] Specifically, if the minority population of the affected area is greater than twice the state percentages, the case should be identified and addressed as an EJ case. Second, if the minority population is less than twice, but greater than the state percentages, and if there are community-identified EJ issues, the case should be identified and addressed as a potential EJ case. Third, if the minority population percentage is equal to or less than the state percentages, the case should not be identified and considered an EJ case. Minority populations, in turn, are defined as comprising all Hispanic ethnicity (including white individuals of Hispanic ethnicity), black or African American alone, American Indian and Alaskan Native alone, Asian alone, and Native Hawaiian and Other Pacific Islander alone; some other race alone; and two or more races. Additionally, the assessment

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[32] In principle, two other communities could be impacted by ADEQ's licensing decisions regarding the mines. Supai is the capital of the Havasupai Indian Reservation with a population of 423. The community is approximately 95 percent Native American and is extremely isolated, eight miles from the nearest road and accessible by hiking, horseback, or helicopter only. Valle, Arizona, is located at the junctions of US Route 180 and State Route 64, the midpoint between Flagstaff and the Grand Canyon. Valle is a very small community with two gas stations, several gift shops, and a post office. In practice, both communities are too remote to be impacted by the mining operations, with Supai being more than 20 miles and Valle more than 17 miles from the proposed mining sites.

[33] See US EPA, 2010c.

accounts for 'sensitive populations,' individuals in the general population more affected by pollution. A sensitive population is defined as children less than or equal to 5 years of age, and adults greater than or equal to 65 years of age.

Only 55 individuals resided within 5 miles of the Canyon Mine site. Approximately 35 percent of these individuals were minorities, and only 11 percent were part of the sensitive population. Since the statewide percentages are 36 percent and 22 percent respectively, ADEQ concluded that licensing the mine was not an EJ concern. Similarly, licensing the Arizona I and Pinenut Mines did not constitute an EJ concern since no one resided within five miles of either site. Finally, disparate impacts on Native Americans were ruled out since the Havasupai, Hualapai, and Kaibab Reservations were all at least 15 miles from the proposed mining sites.

The final step in the assessment was to evaluate the likely impacts of licensing the mining sites on air and water quality in the region. As part of the permit application process, Denison was required to conduct an ambient air dispersion analysis to ensure that emissions from the Arizona I Mine would not cause or contribute to an exceedance of the federal National Ambient Air Quality Standards (NAAQS). The air quality impact analysis showed that the mine operations would not cause or contribute to a NAAQS' exceedance. Similarly, for the Canyon Mine and Pinenut sites, ADEQ analysis verified that the general aquifer protection permits were technically sound and met or exceeded all federal and state legal requirements. Based on both the EJ and environmental impact assessments, the licensing requests were subsequently approved.

Redressing Adverse and Disparate Impacts

In addition to strengthening the review process for air quality permit approval, ADEQ has implemented several programs over the past decade to ameliorate the adverse and disparate impacts of past siting decisions. These initiatives have been consistently characterized by a commitment to both cooperative federalism and community involvement. The pollution prevention program, the South Phoenix Multi-Media Toxics Reduction Project, and the Industry Challenge/Good Neighbor Partnership are three of the more prominent initiatives.[34]

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[34] While not directly targeting South Phoenix, a fourth emissions control program with significant EJ implications in Arizona is the Phoenix Joint Air Toxics Assessment Project (JATAP). The project is designed to protect residents of the greater Phoenix Metropolitan Area (PMA) from cancer and non-cancer

Pollution Prevention (P2) Planning Program

The Arizona legislature adopted a state Pollution Prevention Policy in 1991.[35] Under the Pollution Prevention (P2) Planning Program, prevention is defined as making changes in production procedures and processes, as well as in housekeeping or management techniques, that reduce potential or actual releases of pollutants into the overall environment (air, water, and land). While pollution prevention can occur in a variety of ways, including toxic use reduction, recycling, reclamation, and chemical substitution, reduction at the source is emphasized. The P2 Planning Program requires all industrial facilities within a certain threshold of hazardous waste generation and toxic substance usage to perform a P2 analysis and file an annual P2 Plan. The plans then outline specific pollution prevention opportunities and performance goals.[36]

An audit of the P2 Planning Program was conducted by ADEQ in 2003. The program reported 911 million pounds of pollution prevented by over 200 companies who had submitted plans to the state through 2002. Facilities enrolled in the P2 program were able to reduce the amount of wastewater by 2,612,157 pounds and conserve new water use by 24,102,000 pounds. The total amount of pollution prevented (i.e., pollution prevention across all environmental media) was 221 million pounds. Importantly, in the EJ community of South Phoenix, facilities eliminated 163,360 pounds of particulates and fugitive emissions and prevented the generation of 7,234,588 pounds of wastes using pollution prevention techniques between 1992 and 2002.[37] The success of the program is at least partially attributable to cooperative federalism and community involvement. The EPA has collaborated closely with ADEQ over the entire course of the P2 Planning Program. From 2000 to 2006 alone, EPA grants totaling $209,000 were awarded to ADEQ for

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health risks from hazardous air pollutants. JATAP is a joint effort between state, county, tribal, and EPA officials to address the risk from air toxics in the PMA. In addition to ADEQ, the Maricopa County Air Quality Division (MCAQD), and the EPA, participants include the Salt River Pima-Maricopa Indian Community, the Fort McDowell Yavapai Nation, and the Gila River Indian Community with logistical and technical support from the Institute for Tribal Environmental Professionals. For details, see http://www.epa.gov/ttn/amtic/files/ambient/airtox/2011workshop/day2LeroyWilliamsGilaRiverTribalUpdate.pdf.

[35] Arizona Revised Statutes § 49–961 to 49–973.

[36] See http://www.epa.gov/p2/pubs/casestudies/azmandatoryp2.htm for an overview of the program.

[37] Ibid.

pollution prevention initiatives.[38] In 2007, an additional $80,000 grant was awarded to identify TRI facilities that had not yet filed P2 Plans with ADEQ, and then to provide technical assistance to increase their level of chemical and waste abatement.[39] On the community involvement front, a trusting relationship has developed between P2 Plan filers and ADEQ over time. By engaging the regulated community, there has been a growing awareness of the economic, regulatory, liability, health and environmental benefits of pollution prevention. While substantial penalties for non-compliance are legislatively available,[40] substantial pollution prevention has been achieved without imposing draconian sanctions. For example, ADEQ currently provides a 50 percent reduction in hazardous waste generation fees when a company has an approved P2 Plan in place. From 1999 to 2001, this good faith measure meant an average annual savings to filers of more than $260,000.[41]

South Phoenix Multi-Media Toxics Reduction Project

In August of 2000, residents of South Phoenix, in consultation with EJ organizations, filed an administrative complaint with the Office of Civil Rights within the EPA charging ADEQ with violation of Title VI of the United States Civil Rights Act of 1964. The complaint alleged that ADEQ had repeatedly violated the civil rights of low income and minority residents in South Phoenix by participating in the discriminatory siting and permitting of toxic waste facilities located disproportionately in the community.[42] In 2002, the EPA's Region 9 Air Quality Division identified South Phoenix as an EJ strategic priority, and targeted the area to pilot a multi-media toxics reductions project. In May of 2003, ADEQ Director Steve Owens announced the start of the South Phoenix Multi-

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[38] Source: http://www.epa.gov/p2/pubs/grants.

[39] Ibid.

[40] Under § 49–964 of the Arizona Revised Statutes, a qualifying facility that fails to submit an adequate P2 plan will at first receive written notice of this violation and be given 90 days to submit a modified plan. Continued non-compliance can then be followed by a formal notice of inadequacy (a copy of which is to be placed in ADEQ's annual report), then a public hearing, then an administrative order, and finally a judicial proceeding including an action of contempt. Additionally, ADEQ can provide for inspecting the facility, gathering necessary information and preparing a plan or progress report for the facility at the facility's expense.

[41] Source: http://www.epa.gov/p2/pubs/casestudies/azmandatoryp2.htm.

[42] See http://www.greenaction.org/arizona/pr081800.shtml.

Media Toxics Reduction Project (SPTRP) with the purpose of developing and implementing a plan to reduce air, water, and soil pollution, and improve public health in the community.[43]

The project was initially funded by the EPA with a $270,000 grant to ADEQ to identify sources of toxic pollutants, analyze their potential adverse health and environmental effects, and develop a prioritized action plan to lower particle exposure to these toxic substances. To pursue the goals of the project, the South Phoenix Community Action Council (CAC), a citizen advisory committee, was formed to identify environmental issues of concern in its community.[44] The CAC subsequently identified the geographic area for the project and determined the highest priorities for reducing toxic pollution.[45]

In its final recommendations to ADEQ, the CAC concluded that reducing air pollution was of primary concern to the community, and that improving compliance and enforcement should be a top priority in that regard. Based in part on the recommendations of the CAC, ADEQ subsequently initiated several programs designed to improve the efficiency and effectiveness of its compliance and enforcement programs in South Phoenix. Specifically, a series of workshops were held to assist small hazardous waste generators to comply with environmental law; ADEQ and the EPA conducted a targeted inspection sweep of all South Phoenix hazardous waste treatment, storage, and disposal facilities and large quantity generators; ADEQ undertook aggressive enforcement action in the community over the 2000 to 2006 period, issuing 31 notices of violation and collecting over $375,000 in penalties from violating facilities; supplemental environmental projects were initiated to more directly benefit the South Phoenix community;[46] and in 2005–06, the Hazardous Waste Program doubled the number of compliance officers on staff to augment the agency's ability to effectively monitor and enforce

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[43] See http://www.azdeq.gov/function/about/download/news.pdf.

[44] The community was directly involved in the formation of the CAC, with numerous neighborhood associations, local colleges, businesses, residents, and other stakeholders represented in the selection process. The CAC was co-chaired by ADEQ and community representatives.

[45] Predictably, the composition of the CAC and their recommendations were subject to criticism. For a particularly vituperative appraisal, see http://www.dontwastearizona.org/civil_rights.php.

[46] One South Phoenix mercury recycler, for example, implemented an SEP that provided funds and assistance to the Phoenix Union High School District in South Phoenix for the collection and disposal of hazardous chemicals.

environmental regulations. This combination of compliance assistance, inspection initiatives, enforcement actions, and supplemental environmental projects resulted in enhanced compliance and a significant reduction in toxic air emissions.[47]

Industry Challenge/Good Neighbor (IC/GN) Partnership

A second top priority of the CAC in its final recommendations to ADEQ was the promotion of pollution prevention. The Council recognized the importance and effectiveness of abating toxic emissions at the source, and was very supportive of the ongoing efforts of ADEQ and the EPA in South Phoenix. Between July 2003 and January 2005, community members, businesses, and government officials held a series of six meetings to design and launch the IC/GN Partnership. This was a voluntary partnership between US EPA Region 9, Maricopa County Air Quality Department (MCAQD), community leaders, 21 industries located in South Phoenix, and ADEQ. The IC/GN was launched in March 2005 and concluded in July 2008.[48]

The goals of the partnership were to reduce routine air emissions of priority pollutants by 20 percent, adjusted to production, and to reduce the number and severity of accidental releases.[49] A variety of technical assistance activities was conducted over the 2005–08 period to help participating companies achieve these goals. The EPA performed six free, non-regulatory safety audits for participating South Phoenix companies to improve their site safety and to prevent accidental releases. Reports were provided to six companies outlining changes for improving performance. Additionally, in May of 2006, 2007 and 2008, the EPA in cooperation with MCADD and ADEQ visited 8 to 12 partnership companies per year to help collect, analyze, and normalize their environmental data. Finally, to help companies further improve their environmental performance, the EPA held a series of Environmental Management System (EMS) training workshops in 2006, with help from ADEQ staff. At each workshop, EMS topics and techniques were introduced and then subsequently applied by participating companies.[50]

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[47] See http://www.scribd.com/doc/1916273/Environmental-Protection-Agency-soPhoenixMMTRtoxicsreductionplan.

[48] See http://www.epa.gov/region9/waste/p2/projects/so-phoenix-good-neighbor. html.

[49] See http://www.epa.gov/region9/annualreport/09/communities.html.

[50] See http://www.phoenixindustrychallenge.com/final_report.htm.

The IC/GN was largely viewed as a success. From 2005 to 2008, participating companies collectively reduced toxic air emissions by over 85,000 pounds, electricity use by 60 million KWh, hazardous waste by 373,000 pounds, and water use by 827,000 gallons, adjusted to production.[51] In fact, the partnership has become a model for community toxics reduction programs across the nation.[52]

Implications for Cooperative Federalism

The EPA and ADEQ share responsibility for siting air-polluting facilities in the PMA, with ADEQ assuming primacy. ADEQ collects, validates, and evaluates information required for permit approval; promotes and organizes public participation in the approval process; accounts for potential impacts on learning sites; and conducts EJ assessments as appropriate. The EPA, in turn, provides technical guidance, grant support, and agency oversight of permitting outcomes.

This state-primacy institutional arrangement seems well justified by the evidence. The case study reported in Chapter 3 documented that past siting decisions have resulted in adverse and disparate impacts on Hispanic communities in the PMA. ADEQ has responded by strengthening air emissions permit requirements and by developing in-house *ex ante* EJ assessment capacity. More generally, in a recent evaluation (US EPA, 2006a), the EPA concluded that ADEQ's Title V operating permit program has improved significantly in recent years. The program is now characterized by a multi-pronged approach to public participation, well organized and detailed statements of technical support documents, clear communication and coordination among its various program offices, greatly improved quality of both its major source and minor source permitting programs, and enhanced compliance among the regulated community. In addition, beyond reforming the permitting process, the EPA and ADEQ have also worked cooperatively to address adverse and

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[51] Ibid.

[52] In an audit of IC/GN, several areas of concern or improvement were identified. In designing similar initiatives elsewhere, particular attention should be paid to documenting the response of companies to onsite audits, reducing company attrition in the partnership, maintaining a high level of community involvement throughout the program, encouraging company buy-in to EMS workshops, and tracking health benefits directly attributable to partnership achievements. See http://www.phoenixindustrychallenge.com/attachment_II_lessons_learned.htm.

disparate impacts attributable to past siting decisions. In a series of effective initiatives, ADEQ has taken the lead in the implementation, monitoring and enforcement of EJ programs while the EPA has provided technical guidance and grant support. The net impact of permitting reforms and EJ initiatives has been that trust has been established between the EPA and ADEQ with ADEQ assuming primacy for air emissions permit approval, and the EPA delegating day-to-day permitting responsibilities to ADEQ while providing program support and oversight.

While recent developments under a state-primacy model of cooperative federalism are encouraging, consistently promoting EJ permitting objectives will remain a challenging task. The National Environmental Justice Advisory Council (NEJAC) has recently made a series of recommendations on how to enhance EJ in EPA permitting programs (NEJAC, 2011a). Several of the council's recommendations have already been adopted by ADEQ: EJ considerations are now incorporated early into the permitting process, meaningful public participation is facilitated, and the use of SEPs and good neighbor agreements has become a priority, tying EJ community needs to the permitting process. On the other hand, accounting for cumulative risk remains empirically challenging, as does addressing the creation of a permit and the enforcement of its conditions simultaneously. To build on past successes and to address remaining challenges, the NEJAC has further recommended the use of PPAs. These agreements are flexible documents that can specify the responsibilities and authority of both ADEQ and the EPA in the permitting process. A PPA can address specific activities, as well as broader environment concerns including the incorporation of EJ, cumulative risk assessment, and compliance and enforcement considerations into permit approval protocols. Since PPAs are typically renewed every two years, opportunities for public review and comment are created, bolstering both the transparency and the accountability of the permitting process.[53]

[53] The State of Washington provides a useful example. Upon renewal, a draft PPA is published for a 30-day comment period. Each comment is addressed in writing, all comments are considered for incorporation into the final PPA, and responses are included in the final PPA appendix.

SAFE DRINKING WATER, EJ, AND THE REVISED ARSENIC STANDARD IN ARIZONA

Much of environmental law is selectively enforced, and for good reason. Given institutional, resource and penalty constraints, efficiency justifications for selective enforcement are well established. It is also well established that enforcement of the Safe Drinking Water Act (SDWA) is complex and dependent on selective enforcement. Frequently violations are not pursued at all or prosecuted with trivial expected penalties. This process has been empirically documented in Arizona as well (Rahman et al., 2010).

EJ concerns may be encountered in the process of implementing and selectively enforcing the revised arsenic standard for drinking water. Failure to enforce compliance with water quality standards may deny consumers the health benefits associated with less contaminated water, while forcing compliance may secure benefits but at prohibitive cost for minority or low-income communities. The extent to which EJ concerns complicate enforcement depends on the extent to which minority and/or low-income populations are disproportionately served by public water systems (PWSs) struggling to comply with the revised standard.

Both the zero-order correlation analysis and the logistic regression estimations reported in Chapter 4 support the conclusion that continued selective implementation and enforcement of the revised SDWA arsenic standard is unlikely to disadvantage minority or low-income groups disproportionately in Arizona. That is, cost-effective, affordable compliance is a challenge for small public water systems, not large systems, and small systems requiring remedial action are no more likely to be predominately low-income or minority than to be predominately middle- to high-income and white. Documenting this absence of systemic EJ conflicts arising from Arizona's implementation and enforcement of the revised arsenic standard for drinking water is an important and policy-relevant finding. EJ concerns are not pervasive across affected small PWSs in the state.

Drinking Water Regulations, Income, and EJ

From the perspective of the state of Arizona, the EPA has documented that the adoption of the revised arsenic standard will generate more in health benefits than in abatement costs (US EPA, 2000a). From the perspective of small public water companies requiring remedial action, the case study results have documented that EJ concerns are not

pervasive across systems in the state. From the perspective of low-income individuals and households within small PWSs, however, the implementation and enforcement of the revised standard is more problematic.[54]

A substantial body of research has concluded that lower incomes are associated with higher mortality risks. That is,

> […] the mortality rate for individuals with higher incomes is less than that for individuals with lower incomes. Reasons for this relationship relate to, among other things, better nutrition, better sanitation, better health care, better education, and better socioeconomic status – all items that are easier to come by with money. This raises a key issue about whether the cost of a proposed regulation, which de facto reduces the disposable income of individuals available for other purposes, would increase mortality risks and therefore produce more premature deaths than those purported to be saved by the proposed legislation (Keeney, 1994, p. 95).

The regulatory concern is that higher water bills for low-income customers of small PWSs result in less disposable income for other goods and services like health care, food, energy, and other essential services. In the net, this tradeoff may be welfare decreasing, not increasing.[55] The regulatory challenge is summarized by Sunstein (2001):

> If, for example, those who would bear $300 or more in increased annual costs are also disproportionately poor, there is good reason for government to hesitate before imposing the regulation. It is easy to imagine a situation in which water quality regulation is 'regressive,' in the sense that its costs come down especially hard on poor people. Now that is not a decisive objection to

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[54] For an excellent discussion of these issues in the context of benefit–cost analysis, see Raucher et al., 2011.

[55] The net health risk reduction of drinking water regulations is a particular concern for low-income households in Arizona. Income growth over the past ten years has been termed the 'lost decade' by Harvard economics professor Lawrence Katz (see http://www.nytimes.com/2011/09/14/us/14census.html?_r=1 for a discussion). According to the US Census, median US income fell to 1996 levels in 2010 with 46.2 million people living below the poverty line, the highest number ever recorded. Arizona median income in 2009 was $48,711 compared to $50,221 in the US with 16.5 percent of Arizona residents living below the poverty line compared to 14.3 percent in the US, the highest national percentage since 1993 (see http://quickfacts.census.gov/qfd/states/04000.html). Hispanics comprised 16.3 percent of the US population in 2010. In Arizona, nearly 30 percent of the residents are Hispanic, a minority group with 26 percent of its population living below the poverty line, rising to 32 percent for Hispanics younger than 17 (see http://pewhispanic.org/states/?stateid=AZ).

