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INTERWOVEN CITIES

Liam Magee

► **Interwoven Cities**

Cities and the Global Politics of the Environment

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More than half of humanity lives in cities, and by 2050 this might extend to three-quarters of the world's population. Cities now have an undeniable impact on world affairs: **they constitute the hinges of the global economy, global information flows, and worldwide mobility of goods and people.** Yet, they also represent a formidable challenge for the 21st Century. Cities are core drivers not only of this momentous urbanisation, but also have a key impact on the environment, human security and the economy. Building on the Palgrave Pivot initiative, this series aims at capturing these pivotal implications with a particular attention to the impact of cities on global environmental politics, and with a distinctive cross-disciplinary appeal that seeks to bridge urban studies, international relations, and global governance. In particular, the series explores three themes: 1) What is the impact of cities on the global politics of the environment? 2) To what extent can there be talk of an emerging 'global urban' as a set of shared characteristics that link up cities worldwide? 3) How do new modes of thinking through the global environmental influence of cities help us to open up traditional frames for urban and international research?

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Interwoven Cities

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Series Editors' Preface

The nature and future of cities globally is very much a shared problem. Cities do not stand alone as islands in a sea of globalised flows and transnational challenges, but rather exist in relation with each other and themselves as complex 'bundles' of social, political and economic connections. Liam Magee's *Interwoven Cities* offers an important reminder to students of world politics, urban affairs and environmental studies alike that this complex urban fabric is today critical to understand the evolution of the urban age. Magee's work is an apt addition to this series' collaborative and inquisitive ethos. As he puts it, cities are 'interwoven' by an ensemble of urban fabrics, and we should not respond to such complexity with rigid disciplinary boundaries and individualist policies, but rather by drawing together a number of lines of contemporary urban critique and thinking through their possible renewal.

As per the spirit of Cities and the Global Politics of the Environment, this is a book that challenges conventional thinking about cities by testing new analytical and theoretical ground, surpassing the tradition of relying on models developed through studies of the 'global North' models. Magee argues that it might be necessary to extend the metaphor of the 'urban fabric' to better grasp how the various systems linking cities internally and externally are now emerging. Equally important, Magee does this in order to offer us a chance to reflect on opportunities and strategies for remaking this urban fabric more effectively, justly and openly. In doing so the book tackles the problem of urban

sustainability with a practical intention: Magee wants us to keep a keen eye on developing instruments for critique, assessment, or evaluation. *Interwoven Cities* already suggests some ways that a 'craft of city-making' can be rethought sustainably.

Ultimately, then, Liam Magee's contribution continues the eclectic mix of theoretical and case-study based explorations in the series, asking us to pay attention to the complex texture of the city and of the urban flows defining our time. And if the scope and complexity of the interwoven nature of cities might, as Magee points out, be partly beyond limits of comprehension this does not mean despair. Rather, as the book tells us, this should be seen as a call for even more critical questioning of our rapidly evolving and increasingly interconnected urbanised world.

Michele Acuto
Sofie Bouteligier
and Elizabeth Rapoport

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About the Author

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Introduction: Threads

Abstract: *The Introduction outlines the key argument of the text: that an extended conception of the urban fabric can help grasp the complexities of global challenges that unfold at multiple spatial levels. It also summarises the contents of each of the five chapters and explains their contribution to the argument.*

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Noted *Guardian* film critic Peter Bradshaw (2014) rated the 1983 film *Threads*, 'the film that frightened me most'. It depicts ordinary life in the English city of Sheffield. Through radio and television broadcasts, its citizens hear of escalating tensions in remote Iran. No cause for alarm – such broadcasts then as now are part of the habitual media feed of international events, squeezed in with the hurried schedules of local news, sports and weather forecasts. The film unfolds with the patience of a procedural drama: a couple are expecting a child, neighbours go about their shopping and customers at the local pub discuss current affairs with nonchalance. With an inevitable logic, Britain joins the United States in repelling Soviet aggression; anti-war protests are staged in the streets of the city; shops are raided for supplies in anticipation of imminent attack; local authorities establish a bunker to coordinate a civic response. Unannounced, a nuclear bomb detonates on the outskirts of Sheffield. Immediately much of the city fabric disintegrates. Over the next hour of footage the fallout, in all senses of the word, becomes apparent. The city is broken, a wasteland, with survivors either trapped in the wreckage or exposed to the slow but inevitable poison of radioactivity. The surrounding earth cannot be tilled, even if city-dwellers could relearn the craft of agriculture. Those who live beyond the immediate horrors of disease eke out a subsistence living on the leftovers of a decaying urban landscape. They age quickly. The prospect of a new generation offers a momentary reprieve from a total dystopia, human existence reduced to 'bare life' in Agamben's phrase. The harrowing conclusion, as Bradshaw notes, is both unseen and unspeakable.

In the three decades since the prospects of nuclear war appear to have faded from popular consciousness. Meanwhile, the equally dire effects of climate change have yet to receive the same dramatic illustrations in contemporary film culture. Unlike nuclear war, these effects are not instant. At least for those living in affluent cities, even the grim scenarios of inundated coastlines, extreme natural disasters, prolonged heat waves and water and food shortages seem manageable by comparison, a gradual process of climate change mitigation, adaptation and consumer behaviour change. The lack of dramatic illustration echoes mainstream political apathy. Democratically elected by citizens living in some of the most liveable, affluent and powerful cities in the world, the response of US, Canadian and Australian governments has been torpid. Natural disasters, whose attribution to increased climatic volatility remains highly politically contested, continue to present costly, inconvenient, but

sporadic interruptions to daily urban life. It is difficult to disentangle, from the 'balanced' presentations of the media, both causes and effects. Regardless the impacts of climate change do not yet appear dramatic enough to warrant the kinds of political shifts and pressures that, in part, led to global nuclear nonproliferation and disarmament treaties.

Politically expedient delays do little to arrest the real effects of a changing climate. Brought on by instabilities of the global environment housing them, cities are threatened by both slow- and fast-moving catastrophes. Equally, much of the response to such threats must inevitably come from cities: from the concentrations of capital, power, innovation and cultural practice that reside in them. In spite of their diverse disciplinary and ideological positions, recent urbanists are in consensus that cities are especially active agents in the new millennial world (Barber, 2013; Castells, 2011; Florida, 2010; Glaeser, 2011; Harvey, 2012; Sassen, 1991; Spencer, 2015). They have been critical organisers of human activity, since they first appeared in the Mesopotamian delta five millennia ago, as Mumford (1961, p. 42) noted with irony, to promise a 'more abundant life' while turning 'into its very opposite' through new techniques of 'centralized military control, systematic robbery and economic parasitism'. But in an era of the interconnected global economy, the permeation of transnational telecommunication and information networks and the intensification of international tourism, migration patterns and remittance systems, the urban centre today exerts a still more powerful centrifugal force and gravitational pull. Cities contain half the world's population and incalculably more than half its financial, social and cultural capital.

Moreover, and more than ever, cities do not stand alone. Along with historic interests in their surroundings and hinterlands, they are critically interconnected with other cities. Even the handful of global cities, described by Saskia Sassen (1991) as powerhouses of finance and control, do not exist in isolation. They are global precisely due to the weight and spread of their connectivity to other cities and regions. They influence and are influenced by the rumblings and tremors in other urban epicentres. Highways, shipping routes, airports and underwater cables link cities in infrastructural networks. City mayors and governors convene at assemblies to ratify protocols, sign declarations of principles and boost for business. Multinational corporations choose office and plant locations strategically to mirror their supply chains and customer clusters. Increases in the number and size of cities produce exponentially greater

possible bilateral and multilateral relationships between them. They are interdependent, or in the language deployed here, interwoven, as never before.

These changes follow mutually reinforcing processes of urbanisation, globalisation and technologisation. More people are moving to cities and more people, along with products, information, finance and political influence, are moving between them. This generates more sharply delineated, but at the same time, more complex and dynamic, global social networks and fabrics. How these function is frequently opaque, partly as their range incorporates diverse spatial levels. This is despite the very ubiquity of images of the city: luridly colourised overhead maps of Miami and Hong Kong sell alongside photos of the New York skyline at Ikea chain stores; satellite footage show the illuminated tracery of human development across the night surface of the earth; real-time computer simulations of flight traffic illustrate the constant airborne population roving between metropolitan centres (Prentice, 2015). Cities themselves are also made visible as networks. London's metro system, emblazoned on t-shirts and other merchandise, is a symbol of the connectivity central to the operations of this global city. Such examples only highlight, though, the more general difficulty in imagining the profusion of layers that enmesh and intersect human settlements across the planet.

If it is difficult to see, it is even more difficult to imagine how to alter this global urban landscape. Uneven development describes the production of structural inequality between different geographical areas (Smith, 2008). Canonical examples include the histories of colonisation, in which the coloniser benefits disproportionately from the resources and labour of the colonised. In many cases the recent era of postcolonialism has done little to stem the continued production of inequality, though it has occasionally changed its contours drastically. The enduring condition of uneven development contributes significantly to the changing of the climate and to the hesitation of affluent nations to respond to it. Yet the quality of 'unevenness' itself is not readily located at a particular spatial level; it is distributed variably through neighbourhoods, cities, regions, nations, national federations and continents. Power and influence flow through each of these levels, as well as along multiple conduits of social life. Enacting systemic change on multilevel and multidimensional issues like climate change requires some way to intercept this fractal-like 'space of flows' (Castells, 2011), to hook into the multithreaded circuits and exchanges that run along and cut across the spatial continuum.

Responding to this challenge, *Interwoven Cities* makes the case that in extending the metaphor of the urban fabric, it might be possible to take hold of how these various systems are now unfolding, along with the opportunities and strategies for remaking them. Indeed the urban fabric is already an example of what Johnson and Lakoff (2008) term 'metaphors we live by': highly condensed images that lend coherence to the complexity of everyday experience. The city is the ensemble of fabrics that clothe or embalm us, the place of ties that bind us, the gathering of knots that entwine us. Yet our horizons and challenges are now irrevocably global. Accordingly, this metaphorical schematic must extend from the singular discrete city object to the urbanising planet: to become, in addition, a series of images and associations through which different relations within and between cities can be grasped. Incorporating water piping, sewers, electricity grids, business associations, community groups, political constituencies and cultural affiliations, cities themselves become, in this metaphorical adaptation, arrays of sociotechnical meshes that hold up and in turn are sustained by the people who occupy them. Like fabrics, these infrastructural strands are patched, threaded, woven, stitched and embroidered, alternatively, haphazardly or with care, in a myriad of patterns (Graham & Marvin, 2001). Other threads run from the city to its rural and coastal surrounds: roads, rivers, food supply chains and traditional familial and communitarian relations. In aggregate, cities become interwoven into global fabrics, with different tensile strengths, patterns and densities. Finally, they also weave their own layered histories and projected futures, evoking a temporal dimension at the core of discussions of urban sustainability (James, 2015).

Extending the metaphorical scheme, all of these fabrics are not without seams, cuts and points of friction. Of particular relevance to a sustainable geopolitical fabric, as well as to the prospects for mitigating the worst effects of climate change, is the emergence of new relational strands between cities in the Global South. Not only are these cities themselves proliferating and expanding, so are the ties and lines of influence that bind them together. Relations between cities in China and Africa, India and the Middle East, and South and North America add new and significant layers to discussions of world trade, international human rights treaties and protocols and actions on climate change. These operate, moreover, with varying degrees of formality and transparency, giving further motivation to the fabric metaphor that can incorporate both order and mess, tightness and loosenings, hiddenness and

disclosure. Discussed further in Chapter 4, other, more technified tropes for describing this activity – circuits, networks, software and hardware – work in with the fabric metaphor to capture the variably tangible or intangible characters of these connections.

The conceit of cities interwoven into a series of fabrics, finally, develops an analytical device for drawing together a number of lines of contemporary urban critique and suggestions for renewal. *Interwoven Cities* aims for a coherent and pragmatic vocabulary, then, for urban theory and practice to articulate what might be done to weave an open and sustainable global fabric. The alternative prospect may not quite be the scenario of urban society disintegrating into isolated and shrivelled threads, depicted in the film of the same name. Yet, even an apocalypse played out in intergenerational slow motion is not one worth waiting for.

The book is organised around five related and intersecting themes that develop its structure and argument. These attribute to fabric as is articulated here the properties of being urban, global, sustainable, technological and aesthetic. Chapter 1 begins this articulation with the space and at the level of the city, examining how industrial and modernist developments have served to compile an urban tapestry that is fraught and contested. It is framed around a particular paradox that attends to the modernist city: how even as its critics accumulate and a host of new urbanisms are posed, it remains as entrenched as ever in the rush towards urbanisation in the Global South, and in the increasing deployment of surveillance and militarised technologies in the Global North.

Chapter 2 shifts focus to the urban fabric as it stretches out to regional and global spatial levels. The city's relations to its surrounds – its hinterlands, farms, forests, coasts, rivers, waterways, towns and the encompassing nation state – constitute fragments of its fabric thought large, interconnected with the natural and social habitat from which and with which it is woven. These traditional regional associations represent an intervening layer between the city considered as either a standalone entity, or a nodal part of a global system. The chapter then proceeds with an account of this system along lines suggested most emphatically by Peter Taylor in *World City Network* (2004), and repeated elsewhere in the context of 'world systems' (Friedmann, 1986; Knox & Taylor, 1995). Drawing upon Taylor's work, I nevertheless argue here for a global urban fabric in place of alternative vernaculars, in order to retain connotations of spontaneous and sporadic relations that bind cities together in suggestive as well as systematic ways. Not all relations need comprise a

system, or even a network: as recent discussions of the concept of the 'assemblage' in international relations have shown, many associations are decidedly less deterministic (Acuto & Curtis, 2013).