> the regulation, but it is certainly an important point to consider (Sunstein, 2001, p. 49).

To promote substantive EJ implementation, policy must be concerned with the *net* risk reduction of the revised arsenic regulation. As Raucher et al. (2011, p. 9) point out: 'If a regulation significantly decreases the disposable income of those affected by the regulation, it could wholly or partially offset the health benefits of the regulation itself.' The potential magnitude of the problem is illustrated in Table 5.1 where the EPA estimates for per-household compliance costs by system size are presented. While PWS customers would receive the same health benefits from reducing arsenic concentrations in drinking water to 10 ppb, household compliance costs for small systems with fewer than 3,300 customers can be anywhere from 1.8 to over 10 times more expensive compared to the weighted average across all system size categories. As the cumulative impact of imposing new drinking water regulations increases, low-income households may forgo other necessities. In reviewing the literature on alternative measures of financial distress, Raucher et al. (2011) develop a hierarchy of household necessities. Based on their survey of empirical evidence, increasing the cost of water service to a distressed household may increase the likelihood that the household will forgo some other necessity, starting with health insurance, then dentist appointments, then doctor visits, then adequate nutrition, and finally to eviction or foreclosure on the home. Thus, the core EJ issue at the individual or household level is whether compliance costs of the arsenic rule outweigh the net health risk reduction benefit.[56] To the extent that compliance costs can be made affordable, substantive EJ is promoted.

Finally, it is important to note that, while the empirical evidence cited by Raucher et al. (2011) supports the contention that the net health impact on low-income water consumers may be negative when rate hikes

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[56] In fact, based on the EPA's own estimates of compliance costs, Raucher et al. (2011, pp. 16–18) estimate that cost-associated risks may be within the same order of magnitude as the EPA-estimated arsenic risk reductions. Portney and Stavins (1994), on the other hand, argue that the health impacts of regulatory compliance costs are unlikely to be significant. As a result, conventional benefit–cost analysis ought to remain the principal tool of economic assessment of environmental laws and regulations. In the context of safe drinking water, however, the welfare reducing impact of substantially increased water rates on low-income households is both an allocative efficiency and a distributive equity concern.

Table 5.1 Mean annual costs per household of the arsenic MCL (10 ppb)

CWS Size Category (population served)	EPA Estimated Annual Cost per Household (2000 dollars)
25–100	$327
101–500	$163
501–1,000	$ 71
1,001–3,300	$ 58
3,301–10,000	$ 38
10,001–50,000	$ 32
50,001–100,000	$ 25
100,001–1 million	$ 21
More than 1 million	$ 1
Weighted average across all size categories	$ 32

Notes: Ppb = parts per billion
CWSs serving 3,300 or fewer people constitute 87.5 percent of Arizona's public water systems and 79.7 percent of the systems requiring corrective action to comply with the revised arsenic standard.

Sources: US EPA, 2000a and Cory and Rahman, 2009.

become onerous, this result is not inevitable. More generally, consumers will reallocate their budget across all goods and services to maximize their utility in the face of water rate hikes. Some consumers may choose to forgo health services while others may economize on other non-health-related items to accommodate higher drinking water bills. In either case, consumers may be worse off, particularly low-income consumers who spend a disproportionately large share of their total income on necessities, if their tastes and preferences do not change during the course of MCL implementation. A possible exception to this adverse impact can occur when low-income customers come to highly value the health benefits of a more stringent MCL, as benefit information is disseminated over the course of MCL implementation, and the accompanying rate hike is modest. In this special case, water customers are happy to secure the health benefits of safer drinking water at a modest price and are better off, so that no environmental justice problem exists. Unfortunately, this fortuitous outcome is not descriptive of arsenic abatement in Arizona.

Arizona's Approach to the Implementation and Enforcement of the Revised Arsenic Rule for Drinking Water

In 2002, ADEQ provided a succinct summary of its implementation and enforcement policy to all Arizona public water systems (ADEQ, 2002). Earlier in October, 2001, the EPA had announced its decision to lower the arsenic standard for drinking water from 0.05 mg/l to 0.010 mg/l. The effective date of the revised rule was January 23, 2006. For purposes of implementing the SDWA, Arizona is a primacy state, which requires Arizona to enforce the new arsenic standard. Under ADEQ's enforcement strategy, PWSs would not be considered in violation of the revised standard until one year of quarterly sampling was completed with an annual average of arsenic concentrations exceeding 10 ppb. Monitoring cycles were established based on groundwater entry points and the PWSs' initial monitoring years. Appropriate remedial actions were considered to be any approved combination of disconnecting unsuitable wells, source rehabilitation, blending, point-of-use treatments, and centralized treatments like ion exchange, filtration, and reverse osmosis. Of particular importance for small PWSs, time extensions were made available to systems that could meet the qualifying requirements outlined in the Arizona Administration Code (A.A.C. R18–4-111). An extension to January 23, 2009 was available for all PWSs and an extension to January 23, 2016 could be granted to systems serving fewer than 3,300 people. Additionally, ADEQ in cooperation with the EPA developed several programs to facilitate environmental compliance in small communities generally, as well as specific drinking water programs to provide technical guidance and financial aid.

Arizona's Small Community Environmental Compliance Assistance Program

In 2004, the EPA initiated its Small Local Governments Compliance Assistance policy.[57] The policy was intended to promote environmental compliance among small local governments by providing them with special incentives. More specifically, the policy was designed to encourage small local governments to learn about their environmental obligations and to develop the technical, managerial, and financial capacity necessary to achieve and sustain comprehensive environmental compliance. Two tiers of eligibility were made available: (1) local governments

[57] The policy became effective upon its publication at 69 FR 31278 (Jun. 2, 2004). The policy updated and superseded the 'Policy on Flexible State Enforcement Responses to Small Community Violations.'

with no more than 3,300 permanent residents; and (2) local governments with more than 3,300 but no more than 10,000 permanent residents if the state performed a conforming capacity test and determined that the local government was unlikely to achieve and sustain compliance without the state's assistance. Under the policy, the EPA agreed to reduce or waive the usual non-compliance penalties if the small local government entered into an enforceable agreement that established a schedule for the small government to achieve comprehensive compliance at all of its governmental operations. Importantly, the EPA delegated primacy to the states under this program, both for developing viable environmental management systems for its governmental operations, and for decisions to reduce or waive normal non-compliance penalties.[58]

On November 3, 2005, ADEQ announced the initiation of the state program to provide compliance assistance to Arizona's small communities.[59] As with the EPA program, the state program was developed in recognition of the limited financial, technical, and administrative resources available to small communities for environmental compliance, and to promote the development of management tools to be used to identify, prioritize, correct, and prevent future environmental problems. Once the requirements of the 'small community policy' had been met, a small community or special district qualified for a significant reduction or waiver of penalties that might otherwise be imposed for environmental violations.[60] Eligibility was based on the EPA two-tier protocol. The process itself was initiated by a request of the small community for ADEQ to conduct a capacity test to determine whether the community's compliance capacity was such that the community's compliance with

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[58] For additional details, http://www.epa.gov/oecaerth/resources/policies/incentives/smallcommunity/smalllocalgov2pager.pdf.

[59] See http://www.azdeq.gov/function/compliance/download/smallcomm-policy. pdf. Earlier, in March of 2005, ADEQ introduced another incentive program to encourage compliance. The Arizona Environmental Performance Track program (AzEPT) was designed to encourage and reward businesses that were good environmental stewards. For businesses meeting the eligibility requirements, a variety of regulatory benefits was made available, including reduced inspection frequency, advance notice before an NOC (Notice of Opportunity to Correct) or NOV (Notice of Violation) is issued, flexibility of permit conditions, consolidation and reduction of reporting requirements, multi-media inspections and permitting, and annual meetings with ADEQ executives. See http://www.azdeq.gov/function/news/2005/download/0321.pdf.

[60] See Chapter 12 of the ADEQ Compliance & Enforcement Handbook, Version 2/21/06, available at http://azdeq.gov/function/compliance/download/smallcomm-policy.pdf.

environmental requirements would improve significantly with ADEQ assistance. Once a 'good faith commitment' had been finalized between the small community and ADEQ based on the capacity test results, a penalty reduction of up to 75 percent was made available for civil penalties. Subsequently, after a comprehensive Small Community Environmental Protection Plan (SCEPP) had been developed, a reduction of up to 100 percent was made available. A comprehensive and detailed guide for developing and implementing a SCEPP was made available to all PWSs to assist in meeting the eligibility requirements.

On December 12, 2007, the revised implementation guide for a small community environmental protection plan was finalized.[61] Section 2 of the guidelines was exclusively dedicated to compliance with the SDWA. Rules and regulations were discussed in conjunction with self-assessment questionnaires to help promote the development and implementation of drinking water protection plans. The guidance addresses a wide range of topics including national primary drinking water standards, ADEQ compliance assistance, monitoring assistance programs, common drinking water violations, the surface water treatment rule, consumer confidence reports, grants and below market interest loans, and source water protection. Several small communities have taken advantage of this compliance program including Eagar, Miami, Springerville, and Winslow, Arizona.

Arizona's technical assistance programs

Recognizing that compliance with the revised arsenic standard would be a particular problem for small PWSs and for PWSs in rural areas, ADEQ initiated an aggressive outreach program in 2001 to help identify cost-effective means of compliance on a system-by-system basis. Thousands of contacts were made with owners, operators, and customers of PWSs struggling to come into compliance (Calkins, 2003). The scope of the compliance challenge for Arizona was well illustrated by the fact that 330 PWSs had at least one water source with arsenic concentrations exceeding 10 ppb, and that these systems provided drinking water to approximately 4.1 million Arizonans. Through extensive and sustained outreach efforts, however, a detailed compliance strategy for Arizona was developed, culminating in the Arsenic Master Plan (AMP) finalized in 2003. This collective effort was estimated to have reduced the total cost of developing compliance plans for all PWSs by $6 million, compared to the cost of developing plans separately (Owens, 2003).

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[61] Available at http://www.azdeq.gov/function/compliance/download/ecoss.pdf.

The overarching goal of the AMP was to help PWSs comply with the new arsenic standard. The specific focus of the AMP document (ADEQ, 2003) was to:

- make the federal rule easier to understand;
- ensure that all water systems affected by this rule were aware of what they were required to do and when it was required;
- evaluate each individual water system to determine, based on site specific conditions, which compliance options were preferred considering effectiveness and cost;
- provide assistance to water systems in choosing technical assistance providers should they be needed; and
- provide a comprehensive listing of technical assistance providers who can assist with a system's individual arsenic compliance plan.

In the AMP, the arsenic rule was clarified for owners and operators of PWSs through detailed discussion of all major compliance topics including applicability, monitoring locations, MCL violations, consumer confidence reports, compositing samples, possible rule exemptions, as well as treatment and non-treatment options. Compliance options were then developed to characterize systems serving fewer than 10,000 people. Treatment alternatives and cost models were made available to address the special circumstances facing small systems. In addition, a mentoring program was implemented since levels of expertise varied among different sized systems, and many small systems lacked the needed technical sophistication to comply with the new standard. The stated goals of the mentoring program were to improve small PWS operator knowledge and technology transfer. A list of contractors and vendors was also compiled with areas of expertise identified.

In addition to the AMP, four other technical assistance programs were made available to help small PWSs comply with the new regulation. The Operator Certification Program (OCP) provided training in process control and system integrity. This ADEQ-sponsored training was made available to most operators at no cost.[62] The EPA's Check Up Program for Small Systems (CUPSS) provided an overview to small PWSs of topics ranging from state guidance to drinking water regulations, to compliance, technical, and management assistance.[63] ADEQ's Monitoring Assistance Program (MAP) was designed to significantly decrease

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[62] See http://www.azdeq.gov/environ/water/dw/opcert.html.

[63] See http://water.epa.gov/infrastructure/drinkingwater/pws/cupss/software.cfm.

the cost of water sampling by taking advantage of the economies of scale associated with collective reporting, and was required for all PWSs with fewer than 10,000 customers. Testing was conducted for a set of contaminants including volatile organic chemicals, synthetic organic chemicals, regulated inorganic chemicals, asbestos, radionuclides, nitrate, sulfate, and nickel.[64] Finally, the state's Source Water Assessment and Protection Program (SWAPP) provided an evaluation of each water source used by PWSs in Arizona.[65] These evaluations assessed the hydrogeology of drinking water sources to determine the quality of groundwater being drawn into wells, evaluated the watersheds supplying surface water, and surveyed land use activities occurring near drinking water sources. The information was used to determine the degree to which a public drinking water source was protected from, or at risk of, contaminants.

Arizona's financial assistance programs

Recognizing that compliance with SDWA requirements would be financially challenging for PWSs across the US,[66] Congress amended the SDWA to establish the Drinking Water State Revolving Fund (DWSRF) in 1996. The goal of the DWSRF program is to provide states with a financing mechanism for ensuring safe drinking water to the public. States can use federal capitalization grant money to set up an infrastructure funding account from which financial assistance, mainly as loans, is made available to public water systems. Loans made under the DWSRF program normally have interest rates between zero percent and market rates and repayment terms of up to 20 years. Loan repayments to a state revolving fund are a continuing source of funding for future projects. The program places an emphasis on small and disadvantaged communities and on programs that emphasize prevention (e.g., capacity development, operator certification, source water protection) as a tool for ensuring safe drinking water (US EPA, 2010a).

The DWSRF is a partnership between the EPA and states and consists of independent revolving loan funds. State DWSRFs are funded primarily through annual federal grants, state matching funds, loan repayments and

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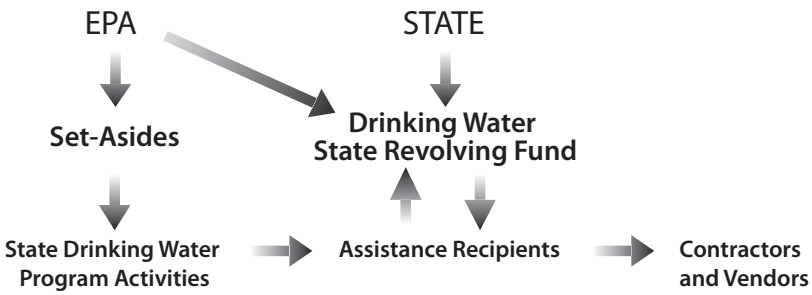
[64] See http://www.azdeq.gov/environ/water/dw/map.html.

[65] See http://www.azdeq.gov/environ/water/dw/swap.html.

[66] The 2007 Drinking Water Infrastructure Needs Survey (US EPA, 2009b, available at http://water.epa.gov/infrastructure/drinkingwater/dwns/index.cfm) estimated the national drinking water infrastructure need for the 20-year period 2007–2026 at $334.8 billion ($16.74 billion annually), a nearly 70 percent increase over the 1999 estimate of $198.2 billion (in 2007 dollars).

interest earnings. The funds are continually recycled from an initial loan back into the program where they can be loaned out for future projects (See Figure 5.2). The DWSRF program is flexible in that states may reserve up to 31 percent of their annual federal DWSRF grant under 'set-asides.' These set-asides can be used to fund a variety of state activities designed to achieve the public health protection objectives of SDWA. Each state uses set-asides to complement its loan program by funding proactive efforts, such as technical assistance, training and other support related to capacity development, operator certification, source water protection and related programs.[67]



Source: US Environmental Protection Agency, 2010a

Figure 5.2 Structure of the DWSRF

The DWSRF program is the principal source of financial assistance for PWSs struggling to comply with the revised arsenic standard. In fact, the DWSRF has been the lead financial assistance program for over 20 years. From 1997 to 2009, state DWSRF programs have provided $16.2 billion in low-interest loans to PWSs. For the four-year period from 2006 to 2009, approximately 30 percent of DWSRF funding, on average, went to help non-compliant systems achieve compliance. In 2009, 712 PWSs, serving 46 million customers, received financial assistance with 38 percent of the funds going to small systems serving fewer than 10,000

[67] Within limits, states also have the ability to transfer funds between their DWSRF and their Clean Water State Revolving Fund (CWSRF) to better address state needs. The SWSRF program primarily provides funding for water quality protection projects. See 42 USC 300j-12 notes and http://water.epa.gov/grants_funding/cwsrf/cwsrf_index.cfm. EPA discusses the importance of this flexibility in a Report to Congress (Oct. 2000 EPA-816-R-00–021) and in a Policy Statement at 65 Fed. Reg. 60, 940 (Oct. 13, 2000). Report available from http://www.epa.gov/nscep/index.html.

customers, and $412 million going to disadvantaged communities serving approximately 3 million consumers. The annual return on investment in 2009 was estimated to be $1.82 spent on infrastructure for every $1 invested by Congress, and $5.50 spent on infrastructure for every dollar invested by the states (US EPA, 2010a).

The DWSRF is administered in Arizona by the Water Infrastructure Finance Authority (WIFA). WIFA is an independent agency of the state of Arizona and is authorized to finance the construction, rehabilitation and/or improvement of drinking water, wastewater, wastewater reclamation, and other water quality facilities/projects.[68] Generally, WIFA offers borrowers below market interest on loans for 100 percent of eligible costs. Under WIFA, a water infrastructure finance authority was established with the responsibility to issue negotiable water quality bonds to generate the state match required by the Clean Water Act for the clean water revolving fund, and to generate the match required by the SDWA for the drinking water revolving fund. Monies in the drinking water revolving fund can then be allocated by WIFA to make a variety of drinking water facility loans, including forgivable principal loans to eligible PWSs to purchase or refinance debt obligations of drinking water facilities at or below market rates, and to provide financial assistance to PWSs to purchase insurance for local water facility bond obligations.[69]

In 2005, WIFA and ADEQ presented workshops around the state to facilitate compliance with the revised arsenic standard. WIFA also made funding arsenic related projects a top priority, expediting the funding process. In that year WIFA received a drinking water capitalization grant award of $23 million.[70] Thirteen PWS projects were funded with $30,776,612 in support, compared to nine funded projects in 2004 receiving $43,318,812 in support (WIFA, 2005). In the 2005 funding cycle, WIFA's below market interest rates and reduced closing costs saved Arizona communities an estimated $31 million over the term of the loans. The majority of these funded projects involved small PSWs serving fewer than 10,000 customers. Eleven such projects were funded with $14,430,012 in 2005, compared to six small PWS projects funded with $5,804,380 in 2004 (WIFA, 2005). Approximately $6 million in

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[68] See Arizona Revised Statutes 49–1202 and 49–1203.

[69] See Arizona Revised Statutes 49–1243.

[70] In fiscal year 2010 Arizona received $27,259,000 in DWSRF funding, amounting to 2.01 percent of the funds available to the states (see http://water.epa.gov/grants_funding/dwsrf/index.cfm).

continual loan and grant funding was spent in six Arizona counties with current populations of fewer than 140,000 individuals.[71]

Finally, one additional source of financial assistance was made available by ADEQ through its AMP efforts. Compliance with the revised arsenic rule would require many small PWSs to build new treatment facilities. Investing in these facilities would, in turn, require adjusting water rates to incorporate arsenic compliance costs while re-evaluating the system financial capacity to ensure sustained SDWA compliance. Financial capacity is based on a variety of complex factors including the income that the system generates, the amount of working capital the system has, the amount of capital improvement reserve the system sets aside, the operating ratio of the system, and the coverage ratio of the system. ADEQ provided a financial analysis tool to PWSs to assess financial capacity and calculate rate adjustments. Training sessions, as well as one-on-one assistance, were made available to all systems. ADEQ also included a total cost estimate and an estimated monthly increase in user fees for each water system based on the preferred technology identified for the system.