This in turn leads to the preoccupation of Chapter 3: the sustainability of cities. The chapter begins with discussions of recent treatments of cities as *dispositifs* and *assemblages*, and I tease out the implications of these treatments for the more colloquial proxy of fabric. I expand the preferred weaving metaphor into a schematic for articulating how the urban fabric can be analytically understood, stretched across three spatial dimensions and one temporal. I then connect this schematic with recent work on a framework, *Circles of Sustainability,* that seeks to describe the domains of cities that warrant sustaining. The resulting matrix offers a pragmatic instrument for critique, assessment or evaluation and suggests ways that a craft of city-making can be rethought. The remaining two chapters take up this challenge in relation to specific areas closely related to craft: technology and aesthetics.

Chapter 4 considers how, contiguous with the rise of automated machines, systems, networks, algorithms and circuits, technology is weaving new fabrics into and between cities. It then discusses ways in which computational models increasingly suggest or proscribe contemporary urban formations. Technological methods for appraising and sensing the city are now dominant and, through the use of simulations and games, offer both new limits and affordances for how the multiple dimensions and domains of unfolding urban fabrics can be rendered visible. The chapter further proposes the methods of crafting software itself suggest ways of opening up these urban fabrics to refactoring and reweaving. Alongside planetary city networks stitched together in new assemblages of open source software and hardware, social movements of hacktivism and tactical urbanism advocate for an undisguisedly technological orientation to the redress of global social and environmental injustice.

Drawing upon the more literal connotations of fabric, Chapter 5 is concerned with the sensory, affective and craft-like aspects of cities. Reviewing Bahktin's formulation of the 'carnivalesque', it ventures into a series of different urban aesthetic 'modes', intentionally fragmentary and kaleidoscopic, to draw out some of the many ways cities are sensed, felt, experienced, lived in and travelled through. The chapter continues by reflecting on the possibility of a city craft and, following Alexander's work in the 1970s, of the global urban design patterns that might guide

it. The chapter concludes with an exhortation to craft new 'comedies of the commons', patterns for a reciprocally rewarding social life.

In addition to this thematic pattern, the book's account of the urban fabric can also be read as folded over the theoretical bolster of the third chapter. Leading up to that point, the first two chapters illustrate how that fabric can be configured in modern and global forms. The last two chapters then discuss practical incursions and incisions, across a hybrid of techniques and crafts, arguing for a critical practice of technology and aesthetics to continue to redress what is presently a fraying global urban fabric.

Accompanying each of the first four chapters is a brief case study that illustrates different forms of intersections and entanglements within the city. Each example relates obliquely to the chapter thematic, but collectively they also emphasise the complications, open-endedness and interconnections that permeate that urban fabric.

1
Frictions in the Urban Fabric

Abstract: *Chapter 1 begins with the space and at the level of the city, examining how industrial and modernist developments have served to compile an urban tapestry that is fraught and contested. It then discusses two contradictory movements in contemporary urban development: new urbanist trends that emphasise human-scale development, creativity, participation, sustainability and cosmopolitanism, and the continuation of modernist impulses in sites of rapid urban growth that privilege monumental architecture, surveillance instruments and opaque planning processes.*

The character of the city in Biblical accounts is decidedly ambiguous. The *Book of Genesis* portrays it often as the locus of suffering and sin. Its first mention is in *Genesis 4:17* where, already accursed in living beyond the Edenic garden and castigated for the murder of his brother, Cain builds a city named after his firstborn son, Enoch. In the preceding verses, only four names are mentioned – Cain himself, his brother Abel and his parents Adam and Eve. The city propels forward the world: after Enoch is created, names proliferate, as does the global population. Just as Adam and Eve clothed themselves after committing the original sin, throughout the *Old Testament* the urban fabric covers over the shameful transgressions of pride, lust, avarice and envy. For their wrongdoings, Babel, Sodom and Gomorrah are in quick succession destroyed by God's wrath. Later, other human settlements will be visited by flood and pestilence. In the great Biblical cycle, from *Genesis* to *Revelations*, ultimately the city transforms into the place of redemption: the second coming of Christ is heralded precisely through the image of the new Jerusalem, the holy city, bathed in light and adorned in jewels, resplendent in the aftermath of the apocalypse. The redemptory narrative does not conclude with the return to a prelapsarian state of nature. Instead it is the City of God that will house and reward those of faith. As St Augustine was later to elaborate, although distinct spiritually, this 'City of King Christ' was inseparable in practice from what he elsewhere names the 'City of Earth': 'In truth, these two cities are entangled together in this world, and intermixed until the last judgment effects their separation' (Dods, 1948).[1] The physical colocation and inseparability of good and evil, of friend and enemy, of heaven and hell, mark terrestrial urban space as deeply contradictory.

Contemporary commentary retain traces of this same ambiguity: cities continue to be characterised through antinomies. They are locations that witness splinterings (Graham & Marvin, 2001) and agglomerations (Sassen, 1991); participations and expulsions; consolidations of global power and political disenfranchisement; sustainable living and environmental pollution; technological innovation alongside material deprivation; the securitisation of property and the uprisings of civilians; extraordinary concentrations of wealth; and crippling displays of dispossession and poverty. Book titles published since 2008, the year UN Habitat announced that for the first time half the world's population has begun to live in urban environments, exhibit a kaleidoscopic array of qualifiers that authors have attached to the city object. The

incomplete list includes: *Arrival City*, *Bird on Fire: Lessons from the World's Least Sustainable City*, *City of Extremes*, *Maximum City*, *Murder City*, *Emerald Cities*, *Rebel Cities*, *Smart Cities*, *The Creative City*, *The Gated City*, *The Happy City*, *The Naked City*, *The Responsive City*, *The Spiritual City* and *The Walkable City*. Distilled from this list is the sense that cities can be desirable, intense, creative, smart, happy, responsive, spiritual and walkable; and at the same time, unsustainable, unjust, murderous, insecure, destitute, insurrectionary and under siege. As the boundaries of highly dense human settlements become more blurred, this contradictory set of adjectives also apply to an object that itself is less clearly defined. Processes of urbanisation now run so prolifically across world space that urban theorists Neil Brenner and Christian Schmid have declared the very concept of the 'city' no longer theoretically coherent (Brenner & Schmid, 2012). In the new millennium, in both quantities and qualities, cities continue to expand and unfold.

This chapter examines one in particular from this field of contradictions that now entangle both cities and their descriptions. That aspect is the surprising obduracy of the historical form of the modernist city. An ideological as well as technological formation that grew from the middle of the nineteenth century to culminate in the large-scale planning experiments and urban sprawl in the twentieth, in a chronological sense its development fits neatly between periods of the 'traditional' (medieval, Renaissance and industrial) and the 'postmodern' (eclectic, fragmentary and participatory) city (Hall, 2014; Harvey, 2003; James, 2006; Scott, 1999; Venturi, Brown, & Izenour, 1972). These periodisations overlook, though, a peculiar disjunction between urban theory and practice. On the one hand, the modernist city as a theoretical construct appears dead: since the 1960s, beginning with its most famous critic Jane Jacobs and the publication of *The Death and Life of Great American Cities* (1961), a virtual industry has developed around critiques of this form and its entailments (Gehl, 2010; see, for example, Kunstler, 2013; Ross, 2011; Scott, 1999). On the other, sites of rapid urbanisation in the new millennium continue, resolutely, to develop according to modernist blueprints. The burgeoning cities of China, India, Africa and elsewhere adopt the same brutal and monumental forms of urbanism, now nearly universally decried. At the same time, new methods of technologically enhanced or retrofitted urban development have revived modernist aspirations for surveillance and control in the Global North. With few if any remaining apologists, the modernist city might appear long

forgotten in theory; in practice it appears to grow at an ever increasing rate. This durability of obsolete form in the rapidly urbanising world poses critical dilemmas that are both conceptual and practical, extending and exacerbating the challenge of fashioning a sustainable and equitable global urbanism.

At one level, this contradiction of theory and practice readily dissolves through explanations of the rampant rise of capitalism, globalisation and population growth in the megacities of the Global South. New urban areas, to follow the deterministic logic dictated by the experience of cities of the Global North, need to industrialise and to modernise, to rip through the dense swaddling of urban infancy to experience the benefits of a matured urbanisation that lie beyond. According to this view, twenty-first century cities must necessarily pursue the threads laid down by Manchester, Boston and other sites of nineteenth century industrialisation. In the long run, economic growth catalyses both social welfare and environmental remedy. Implementation of the modernist urban form constitutes an essential step in the creation of wealth that will eventually transcend it, bringing about an enlightened citizenry that will demand – and can afford – the luxuries of environmental regulations, increased parklands, 'green' building codes, pollution reduction, dense and vibrant neighbourhoods and the return of slow modes of commuting, walking and cycling. Like the carefully iodised simulations that spruik new real-estate in gated communities, to those with ready cash deposits and valid credit checks, a future urbanity free of mass congestion, toxic pollutants and insecurity can be teased out through the magical instrument of income. The chaotic, pre-modern, informal and labyrinthine city must be renovated to make way for collective prosperity to ride in on the back of the streamlined flows of finance. Monumental large-scale development smooths the way for the seamless functioning of capital, energy, workers, information and transport. Space must be surveyable, militarily and operationally, to ensure frictions and knots cannot obstruct the silk-like machinic operations of the city. Residual communities must be resettled, forcibly or otherwise and contestation suppressed. As depicted in the clean lines of computer-aided design (CAD) renderings and simulations, new millennial updates on the blueprints and models of the modernist planning era, new cities will be idyllic and friction-free, a strange fusion of the metropolitan and the pastoral. Such explanations on the necessity of the specific prescriptions of modernity recapitulate, then, the Biblical trajectory that describes an arc of progression from the sinful city to the City of God.

The continuation of the modernist dream of orderly cities represents a key fallibility in efforts to imagine and to practice, urban development otherwise. As I discuss further in Chapter 2, this continuation also limits how the city entity can comport itself with respect to its global habitat: its surrounding regions and the always evolving world city system. Urban models that remain stitched into this singular narrative risk perpetuating a form of exceptionalism, in which well-greased and efficient cities are the frontrunners chasing an ever elusive future vanishing point, their archetypal designs illustrating how to regulate disorganised chaotic space. These exemplar cities, clean, orderly and open for business, alternatively advise, console and cajole retrograde cities into better behaviour. Under the guise of advising on sustainability, resilience or liveability goals and enacted through global conference, forum and advisory circuits, such exceptionalism today mirrors past historical discourses of colonialism, patronage and core–periphery power relations. Conveniently ignored is the fact that these exceptional cities have already exported industrial production, with its environmental externalities and social inequities, to the same retrograde cities they now seek to advice. In replicating forms of uneven development that again date to the colonial era, globalised outsourcing is capable of moving sites of toxic outputs and hazardous or mind-numbing labour to those cities most eager to build productive capacity and with populations less willing or able to argue. The meritorious yet highly partial and uneven 'greening' of postindustrial cities in no way compensates for the mass ecological effects of hyper-industrialisation. The very city indexes that function as measures of self-congratulatory government policy can equally be read as indicators of global environmental and social injustice.

The durability of the modernist urban enterprise has had another effect. In sedimenting dualistic categories of 'developed' and 'developing', of the Global North and South, or of established and emerging economies, it ignores or suppresses many of the beneficial side-effects of what Brenner and Schmid have termed 'planetary urbanism' (2012), or more recently, Spencer has called the 'global urban ecosystem' (2015). Cities are connected as never before to other cities, regions, nations and continents. The pervasiveness of global travel, media exposure and interconnected information systems establish virtuous intercity networks that acknowledge collective and local knowledges and practices. Competitive rivalries to host multinational corporate offices also surprisingly facilitate the kinds of networks that can cooperate to build more equitable

and sustainable cities. In the face of climate change, a fragile world order and uneven patterns of economic growth, the many points of connectivity within and between cities already compose a vibrant world network, a series of overlapping fabrics generating wrinkles of resistance against, and possibilities beyond, the long and enduring shadow cast by the modernist urban development era.

It is critical to be alive to these points of resistance and possibility. For far from being a defunct category relegated to histories of planning, the core intellectual and ideological impulses of modernism continue to haunt emerging cities in the new millennium. While such histories may bookend it with other periodisations, the impulses of a totalising, homogenising and repressive modernity continue to be grafted onto contemporary sites of massive and rapid urban fabrication. This chapter plots a brief outline of the modernist city, including its postmillennial incarnations and responses, as a first step towards the articulation of how an alternative urban fabric might be constituted.

1.1   The total city

David Harvey describes, in *Paris, Capital of Modernity*, the immense disruption to what was, in the mid-nineteenth century, still a metropolis contoured along medieval lines. Industrialisation had brought to these patterns increased congestion, pollution, disease and mass poverty. Unplanned, irregular and informal adaptation created urban vestments sewn with epidemiological hazard and political dissent. The medieval city could no longer manage to contain the horrors of industrialisation, or incorporate the logistics required to feed, clothe and house the burgeoning populations it attracted. Engels and Dickens were early commentators to react in horror to the decrepitude and misery accompanying early nineteenth century urbanisation. In the cities of Manchester and London, industrialisation had mottled an already ragged urban form with factories and congested slum housing and saturated its narrow channels, streets and homes with smog, waste and a restless new urban proletariat. On the spatial segregation of this proletariat in Manchester, Engels complained he had never seen 'so systematic a shutting out of the working-class from the thoroughfares, so tender a concealment of everything which might affront the eye and the nerves of the bourgeoisie' (1993, p. 48). Beneath this tender concealment lay 'the most horrible

dwellings which I have yet beheld': buildings which have been 'patched over until not a foot of land is left'; polluted rivers which when dry leave behind 'a long string of the most disgusting, blackish-green, slime pools'; and courtyards containing 'foul pools of stagnant urine and excrement' that at the 'time of the cholera' needed to be bleached with 'chloride of lime' (Engels, 1993, p. 48–49). His testimony features well-chosen figures of speech, for it is one of an urban fabric rapidly disintegrating.