The Tubac Experience

ADEQ, in close collaboration with the EPA, made a variety of assistance programs available to small PWSs struggling to comply with the revised arsenic standard. The centerpiece of those programs was the Arsenic Master Plan (AMP), which developed site-specific recommendations on the least-cost means of compliance for each PWS, as well as an evaluation of the financial capacity of each system. Complementary programs on the technical assistance side were the state's OCP, MAP and SWAPP policies. On the financial side of assistance, the EPA made

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[71] While WIFA is the principal agency providing financial assistance to small PWSs, several other potential sources of support were available to assist in SDWA compliance: Arizona Rural Development (ARD) under the US Department of Agriculture administers a water and wastewater loan and grant program for Arizona's rural areas; the Border Environmental Cooperation Commission (BECC) and the North American Development Bank (NADBank) provide capital for environmental infrastructure projects in the border region with water projects being a priority; the Rural Utilities Service (RUS) is a federal agency responsible for providing rural infrastructure assistance in electricity, water, and telecommunications; and CoBank specializes in cooperative, agribusiness, rural utility, and farm credit financing, and provides assistance to water and wastewater systems in unincorporated areas or systems in incorporated towns with fewer than 20,000 people.

substantial compliance funding available for the state, funding that is administered independently through the state WIFA agency. These efforts constituted an extensive and consequential set of programs specifically designed to ease the burden on small Arizona PWSs trying to comply with the new water quality standard. Despite these efforts, compliance remained a complex and problematic undertaking for many small PWSs, as the experience of the small community of Tubac, Arizona illustrates.

Tubac is a census-designated place (CDP) located on the Santa Cruz River, approximately 45 miles south of Tucson, Arizona. Tubac had a tumultuous early history.[72] It was the first European settlement in Arizona, dominated by Spain from 1700 to 1750, then subjected to Mexican rule and conflicts with nearby Apache tribes until becoming a US possession in 1853 with the Gadsden Purchase. Tubac become part of the state of Arizona in 1912, then in 1948 the artist Dale Nichols established the Tubac Artists School, and today the town is known as an outstanding artist colony with over 100 small businesses, including lodgings, art galleries, restaurants and gift shops.[73]

As of the 2010 census, there were 1,183 individuals and 527 households residing in the CDP.[74] In total, the population of Tubac increased 25.5 percent between 2000 and 2010. The median age was 50 years with 22.3 percent of the residents over the age of 65. Residents who self-identified as having Hispanic ethnicity increased 42.2 percent from 2000 to 2010 and constituted 48.4 percent of the CDP population. Median household income in Tubac was $51,964 compared to $54,637 in Arizona and $55,970 in the US. However, owing to 28.8 percent of the CDP households making more than $100,000 per year, per capita household income was $40,372 in Tubac compared to $26,996 in Arizona and $28,779 in the US. Importantly, nearly one in four households (23.5 percent) in Tubac had an annual income below $25,000, and 15.2 percent had incomes below $15,000 per year. Unemployment in the CDP was nearly 18 percent in 2010 with negative recent job growth.[75]

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[72] See http://www.tubacaz.com/abouttubac.asp for a succinct summary.

[73] Tubac is nationally known for both its art and history. The Tubac Presidio State Historic Park was established in 1959 and the Museum in 1964. The first Tubac Festival of the Arts took place in 1960, with the Tubac Center of the Arts opening in 1972.

[74] For a comprehensive listing of Tubac demographic data, see http://www.clrsearch.com/Tubac_Demographics/AZ/.

[75] The overall quality of life in Tubac is judged to be high by CLRsearch.com, a real estate service that provides information on home, school and community demographic characteristics for cities across the US. A quality-of-life

The principal provider of drinking water in the Tubac CDP at the time of implementing the revised arsenic standard was Arizona American Water (AAW). AAW is a large, technically sophisticated company providing water to over 300,000 customers in Arizona, and operating as a regulated utility in 20 states, serving over 15 million people across 30 states and parts of Canada.[76] In 2005, AAW had 532 customers in Tubac. Owing to the small customer base, the company first explored the feasibility of using point-of-use or point-of-entry (POU/POE) treatment technologies. At the time, the EPA acknowledged that PWSs serving between 25 and 500 users are typically not large enough to make centralized treatment systems cost effective. For some small systems, distributing POU/POE treatment units to individual households may be an appropriate alternative. Historically, however, the difficulty with these treatment systems, particularly for home use, is determining when the device requires servicing, a feature required by law. EPA-sponsored research demonstrated that POU/POE treatment based on quartz crystal microbalance technology is effective at removing arsenic in drinking water to safe standards.[77] Moreover, by integrating an arsenic sensor and alarm, the need to replace sorbent can be indicated, much as a home smoke alarm alerts occupants to the threat of fire. Unfortunately, these systems also require certification, treatment verification, contingency planning, backflow prevention and long-term monitoring to be efficacious. In fact, in comparing POU/POE and centralized treatment costs, Kommineni et al. (2002) found that POU/POE treatment costs are lower than centralized treatment only for small systems with service connections up to 80 homes. As the number of service connections approaches 200, the costs for POU/POE and centralized treatment are similar. At 200 or more connections, the costs for administration, treatment, monitoring

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index is calculated based on what variables affect individuals as they search for a new home, how much they would enjoy living in a place, and the impact of selected variables. Positive variables weighted for the quality-of-life index include amusement, culture, education, medical facilities, religion, restaurants and weather. Negative variables include crime, earthquake frequency, pollution and mortality. An area's index score is compared to the national average of 100. A score of 200 indicates twice the national average, while 50 indicates half the national average. The quality-of-life index for Tubac is 148, compared to 129 for Arizona and 100 for the US.

[76] Customers of Arizona American Water are now served by EPCOR Water. See http://epcor.com for additional information.

[77] See http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5595/report/F.

and reporting for POU/POE treatment are substantially more than those for a centralized treatment.

Having ruled out POU/POE technologies for Tubac, AAW then began designing an arsenic treatment plant (ATP). Significant levels of treatment were required. The three groundwater wells servicing Tubac contained an average arsenic concentration of 25 ug/l, ranging from a low of 16 to a high of 36, making simple blending of water sources infeasible. To help defray ATP costs, AAW partnered with Tubac Marketplace, a small commercial development in the city, saving approximately $1 million in siting, storage, and pumping capacity expenditures. In the final design, one of the three wells was put out of service. The remaining two wells were then connected by a 4,900 ft pipe of 12 inch diameter to the treatment plant itself. The plant was then able to treat arsenic to the safe levels prescribed by law (approximately 5 ug/l) and was capable of delivering 500 gallons per minute to customers. Additional storage of 500,000 gallons of water was also constructed. The total cost of the plant was estimated to be $2.3 million, requiring a customer rate increase of approximately $70 per month.[78] This rate increase was in addition to the 17 percent increase requested by AAW to cover other infrastructure investment and increased operating expenses incurred between 2001 and 2005. The net impact for Tubac water customers would be expending approximately 2.2 percent of the median Tubac level of income on drinking water, four times the US average. As a consequence, AAW requested a 12-month exemption in 2005 and a 3-year exemption in 2008 from the EPA to allow time to explore more cost-saving alternatives.[79] In both cases, the EPA/ADEQ denied the request.

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[78] Compare this actual rate impact to the EPA estimated cost of $163 per year in 2000 dollars reported in Table 5.1.

[79] A state that has primary enforcement responsibility may exempt any public water system within the state's jurisdiction from any requirement respecting a maximum contaminant level or any treatment technique requirement, or from both, of an applicable national primary drinking water regulation. Exemptions allow eligible systems additional time to build capacity in order to achieve and maintain regulatory compliance with newly promulgated SDWA requirements, while continuing to provide acceptable levels of public health protection. Exemptions do not release a water system from complying; rather, they allow water systems additional time to comply. Systems must achieve compliance as expeditiously as practicable and in accordance with the schedule determined by the state. In addition, initial exemptions cannot exceed three years, but systems serving fewer than 3,301 persons may be eligible for one or more additional

The potential for dramatic increases in water rates was viewed with alarm by many of AAW's Tubac customers. The Santa Cruz Valley Citizens Council (SCVCC) gave voice to these concerns. The SCVCC is a non-profit Arizona corporation whose purpose is to inform and educate its members about local and regional issues affecting community interests, and to express the view of their membership regarding these issues.[80] The SCVCC is a volunteer group and has been active in disseminating information to Tubac residents about government, utility and development issues for the past 25 years. The council has a current membership of 240 individuals.

The SCVCC held frequent meetings over the 2003 to 2010 period to address water rate concerns, and to actively lobby for more cost-effective solutions to the federally mandated arsenic treatment requirements. In 2003, AAW announced to its customers that an average rate increase of nearly 86 percent would be required to fund costly treatment to reduce naturally occurring arsenic in the drinking water. Faced with an average increase that might amount to $78 per month, or $956 per year, the SCVCC collected 300 petition signatures, and contacted the Arizona legislature to forestall the rate hike until other cost-saving alternatives could be explored. A few months later the Arizona Corporation Commission (ACC), an independent, popularly-elected branch of state government with the authority to regulate public utilities,[81] denied AAW the rate adjustment, saving Tubac customers $468,000 a year in higher water fees for the subsequent three years (Vandervoet, 2008). Later in the compliance process, a series of SCVCC meetings were conducted in which even greater concern over the financial impact of arsenic treatment was expressed. In January of 2009, James Patterson, the 2nd vice president of the SCVCC, discussed the dramatic rate impact of AAW's current request for a 72 percent increase in the base rate water fee, followed by an additional 72 percent increase to cover the cost of arsenic treatment. The council strongly recommended the pursuit of more cost-effective alternatives including the procurement of WIFA funding, consolidation of the Tubac water systems with larger systems within AAW's customer base,

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two-year extension periods (not to exceed six years). See http://www.epa.gov/compliance/civil/sdwa/sdwaenfreq.html.

[80] See http://www.yourscvcc.org/. In addition to arsenic treatment of drinking water, the SCVCC has been actively involved in border patrol issues, the siting of power lines, the proposed Rosemont Copper Mine in the nearby Santa Rita Mountains, and the establishment of the Tumacacori Highlands Wilderness Area.

[81] The ACC was established in 1912 as a constitutional authority. The ACC currently regulates over 400 PWSs in Arizona.

or reconsideration of the use of POU/POE technologies to address cost concerns.[82] Later, in March of 2009, 120 individuals attended an intense SCVCC meeting with both ACC and AWW representatives to express their dissatisfaction with an overall water rate increase that was now projected to reach as high as $111 per month, amounting to a 226 percent increase (Vandervoet, 2009). The initial exchanges between AAW and the SCVCC were adversarial. Later in the compliance process, however, AAW and the SCVCC partnered to promote cost-effective treatment of the arsenic in the Tubac drinking water supply. This partnership was extremely effective in mobilizing agency and resource support.

Any AAW rate increase request has to be approved by the Arizona Corporation Commission (ACC). The SCVCC and AAW found a willing and enthusiastic partner with the ACC in the pursuit of assisting small PWSs comply with the revised arsenic standard.[83] In fact, ACC staff, in cooperation with ADEQ, sponsored several workshops around the state on PWS compliance while simultaneously lobbying the state's congressional delegation and state legislature for support in identifying funding opportunities.[84] Particularly important on the funding side of assistance was the cooperation between the SCVCC, AAW, and ACC compliance partnership and the state of Arizona's WIFA agency.[85]

As discussed earlier WIFA was also very supportive of finding cost-effective means of assisting small PWSs comply with SDWA

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[82] These concerns and recommendations were also discussed in an editorial appearing in the *Tubac Villager*, a monthly publication serving Tubac and surrounding area residents (Patterson, 2009).

[83] In an April 2005 letter to AAW, one of ACC's commissioners, Kris Mayes, characterized a proposed arsenic surcharge of $75 per month in Tubac as a financial 'trainwreck,' and strongly encouraged AAW to pursue all cost-savings alternatives to ease the burden. See http://www.azcc.gov/commissioners/PDF/Mayes-04–11–05.pdf.

[84] The ACC was very active throughout the compliance process, participating in the development of the AMP with ADEQ, conducting 78 in-person visits with PSWs throughout the state, conducting meetings with the governor and the congressional delegation seeking support to lessen the financial burden, and interacting on a continuous basis with PWSs on their plans and progress toward implementation. See http://www.azcc.gov/commissioners/Mayes/speeches/IOWUA percent20powerpoint_revise.ppt.

[85] The partnership of SCVCC, AAW, and ACC was also able to successfully lobby Congresswoman Gabrielle Giffords for financial support of ATP construction. An earmark request for $1.1 million in the 2010 appropriations bill was submitted by her office with Representative Frank Antenori joining in the support of the request. See http://www.washingtonwatch.com/bills/history/ED_32366.html?dir=asc.

requirements. Fortunately, WIFA was particularly well funded in 2009 owing to congressional passage of the American Reinvestment and Recovery Act (ARRA). This act was passed by Congress and signed by President Obama in February of 2009. An additional $2 billion of DWSRF funding was made available to the EPA for high priority projects. Monies allocated to the states had to be committed to 'shovel-ready' projects by February of 2010. No state matching funds were required, and 50 percent of the ARRA funds were designated directly to grants, principal forgiveness loans, and negative interest loans. Water systems of any size were eligible for ARRA funding, but special emphasis was placed on helping small PWSs comply with SDWA requirements. As a result of ARRA funding, WIFA was administering a revolving state fund of $81 million with a SDWA allocation of approximately $26 million.[86] This infusion of funding made it possible for WIFA to award AAW a $1.5 million low-interest loan and an additional $1.5 million ARRA grant with forgivable principal on June 26, 2009.[87]

With the support of WIFA funding, construction of the ATP began in June of 2009. The plant was completed and began operation in January of 2010. In May of 2008, AAW submitted an ACC request, which was approved, for a permanent rate increase, known as an arsenic cost recovery mechanism (ACRM), for Tubac water customers. After construction of the ATP was completed, AAW submitted a final arsenic surcharge request for $3.99 base service and 0.7¢ per 1,000 gallon usage, amounting to a rate increase of $11.65 per month or a 21.3 percent increase for the average Tubac resident. After an engineering and financial review, the ACC finally approved an $8.13 rate increase in August of 2010 amounting to a 15 percent surcharge for AAW customers in Tubac.[88]

Implications for Cooperative Federalism

Clearly the Tubac experience is an example of a substantive EJ success story, particularly for the nearly one out of four households in Tubac with an annual income below $25,000. AAW customers were ultimately able to secure the health benefits of dramatically reduced arsenic in their

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[86] See http://www.azwifa.gov/?pageid=publications and view WIFA Annual Report for FY2009.

[87] See http://www.azwifa.gov/?pageid=recoveryact. The total WIFA award to AAW was later reduced to $2,006,976 after AAW was able to reduce ATP construction costs by approximately $300,000 through value engineering.

[88] See http://images.edocket.azcc.gov/docketpdf/0000108756.pdf.

drinking water for a nominal rate increase of just $8.61 per month, compared to projected initial estimates ranging from a low of $70 to a high of $111 per month. The Tubac experience also illustrates the complexity and fragility of achieving this type of propitious compliance outcome. Over 50 percent of the cost to build an arsenic treatment plant was covered by an ARRA grant with forgivable principal, grant funding not normally available to WIFA. Additionally, ADEQ interacted continuously and cooperatively with five independent, but interrelated, organizations over the eight-year period from 2002 to 2010. Had the EPA, WIFA, ACC, AAW and/or SCVCC adopted a non-cooperative or even obstructionist participation strategy throughout the compliance process, this EJ-enhancing outcome might very well have been strikingly different. While ADEQ can take the lead in finding a cost-effective implementation strategy, the final outcome will ultimately depend on a complex form of cooperative federalism.

Looking to the future, the central EJ policy concern in the context of providing safe drinking water is that promulgation of new or revised MCLs may result in a regressive pattern of distributing benefits and costs. That is, SDWA programs may tend to promote the interests of higher-income groups more than those of the poor. Yet, given the substantial health and longevity benefits of safe drinking water, it is clear that the interests of society, including those of the poor, justify substantial SDWA investment. One extreme reaction to the tension between society's interests generally and the interests of its low-income constituents is to argue that resource allocation and income distribution are separate issues. Water quality standards should be set, implemented, and enforced based on allocative efficiency alone, leaving distributional and poverty concerns to other branches of government. Unfortunately there is little recent evidence to suggest that poverty programs have been effective in this regard.[89] A diametrically opposed view would argue that the elimination of poverty is a higher priority concern than the luxury of improving environmental quality. Environmental programs should not make the

[89] Recently the US Bureau of the Census announced a second way to calculate the number of America's poor. The new method adds the value of food stamps, school lunches, housing subsidies and the earned income tax credit while subtracting payroll and income taxes, child care costs, and out-of-pocket medical expenses. The new method results in 16 percent of Americans living in poverty in 2010, slightly higher than the official 2010 rate of 15.2 percent. Poverty rates for the elderly and Hispanics, 15.9 percent and 28.2 percent respectively, were also higher under the revised measure. See http://www.reuters.com/article/2011/11/07/us-usa-poverty-idUSTRE7A634M20111107.

disadvantaged worse off. In the context of drinking water, promulgation of MCLs that disadvantage low-income consumers should be postponed indefinitely until their regressive implications can be addressed. The viable common ground between these two polar views, however, is to incorporate sensible redistributive provisions directly into SDWA programs. An immediately applicable means to this end is to subsidize compliance with federal funds, rather than state or local revenues, since the federal tax system is more progressive (Baumol and Oates, 1988).

The most salient and effective program for subsidizing SDWA compliance has been the use of the EPA's DWSRF allotments, particularly as they apply to supporting small PWS compliance. Since fiscal year (FY) 1998, the Safe Drinking Water Act has required that the EPA allot grant funding to each state based on the state's proportional share of the total eligible needs reported for the most recent Drinking Water Infrastructure Needs (DWIN) Survey. The minimum proportional share that each state can receive is 1 percent of funds available for allotment to all of the states. Over the 2004 to 2010 period, the EPA received Congressional DWSRF funding of $827,130,867 annually, on average, ranging from a low of $822,933,000 to a high of $830,310,200. Arizona's annual allotment, however, jumped from approximately $9.4 million in 2004 and 2005 to roughly $23.5 million over the 2006 through 2009 period, as the state's proportional share was adjusted from 1.13 percent to 2.84 percent based on results from the 2003 DWIN survey, published in 2005. Based on the 2007 DWIN survey, Arizona's proportional share has been lowered to 2.01 percent, effective FY 2010.[90] This adjustment, coupled with Congressional concern over the US debt crisis, strongly suggests that Arizona's WIFA program may have substantially fewer funds to allocate to small PWSs in the state for the foreseeable future.[91]

Beyond assuming primacy for apportioning DWSRF allotments, the EPA is also well positioned to assume a leadership role in evaluating fundamental SDWA reforms. It is widely recognized that increased flexibility should be incorporated whenever possible into the SDWA if this act is to be truly protective of public health for all classes of water consumer. A variety of reforms has been proposed. Prominent among

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[90] http://www.epa.gov/ogwdw/dwsrf/allotments/index.html.