Such squalor stood in sharp contrast to emerging artistic values and scientific attitudes that accompanied the Enlightenment. New manu-facturing and civil engineering techniques fused with fledgling social sciences to generate novel urban planning approaches. In what Harvey (2003) terms the first modernist city, massive swathes of Parisian alleys, crowded buildings and ghettoes for labouring communities were demolished under directives of the Prefect of the Seine, Georges-Eugene Haussmann, the first of many great schemes to refashion the urban fabric according to a single and all-encompassing scheme. Enlightenment aesthetics informed Haussmann's urban design and planning, suggesting clean lines and open spaces – wide boulevards, public squares and open gardens – around which buildings could be tastefully organised and arranged. Simultaneously, these spaces served instrumental purposes for Napoleon III's 2nd Republic, equipping the state to monitor and suppress popular unrest, riots and revolutions, in direct response to the upheavals in Paris during the 1830s and 1840s. High visibility assisted military and police forces to survey and occupy the city, forcing the organisation of urban movements literally underground (Harvey, 2003). The ugly could be beautified; the disorganised could be formalised; the unruly could be governed. All together, both industrialisation and the subsequent refabrication of Paris demonstrated the complex character of modern-ising urban space: the massive increases in demography, the cellular expansion of informal housing, the appalling sanitation conditions, the rise of a politically active and urbane yet disenfranchised proletariat, and the attempt by the state simultaneously to problematise and solve these epidemiological and security issues through a technologically driven and politically motivated sterilising aesthetics.

Even prior to the Haussmannisation of Paris, many of Europe's former and new colonies were erecting cities according to similar schemes. Visionary planners, aided by Enlightenment sciences in the management of populations and space, drafted blueprints of ideal urban forms. Sennett (1996), Hall (2014) and Boyce (2012) describe the meticulous geometric

plans, incorporating both public parklands and well-regulated grid street patterns that informed respective design of New York, Adelaide and, to a lesser degree, Melbourne in the early part of the nineteenth century. Yet for Harvey, Haussmann's complete restructuring of a large existing world city was critical to the inspiration of subsequent modernist movements to beautify cities elsewhere. From Howard's 'Garden City' through to Le Corbusier's 'Radiant City' and Moses' reconstruction of New York, an eclecticism of ideological, aesthetic and scientific principles were gathered into various schools and factions of the newly emergent urban planning discipline. Collectively, however, they shared certain common threads. The modernist city should be conceived not as a collection of neighbourhoods that haphazardly self-assemble over time, but as a totalised object, an ensemble that could be best appreciated as a whole and in a single instant. No longer an object that belonged as an element of a larger political, communitarian or artistic ontology, it could now also be thought of as a system in itself, a whole composed of interlocking functional parts, amenable to the latest civic and social engineering techniques (Natrasony & Alexander, 2005). The application of geometry and surveying informed the use of top-down designs, blueprints, maps and diagrams to depict prospective as well as current urban forms. The rebuilding of Chicago after the Great Fire of 1871 granted architects and planners free reign to experiment with innovations in building materials such as steel and reinforced concrete, making possible the imagining and the constructing of vastly taller buildings and more ambitious urban infrastructures. Continued waves of urbanisation prompted the erection of new cities, often led by a single appointed master planner who could now survey the whole in advance of its construction, applying a unified vision to the developments as far flung across the planet as Brasilia, Canberra and Chittagong.

As Hall describes in *Cities of Tomorrow* (2014), early planners were explicit ideologues, whose beliefs spanned the political spectrum. Similarly utopic visions of ordered, healthy, light, clean and well-functioning cities were common to planners of conservative and radical, and of capitalist and communist persuasions. Regardless of who owned the means of production, the end product, from a planning perspective, would still be dictated by the benevolent state (Scott, 1999). Modernist planning did not, however, unfold in an entirely uniform and consistent way. Variations could accommodate particular state directives, cultural adaptations, climatic variations and ideological and aesthetic

preferences. Moreover, while they might share an inclination towards geometrically regular forms, those forms could be arrayed in different ways and at different scales. Howard's hexagonal neighbourhood designs were intentionally fractal-like, intended to house people in the hundreds or thousands, to be replicated over and over, at safe distances from each other. Le Corbusier's grandiose and recta linear city, at the other extreme, preferred brutal monumentalism that could accommodate and employ a population counting in the millions.

Unlike other experiments in modernist form – experiments that audiences could elect to read, listen to, or consume – rigidly planned cities embedded themselves on the landscape at scales that materially impacted the world's rapidly urbanising population. The emergent metropolitan ecologies of reinforced concrete, steel, glass and asphalt produced and in turn responded to new subjectivities, the unfolding of a novel 'affective economy' (Bailey, 2014). Trains, streetcars, bicycles and automobiles at first permitted and later became essential to the traversal of the newly opened up vast expanses of the modern city. Telecommunications made possible new networks of friendships, business arrangements, affiliations and alliances across the urban fabric. To move away from family and neighbourhoods no longer meant to lose touch; frequent virtual as well as actual re-acquaintances could be realised. Thickened clusters of local community relations were increasingly supplemented or replaced by thin and tenuous networks that stretched over urban space and, at the same time, accentuated complicated affective conditions of freedom, loneliness, solidarity and alienation. Baudelaire's *flaneur*, drunk on the cinema-like experience of the exotic carnival of the city, could exist both as part of the *polis* and as an aloof observer, a self-imposed outsider commenting upon its bourgeois society. The experimental form of Joyce's *Ulysses* reflects the assemblage of fragmentary conversations and internal monologues voiced by an eclectic range of modern subjects, as they career about the equally modern streets and buildings of Dublin. Urbanisation also scaled up the application and effectiveness of medical and scientific innovation. Haussmann's ordering of Paris and its subsequent replication elsewhere, produced an undeniable demographic dividend: along with medicinal and surgical improvements, citywide clean water supply and sewerage facilities lowered child mortality and increased life expectation considerably.

Even from the outset, however, the modernising metropolis engendered a critical response. For Harvey, the 'Haussmannisation of Paris'

in the 1850s is the product of a desire to 'show that what went before was irrelevant' (Harvey, 2003, p. 10) and further to illustrate:

> that there was no alternative to the benevolent authoritarianism of Empire. The republican, democratic, and socialist proposals and plans of the 1830s and 1840s were impractical and unworthy of consideration (Harvey, 2003, p. 10).