[91] In 2009, the US economy was burdened with $11.7 trillion worth of debt. At the time, the Obama administration was estimating that the US could face a cumulative $9 trillion in additional deficits over the next decade (Suddath, 2009). By November of 2011, the US debt surpassed $15 trillion, amounting to 98.9 percent of gross domestic product. See http://www.gurufocus.com/news/153855/a-15trillion-problem-us-debt-to-gdp-at-989-and-rising.

these proposals are the reforms advocated by the National Rural Water Association including: (1) basing MCLs on the magnitude, duration and frequency of exposure; (2) triggering enforcement actions only when a PWS is in significant non-compliance with SDWA regulations; (3) giving states exclusive enforcement authority, with the EPA exercising deferential oversight; (4) making variances and exemptions more compatible with the needs of PWSs; and (5) allowing affordability to be an affirmative defense in enforcement actions (Koorse, 2002).[92] Additionally, regulatory flexibility could be enhanced by the use of dual standards, allowing small PWSs to achieve slightly less stringent water quality standards, and by facilitating the use of system consolidation to increase the customer base of small PWSs. Failing to significantly increase flexibility in SDWA enforcement will perpetuate a status quo characterized by a high rate of non-compliance for small PWSs, and the serious enforcement issues that engenders, as well as economic hardship imposed on those small systems who do choose to comply (Raucher et al., 2011). Thoughtful SDWA reform, on the other hand, has the potential to greatly assist states in promoting EJ in MCL implementation.

At the state level, the recent arsenic experience has demonstrated ADEQ's ability to provide state-of-the-art technical and financial assistance to small PWSs struggling to comply with SDWA requirements; to approach the implementation and enforcement of regulations with compliance flexibility and sound judgment in exercising selective enforcement; and to work cooperatively within a complex federalist structure involving the EPA, WIFA, ACC, public water companies, and community organizations. This combination of providing assistance, exercising flexibility in enforcement, and embracing cooperative engagement strongly supports a state-primacy model of cooperative federalism for implementing and enforcing future drinking water standards.

Implementing future MCLs for drinking water in a manner that promotes substantive EJ for low-income customers of small PWSs will continue to be a daunting proposition for the state of Arizona. The National Primary Drinking Water Standards (NPDWS) promulgated by the EPA are legally enforceable standards that apply to all PWSs. These regulations limit drinking water contamination from organic chemicals, radionuclides, inorganic chemicals, microorganisms, disinfectants, and disinfection by-products. In 2011, the EPA was monitoring over 200

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[92] The EPA has never determined that one of its MCLs is unaffordable (Raucher et al., 2011). For a discussion of potential reforms for evaluating affordability, see Rubin, 2001.

drinking water standards, compared to 19 MCLs in 1975 (US EPA, 2011a). Not surprisingly, the consumer price index (CPI) for water and sewer has surpassed the CPI for all items for the past 15 years, as illustrated in Figure 5.3. Meanwhile poverty has remained an intractable problem for the state of Arizona. In 1996, approximately 20.5 percent of the state's population lived below the poverty level. In 2011, the same percentage hovered around 21.2 percent with 1.4 million people living below the line, including 31.3 percent of children under the age of 18 years of age, and 13.8 percent of adults over the age of 65.[93] Coupling ever-increasing drinking water regulations[94] with resource costs outpacing the national rate of inflation, with a large and increasing resident population living in poverty, dramatically illustrates the substantive EJ challenges facing the state of Arizona in the future.

Implementation challenges are best met proactively. In fact, the EPA requires the explicit integration of EJ considerations in its rulemaking, from inception, to promulgation, to actual implementation (US EPA, 2010d). In the arsenic regulation case, however, the EPA failed to analyze whether affected small communities had disproportionate numbers of low-income residents. This failure to consider EJ in the rulemaking process resulted in a regulation that frequently requires low-income households in small communities to pay dramatically more for regulatory compliance while receiving smaller, possibly negative, public health benefits (Rubin and Raucher, 2010). This omission has been highlighted in a recent US GAO (2011) study that strongly recommended the establishment of explicit protocols for evaluating the health effects on sensitive populations of proposed SDWA regulations. This recommendation applies with particular force in Arizona. EJ forecasting studies, conducted by ADEQ and funded by the EPA before promulgation of new drinking water standards, would be useful addendums to the action development process.[95]

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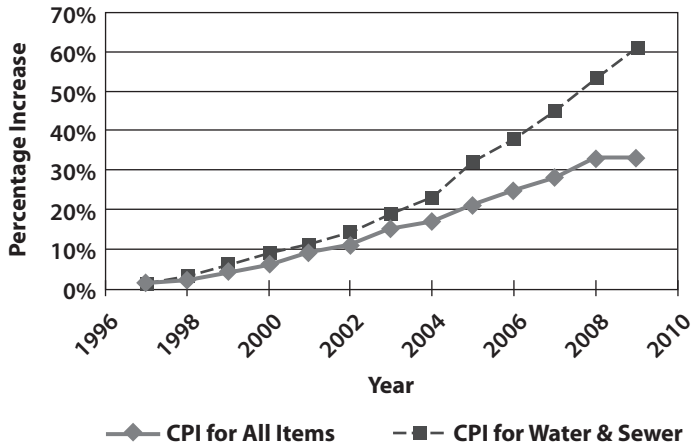
[93] See http://azstarnet.com/news/local/article_551a7372–415a-5dc5-a27d-ab19a1171e81.html. The percentage of residents living in poverty in Arizona is second only to Mississippi with 23.1 percent.

[94] The EPA is charged with regulating five new pollutants per year under the SDWA. The EPA under the Obama administration has committed to adding 16 contaminants to the list of regulated substances.

[95] The carcinogenic contaminant hexavalent chromium is currently under consideration for regulation in drinking water. See http://water.epa.gov/drink/contaminants/basicinformation/chromium.cfm. Treating hexavalent chromium can be extraordinarily expensive, and research is underway to provide data that will allow for an informed risk assessment. A Performance Partnership Grant



Source: US Department of Labor, Bureau of Statistics, Consumer Price Index. Available at http://www.bls.gov/cpi/.

Figure 5.3 US water rate increases

CONCLUDING REMARKS

The results of the two EJ case studies illustrate several federalism results that may have general applicability to other states. In particular, the results strongly suggest that agreements between the EPA and state environmental agencies on cooperative federalism should be carefully crafted to account for trust, involvement, primacy, expectations, and community involvement.

- Trust: Trust is earned when a state environmental agency demonstrates competence, integrity, and reliability in promoting EJ objectives. For example, in the Arizona siting case study, ADEQ established trust with the EPA through strengthening permit requirements, by developing *ex ante* EJ assessment capacity, and by working cooperatively to address adverse and disparate impacts attributable to past siting decisions. In the absence of trust, the EPA would be required to assume full EJ responsibility for future siting decisions with ADEQ only conducting support activities as

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from the EPA would be one way to support complementary studies by ADEQ on the EJ implications of regulating this contaminant in the state.

required. In the presence of trust, PPAs based on cooperative federalism become operational.

- Involvement: A low level of involvement is characterized by the state environmental agency assuming a leadership role in EJ documentation and policy formation, with the EPA providing resources and program support while exercising watchful oversight. A high level of involvement, on the other hand, is desirable when the EPA is better positioned to document the nature and extent of EJ concerns and takes the lead in policy implementation. In the Arizona drinking water case study, the EPA was clearly better positioned to assume a leadership role in evaluating fundamental SDWA reforms, reforms that could greatly assist the state in promoting EJ in MCL implementation. High EPA involvement, coupled with ADEQ documentation and logistical support, was appropriate. By way of contrast, ADEQ's comparative advantage in the drinking water case study was its ability to provide state-of-the-art technical and financial assistance to small PWSs struggling to comply with SDWA requirements. Low EPA involvement, with ADEQ assuming the leadership role in MCL implementation, was the condign cooperative relationship. As these case study results illustrate, a careful delineation of involvement and leadership responsibilities based on comparative advantage is central to constructing successful PPAs.
- Primacy: Primacy is concerned with assigning primary responsibility. In the drinking water case study, ADEQ assumed primacy for enforcing the SDWA. The EPA awarded primacy to Arizona after a set of eligibility criteria was met by ADEQ, including the establishment and maintenance of a state program for the certification of laboratories testing for drinking water contaminants; the establishment and maintenance of an engineering program to ensure that the design and construction of new PWS facilities are compliance compatible; acquiring the legal authority to require suppliers of water to keep appropriate records and make appropriate reports to the state; and having the authority to assess civil or criminal penalties for violation of the state's primary drinking water regulations.[96] Having established trust, the EPA was able to delegate SDWA enforcement responsibilities to ADEQ based on comparative advantage, while continuing to provide logistical support and oversight.

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[96] See the Code of Federal Regulations, Title 40: Protection of Environment, Part 142-National Primacy Drinking Water Regulations Implementation, Subpart B-Primacy Enforcement Responsibility, § 142.10.

Primacy in the EJ context is more nuanced. In addition to assigning primary responsibility for enforcement, PPAs can be constructed to delegate primacy across an array of activities. In the siting case study, ADEQ established that primacy was best allocated to the state for processing siting applications, documenting the nature and scope of related EJ concerns, and for implementing, monitoring, and enforcing EJ remedial programs when appropriate. In the drinking water case study, ADEQ's primacy role was limited to providing technical and financial assistance to small PWSs. What is clear from both case studies is that it is quixotic to try to generalize *ex ante* about how primary responsibility should be structured within PPAs. Ultimately, assigning primacy will be issue, activity, and state specific, as trust, involvement, and comparative advantage vary from state to state. Fortunately, PPAs are precisely the type of flexible contracting document capable of accommodating such diversity.

- Expectations: ADEQ has considerable influence over siting outcomes that promote EJ. The agency administers a comprehensive application program, has documented efficacy in accurately and expeditiously verifying applicant documentation, has developed *ex ante* EJ assessment capacity, and is experienced in developing meaningful community involvement programs. Assuming that the state of Arizona and the EPA continue to provide adequate funding, and that ADEQ is able to continue to recruit and retain competent personnel, it is reasonable to have high expectations for the agency's siting decision making and to hold ADEQ accountable accordingly. By way of contrast, ADEQ is only one part of a complex system of cooperative federalism involved in securing drinking water outcomes that promote EJ. While ADEQ is instrumental in providing state-of-the-art technical and financial assistance to small PWSs, the final EJ outcome will also depend crucially on the participation of the EPA, water companies, the ACC, WIFA and community involvement. Expectations in the context of MCL implementation, then, should reflect ADEQ's central but limited role in determining final outcomes. Setting realistic expectations within a PPA is clearly a necessity if the management conundrum of assigning responsibility without adequate authority is to be avoided.

- Community involvement: The South Phoenix Community Action Council played a vital role in bringing the air quality plight of South Phoenix residents to light and in initiating EJ programs designed to address disparate and adverse impacts in the PMA. Similarly, the Santa Cruz Valley Citizens Council mobilized the coalition of AAW, ADEQ, ACC, and WIFA that resulted in dramatically reduced water rate increases for residents of the small community of Tubac. The results of both case studies pointedly suggest that accommodating community involvement in future PPAs is likely to produce enhanced EJ outcomes in both siting and regulatory decision making. This eventuality is explored in the next chapter where it is argued that investing in community involvement programs is fully justified on both economic efficiency and distributive equity grounds.

6. Community involvement and substantive environmental justice

INTRODUCTION

The US commitment to community involvement as a means of promoting environmental justice (EJ) is substantive and long-standing. At the presidential level, Executive Order 12898 on EJ directs each federal agency to take steps that ensure adequate and effective communication between decision makers and affected minority and low-income communities.[1] At the congressional level, environmental legislation over the past 35 years has routinely included public participation provisions (Foster, 2008).[2] At the agency or departmental level, the EPA has been the lead federal agency in incorporating community involvement into its regulatory decision making. In 2000, the agency published 'The Model Plan for Public Participation,' developed by the National Environmental Justice Advisory Council (NEJAC), which presents a model for the core values, guiding principles, and critical elements of more expanded, meaningful public participation (US EPA, 2000b). The central guiding principles enumerated by NEJAC are designed to develop a public participation process that involves communities in decisions that affect their lives; provides participants with the information they need to engage in a meaningful way; and includes the promise that the public's contribution will influence the final decision.[3] In recent years, the EPA has reaffirmed its commitment to community involvement by making substantial additional investments to expand and improve its efforts to

[1] Executive Order No. 12898, 3 C.F.R. § 859 (1995). Under the guidance of EO 12898, agencies must work to ensure that public documents, notices, and hearings are concise, understandable, and readily accessible to the public.

[2] See, for example, National Environmental Policy Act, 42 U.S.C. §§ 4332 (C), 4368; Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§ 9617, 9659; Emergency Planning and Community Right-to-Know Act, 42. U.S.C. 11,044, 11,046; and Clean Water Act, 33 U.S.C. §§ 1365, 1344 (O), 1342 (J).

[3] See also US EPA, 2003b and US EPA, 2003c.

educate, communicate, engage, and partner with those who are impacted by environmental issues and concerns.[4]

The federal commitment to community involvement is echoed in the states. In a recent survey (Bonorris, 2010), 40 states were identified as having significant investments in community involvement as part of their implementation strategies for EJ initiatives. These EJ initiatives involved the siting, regulation, and reclamation of polluting activities, addressing EJ concerns as diverse as brownfields redevelopment, toxic waste cleanup, community education, hydrogen fuel regulations, tribal cultural places, transportation planning, biomonitoring, supplemental environmental projects, compliance and enforcement, children's health issues, climate change, and redressing adverse and disparate impacts (Bonorris, 2010). In the case of Arizona, community involvement played a pivotal role in each of the EJ case studies: the South Phoenix Community Action Council and addressing disparate air quality impacts in South Phoenix; and the Santa Cruz Valley Citizens Council and complying with the revised arsenic standard in drinking water.[5]

Given the pervasive reliance on community involvement to facilitate EJ initiatives, the question naturally arises as to whether investments in public participation are a wise use of scarce agency resources. Over the ten-year period from 1997 to 2006, the EPA's enforcement funding to the states declined in real terms by 8 percent (US GAO, 2007). In Arizona, the state has faced severe budgetary shortfalls over the 2007 to 2012 period. As a result, the Arizona Department of Environmental Quality (ADEQ) has faced significant budget reductions in its general operating budget, pollution discharge elimination system, hazardous waste program, and safe drinking water compliance programs. In FY 2008 alone, ADEQ contributed $41.6 million toward reducing the state's budget deficit, followed by an additional $96.9 million in 2009.[6] Clearly, difficult decisions must be made about the amount of scarce agency

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[4] Illustrative of this commitment was the 2011 Community Involvement Training Conference held July 19–21, 2011 in Arlington, Virginia. The conference brought together more than 450 people from the EPA and its federal, state, tribal, and local partners who plan and implement environmental community involvement, outreach, and education programs. For details see http://www.epa.gov/ciconference/.

[5] Community involvement/public participation has been mandated in Arizona water quality legislation as well. See, for example, §§ 49–289.02 through 49–289.04 in the Arizona Revised Statutes under remedial actions.

[6] See http://coaching.typepad.com/files/adeq-budget-fact-sheet-fy-2010–642-pm-02102009.pdf or search for FY2010 Arizona Department of Environmental Quality Fact Sheet.

resources, particularly resources designed to promote EJ, to earmark for community involvement programs.

Traditionally, community involvement programs have been justified by a variety of deontological notions of fairness.[7] That is, investing in community involvement has been viewed not so much a question of allocating agency resources efficiently, but more as a question of doing what is ethically required. In reality, significant investments in community involvement programs are well justified on both distributive equity and economic efficiency grounds. By coupling fundamental principles of EJ with robust and effective community involvement, it creates an institutional framework that can guide agency decision making to outcomes that promote substantive EJ.[8]

PRINCIPLES OF DISTRIBUTION, ENVIRONMENTAL JUSTICE, AND TRI FACILITY SITING

Approving a siting permit for a TRI facility would constitute a potential Pareto improvement (PPI) if the benefits of approval exceeded the costs.[9] Under these conditions, the change in net benefits (i.e., benefits–costs) is positive so that in principle those who benefit from siting approval could

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[7] Deontological principles of justice maintain that what makes a choice right is its conformity with a moral norm (e.g., some principles of corrective justice, promise keeping in contracts, or holding injurers liable for the harm done), not the goodness of its expected effects (Kaplow and Shavell, 2002). Immanuel Kant, for example, insisted that deontological duties are categorical, to be executed without regard to the consequences. Consequentialist ethical theories, by comparison, hold that a decision is morally right if and only if there is no other action, among those available to the agent, that has better consequences; otherwise, the action is wrong (Shaw, 2006). That is, consequentialism instructs an agent to do what is likely to have the best results as judged by what a reasonable and conscientious person in the agent's circumstances could be expected to know. A special case of consequentialism is utilitarianism, as advocated by John Stuart Mill, which maintains that the aim of action should be to promote the largest possible balance of pleasure over pain or the greatest happiness for the greatest number. For a particularly useful discussion of deontological versus consequentialist ethical theories, see Alexander and Moore (2008).

[8] For concreteness, the following sections discuss this assertion in the context of siting polluting facilities. Extensions to the regulation of polluting facilities are straightforward.

[9] For a discussion of Pareto optimality and its variants, see Feldmann (1998).

compensate those who would bear costs. The PPI criterion for policy analysis is usefully viewed as a minimum or threshold condition for siting approval. Applications that generate more in environmental costs than in economic development benefits should be rejected. The PPI criterion is also the rationale for the justification exclusion in the Draft Revised Guidance for Investigating Title VI Administrative Complaints. Under the guidelines, a challenged activity can be justified by showing that agency decision making was necessary to meet a goal that is legitimate, important, and integral to the agency's institutional mission (e.g., facilitating economic development), notwithstanding the adverse disparate impacts (Revesz, 2008, part II, pp. 29–30).[10]

The PPI criterion is an allocative efficiency requirement. Policy choices that generate more in costs than benefits should be rejected. Approving a siting permit for a TRI facility would constitute an actual Pareto improvement (API), on the other hand, if the benefits of approval exceeded the costs and those who benefited from the siting compensated those who bear costs. Under an API, winners compensate losers so that no one is made worse off while some are made better off. The API criterion for decision making is clearly much more stringent than the PPI criterion, and constitutes one of the goals of substantive EJ; namely, that conditions attached to permit approval should guarantee that no net costs are imposed on the community directly impacted by the siting.

For purposes of evaluating a siting application, satisfying the PPI criterion is a necessary condition for satisfying the API criterion and promoting substantive environmental justice. In 2001, however, Kaplow and Shavell established an important and striking result for the evaluation of legal rules; namely, that any method of policy assessment that is not purely welfarist violates the Pareto principle.[11] That is, any conceivable notion of social welfare that does not depend solely on individuals' utilities will sometimes require adoption of a policy that makes everyone

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[10] An example would be the implementation and enforcement of the revised arsenic standard in drinking water. ADEQ's decision to force compliance with the revised standard is clearly necessary to meet a goal that is legitimate, important, and integral to its institutional mission. Unfortunately, low-income customers of small public water systems may well be made worse off by being forced to pay higher water bills when that incremental expense would be better spent on other necessities. Under these circumstances, SDWA policy constitutes a PPI and is justified, but fails to constitute an improvement that unambiguously promotes substantive environmental justice.