This break with the revolutionary near-past, coupled with new 'technologies' and 'organizational forms', enabled Haussmann to 'think of the city (and even its suburbs) as a totality rather than as a chaos of particular projects' (Harvey, 2003, p. 13). Yet Haussmann's contemporary, the writer Flaubert would present this total city as a pure aesthetic object, strangely *lacking* in 'totality' in another sense:

> There is, therefore, no unitary definition of the city as a totality, let alone as a "sentient being" or a "body politic." Flaubert reduces the city to a stage set that, no matter how beautifully constructed and sublimely furnished, functions as a backdrop to the human action that proceeds in and upon it. The city becomes a dead object (as it largely does in Haussmann's planning) ... The city gains in our sense of it as an independent work of art (to be admired and criticized as such) but entirely loses its character as a "sentient being" or "body politic" (Harvey, 2003, p. 88).

Alienation, both in Marx's specific sense and as a broader phenomenological response to modernity, comes to dominate subsequent urban description. Kafka's antiheroes wander interminable and blighted corridors of the modern bureaucracy. Ironically, in *The Castle*, his hero is complicit in the very manufacturing of modern estrangement – his occupation is one of a Land Surveyor. L. S. Lowry's north England streetscapes depict faceless workers scattered across nondescript industrial backdrops. Both *Ulysses* and T. S. Eliot's 'The Waste Land' counterpose classical antiquity with the tawdry, dehumanising and distinctly urban present. The newly sanitised cities in the late nineteenth and early twentieth centuries might have solved, at least in Europe, America and Australia, the worst epidemiological problems of high human density that plagued Dickensian London and Engel's Manchester. But they did so with disregard for the everyday practices of the working class neighbourhoods they displaced. They created instead 'independent work of art[s]' that, as Jan Gehl puts it, dehumanise at the level of the street while looking beautiful when 'seen from the air' (2010, p. 197). Only from such commanding heights could the total city be admired.

The development of ordered central downtowns in the United States witnessed an accompanying and complementary trend to the vertical rise of skyscrapers: the horizontal spread of suburbia. As a spatial arrangement of the built environment, however, suburbanisation has little in common with landmark modernist designs, such as Le Corbusier's *Plan Voisin*, envisioned as a further rationalisation of Paris. In the suburbs, houses could be particularised and individualised; neighbourhood communities and their small-scale streetscapes established; and the more toxic effects of the metropolis avoided through relatively low density and capacious living. On the other hand, this constrained individuation at the household scale still required homogenisation, planning regulation and heavy industrialisation at neighbourhood and citywide scales. Freeways needed to be built to transport workers to and from the industrial and commercial downtown centres, where the majority still worked. Suburbs required a high degree of similarity in form to minimise the logistical complexities involved in removing waste, delivering energy, water and telecommunications, and supplying health, education and municipal services. As its critics have complained often (Avent, 2011; Kunstler, 2013; Ross, 2011), the rise of tightly coordinated gated communities, low densities and flat topographies, along with developments of vast stultifying shopping malls, generic cultural attractions, highway networks and endemic car dependency, has led to highly regulated and homogeneous ways of life, far from the civic and cosmopolitan potentials available to a more vibrant city form. Worse still, the horizontal suburbanised city served to concretise, as it were, existing class, gender and racial divisions. Uneven spatial development perpetuated environmental inequity and economic disadvantage, reinforced, at least for cities in the United States and South Africa, by the racially divided experiences of white and black urban dwellers (Martelle, 2012; Murray, 2011; Ross, 2011).

In the early decades of the new millennium it appears that at least in the United States, demographic and house price patterns are beginning to follow the advice of the critics. Populations are migrating back towards the inner city in search of higher incomes, reduced commute times and the experience of urban authenticity (Gallagher, 2013; Zukin, 2009). However, the return of the desirability of the interior of the American city risks ostracising the poor again to the precarious peri-urban margins. In Paris, the auspiciously named 'boulevard périphérique' segregates its trendy and tourist-friendly Haussmannian centre from 'les banlieues',

where long after Haussmann's reforms the city continues to export both 'its poor and its dead' (Pinçon & Pinçon-Charlot, 2014).

1.2   Urbanisms of the new millennium

Late twentieth century criticisms of the modernist city have begun to congeal around distinct counter-urbanist schools and practices. The most well known of these, New Urbanism, looks to address the excesses of modernism that produce what Kunstler has termed the 'obliteration of the human scale' (2013, p. 85). The *Charter of the New Urbanism* (2011) further argues that this involves remediating:

> [the] disinvestment in central cities, the spread of placeless sprawl, increasing separation by race and income, environmental deterioration, loss of agricultural lands and wilderness, and the erosion of society's built heritage.

Whereas, Modernism prized the grandiose and the scientific, new urbanism emphasises the particular and the practiced or experiential conditions of city life. This is evident in its preoccupations with community formations and craft-like patterns for urban design. For practitioners such as Andres Duany and Jan Gehl, new urbanism stems both from the critiques and activism of Jane Jacobs (Farr, 2012), and the design patterns of architect Christopher Alexander. The latter, published in the seminal volume *A Pattern Language* in the late 1970s, were motivated by the egalitarian impulse that:

> towns and buildings will not be able to become alive, unless they are made by all the people in society, and unless these people share a common pattern language, within which to make these buildings, and unless this common pattern language is alive itself (Alexander, Ishikawa, & Silverstein, 1977, p. x).

Alexander begins this design vernacular with patterns for the large scale, the region and the town, and progresses to the small, the individual building and its features. Of the 253 patterns in total, 94 relate to the urban environment, with pattern names that include 'Independent Regions', the 'Magic of the City', 'Parallel Roads', 'Carnival', 'Still Water', 'Small Services Without Red Tape' and 'Sleeping in Public' (Alexander et al., 1977). Since *A Pattern Language*, the format – short, even epigrammatic recipes for urban form and design that mirror the layout of the cooking or knitting book – has proved perhaps more influential than Alexander's specific recommendations. Deploying a parade of surrealist

motifs, Rem Koolhaas' (2014) *Delicious New York* reads that city with a similar concern for its aesthetic forms and affects. Jan Gehl's (2010) *Cities for People* prescribes human-scale design patterns for building height, shared use of streets, green spaces and stimulating, walkable streetscapes. Jaime Lerner's (2014) *Urban Acupuncture* outlines patterns that employ art, colour, music and low-cost infrastructure to intervene in favelas, slums and other spaces of built-up pressure or fatigue. Canvassed in the remainder of this section, the emphasis on small-scale and craft-like patterning carries across to many other prescriptions for the postmodernist or new millennial city.