[11] The KS proof of this proposition is presented in Appendix 7.

worse off.[12] This theme was subsequently elaborated on in *Fairness versus Welfare* (2002) where the authors concluded that

> […] legal policy should be evaluated using the framework of welfare economics, under which assessments of policies depend exclusively on their effects on individuals' well-being. […] In arguing that no evaluative importance should be given to notions of fairness, we are criticizing principles that give weight to factors that are independent of individuals' well-being or its overall distribution. […] pursuing notions of fairness comes at the expense of individuals' well-being. Indeed, giving weight to any notion of fairness entails accepting the conclusion that it may be good to adopt legal rules under which literally everyone is made worse off.[13]

This critique applies with particular force to notions of fairness frequently employed in the context of EJ. That is, conventional notions of fairness, applied in the absence of effective community involvement, are insufficient guides to decision making that can consistently promote substantive EJ. In fact, the application of these notions may well result in counterproductive, even paradoxical outcomes, making both candidate host communities and owner/operators of TRI facilities worse off.[14]

THREE DEONTOLOGICAL PRINCIPLES OF EJ

In discussing EJ, it is common to distinguish between procedural and substantive justice. Procedural justice is concerned with due process and

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[12] For discussion of this claim, see Fleurbaey et al., 2003; Dorff, 2002; and Coleman, 2003.

[13] Kaplow and Shavell, 2002, pp. 465–6. The authors argue that the intuition behind this claim is straightforward; the idea that 'advancing notions of fairness reduces individuals' well-being, is in fact tautological on a general level. By definition, welfare economic analysis is concerned with individuals' well-being, whereas fairness-based analysis (to the extent that it differs from welfare economic analysis) is concerned with adherence to certain stipulated principles that do not depend on individuals' well-being. Thus, promoting notions of fairness may well involve a reduction in individuals' well-being,' (Kaplow and Shavell, 2002, p. 7).

[14] A simple, if somewhat stylized, example would be prohibiting the siting of TRI facilities in low-income communities as a matter of fairness. If the additional environmental risk posed by the facility was de minimis while the economic development benefits in the form of improved infrastructure and employment opportunities in the host community were substantial, prohibiting the siting would make both the host community and the TRI facility owner/operators worse off, a clear violation of the PPI criterion.

equal protection under the law, emphasizing meaningful involvement in environmental decision making. Substantive EJ, on the other hand, is concerned with the equitable distribution of environmental benefits and burdens.[15] In the context of TRI facility siting, the challenge is to develop a principle of distribution that can address the issue of disproportionate exposure of minority communities to environmental hazards, toxics and pollution. Three notions of fairness have played a prominent role in discussions of these concerns.

Right to Environmental Protection

In defining EJ, the US Environmental Protection Agency (EPA) asserts that no group should bear a disproportionate share of negative environmental consequences. The emphasis on disproportionate impact characterized much of the early EJ literature. Robert Bullard, widely regarded as one of the pioneering researchers and a leading scholar in this area, has argued that EJ requires going beyond concern for disproportionate impacts. A workable EJ framework must incorporate the principle of the right of all individuals to be protected from environment degradation:

> Unequal protection needs to be attached via a Fair Environmental Protection Act that moves protection from a 'privilege' to a 'right.' […] From this critical vantage point, the solution to unequal environmental protection is seen to lie in the struggle for justice for all Americans. No community, rich or poor, black or white, should be allowed to become an ecological 'sacrifice zone.' […] Our long-range vision must also include institutionalizing sustainable and just environmental practices that meet human needs without sacrificing the land's ecological integrity.[16]

Basing EJ on this notion of fairness requires that entities applying for operating permits (e.g., landfills, incinerators, smelters, refineries, chemical plants, and so on) not only document that their operations will not disproportionately impact racial and ethnic minorities, but also establish that their operations are not harmful to human health.

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[15] As Bell (2004) points out, procedural justice may be intrinsically valuable by furthering substantive environmental justice goals. The concern here, however, is with substantive environmental justice exclusively and the underlying distributive principles that may promote it.

[16] Bullard, 1993, as excerpted in Rechtschaffen and Gauna, 2003, pp. 417–19.

Critics argue that advocates of a right to environmental protection frequently adopt an absolutist perspective. By insisting that no community should be harmed and that all concerns should be redressed, attention can be deflected from serious hazards to less serious risk. No guidance is provided by this notion of fairness on how to set risk priorities, and failure to set environmental priorities may actually worsen the hazards faced by minority and low-income communities.[17] Given this failing, it is clear that advocating a right to environmental protection cannot help much in the assessment of more complex risk–benefit tradeoffs.[18]

Absolutist criticisms of a right to environmental protection are simply inapposite. The right to environmental protection is not intended to address the setting of risk priorities; nor does it argue that no community should be harmed. Instead, the existence of an important property right is asserted: the host community has a right to be free from the additional environmental risk posed by the applicant TRI facility. Residents of the host community are then free to exercise that right or not based on their own assessment of economic development benefits and environmental costs. In economic terms, the siting valuation issue evolves around the host community's willingness to accept permit approval, not its willingness to pay for permit rejection. In legal terms, the right to environmental protection would argue that ADEQ should adopt a deferential standard of review with respect to the host community's legitimate concerns.

Principle of Prima Facie Political Equality

In a recent contribution to the EJ literature, Shrader-Frechette (2002) argues that to correct the problems of EJ it will be necessary to improve the principles and practices of distributive justice, where distributive justice requires adopting social policy that promotes an equal apportionment of social benefits and burdens. Specifically:

> Arguing […] for a principle of political equality, but admitting that sometimes good reasons may justify treating groups differently, is arguing for a principle of prima facie political equality. The PPFPE presumes that equality is defensible and that only different or unequal treatment requires justification, that the discriminator bears the burden of proof. Not to put this burden on the possible discriminator would be to encourage power, rather than

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[17] Nichols, 1994, p. 268.

[18] See Foreman, 1998, pp. 115–21 for a discussion of this and related critiques.

> fairness, to determine treatment under the law. Two of the goals of the PPFPE are to help ensure equal distribution of environmental impacts and to place the burden of proof on those attempting to justify unequal distribution.[19]

In this ethical framework, equality of treatment does not require giving everyone the same treatment. In the context of minority communities and disproportionate environmental risk, the imposition of unequal environmental burdens would not violate the PPFPE if there were morally relevant reasons for different treatment or if the interests of one group were 'correctly' judged to outweigh those of another.

Critics can argue that the pursuit of political equality, if taken literally, suggests an equal distribution of TRI facilities across the Phoenix Metropolitan Area (PMA) is a priori defensible.[20] Based on this regional perspective, approval of sites in communities where net benefits are negative, and denial of applications in neighborhoods where both the community and site applicants would be made better off, could not be ruled out.[21] From the more policy-relevant perspective of the communities that would actually be impacted by approval of a TRI facility siting application, it is unclear what role 'equal treatment' would play in evaluating the TRI siting request. Under the PPFPE, morally relevant reasons would have to be proffered to justify different treatment. To the extent that these reasons are non-consequentialist in nature, violations of the Pareto principle cannot be ruled out.

Equality criticisms of the PPFPE are ill-founded. That is, imposing unequal environmental burdens on a community may not violate principles of political equality:

> To establish that the distribution violated principles of political equality, one would have to argue either that there were no morally relevant reasons for different treatment or that the interests of some group were wrongly judged to outweigh those of another. Only a case-by-case analysis, not merely different treatment, is sufficient to show violation of political equality.[22]

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[19] Shrader-Frechette, 2002, p. 27.

[20] For critical reviews of the PPFPE, see DeShalit, 2004; and McShane, 2003.

[21] An alternative and more defensible principle of distribution from a regional perspective would be to distribute TRI facilities equimarginally, not equally, so that regional net benefits are maximized. As a practical matter, a neighborhood, not regional, perspective is required for evaluating site applications since permitting requests are community-specific owing to infrastructure and input cost concerns.

[22] Shrader-Frechette, 2002, p. 26.

The consequentialist criteria for evaluating morally relevant reasons for different treatment are not explicated by PPFPE. What is asserted by the PPFPE is that it is unethical to expose people to environmental hazards without first obtaining their free and informed consent. Free and informed consent, in turn, requires that residents of the proposed host community have all relevant information concerning environmental risks, be capable of understanding that information, not be coerced, and be competent to make autonomous decisions. That is, a case is made that procedural justice, actualized through community involvement, is a necessary condition for substantive EJ.

The Difference Principle

In his classic analysis of justice, John Rawls (1971) argues that society should adopt a set of political, economic, and social institutions that guarantees each individual the same unassailable claim to a fully adequate scheme of equal basic liberties and that:

> Social and economic inequalities are to satisfy two conditions: First, they are to be attached to offices and positions open to all under conditions of fair equality of opportunity; and second, they are to be to the greatest benefit of the least-advantaged members of society (the difference principle).[23]

In a recent contribution to the environmental ethics literature, Bell (2004) argues that the difference principle can be extended to address substantive EJ concerns. This extension is predicated on the established link between environmental pollution and the degradation of health. In *Justice as Fairness*, Rawls (2001) appends health care to the list of primary goods, goods that are publicly recognized as citizens' needs and counted as advantageous for all, arguing that the aim of health care is to maintain and restore the minimum essential capacities for being a normal and fully cooperating member of society.[24] By extension then, environmental goods should be included on the list of primary goods since exposure to toxics, pollution and contamination is linked so closely to respiratory and carcinogenic illnesses.[25] Trading off the provision of environmental goods with other primary goods then becomes a matter of identifying least-advantaged groups, followed by an evaluation of the effects of

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[23] See Rawls, 2001, pp. 42–3.
[24] Rawls, 2001, p. 172.
[25] Bell, 2004, p. 298.

alternative policy packages on citizens' essential capacities, based on as much empirical information as it is cost-effective for society to acquire.

Critics can certainly argue that it is unclear how an extension of the difference principle to EJ could be applied to the evaluation of site applications since the very definition of least-advantaged members of society will be unclear in many applications. For example, the statistical evidence for the PMA suggests that the poorest, least-advantaged neighborhoods are not even candidates to be host communities owing to inadequate infrastructure. Moreover, within many candidate communities, income and minority composition are relatively homogeneous, making meaningful distinctions between advantaged and least-advantaged residents difficult to delineate. For the remaining candidate host communities, where least-advantaged populations may be well defined, heterogeneous tastes for environmental risk and economic development are likely to characterize neighborhood residents. Under these circumstances, trading off one primary good, environmental quality, for another primary good, economic opportunity, for a 'representative' resident becomes empirically intractable, requiring the identification of tastes and preferences for affected groups, interpersonal comparisons of well-being between these groups, and the aggregation of these assessments across community residents. Establishing a coherent decision rule under these conditions is problematic at best, quixotic at worst. Moreover, the equitable allocation of primary goods may not be related in any systematic or predictable way to the well-being of community residents impacted by the TRI facility, the central EJ concern.[26]

Operational criticisms of the difference principle are clearly valid and raise legitimate concerns about the application of the principle to permitting decisions that promote substantive EJ. In the context of EJ, however, the difference principle is not teleological, not consequentialist.[27] The principle is a deontological notion of fairness that argues that environmental quality is a primary good and that trading off environmental quality for other primary goods is a matter of individual

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[26] See Sumner, 1996, pp. 42–80.

[27] Rawl's *Theory of Justice* (1971) rests on two principles: the difference principle and the liberty principle, which requires that each person have an equal right to the most extensive basic liberty compatible with a similar liberty for others. In the Rawlsian framework, the liberty principle may not be violated, even for the sake of the difference principle. As Long (2002) points out, justice as fairness is not a purely consequentialist theory. The difference principle is lexicographically posterior to the non-consequentialist liberty principle. Thus 'Rawlsian theory provides no guarantee that justice as fairness will even tend to

autonomy. In the context of facility siting and permit approval, the challenge is to identify the relative valuation of primary goods for residents of the host community.

Summing Up

The three deontological principles of EJ, taken together, argue for a specific institutional framework for facility siting and permit approval. Decision making should recognize the right of host community residents to be free from the additional environmental risk posed by the applicant facility; to not be exposed to environmental hazards without their free and informed consent as a requirement of procedural justice; and to have their own assessment of primary good tradeoffs be an essential part of permit decision making. The challenge for state environmental agencies then becomes working within this framework to create decision making that promotes substantive EJ.

A WELFARIST APPROACH TO TRI FACILITY SITING

Successful decision making in permitting requires the documentation and valuation of host residents' preferences. Normative welfare economics provides one alternative. A welfarist assessment of a TRI facility siting application would be consequentialist and individualistic. That is, the assessment would be based exclusively on the proposed facility's impact on the individual well-being of host community residents.[28] Based on a positive economic analysis of the facility's effects on individuals, a normative analysis would then be conducted to determine its social

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produce good consequences' (Long, 2002, p. 4). In *The Idea of Justice*, Sen (2009) provides an insightful critique and extension of the Rawlsian theory of justice.

[28] The welfare economic conception of individuals' well-being is a comprehensive one: 'It recognizes not only individuals' levels of material comfort, but also their degree of aesthetic fulfillment, their feelings for others, and anything else that they might value, however intangible. The welfare economic notion of individuals' well-being incorporates compensatory goals, because the prospect of compensation raises the well-being of potential victims of harm if they are risk averse and uninsured. Moreover, the economic notion of social welfare is one that is concerned explicitly with the distribution of income. Welfare economics thus accommodates all factors that are relevant to individuals' well-being and to its distribution' (Kaplow and Shavell, 2002, p. 4). For a discussion of multidimensional measurements of well-being, see Rahman et al., 2005.

desirability. Thus, a consequentialist, teleological perspective is adopted in this approach to distributive analysis. Predicated on an assessment of the facility's impact on individual well-being, as well as on the concomitant distributive implications, information is aggregated across individuals to form an overall social judgment on the likelihood that approval of the application would be welfare enhancing.

As an applied matter, conducting a normative economic analysis requires: (1) an evaluation of how individuals' utility or well-being will be affected; (2) an assessment concerning interpersonal comparisons of utility between the various members of the host community; and (3) the aggregation of this information across community residents to formulate a coherent social welfare assessment based on cogent distributive judgments. Each of these steps faces formidable implementation obstacles.[29] More pragmatically, it seems unlikely that prescriptions from normative economic analysis could serve as a consensual basis for evaluating a contentious siting proposal:[30]

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[29] For example, aggregation of individuals' well-being into a single measure of social welfare is controversial and an area of normative economics that is largely unresolved. A variety of principles can govern distribution so disagreements about the nature of social welfare functions, and their alternative policy recommendations, will be the rule, not the exception. (See Sen and Williams, 1982 for a survey; for a skeptical assessment, see Mishan, 1981, pp. 125–34.) Similarly, construction of a notion of well-being that is interpersonally comparable and adequate for purposes of distributive justice is an unresolved conceptual issue in normative economics. Specifically, there is no unanimity among academics that comparisons of well-being are meaningful, or, if so, that such comparisons can actually be carried out (see Elster and Roemer (1991) for a survey of some of the problems of conceptual and empirical indeterminacy). Finally, the meaning and measurement of well-being are not straightforward. For a survey of issues and recent advancements, see Kahneman and Krueger (2006) and Kahneman and Thaler (2006); for a critical discussion of the concept of well-being, see Scanlon (1999); and for a discussion of statistical issues in the measurement of well-being, see Rahman et al. (2011).

[30] As noted in Kaplow and Shavell (2002), empirical research on legal rules is in its infancy. Unfortunately, site approval will typically have manifest distributive consequences so that policy recommendations must make distributive judgments. While welfare economics encompasses distributive judgments, its use in siting cases is likely to yield highly uncertain conclusions. It can be argued that 'rough and ready' assessments will suffice, as Bell (2004) posits in defense of his Rawlsian extension of the difference principle to environmental justice. However, when the political cost of engaging in decision making that does not command consensus is considered, a highly speculative estimate may actually be

> […] Even if general and comprehensive teleological principles were adopted as political principles of justice, the form of public reasoning they specify tends to be politically unworkable. For if the elaborate theoretical calculations involved in applying their principles are publicly admitted in questions of political justice, the highly speculative nature and enormous complexity of these calculations are bound to make citizens with opposing views and interests highly suspicious of one another's arguments. […] The information they presuppose is difficult if not impossible to obtain, and often there are insuperable problems in reaching an objective and agreed assessment.[31]

A second-best, but empirically tractable alternative to normative economic analysis is the use of benefit–cost analysis (BCA). BCA is an attempt to identify and express in dollar terms all of the effects of a proposed facility siting. This approach to documenting and valuing host residents' preferences is welfarist; that is, the effects of permit approval are no more or no less than the aggregate of the effects on the individuals in the host community. Benefit and cost estimates are monetary and account for both the impacts on residents through economic development and the impacts through increased environmental risk owing to pollution. Benefits are typically measured by the willingness of individuals to pay for the outputs of the facility while costs are calculated as the amount of compensation required to exactly offset negative consequences of permit approval (Portney, 2008). Importantly, difficult adjustments for distributional concerns, particularly for income, as well as judgments about interpersonal comparisons of utility are abjured.

Valuing the environmental impacts on host community residents would typically be conducted in one of two ways. The contingent valuation method would ask residents directly about their willingness to pay to avoid increased health risks. The hypothetical nature of these questions, and the fact that truthful responses are constrained by residents' ability to pay, make these estimates problematic, and probably best viewed as lower bounds on valuation.[32] The second approach is to document how much people are willing to pay for market goods with an environmental quality component (e.g., housing in less polluted areas, wage premiums for jobs that pose health risks, or participation in desirable recreation

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worse than no estimate at all. See Kaplow and Shavell, 2002, pp. 457–61 for reactions to problems of conceptual and empirical indeterminacy.

[31] Rawls, 1996, p. 162.

[32] For a skeptical view concerning the usefulness of contingent valuation in BCA, see Diamond and Hausman (1994).

sites (Portney, 2008)). Unfortunately, the connection between market-based estimates of environmental costs and preferences of host community residents is suggestive at best, misleading at worst.[33]

To be clear, BCA analysis does provide extremely useful information for the permitting process. The magnitude of economic development benefits is documented, the nature and extent of the environmental risk is catalogued, and threshold values for resident compensation are estimated. The BCA process itself, however, is empirically challenging and controversial. Difficult issues involving the treatment of costs, estimating total economic value, revealed preference valuation, contingent valuation, choice modeling, option value, discounting, and valuing health and longevity must be addressed (Pearce et al., 2006). To the extent that these issues can be successfully addressed, decision making is better informed and procedural justice bolstered.

For purposes of substantive EJ, BCA provides essential, but insufficient, information for permit decision making. That is, BCA is not intended to be the only basis for decision making (Portney, 2008).[34] More precisely, approving a siting permit would pass an economic efficiency test if the facility generated more in benefits than costs. BCA attempts to document if this PPI criterion is met. In contrast, substantive EJ requires that permit approval results in an API, that the facility not only generates more economic benefits than environmental costs, but also that the host community is made whole through compensation. While BCA can assemble and organize raw data on the distribution of project costs and benefits, identifying alternative compensation requirements requires additional information on residents' income-risk preferences based on willingness to accept (WTA) and not willingness to pay (WTP). Stated preference studies have repeatedly documented substantial divergences

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[33] For an excellent survey of the strengths and weaknesses of BCA from economic, philosophical and legal perspectives, see Adler and Posner (2001). Market-based estimates of benefits and costs are hindered by the fact that a market good can have several intangible characteristics and that these characteristics can be collinear.