The starting point of new urban design concerns its topography. The city skyline should be patterned according to a golden ratio of rational and liveable medium density, using appropriate regional planning to limit developmental excesses (Duany, Speck, & Lydon, 2010). Against the antihuman fetishes of soaring skyscrapers and relentless suburbia – one is a vertical extreme and the other is horizontal – medium density promotes an ideal form of two- to six-story walk-up buildings of varied design and mixed use (Duany et al., 2010). A ground floor should offer tightly clustered and diverse small business – no franchises or chains, instead the best cornucopia of oddities that craft capitalism can provide (Gehl, 2010). Above the ground floor live residents engaged in their idiosyncratic and non-templated ways of living. They frequently come down to congregate, to celebrate what Jacobs (1961) called the 'ballet of the sidewalk', rebinding the social fabric through minutial transactions in public discourse, street-level surveillance and neighbourly aid.

The city also ought to support slow-moving human-powered transport: walking, jogging, skating and cycling. Wide, obstacle-free pavements, clearly marked bicycle lanes or shared-use streets, short traffic light cycles, car-free days or times, pedestrian and bike-friendly road laws and inviting street scapes invite alternative modes and places of transit to the car and road (Farr, 2012; Gehl, 2010; Soderstrom, 2008; Speck, 2013). Acknowledging that artificially powered transport is essential for travelling the longer distances of a spawling metropolis, the new millennial city opts for a revitalised conception of public transport: light rail reclaiming the median strips of large thoroughfares; rapid transit buses congregating at central nodes and dispersing through suburbia; and smart apps displaying real-time time tables and estimated commute times. To accommodate the inevitable and ongoing reliance on the automobile, travel is also reconceived through crowd-sourced carpooling

and on-demand transportation coordinated through hubs such as *Uber*, with communications between vehicles, satellite and road cameras optimising route selection and minimising traffic congestion. Driver-less and electric cars, on the distant horizon, promise the flexibility of private transport coupled with the energy efficiency of public transport.

The city should foster creativity. In Florida's (2002) articulation, the creative class has come to represent a convenient 'third way' that mediates a city's commanding elite and its bohemian underbelly. In the practice of urban design, professional 'creatives' – information technology workers, engineers, designers, teachers, managers and *avant garde* artists – also negotiate the disjunctions between planning, policies and implementation of hard infrastructure, with an emphasis on efficiency and cost and the kinds of small-scale arts, crafts, tinkering and experimentation that permeate neighbourhood development. In the words of one of its proponents, Charles Landry, this fusion involves the transition 'from urban engineering to creative city-making' (2008, p. 22). Catering to the creative classes also places pressure on the city to offer spaces of continuous surprise, stimulation, opportunity and innovation (Florida, 2010).

The city also ought to minimise the production of carbon emissions and the 'heat island' effects of its concretised built environment. Sustainable urbanist design encourages shade-giving trees, liberally planted; heat-reflecting roads; roof-top gardens; breathable building forms with opening windows and balconies; and smart building techniques that reduce energy consumption and emissions (Farr, 2012). These supplement efforts to devolve environmental responsibilities back onto consumers, with government promotions of car pooling, water-saving taps, energy monitors, solar panels and better building insulation. State-led efforts to encourage behaviour change can however lead to unintended consequences, with citizens equally expecting more from governments, particularly in the enforcement of stronger corporate environmental responsibility (Scerri & Magee, 2012). Alternative movements now seek to circumvent large state and corporate actors entirely through volunteer-led natural habitat groups, renewable energy cooperatives, farmers markets and urban agriculture social enterprises (Dubbeling, Zeeuw, Veenhuizen, & others, 2010; Mougeot, 2000; Pearson, Pearson, & Pearson, 2010).

Opposed to the citywide monumentalism that defined the modernist era, instead new urbanism promotes localised, temporary and

incremental incisions into the urban fabric. Concepts such as 'tactical' or 'guerrilla urbanism' (Lydon & Garcia, 2015), 'pop-up' shops, bars and markets and 'urban acupuncture' (Lerner, 2014) presage new ways of refashioning the city. Instruments such as savings groups and partici-patory budgeting forums (Cabannes, 2004; Sousa Santos, 1998; Souza, 2001) offer ways to include poor communities, otherwise ignored in the urban margins and interstices, in economic development and political decision-making. Key here is the sense that the future of the city must be shaped by a constituency made of more than its experts and elites. The same impulse towards open-endedness and indeterminacy has made its way into more generalised understandings of the city. Against the deterministic sciences that dictated the precise angles and contours of Haussmann's or Le Corbusier's cityscapes, in the new millennium 'open cities' should be anchored instead upon epistemologies of complexity (Batty, 2007), emergence (DeLanda, 2011), ambiguity and incomplete-ness (Sennett, n.d.).

Finally, the new millennial city imagines a reconfigured urban spirit, one that realises principles of representational democracy, political soli-darity and solemn engagement in the life of the *polis*, first glimpsed in the Ancient Greek city states (Sennett, 1996), or as Nussbaum (1997, p. 20) notes, in the linkage of 'world citizenship' to Stoic virtues, empathy towards others and the regulation of passions. Cosmopolitanism, being a 'citizen of the world', is reasserted as a critical alternative for modern cities beleaguered by individualism, aggression and indifference towards others (Nussbaum, 1997), or, for Harvey (2009, p. 282), as a starting point for forging a 'revolutionary politics … when "spaces of hope" are opening up all around us for the taking and the making'.

As these diverse aspirations suggest, the 'turn' reflected by new urban-ist and other movements marks an optimistic sense that cities are not merely implacable objects of historical legacy nor monuments best left to technocratic experts. Instead they are imagined as pliable artefacts, to be woven and warped to sustain and encourage new forms of urban life. However, there is a risk that such theorisations and their various instantiations in cities that trumpet new urbanist virtues – Copenhagen, Melbourne, Vancouver, Berlin, Curitiba – can obscure the ways in which much urban development continues to follow a well-worn and obdurate modernist pattern, even in the very cities that proclaim to be otherwise. Elsewhere what might be termed modernist anti-patterns continue to be threaded anew.

1.3   Hyper-urbanism in the Global South

Contrasting with the promises of the postmillennial city is the reality of where most of the world's urban development currently takes place: in cities of the Global South, where patterns of high modernist planning continue to replicate. While comparatively cashed-up cities in Australasia, North America and Europe try to leapfrog each other in the liveability stakes, in China, India, parts of the Middle East, Africa and Latin America, demographic growth and mass migration to urban areas is weaving a new stratum of cities over the existing global urban fabric. By one measure, 98 of the top 100 fastest growing cities are in the Global South (City Mayors, n.d.). Such sites of hyper-urbanism are no longer necessarily the well-known megacities of Mumbai, Shanghai, Sao Paolo or Mexico City. Cities with names such as Beihai, Ghaziabad, Sana'a, Surat, Bamako, Faridabad and Siliguri, often offshoots or minor nodes in national economic exchanges, have begun to expand as the megacities reach demographic saturation point. In the United States, less stratospheric but still significant shifts are remaking the cities of Phoenix, Austin and Houston.