[34] For a scholarly discussion and defense of how BCA analysis, conducted by experts in the absence of robust public participation is sufficient, see Sunstein (2002). For a spirited dissent, see Shrader-Frechette (2010). Sagoff (2004), on the other hand, objects to benefit–cost analysis on the grounds that the relationship between WTP and human well-being is tenuous, both in principle and in fact. Instead, the goals and means of environmental policy should be determined through stakeholder processes in which participants strive to reach consensus through fair and open deliberation. Howarth (2005) provides an informative review.

between WTP and WTA as measures of value (Pearce et al., 2006). In the context of the host community losing the status quo, WTA for expected loss is the relevant welfare measure. Given the complexity of a facility siting controversy, immanent problems of conceptual and empirical indeterminacy in welfarist assessments, and the likely irreversibility of approving and subsequently building a TRI facility, advocating the use of normative economic prescriptions or the sole use of BCA to evaluate siting applications seems simply untenable.[35]

THE CONCEPTUAL CASE FOR COMMUNITY INVOLVEMENT

At the heart of the permit evaluation process are distributional concerns, concerns between majority and minority, low- and high-income, and advantaged and least-advantaged residents in communities impacted by the proposed TRI facility. Unfortunately, commonly advocated notions of fairness by themselves are unreliable distributive principles for evaluating site applications, while prescriptions from welfare economics fail to provide a fully implementable principle of distribution. By advocating a non-consequentialist or deontological pursuit of a right, equality, or a distributive principle, notions of fairness fail to provide a systematic connection to the actual well-being of community residents. Pareto-improving decision making would occur only by chance. In contrast, welfarist evaluations of site applications are consequentialist and teleological, based exclusively on the proposed facility's impact on the

[35] The state-of-the-art procedure for valuing the income-risk preferences of host community residents in a BCA would typically be the contingent valuation (CV) method. CV studies have frequently been criticized on both validity and reliability grounds (Venkatachalam, 2004). Validity refers to the accuracy and reliability refers to the consistency of CV results. Disparities between WTP and WTA measures of value have been well documented, both theoretically and empirically. Income and substitution effects, prospect theory, endowment effects, property rights, transaction costs, respondents' familiarity with the valuation, hypothetical payments, and broad-based individual preferences have all been posited as explanations for this divergence (see Venkatachalam (2004) for a discussion). Since the estimated difference between WTP and WTA can be orders of magnitude, some authors have even argued that only WTP is the proper measure of value for BCA (NOAA, 1993). The essential point for permitting, then, is that professionally conducted CV studies can aid in the permitting decision, but garnering additional information through the public participation/community involvement is prudent and necessary.

individual well-being of host community residents. Nevertheless, given the formidable problems of conceptual and empirical indeterminacy in welfarist assessments, advocating the sole use of BCA prescriptions to evaluate siting applications is unwarranted.

The three deontological principles of EJ establish an institutional framework, the ground rules, for the permit approval process. BCA provides essential information on whether approval constitutes a PPI, the nature and extent of environmental risk posed by the facility, and on the distribution of benefits and costs that would result from siting the facility. Adding a robust public participation/community involvement program to the permitting process can then help to ensure that decision making promotes substantive EJ.

A well-established result from positive economic analysis is that voluntary two-party bargaining in a zero-transaction-cost world results in optimality (Coase, 1960).[36] In the context of facility siting approval, voluntary negotiations between host community residents and TRI facility applicants could reasonably be expected to result in Pareto-improving

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[36] Ronald Coase is a British-born, American-based economist and the Clifton R. Musser Professor Emeritus of Economics at the University of Chicago Law School. He received the Nobel Memorial Prize in Economics in 1991. Coase is best known for his article on 'The Problem of Social Cost' (1960), which argued that well-defined property rights can overcome the problems of externalities. This proposition was initially met with skepticism by the economics profession. Professor Coase defended his ideas before a disbelieving University of Chicago group that included some of the leading economists of the time – Milton Friedman, Al Harberger, Harry Johnson, and George Stigler. Specifically, 'The defense was arranged by Coase as a condition of his coming to Chicago, at Stigler's request, to give a regular workshop. The workshop given, the defense took place after dinner at Director's home. The notion to be defended was Coase's claim that in a world of zero transaction cost the assignment of legal liability for damages would have no impact on resource allocation. Stigler reports (Kitch 1983) that Friedman provided most of the argument against this proposition, but that all attending, save, of course, Coase, began by disagreeing with it. By the end of the discussion, all agreed with it. Coase's performance at this conversion revealed the tenacity and forcefulness of this polite, soft-speaking Englishman. Out of this debate was to come the logic that Coase would describe as common sense and that Stigler, in a revision of his influential price theory text, would later describe as "The Coase Theorem"' (Demsetz, 1998, p. 263). For an in-depth discussion of the Coase Theorem, see de Meza (1998) and Dick (1976). For a short biography of Ronald Coase, see Demsetz (1998).

decision making if transaction costs can be minimized.[37] Here the regulatory agency is cast in the role of reducing the logistical costs of negotiation and creating bargaining conditions consistent with free informed consent, not in the role of outside analyst. As a result, unlike prescriptions from normative economics, negotiated approaches to siting approval are not overwhelmed by information requirements and empirical indeterminacy. Residents are well positioned to assess the welfare impacts of environmental risks and economic development benefits, to make appropriate interpersonal comparisons of well-being, and to develop a consensual procedure for aggregating welfare impacts across involved parties. Moreover, unlike notions of fairness, a negotiated approach to siting approval is consequentialist in nature, based on community residents' tastes and preferences. Rights, equality, and distributive principles will be pursued only to the extent that they enter the utility calculations of residents directly, not deontologically.

Several of the concerns raised by notions of fairness are addressed by adopting a negotiated approach to site approval. By making approval contingent upon community endorsement, low-income and minority residents acquire an important property right, the right to be free of any additional environmental risk that the facility might pose. To minimize transaction costs, residents of the host community must be fully informed of both environmental risks and economic development benefits, and be able to fully participate in the negotiation process, necessary conditions for free informed consent and procedural justice. Additionally, by promoting autonomous decision making and self-determination, community residents are free to select a mix of primary goods that are welfare enhancing, based on their own perceptions and judgments.

A few caveats are in order. Facilitating effective community involvement in the permitting process is challenging for a variety of reasons. As Shelia Foster points out:

> Regardless of the formal mechanisms for public participation, low-income communities and communities of color face a number of obstacles in effectuating that participation. Information, education, and an understanding of risk communication are necessary for members of the public to discuss issues with experts and bureaucrats. […] Lack of early, direct, significant citizen participation decreases the legitimacy of agency action for many affected communities (Foster, 2008, p. 226).

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[37] Several states have adopted negotiated approaches to the evaluation of siting applications. For a survey of current environmental justice programs generally visit http://www.uchastings.edu/public-law/docs/ejreport-fourthedition.pdf.

Three potential sources of inefficiency deserve particular attention: high transaction costs, imperfect information, and strategic behavior. State environmental agencies must first create a public participation process that allows both the TRI facility representatives and host community residents to participate in a cost-effective way. The EPA has addressed this issue extensively in its Public Involvement Policy and through technical guidance documents outlining how to plan and budget for public involvement and how to provide technical and financial assistance for the process (US EPA, 2003b). Second, the negotiation process must be based on accurate information. Ultimately, the state environmental agency must assess the validity of information submitted by the permit applicant, community residents, and its own BCA, possibly including the results of the contingent valuation analysis of host community preferences. Again, the EPA has assisted in this effort by providing technical assistance on how to review, evaluate, and use public input (US EPA, 2003c) and in how to prepare a BCA (US EPA, 2010d). Finally, the success of the negotiation, in terms of both distributive equity and economic efficiency, is predicated upon both parties negotiating cooperatively, not strategically. Strategic behavior refers to decision making among a small number of participants that takes into account the actions and reactions of other agents. Its essential feature is the recognition of the direct interdependence between one's behavior and that of others. With strategic bargaining, the negotiation process can deteriorate from one designed to make the host community whole to a process viewed as a zero-sum game. With non-cooperative bargaining, permit evaluation moves from a negotiation process to a type of binding arbitration[38] with the state environmental agency determining how to condition permit approval to ensure an outcome that promotes substantive environmental justice.

CONCLUDING REMARKS

It is helpful to think of ADEQ's role in the permitting process as being similar to the role of a judge resolving a public nuisance case. These cases are typically resolved in two steps. First, a decision must be made as to which party has the right to prevail. For TRI siting, the host community has the right to be free from harm. Second, that right is then

[38] Arbitration is a process of dispute resolution in which a neutral third party (arbitrator) renders a decision after a hearing at which both parties have an opportunity to be heard.

protected either by issuing an injunction or by imposing liability. If the BCA reveals that the costs of permit approval exceed the benefits, then ADEQ issues an injunction by denying the siting application. If the BCA documents that the PPI criterion is met, then ADEQ imposes liability on the TRI facility by conditioning approval in a way that increases economic development benefits accruing to the host community and/or lowers the associated environmental risks. The exact nature of adequate compensation is discovered through the community involvement process. Either way, an injunction or liability assures that the host community is not made worse off.

Clearly formidable procedural challenges remain, challenges involving the scope of, consent to, involvement in, and enforcement of negotiated agreements.[39] While each of these concerns has significant implications for procedural justice, none is empirically intractable. By coupling the application of foundational EJ principles and BCA with a Coasian approach to conflict resolution and substantive EJ, a conceptually coherent framework for decision making is created that is Pareto consistent and welfare enhancing.[40]

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[39] For an introductory discussion of the scope of feasible and permissible items for negotiation, see Been (1994). For an evaluation of the need for and requirements of free informed consent, see Faden and Beauchamp (1994). For a survey of the challenges posed by promoting broad public participation in the process of reaching a negotiated accord, see Foreman (1998, pp. 34–63). For a discussion of procedural justice considerations in a case-study setting, see Shrader-Frechette (2002, pp. 71–93). Finally, for empirical evidence that the collaborative decision-making process promotes both distributive equity and allocating efficiency goals, see Rhoads and Shogren (2001).

[40] While this analytical framework can be expected to be welfare enhancing, it is unlikely to result in an actual Pareto improvement since unanimity among host community residents about the nature of adequate compensation will be the exception, not the rule. That is, the Coasian approach to negotiating compensation will make the host community as a whole better off, not necessarily every single resident.

7. Environmental justice in the US: looking ahead

On September 14, 2011, the EPA announced the release of Plan EJ 2014, a three-year comprehensive plan to advance EJ efforts in nine areas, including permitting, rulemaking, and enforcement. Plan EJ 2014 is designed to serve as a roadmap that will help the EPA integrate EJ into the agency's programs, policies, and activities. The plan highlights cross-agency focus areas, tools development, and program initiatives as three essential elements of an effort to systematically incorporate EJ concerns across the EPA's day-to-day activities. The goals of the plan are to protect health in communities overburdened by pollution, to empower communities to take action to improve their health and environment, and to establish partnerships with the local, tribal, state, and federal organizations to achieve healthy and sustainable communities.[1]

In developing the plan, the EPA has acknowledged that practices to ensure early and effective public participation in the permitting process have not been widely adopted, and that significant challenges remain for incorporating EJ into permitting protocols, particularly as EJ concerns relate to cumulative/multi-media impacts. The general permitting goal of the plan is to ensure that EJ concerns are given full consideration in the decision to approve and condition a permit when the permit is issued under existing federal environmental law. As such, one objective of the plan is to enable overburdened communities[2] to have full and meaningful access to the permitting process. To enhance EJ in permitting, the EPA

[1] The EPA will be implementing Plan EJ 2014 over several years. In 2014, the EPA will make an assessment of its progress in achieving the Plan's goals. The Plan is timed to coincide with the 20th anniversary of President Clinton's Executive Order 12898 that directed each federal agency to make achieving EJ part of its mission. For an executive summary of Plan EJ 2014, see http://www.epa.gov/compliance/ej/resources/policy/plan-ej-2014/plan-ej-exec-sum.pdf.

[2] In Plan EJ 2014, EPA uses the term 'overburdened' to describe the minority, low-income, tribal, and indigenous populations or communities in the United States that potentially experience disproportionate environmental harms and risks as a result of greater vulnerability to environmental hazards. This increased vulnerability may be attributable to an accumulation of both negative

has developed a set of draft tools to increase the meaningful participation of EJ communities. In addition to providing a cohesive set of tools for issuing permits, the EPA has also committed to developing a public database of complementary instrumentalities to serve as a resource for permitting agencies.[3]

A second initiative under the plan is to more effectively protect human health and the environment in overburdened communities by developing and implementing guidance to incorporate EJ into the EPA's rulemaking process. The plan contains a three-part program for making EJ a more integral part of rulemaking. First, the EPA intends to finalize its guidance document for considering EJ in the rulemaking process. This guidance requires EPA staff to facilitate EJ community involvement, to consider whether EJ communities would be disproportionately impacted by the rule, and to assess how public participation and potential disproportionate impacts influence the final rule. Second, the EPA's staff will be given more training on EJ principles and practices, with the EPA subsequently monitoring how effectively this training is being applied to rulemaking. Third, the EPA will work with other agencies to develop technical guidance for conducting EJ assessments of proposed rules. Particularly noteworthy for future rulemaking will be EPA initiatives designed to train and support national program managers (NPMs) and regional offices in applying EJ rulemaking guidance during implementation. NPMs lead the major EPA offices that are responsible for developing regulations to protect air, water, and land resources.[4]

A third major initiative under the plan is to fully integrate consideration of EJ concerns into the planning and implementation of EPA's compliance and enforcement programs. Under the plan, the EPA intends to allocate a greater proportion of its compliance and enforcement resources to issues that have a significant impact on EJ communities. Additionally, the plan calls on the EPA to continue and broaden its practice of using settlements to induce companies to take action that

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and lack of positive environmental, health, economic, or social conditions within these populations or communities.

[3] For details on this permitting initiative, including the organizational structure, implementation strategies and activities, plans for stakeholder involvement, and promised deliverables, see http://www.epa.gov/compliance/ej/resources/policy/plan-ej-2014/plan-ej-permitting-2011–09.pdf.

[4] For details on this rule-making initiative, including the organizational structure, implementation strategies and activities, plans for stakeholder involvement, and promised deliverables, see http://www.epa.gov/compliance/ej/resources/policy/plan-ej-2014/plan-ej-rulemaking-2011–09.pdf.

environmentally benefits EJ communities. Accelerating ongoing efforts to communicate more effectively with overburdened communities about enforcement actions and program activities is also a top priority of this compliance and enforcement initiative.[5]

In developing Plan EJ 2014, the EPA asked the National Environmental Justice Advisory Council (NEJAC) to conduct a review of the agency's draft plan as it relates to its stated goals of protecting health, empowering communities, and forming crucial partnerships. NEJAC was generally supportive of the organization and intent of the draft plan, but recommended that the agency provide more specificity with respect to the plan's activities and expected outcomes:

> EPA's Plan EJ 2014 should provide explicit criteria and outcome measures by which implementation of the Plan will be assessed. The goals need to be operationalized and evaluated and people/entities need to be held accountable for progress toward the goals. Many of the goals will require high-level agency oversight and coordination of the Plan and its implementation. Environmental justice community involvement in operationalizing and implementing is critical. That said, the time and effort that this will take means that it will be essential that clear standards and expectations are laid out and which do not fall solely to the responsibility of any one stakeholder. The Agency must be accountable for the larger goals. A lot of the Plan focuses on environmentally-just processes. While this is certainly important, focusing on process alone is insufficient. An equally, if not more, important goal is to ensure environmentally-just outcomes (NEJAC, 2011b, p. 2).

Partly in response to NEJAC's request for more specificity, the plan now has detailed strategies, activities, and deliverables, as well as formal commitments for ongoing progress assessments.

In announcing the plan, the EPA has committed the agency to substantive and continuing efforts to promote EJ in its permitting, rulemaking, and enforcement decision making. These initiatives are likely to redound to the benefit of state environmental agencies as well. For example, as the case study results reported in Chapter 3, 4, and 5 have shown, the Arizona Department of Environmental Quality is facing formidable challenges in accounting for cumulative risk in permitting

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[5] EPA's Office of Enforcement and Compliance Assurance will report annually on progress in implementing the strategies enumerated in its implementation plan for advancing EJ through compliance and enforcement. For details on this initiative, including the organizational structure, implementation strategies and activities, plans for stakeholder involvement, and promised deliverables, see http://www.epa.gov/compliance/ej/resources/policy/plan-ej-2014/plan-ej-c-e-2011–09.pdf.

decisions, anticipating the EJ impacts of implementing new drinking water standards, in incorporating enforcement provisions directly into the permit approval process, and in exercising appropriate enforcement discretion in drinking water compliance activities. Advances on these fronts as a result of the plan's activities can greatly assist the state in promoting EJ in agency decision making. Similar synergistic impacts can reasonably be expected for other state agencies as well. Given the central role that state environmental agencies play in promoting EJ in permitting and regulatory decision making, the ancillary benefits of the plan are likely to be pivotal in addressing EJ concerns. As the EPA states:

> In recent years, States have emerged as an important group in efforts to address environmental justice. At least forty-two States and the District of Columbia have adopted environmental justice statutes, executive orders, or policies. These states have been pioneering, and resourceful in their approaches. States have the ability to understand and address EJ issues in multiple communities in ways far beyond the reach of the Federal government. States are often the most appropriate governmental entity to identify opportunities for improving community health, leveraging local resources and providing broad-based activity across a wide geographic area. Additional funds applied to their efforts can have a tremendous leveraging effect and foster significant and measurable advances in policy and practice (NEJAC, 2011b, p. 9).

The federalism challenge in coming years will be to effectively craft cooperative agreements that capitalize on advances achieved under the plan while carefully accounting for the comparative advantage of the states in documenting and addressing EJ concerns in their communities.[6]

Finally, the EPA acknowledges in the plan that many communities still lack the capacity to affect environmental outcomes, living in the shadows of adverse and disparate impacts. To address this concern, the agency has

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[6] The recently initiated State Environmental Justice Cooperative Agreement (SEJCA) program was developed by the EPA's Office of Environmental Justice with this spirit of cooperation in mind. The SEJCA program supports innovative state activities that lead to measurable environmental or public health results in communities disproportionately burdened by environmental harms and risks. The goals of the SEJCA initiatives are to build partnerships with community organizations, to pilot activities in specific communities that can be modeled and expanded into other geographical areas, and to strengthen the development and implementation of specific approaches to achieving EJ. Projects are explicitly designed to take advantage of state information, state leadership, and state targeting of disproportionately burdened areas. For an overview of innovative state proposals, see Bonorris and Targ (2010).

committed to supporting community-based action programs.[7] As discussed in Chapter 6, committing to purposeful and consequential community involvement as part of agency decision making is likely to result in better designed policy, in terms of both distributive equity and economic efficiency. To support community empowerment, the EPA has committed to making agency resources more accessible to under-served communities while developing improved agency understanding of implementing community-based programs. The overarching intent of this and all other initiatives under the plan is to secure environmental, health, and economic improvements in all EJ communities.

[7] For details on the EPA's plan for supporting community-based action programs, including the organizational structure, implementation strategies, community engagement activities, deliverables, and assessment commitments, see http://www.epa.gov/compliance/ej/resources/policy/plan-ej-2014/plan-ej-community-action-2011–09.pdf.

Appendix 1 Federal actions to address environmental justice in minority populations and low-income populations: Executive Order 12898

February 11, 1994

EXECUTIVE ORDER

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Sec. 1–1. IMPLEMENTATION.

1–101. Agency Responsibilities. To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

1–102. Creation of an Interagency Working Group on Environmental Justice. (a) Within 3 months of the date of this order, the Administrator of the Environmental Protection Agency ('Administrator') or the Administrator's designee shall convene an interagency Federal Working Group on Environmental Justice ('Working Group'). The Working Group shall comprise the heads of the following executive agencies and offices, or their designees: (a) Department of Defense; (b) Department of Health and Human Services; (c) Department of Housing and Urban Development; (d) Department of Labor; (e) Department of Agriculture; (f) Department of Transportation; (g) Department of Justice; (h) Department of the Interior; (i) Department of Commerce; (j) Department of Energy; (k) Environmental Protection Agency; (l) Office of Management

and Budget; (m) Office of Science and Technology Policy; (n) Office of the Deputy Assistant to the President for Environmental Policy; (o) Office of the Assistant to the President for Domestic Policy; (p) National Economic Council; (q) Council of Economic Advisers; and (r) such other Government officials as the President may designate. The Working Group shall report to the President through the Deputy Assistant to the President for Environmental Policy and the Assistant to the President for Domestic Policy.

(b) The Working Group shall: (1) provide guidance to Federal agencies on criteria for identifying disproportionately high and adverse human health or environmental effects on minority populations and low-income populations;

(2) coordinate with, provide guidance to, and serve as a clearinghouse for, each Federal agency as it develops an environmental justice strategy as required by section 1–103 of this order, in order to ensure that the administration, interpretation and enforcement of programs, activities and policies are undertaken in a consistent manner;

(3) assist in coordinating research by, and stimulating cooperation among, the Environmental Protection Agency, the Department of Health and Human Services, the Department of Housing and Urban Development, and other agencies conducting research or other activities in accordance with section 3–3 of this order;

(4) assist in coordinating data collection, required by this order;

(5) examine existing data and studies on environmental justice;

(6) hold public meetings as required in section 5–502(d) of this order; and

(7) develop interagency model projects on environmental justice that evidence cooperation among Federal agencies.

1–103. Development of Agency Strategies. (a) Except as provided in section 6–605 of this order, each Federal agency shall develop an agency-wide environmental justice strategy, as set forth in subsections (b)–(e) of this section that identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The environmental justice strategy shall list programs, policies, planning and public participation processes, enforcement, and/or rulemakings related to human health or the environment that should be revised to, at a minimum: (1) promote enforcement of all health and

environmental statutes in areas with minority populations and low-income populations; (2) ensure greater public participation; (3) improve research and data collection relating to the health and environment of minority populations and low-income populations; and (4) identify differential patterns of consumption of natural resources among minority populations and low-income populations. In addition, the environmental justice strategy shall include, where appropriate, a timetable for undertaking identified revisions and consideration of economic and social implications of the revisions.

(b) Within 4 months of the date of this order, each Federal agency shall identify an internal administrative process for developing its environmental justice strategy, and shall inform the Working Group of the process.

(c) Within 6 months of the date of this order, each Federal agency shall provide the Working Group with an outline of its proposed environmental justice strategy.

(d) Within 10 months of the date of this order, each Federal agency shall provide the Working Group with its proposed environmental justice strategy.

(e) Within 12 months of the date of this order, each Federal agency shall finalize its environmental justice strategy and provide a copy and written description of its strategy to the Working Group. During the 12 month period from the date of this order, each Federal agency, as part of its environmental justice strategy, shall identify several specific projects that can be promptly undertaken to address particular concerns identified during the development of the proposed environmental justice strategy, and a schedule for implementing those projects.

(f) Within 24 months of the date of this order, each Federal agency shall report to the Working Group on its progress in implementing its agency-wide environmental justice strategy.

(g) Federal agencies shall provide additional periodic reports to the Working Group as requested by the Working Group.

1–104. Reports to the President. Within 14 months of the date of this order, the Working Group shall submit to the President, through the Office of the Deputy Assistant to the President for Environmental Policy and the Office of the Assistant to the President for Domestic Policy, a

report that describes the implementation of this order, and includes the final environmental justice strategies described in section 1–103(e) of this order.

Sec. 2–2. FEDERAL AGENCY RESPONSIBILITIES FOR FEDERAL PROGRAMS.

Each Federal agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin.

Sec. 3–3. RESEARCH, DATA COLLECTION, AND ANALYSIS.

3–301. Human Health and Environmental Research and Analysis. (a) Environmental human health research, whenever practicable and appropriate, shall include diverse segments of the population in epidemiological and clinical studies, including segments at high risk from environmental hazards, such as minority populations, low-income populations and workers who may be exposed to substantial environmental hazards.

(b) Environmental human health analyses, whenever practicable and appropriate, shall identify multiple and cumulative exposures.

(c) Federal agencies shall provide minority populations and low-income populations the opportunity to comment on the development and design of research strategies undertaken pursuant to this order.

3–302. Human Health and Environmental Data Collection and Analysis. To the extent permitted by existing law, including the Privacy Act, as amended (5 USC. section 552a): (a) each Federal agency, whenever practicable and appropriate, shall collect, maintain, and analyze information assessing and comparing environmental and human health risks borne by populations identified by race, national origin, or income. To the extent practical and appropriate, Federal agencies shall use this information to determine whether their programs, policies, and activities have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations;

(b) In connection with the development and implementation of agency strategies in section 1–103 of this order, each Federal agency, whenever

practicable and appropriate, shall collect, maintain and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on the surrounding populations, when such facilities or sites become the subject of a substantial Federal environmental administrative or judicial action. Such information shall be made available to the public, unless prohibited by law; and

(c) Each Federal agency, whenever practicable and appropriate, shall collect, maintain, and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding Federal facilities that are: (1) subject to the reporting requirements under the Emergency Planning and Community Right-to-Know Act, 42 USC. section 11001–11050 as mandated in Executive Order No. 12856; and (2) expected to have a substantial environmental, human health, or economic effect on surrounding populations. Such information shall be made available to the public, unless prohibited by law.

(d) In carrying out the responsibilities in this section, each Federal agency, whenever practicable and appropriate, shall share information and eliminate unnecessary duplication of efforts through the use of existing data systems and cooperative agreements among Federal agencies and with State, local, and tribal governments.

Sec. 4–4. SUBSISTENCE CONSUMPTION OF FISH AND WILDLIFE.

4–401. Consumption Patterns. In order to assist in identifying the need for ensuring protection of populations with differential patterns of subsistence consumption of fish and wildlife, Federal agencies, whenever practicable and appropriate, shall collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. Federal agencies shall communicate to the public the risks of those consumption patterns.

4–402. Guidance. Federal agencies, whenever practicable and appropriate, shall work in a coordinated manner to publish guidance reflecting the latest scientific information available concerning methods for evaluating the human health risks associated with the consumption of pollutant-bearing fish or wildlife. Agencies shall consider such guidance in developing their policies and rules.

Sec. 5–5. PUBLIC PARTICIPATION AND ACCESS TO INFORMATION.

(a) The public may submit recommendations to Federal agencies relating to the incorporation of environmental justice principles into Federal agency programs or policies. Each Federal agency shall convey such recommendations to the Working Group.

(b) Each Federal agency may, whenever practicable and appropriate, translate crucial public documents, notices, and hearings relating to human health or the environment for limited English speaking populations.

(c) Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public.

(d) The Working Group shall hold public meetings, as appropriate, for the purpose of fact-finding, receiving public comments, and conducting inquiries concerning environmental justice. The Working Group shall prepare for public review a summary of the comments and recommendations discussed at the public meetings.

Sec. 6–6. GENERAL PROVISIONS.

6–601. Responsibility for Agency Implementation. The head of each Federal agency shall be responsible for ensuring compliance with this order. Each Federal agency shall conduct internal reviews and take such other steps as may be necessary to monitor compliance with this order.

6–602. Executive Order No. 12250. This Executive order is intended to supplement but not supersede Executive Order No. 12250, which requires consistent and effective implementation of various laws prohibiting discriminatory practices in programs receiving Federal financial assistance. Nothing herein shall limit the effect or mandate of Executive Order No. 12250.

6–603. Executive Order No. 12875. This Executive order is not intended to limit the effect or mandate of Executive Order No. 12875.

6–604. Scope. For purposes of this order, Federal agency means any agency on the Working Group, and such other agencies as may be designated by the President, that conducts any Federal program or activity that substantially affects human health or the environment. Independent agencies are requested to comply with the provisions of this order.

6–605. Petitions for Exemptions. The head of a Federal agency may petition the President for an exemption from the requirements of this order on the grounds that all or some of the petitioning agency's programs or activities should not be subject to the requirements of this order.

6–606. Native American Programs. Each Federal agency responsibility set forth under this order shall apply equally to Native American programs. In addition, the Department of the Interior, in coordination with the Working Group, and, after consultation with tribal leaders, shall coordinate steps to be taken pursuant to this order that address Federally-recognized Indian Tribes.

6–607. Costs. Unless otherwise provided by law, Federal agencies shall assume the financial costs of complying with this order.

6–608. General. Federal agencies shall implement this order consistent with, and to the extent permitted by, existing law.

6–609. Judicial Review. This order is intended only to improve the internal management of the executive branch and is not intended to, nor does it create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by a party against the United States, its agencies, its officers, or any person. This order shall not be construed to create any right to judicial review involving the compliance or noncompliance of the United States, its agencies, its officers, or any other person with this order.

William J. Clinton

THE WHITE HOUSE,

February 11, 1994.

Source: *Federal Register*, V. 59, N. 32, Wednesday, February 16, 1994, Presidential Documents. Available at http://www.archives.gov/federal-register/executive-orders/pdf/12898.pdf.

Appendix 2 Title VI and environmental justice at EPA

In July 1964 Congress passed the Civil Rights Act of 1964. Title VI of the Civil Rights Act states that *'No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.'*

In February 1994, President Clinton issued Executive Order 12898, 'Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.' In a separate memorandum, President Clinton identified Title VI as one of several federal laws already in existence that can help 'to prevent minority communities and low-income communities from being subject to disproportionately high and adverse environmental effects.'

There are several basic differences between EPA's responsibilities under Title VI and under Executive Order 12898:

Title VI

1. Title VI prohibits recipients of federal financial assistance (*e.g.*, states, universities, local governments) from discriminating on the basis of race, color, or national origin in their programs or activities.
2. Title VI is a federal law that applies to federal financial assistance recipients (*i.e.*, persons or entities that receive EPA financial assistance) and not to EPA itself as the Executive Order does.
3. Title VI allows persons to file administrative complaints with the federal departments and agencies that provide financial assistance alleging discrimination based on race, color, or national origin by recipients of federal funds.
4. Under Title VI, EPA has a responsibility to ensure that its funds are not being used to subsidize discrimination based on race, color, or national origin. This prohibition against discrimination under Title VI has been a statutory mandate since 1964 and EPA has had Title VI regulations since 1973.

5. EPA's Office of Civil Rights is responsible for the Agency's administration of Title VI, including investigation of such complaints.

Executive Order 12898

1. Executive Order 12898 generally calls on each federal agency to achieve 'environmental justice … by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations … .'
2. Executive Order 12898 applies to federal agency actions, including EPA's, and directs agencies, to the extent permitted by law, to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.
3. Executive Order 12898 is a directive from the President of the United States to federal agencies intended to improve the internal management of the federal government.
4. The Executive Order establishes the Administration's policy on environmental justice; it is not enforceable in court and does not create any rights or remedies.
5. EPA's Office of Environmental Justice works to ensure that EPA's actions are in compliance with the Executive Order.

Source: US EPA. Available at http://www.epa.gov/ocr/t6andej.htm.

Appendix 3 Simultaneous equation estimation

The simultaneous model used for explaining siting decision and reverse causality is given by:

$$EXPOSURE^{*}_{it} = b_0 + b_{00} \cdot DUM2000_{it} + b_1 \cdot MANUFCTG_{it} + b_2 \cdot INCOME_{it} + b_3 \cdot RENT_{it} + \gamma_1 \cdot SHMIN_{it} + u_{1it}, \quad \text{(A3.1)}$$

and

$$SHMIN_{it} = c_0 + c_{00} \cdot DUM2000_{it} + c_1 \cdot OWN_{it} + c_2 \cdot DENSITY_{it} + \gamma_2 \cdot EXPOSURE^{*}_{it} + u_{2it}, \quad \text{(A3.2)}$$

where b_0, b_{00}, b_1, b_2, b_3, c_0, c_{00}, c_2, γ_1, γ_2 are parameters to be estimated, u_{1it} and u_{2it} are disturbance terms, *DUM2000* is a dummy variable for year 2000 and other variables are as given in Table 3.1. The structural model given in equations (A3.1) and (A3.2) is simultaneous with the unobservable endogenous variable on the right-hand side of (A3.2). An estimation procedure should account for this simultaneity and possible correlation between u_1 and u_2 to obtain consistent and efficient parameter estimates. Traditional instrumental methods are not feasible because of the unobservable nature of the endogenous variable on the right-hand side of (A3.2).[1] We derive the reduced form model from the structural model and estimate it with full information maximum likelihood methods.

We assume that error terms in equations (A3.1) and (A3.2) are jointly normally distributed as:

[1] A simultaneous model with observed binary variable, *EXPOSURE,* instead of unobservable *EXPOSURE**, on the right-hand side of (A3.2) is internally inconsistent and cannot be estimated unless $\gamma_1 = 0$ or $\gamma_2 = 0$. See Maddala, 1983, pp. 117–18.

$$\begin{pmatrix} u_{1it} \\ u_{2it} \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \sigma_{12} \\ \sigma_{12} & \sigma_{22} \end{pmatrix}\right]. \tag{A3.3}$$

As is customary in probit models, the variance of u_1 has been normalized to 1. The structural model given in equations (A3.1) and (A3.2) can be written in its reduced form as:

$$y^*_{1it} = \left(xb_{1it} + \gamma_1\, xb_{2it}\right)/\left(1-\gamma_1\,\gamma_2\right) + \varepsilon_{1it} = rhs_{1it} + \varepsilon_{1it} \tag{A3.4}$$

and

$$\begin{aligned}
&y_{2it} = \left(xb_{2it} + \gamma_2 \cdot xb_{1it}\right)/\left(1-\gamma_1 \cdot \gamma_2\right) + \varepsilon_{2it} = rhs_{2it} + \varepsilon_{2it} \\
&where\ y^*_{1it} \text{ is } EXPOSURE^*_{it}, y_{2it} \text{ is } SHMIN_{it}, \\
&xb_{1it} = b_0 + b_{00} \cdot DUM2000_{it} + b_1 \cdot MANUFCTG_{it} + b_2 \cdot INCOME_{it} + b_3 \cdot RENT_{it}, \\
&Xb_{2it} = c_0 + c_{00} \cdot DUM2000_{it} + c_1 \cdot OWN_{it} + c_2 \cdot DENSITY_{it}, \\
&\varepsilon_{1it} = \left(u_{1it} + \gamma_1 \cdot u_{2it}\right)/\left(1-\gamma_1 \cdot \gamma_2\right), \text{ and} \\
&\varepsilon_{2it} = \left(\gamma_2 \cdot u_{1it} + u_{2it}\right)/\left(1-\gamma_1 \cdot \gamma_2\right).
\end{aligned} \tag{A3.5}$$

Given that u_{1it} and u_{2it} are normally distributed random variables, ϵ_{1it} and ϵ_{2it} are also normally distributed. That is:

$$\begin{pmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} s_{11} & s_{12} \\ s_{12} & s_{22} \end{pmatrix}\right] \tag{A3.6}$$

where,

$$\begin{bmatrix} s_{11} & s_{12} \\ s_{12} & s_{22} \end{bmatrix} = \begin{bmatrix} \dfrac{1+\gamma_1^2\sigma_{22}+2\gamma_1\sigma_{12}}{\left(1-\gamma_1\gamma_2\right)^2} & \dfrac{\gamma_2+\gamma_1\sigma_{22}+\left(1+\gamma_1\gamma_2\right)\sigma_{12}}{\left(1-\gamma_1\gamma_2\right)^2} \\ \dfrac{\gamma_2+\gamma_1\sigma_{22}+\left(1+\gamma_1\gamma_2\right)\sigma_{12}}{\left(1-\gamma_1\gamma_2\right)^2} & \dfrac{\gamma_2^2+\sigma_{22}+2\gamma_2\sigma_{12}}{\left(1-\gamma_1\gamma_2\right)^2} \end{bmatrix}$$

Note that the conditional distribution for $\epsilon_{1it} \mid \epsilon_{2it}$ is also normal and is given by:

$$\varepsilon_{1it}\,|\varepsilon_{2it} \sim N\left[\left(s_{12}/s_{22}\right)\cdot\varepsilon_{2it},\quad s_{11}\cdot\left(1-\rho^2\right)\right] \quad \text{where} \quad \rho = \frac{s_{12}}{\sqrt{s_{11}\cdot s_{22}}}$$

is the correlation coefficient. (A3.7)

Because pooled data from two different time periods (1990 and 2000) is used for estimation of model parameters, error terms are allowed to exhibit time-wise heteroscedasticity. Time varying heteroscedasticity is accommodated by rewriting the variances and covariances as:

$$\sigma_{12it} = \sigma_{12a} + \sigma_{12b}\ \text{DUM2000}_{\ it} \text{ and} \tag{A3.8a}$$

$$\sigma_{22it} = \sigma_{22a} + \sigma_{22b}\ \text{DUM2000}_{\ it}\,. \tag{A3.8b}$$

Under the formulation in (A3.8a) and (A3.8b), a test for heteroscedasticity is conducted by simply testing the hypothesis, $= \sigma_{12b} = \sigma_{22b} = 0$. Obviously, when error term us is heteroscedastic, error term ϵs, being linear functions of us, is also heteroscedastic. In particular, s_{11}, s_{12}, s_{22} and ρ are also time varying when heteroscedasticity is allowed.

Full information maximum likelihood estimates of the parameters (b_0, b_{00}, b_1, b_2, b_3, c_0, c_{00}, c_1, c_2, γ_1, γ_2, σ_{12a}, σ_{12b}, σ_{22a}, σ_{22b}) are obtained by maximizing the following log-likelihood function:

$$\ln L = \sum_{it\in(y_{1it}=1)} \ln\, prob\left(y_{1it}=1\,|y_{2it}\right) + \sum_{it\in(y_{1it}=0)} \ln\, prob\left(y_{1it}=0\,|y_{2it}\right) + \sum_{t=1}^{2}\sum_{i=1}^{n} \ln f\left(y_{2it}\right) \tag{A3.9}$$

where, $f\left(y_{2it}\right) = f\left(\varepsilon_{2it} - rhs_{2it}\right)$ is a marginal distribution. The conditional probabilities in (A3.9) can be evaluated using results in (A3.7).

$$\begin{aligned} prob\left(y_{1it}=1\,|y_{2it}\right) &= prob\left(y^{*}_{1it}>0\,|y_{2it}\right) \\ &= prob\left(\varepsilon_{1it} > -rhs_{1it}\,|y_{2it}\right) \end{aligned}$$

Conditioning on y_{2it} is equivalent to conditioning on ϵ_{2it} because, given exogenous variables and y_{2it}, ϵ_{2it} can be obtained using (A3.5). Hence, the conditional probability can be written as:

$$\begin{aligned} prob\left(\varepsilon_{1it} > -rhs_{1it}\,|y_{2it}\right) &= prob\left(\varepsilon_{1it} > -rhs_{1it}\,|\varepsilon_{2it}\right) \\ &= prob\left(\varepsilon_{1it} < rhs_{1it}\,|\varepsilon_{2it}\right). \end{aligned}$$

Subtracting the mean and dividing by the variance of the conditional distribution from both sides of the above inequality, we get:

$$
\begin{aligned}
prob\left(\varepsilon_{1it} < rhs_{1it} \left| \varepsilon_{2it}\right.\right) &= prob\left[\frac{\varepsilon_{1it} - \left(s_{12}/s_{22}\right)\cdot\varepsilon_{1it}}{\sqrt{s_{11}\left(1-\rho^2\right)}} < \frac{rhs_{1it} - \left(s_{12}/s_{22}\right)\cdot\varepsilon_{2it}}{\sqrt{s_{11}\left(1-\rho^2\right)}} \left| \varepsilon_{2it}\right.\right] \\
&= prob\left[z < \frac{rhs_{1it} - \left(s_{12}/s_{22}\right)\cdot\varepsilon_{2it}}{\sqrt{s_{11}\cdot\left(1-\rho^2\right)}} \left| \varepsilon_{2it}\right.\right] \\
&= \Phi\left[\frac{rhs_{1it} - \left(s_{12}/s_{22}\right)\cdot\varepsilon_{2it}}{\sqrt{s_{11}\cdot\left(1-\rho^2\right)}}\right] \\
&= \Phi\left[\frac{rhs_{1it} - \left(s_{12}/s_{22}\right)\cdot\left(y_{2it} = rhs_{2it}\right)}{\sqrt{s_{11}\cdot\left(1-\rho^2\right)}}\right]
\end{aligned}
$$

where Φ is the cumulative standard normal distribution. The second conditional probability in (A3.9) can be evaluated in a similar way.

$$
\begin{aligned}
prob\left(y_{1it} = 0 \left| y_{2it}\right.\right) &= prob\left(y^*_{1it} = 0 \left| y_{2it}\right.\right) \\
&= prob\left(\varepsilon_{1it} < -rhs_{1it} \left| y_{2it}\right.\right) \\
&= prob\left(\varepsilon_{1it} < -rhs_{1it} \left| \varepsilon_{2it}\right.\right) \\
&= \Phi\left[\frac{-rhs_{1it} - \left(s_{12}/s_{22}\right)\cdot\left(y_{2it} - rhs_{2it}\right)}{\sqrt{s_{11}\cdot\left(1-\rho^2\right)}}\right].
\end{aligned}
$$

Using the expressions derived for conditional probabilities, the log-likelihood function in (A3.9) can now be written in its final form as:

$$\ln L = \sum_{t=1}^{2}\sum_{t=1}^{n} y_{1it} \cdot \ln \Phi \left[\frac{rhs_{1it} - \left(s_{12it} / s_{22it}\right) \cdot \left(y_{2it} - rhs_{2it}\right)}{\sqrt{s_{11it} \cdot \left(1 - p_{it}^2\right)}} \right]$$
$$+ \sum_{t=1}^{2}\sum_{t=1}^{n} \left(1 - y_{1it}\right) \cdot \ln \Phi \left[\frac{-rhs_{1it} - \left(s_{12it} / s_{22it}\right) \cdot \left(y_{2it} - rhs_{2it}\right)}{\sqrt{s_{11it} \cdot \left(1 - p_{it}^2\right)}} \right]$$
$$- \sum_{t=1}^{2}\sum_{t=1}^{n} 0.5 \ln s_{22it} - 0.5 \sum_{t=1}^{2}\sum_{t=1}^{n} \left(y_{2it} - rhs_{2it}\right)^2 \Big/ s_{22it}. \qquad \text{(A3.10)}$$

Source: Aradhyula et al., 2006.

Appendix 4 Estimated benefits and costs of the revised arsenic standard[1]

Incremental Benefits

Health benefits
Descriptive assessment:

- Avoided costs of bladder and lung cancer.
- Avoided premature deaths valued at $6.1 million per statistical life.
- Avoided non-fatal cancer cases monetized using a willingness-to-pay value of $607,162.

Monetized annual value: $139.6–$197.7 million per year.
Additional benefits not monetized:

- Avoided cases of skin, liver, kidney, and prostate cancer.
- Avoided cardiovascular and pulmonary effects and psychological effects of knowing that the drinking water is safer to consume.

ANNUALIZED BENEFITS: $139.6–$197.7 million per year.

Incremental Costs

Systems costs (assuming a 7 percent discount rate)
Descriptive assessment:

- Treatment costs.
- Monitoring and administrative expenses.

[1] The revised standard lowered the maximum contaminant level for arsenic in drinking water from 50 ppb to 10 ppb. Benefits and costs are in 1999 dollars.

Monetized annual value:

- Treatment costs: $200.6 million per year.
- Monitoring/administrative costs: $ 3.8 million per year.

State costs

Monetized annual value: $ 1.2 million per year
ANNUALIZED COSTS: $205.6 million per year

Net Benefits

ANNUALIZED NET BENEFITS: -$66.0 million–$7.9 million per year
Source: US EPA, 2000a.

Appendix 5 Federal register of environmental documents: Executive Order 13132 – Federalism

August 4, 1999

EXECUTIVE ORDER

By the authority vested in me as President by the Constitution and the laws of the United States of America, and in order to guarantee the division of governmental responsibilities between the national government and the States that was intended by the Framers of the Constitution, to ensure that the principles of federalism established by the Framers guide the executive departments and agencies in the formulation and implementation of policies, and to further the policies of the Unfunded Mandates Reform Act, it is hereby ordered as follows:

Section 1. Definitions. For purposes of this order:

(a) 'Policies that have federalism implications' refers to regulations, legislative comments or proposed legislation, and other policy statements or actions that have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

(b) 'State' or 'States' refer to the States of the United States of America, individually or collectively, and, where relevant, to State governments, including units of local government and other political subdivisions established by the States.

(c) 'Agency' means any authority of the United States that is an 'agency' under 44 U.S.C. 3502(1), other than those considered to be independent regulatory agencies, as defined in 44 U.S.C. 3502(5).

(d) 'State and local officials' means elected officials of State and local governments or their representative national organizations.

Sec. 2. Fundamental Federalism Principles. In formulating and implementing policies that have federalism implications, agencies shall be guided by the following fundamental federalism principles:

(a) Federalism is rooted in the belief that issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people.

(b) The people of the States created the national government and delegated to it enumerated governmental powers. All other sovereign powers, save those expressly prohibited the States by the Constitution, are reserved to the States or to the people.

(c) The constitutional relationship among sovereign governments, State and national, is inherent in the very structure of the Constitution and is formalized in and protected by the Tenth Amendment to the Constitution.

(d) The people of the States are free, subject only to restrictions in the Constitution itself or in constitutionally authorized Acts of Congress, to define the moral, political, and legal character of their lives.

(e) The Framers recognized that the States possess unique authorities, qualities, and abilities to meet the needs of the people and should function as laboratories of democracy.

(f) The nature of our constitutional system encourages a healthy diversity in the public policies adopted by the people of the several States according to their own conditions, needs, and desires. In the search for enlightened public policy, individual States and communities are free to experiment with a variety of approaches to public issues. One-size-fits-all approaches to public policy problems can inhibit the creation of effective solutions to those problems.

(g) Acts of the national government – whether legislative, executive, or judicial in nature – that exceed the enumerated powers of that government under the Constitution violate the principle of federalism established by the Framers.

(h) Policies of the national government should recognize the responsibility of – and should encourage opportunities for – individuals, families, neighborhoods, local governments, and private associations to achieve their personal, social, and economic objectives through cooperative effort.

(i) The national government should be deferential to the States when taking action that affects the policymaking discretion of the States and should act

only with the greatest caution where State or local governments have identified uncertainties regarding the constitutional or statutory authority of the national government.

Sec. 3. Federalism Policymaking Criteria. In addition to adhering to the fundamental federalism principles set forth in section 2, agencies shall adhere, to the extent permitted by law, to the following criteria when formulating and implementing policies that have federalism implications:

(a) There shall be strict adherence to constitutional principles. Agencies shall closely examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and shall carefully assess the necessity for such action. To the extent practicable, State and local officials shall be consulted before any such action is implemented. Executive Order 12372 of July 14, 1982 ('Intergovernmental Review of Federal Programs') remains in effect for the programs and activities to which it is applicable

(b) National action limiting the policymaking discretion of the States shall be taken only where there is constitutional and statutory authority for the action and the national activity is appropriate in light of the presence of a problem of national significance. Where there are significant uncertainties as to whether national action is authorized or appropriate, agencies shall consult with appropriate State and local officials to determine whether Federal objectives can be attained by other means.

(c) With respect to Federal statutes and regulations administered by the States, the national government shall grant the States the maximum administrative discretion possible. Intrusive Federal oversight of State administration is neither necessary nor desirable.

(d) When undertaking to formulate and implement policies that have federalism implications, agencies shall:

L (1) encourage States to develop their own policies to achieve program objectives and to work with appropriate officials in other States;
L (2) where possible, defer to the States to establish standards;
L (3) in determining whether to establish uniform national standards, consult with appropriate State and local officials as to the need for national standards and any alternatives that would limit the scope of national standards or otherwise preserve State prerogatives and authority; and
L (4) where national standards are required by Federal statutes, consult with appropriate State and local officials in developing those standards.

Sec. 4. Special Requirements for Preemption. Agencies, in taking action that preempts State law, shall act in strict accordance with governing law.

(a) Agencies shall construe, in regulations and otherwise, a Federal statute to preempt State law only where the statute contains an express preemption provision or there is some other clear evidence that the Congress intended preemption of State law, or where the exercise of State authority conflicts with the exercise of Federal authority under the Federal statute.

(b) Where a Federal statute does not preempt State law (as addressed in subsection (a) of this section), agencies shall construe any authorization in the statute for the issuance of regulations as authorizing preemption of State law by rulemaking only when the exercise of State authority directly conflicts with the exercise of Federal authority under the Federal statute or there is clear evidence to conclude that the Congress intended the agency to have the authority to preempt State law.

(c) Any regulatory preemption of State law shall be restricted to the minimum level necessary to achieve the objectives of the statute pursuant to which the regulations are promulgated.

(d) When an agency foresees the possibility of a conflict between State law and Federally protected interests within its area of regulatory responsibility, the agency shall consult, to the extent practicable, with appropriate State and local officials in an effort to avoid such a conflict.

(e) When an agency proposes to act through adjudication or rulemaking to preempt State law, the agency shall provide all affected State and local officials notice and an opportunity for appropriate participation in the proceedings.

Sec. 5. Special Requirements for Legislative Proposals. Agencies shall not submit to the Congress legislation that would:

(a) directly regulate the States in ways that would either interfere with functions essential to the States' separate and independent existence or be inconsistent with the fundamental federalism principles in section 2;

(b) attach to Federal grants conditions that are not reasonably related to the purpose of the grant; or

(c) preempt State law, unless preemption is consistent with the fundamental federalism principles set forth in section 2, and unless a clearly legitimate national purpose, consistent with the federalism policymaking criteria set forth in section 3, cannot otherwise be met.

Sec. 6. Consultation.

(a) Each agency shall have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. Within 90 days after the effective date of this order, the head of each agency shall designate an official with principal responsibility for the agency's implementation of this order and that designated official shall submit to the Office of Management and Budget a description of the agency's consultation process.

(b) To the extent practicable and permitted by law, no agency shall promulgate any regulation that has federalism implications, that imposes substantial direct compliance costs on State and local governments, and that is not required by statute, unless:

L (1) funds necessary to pay the direct costs incurred by the State and local governments in complying with the regulation are provided by the Federal Government; or

L (2) the agency, prior to the formal promulgation of the regulation,

L (A) consulted with State and local officials early in the process of developing the proposed regulation;

L (B) in a separately identified portion of the preamble to the regulation as it is to be issued in the Federal Register, provides to the Director of the Office of Management and Budget a federalism summary impact statement, which consists of a description of the extent of the agency's prior consultation with State and local officials, a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation, and a statement of the extent to which the concerns of State and local officials have been met; and

L (C) makes available to the Director of the Office of Management and Budget any written communications submitted to the agency by State and local officials.

(c) To the extent practicable and permitted by law, no agency shall promulgate any regulation that has federalism implications and that preempts State law, unless the agency, prior to the formal promulgation of the regulation,

L (1) consulted with State and local officials early in the process of developing the proposed regulation;

L (2) in a separately identified portion of the preamble to the regulation as it is to be issued in the Federal Register, provides to the

Director of the Office of Management and Budget a federalism summary impact statement, which consists of a description of the extent of the agency's prior consultation with State and local officials, a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation, and a statement of the extent to which the concerns of State and local officials have been met; and

L (3) makes available to the Director of the Office of Management and Budget any written communications submitted to the agency by State and local officials.

Sec. 7. Increasing Flexibility for State and Local Waivers.

(a) Agencies shall review the processes under which State and local governments apply for waivers of statutory and regulatory requirements and take appropriate steps to streamline those processes.

(b) Each agency shall, to the extent practicable and permitted by law, consider any application by a State for a waiver of statutory or regulatory requirements in connection with any program administered by that agency with a general view toward increasing opportunities for utilizing flexible policy approaches at the State or local level in cases in which the proposed waiver is consistent with applicable Federal policy objectives and is otherwise appropriate.

(c) Each agency shall, to the extent practicable and permitted by law, render a decision upon a complete application for a waiver within 120 days of receipt of such application by the agency. If the application for a waiver is not granted, the agency shall provide the applicant with timely written notice of the decision and the reasons therefor.

(d) This section applies only to statutory or regulatory requirements that are discretionary and subject to waiver by the agency.

Sec. 8. Accountability.

(a) In transmitting any draft final regulation that has federalism implications to the Office of Management and Budget pursuant to Executive Order 12866 of September 30, 1993, each agency shall include a certification from the official designated to ensure compliance with this order stating that the requirements of this order have been met in a meaningful and timely manner.

(b) In transmitting proposed legislation that has federalism implications to the Office of Management and Budget, each agency shall include a

certification from the official designated to ensure compliance with this order that all relevant requirements of this order have been met.

(c) Within 180 days after the effective date of this order, the Director of the Office of Management and Budget and the Assistant to the President for Intergovernmental Affairs shall confer with State and local officials to ensure that this order is being properly and effectively implemented.

Sec. 9. Independent Agencies. Independent regulatory agencies are encouraged to comply with the provisions of this order.

Sec. 10. General Provisions.

(a) This order shall supplement but not supersede the requirements contained in Executive Order 12372 ('Intergovernmental Review of Federal Programs'), Executive Order 12866 ('Regulatory Planning and Review'), Executive Order 12988 ('Civil Justice Reform'), and OMB Circular A-19.

(b) Executive Order 12612 ('Federalism'), Executive Order 12875 ('Enhancing the Intergovernmental Partnership'), Executive Order 13083 ('Federalism'), and Executive Order 13095 ('Suspension of Executive Order 13083') are revoked.

(c) This order shall be effective 90 days after the date of this order.

Sec. 11. Judicial Review. This order is intended only to improve the internal management of the executive branch, and is not intended to create any right or benefit, substantive or procedural, enforceable at law by a party against the United States, its agencies, its officers, or any person.

THE WHITE HOUSE,
August 4, 1999.
[FR Doc. 99–20729
Filed 8–9-99; 8:45 am]
Billing code 3195–01-P

Source: *Federal Register*, V. 64, N. 153, Presidential Documents, pp. 43255–43259, August 4, 1999, Tuesday, August 10, 1999. Available at http://www.archives.gov/federal-register/executive-orders/1999.html.

Appendix 6 Any non-welfarist method of policy assessment violates the Pareto principle [1]

Let x denote a complete description of the world. In particular, x includes a comprehensive account of each of n individuals' situations and of anything that might be relevant under any method of evaluating the state of the world. Let X be the set of all conceivable states of the world.

A social welfare function, F, is a function from the set of states of the world, X, to the real line, R.

An individual i's utility function, U_i , is also a function from X to R.

An individualistic social welfare function, W, is a social welfare function of the form $W(U_1(x), \ldots , U_n(x))$.

The reader may verify that the following statement is true.

Observation. A social welfare function F is not individualistic if and only if there exist x, $x^1 \in X$ such that $U_i(x) = (x^1)$ for all i and $F(x) \neq F(x^1)$.

We remark that familiar conceptions of fairness are associated with social welfare functions that are not individualistic. Consider, for example, the notion that the punishment should fit the crime. If a social evaluator accords weight to this idea of fairness, he would prefer a state of the world x in which punishments fit crimes to a state in which x^1 punishments do not fit crimes, when other things are equal, and thus when all individuals have the same level of utility in the two states. Because, then, $F(x) \neq F(x^1)$ even though for all i, the social welfare function that incorporates this notion of fairness in punishment is not individualistic.[2]

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[1] Reprinted with permission: Excerpt from Kaplow, Lewis and Steven Shavell, 2001. 'Any Non-welfarist Method of Policy Assessment Violates the Pareto Principle,' *Journal of Political Economy* 109(2):281–6.

[2] To be concrete, consider the differentiable social welfare function $F(U_1(y_1), \ldots , U_{it} (y_n), z)$, where y_1 *is* the net income of individual i, z is a measure of the expected number of instances in which monetary punishments will not fit an undesirable act, and $\partial F/\partial z < 0$. To see that this F is not individualistic, one need

The (weak) Pareto principle is that if, for any states x, $x^1 \in X$, we have $U_i(x) > U_i(x^1)$ for all i, then $F(x) > F(x^1)$.

Let us make two assumptions.

Assumption 1. There exists a good such that, if each person has δ more of it, then each person is better off. Specifically, let m_i be individual i's amount of the good. Then if two states, x and x^1, are identical except that, for all i, m_i in x is higher by $\delta > 0$ than m_i in x^1, then $U_i(x) > U_i(x^1)$ for all i.

Assumption 2. The function F is continuous in the m_i.

Observe that assumption 2 does not imply the stronger assumption that F is continuous in x and thus does not rule out a variety of nonindividualistic social welfare functions that involve discontinuities. (For example, a social welfare function embodying the principle that promises should be kept might fall discontinuously if a promise is broken.) We suppose only that F is continuous in some good satisfying assumption 1. (We imagine that the social value of at least one ordinary consumption good is unrelated to the normative appeal of promise-keeping, so that an F reflecting the appeal of promise-keeping would be continuous in the good even if it is not continuous in whether a promise is kept.)[3]

Proposition. If a social welfare function F satisfies assumptions 1 and 2 and F is not an individualistic social welfare function, then F violates the Pareto principle.

Proof. If F is not an individualistic social welfare function, we know from the observation that there exist x, $x^1 \in X$ such that $U_i(x) = U_i(x^1)$ for all i and $F(x) \neq F(x^1)$. Suppose, without loss of generality, that $F(x) > F(x^1)$. Construct x'' from x^1 by increasing each m_i in x^1 by a positive amount δ. By assumption 2 (continuity), we know that if δ is sufficiently small, then $F(x) > F(x'')$. By assumption 1, we have $U_i(x'') > U_i(x^1)$ for all i, and because $U_i(x^1) = U_i(x)$ for all i, we know that $U_i(x'') > U_i(x)$ for all i. Hence, if the Pareto principle is satisfied, $F(x\mathbb{C}) > F(x)$. But $F(x) > F(x'')$, so F violates the Pareto principle. Q.E.D.

The plausibility of the proposition is suggested by reflection on what it means for a social welfare function not to be individualistic. Such a social welfare function must ascribe weight to some factor independently of its effect on individuals' utilities. Therefore, a social state that is desirable with respect to the (nonutility) factor will be deemed superior

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only consider any two states, x and x^1, in which all individuals have the same level of utility (i.e., income net of any monetary punishments) but in which z is different.

[3] We note that assumptions 1 and 2 are stronger than necessary to prove our result.

to another state that is identical except that (1) it is inferior with respect to the factor and (2) all individuals are slightly better off.

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