These cities offer glimpses of what urbanism now means for most people entering them from the hinterlands of the country, or in many cases, from neighbouring countries or regions. Rather than adopting best practices from the kinds of comparatively dilettante new urbanism described earlier, many rapidly expanding cities appear to desire to recapitulate, in ever greater degrees of scale, the grand designs that mark modernist planning. Sweeping boulevards, flyover freeways and gleaming 'aerotropolises' (Kasarda & Lindsay, 2011) mark the re-engineering of traditional cities for the car and plane. Often accompanied by forced eviction, high-rise housing, both public and private, take the place of intimate urban villages – the much publicised destruction of Beijing's hutong enclaves before the 2008 Olympics being merely one of many examples. Gleaming office blocks, replete with corporate logos and branding, develop according to internationalist principles on the outskirts of cities such as Hyderabad and Bangalore. Meanwhile, in the interstices of these developments, vast waves of rural migrants and the indigenous urban poor take up formal but precarious and exploitative employment in booming construction sites, manufacturing industries and off-shore service centres. A separate informal economy substitutes for an unformed or still-fledgling civic infrastructure, retail industry and

service sector. The uneven contours of fast-tracked urbanisation mean the majority of the new urban poor live in slums and shanty towns, irregular settlements that, in Davis' words, 'somehow exist outside the formal relations of production, in Dickensian squalor or worse, ravaged by emergent diseases and subject to the various mega-disasters following in the wake of global warming and the exhaustion of urban water supplies' (2006, p. 129). While slums develop their own patterns of resilience and resistance (Simone, 2010), they are rarely afforded the basics of sanitation, much less the kinds of civic benefits promoted by new urbanism.

The hyper-fabrication experienced in the most rapidly developing cites also bring complaints over the state of the environment and political life. Phnom Penh exhibits the paradox of a fast expanding city housed in a national context that remains politically and demographically, if not economically, beholden to its agrarian roots. Paradoxically, in the area of land rights, the rural poor have at least symbolic access to government regulation that the urban poor lack. The infrastructure and flamboyant architecture of Dubai and Doha are constructed by a largely South Asian workforce without the most basic political entitlements, while the burgeoning populations of locals and European expatriates consume the resources of a fragile coastline. Governments in India and China are seemingly powerless to curb the mass industrial pollution brought about by megacity-sized populations travelling by car and working in factories, in conditions that were once also the blight of European and North American industrialisation.

Judging by the coalescence of world metropolitan populations, the technological carrying capacity of today's megacities appears to be around 20 million inhabitants. As Mumbai, Mexico City, Shanghai, Guangzhou, Tehran and Karachi converge towards this apparent limit, their demographic growth rates have seemed to slow or stagnate. In the cases of China and India, with surplus rural populations and strong national growth rates to maintain, industry and populations have spilled over into second- and third-tier cities – sometimes offshoots of a megacity, in the case of Ghaziabad, neighbouring New Delhi or sometimes a regional hub that has picked up on an excess of trade in the broader industrial region, as in the case of Beihai, further south to Guangzhou and Shanghai. Mumbai, in the words of Suketu Mehta (2005) a bustling 'Maximum City', has more recently also become known as a dying city, overgrown and unable to harbour the aspirations of incoming migrants.

In its place, little known Indian cities such as Kanpur and Siliguri are expanding rapidly on the back of growth in financial, IT, education and tourism sectors.

These secondary cities are arguably now, in the new millennium, the quintessential sites of urbanism. As I describe in the short case study of Siliguri at the end of Chapter 3, they are effective barometers of how the majority of the world's urbanising populations are likely to live in the decades ahead. Today, they look condemned to repeat the mistakes of modernist urban development at the heart of laments and critiques that stretch back to the early nineteenth century. The rapacious logic with which they unfold appears to perpetuate a lock-step form of urban growth. Gated communities for the rich and crowded high-rises for the poor, congested streets, generic shopping malls, international brands and franchises, permanently installed hazes of pollution and exploitative working conditions continue to replicate dated patterns of urban planning, with their seemingly inevitable side-effects.

What distinguishes many development patterns in these cities is that they fail even against the more benign prescriptions of modernist urban planning. Informal slum settlements on the peripheries and in the interstices of rapidly developing cities settle into micro-patterns of habitual communal arrangement and negotiation. These are frequently at odds with the overhead city plans and individual building blueprints that satisfy bureaucratic land and infrastructure departments. Such settlements also often long outlive their apparently transitory character, forming residual pockets of commercial and communitarian life that are indispensable to the city's overall functioning, but possess scant formal representation in its political life (Simone, 2010). Slum communities also generate pockets of political resistance and protest, sometimes with the help of NGOs and local government members. Rightly championed as under-represented and forgotten voices of the city, slums present intractable challenges to civic authorities no longer operating under the *carte blanche* of outright authoritarianism. The circumstances of fragile democracy that prevail in parts of urban Asia, Latin America and increasingly Africa make it difficult for autocrats to engineer or re-engineer wholesale cities, in the manner of Haussmann or Le Corbusier. Instead planned segregation is instituted on more modest scales, at the level of the gated community, business park or strategically placed freeway (Pinçon & Pinçon-Charlot, 2014). These designs in turn introduce their own dilemmas, openly acknowledging the intervention

of global firms and capital, two-speed economies, concomitant spatial differentiation and a permanent level of low-grade urban class warfare (Graham, 2011; Murray, 2011; Sassen, 2014).

A further feature of new Global South cities is the ambiguous benefits of their colonial heritage. As Hunt (2014) has described, the legacy of the British Empire includes those of importing Victorian civic and legislative infrastructures. Indian cities such as Kanpur bear the hallmarks of street patterns woven before the era of automobiles. Streets now labour under the weight of pedestrians, bicycles, tuk-tuks, cars, buses and trucks, all competing for limited space on wearing and unmarked roads. Buildings designed before the advent of telephone, electrical and information networks are now casually retrofitted with tangled clusters of wires and leads hanging precipitously from their exteriors. The rational and ordered colonial blueprints have been subverted and superseded by new fibrous layers of technology that speed up the city's operations to nationally or globally competitive levels. The intensification of transport and communication networks stand in stark contrast with urban forms that have not been substantially remade since the nineteenth century. As Engels noted about nineteenth century English cities, here too one 'can only wonder that the whole crazy fabric still hangs together' (1993, p. 25).

Meanwhile, the peripheries of megacities hint at the promise of modernism made good. A new form of high-rise, distinctly rationalist and 'smart' urban development has taken root in spaces such as outer Kolkata, Navi (new) Mumbai, the river-hugging gentrified zones of Phnom Penh, the demolished interiors of Beijing's hutongs and the glistening spectacles of Dubai. Catering to the burgeoning young and confident middle classes of the developing world, these complexes owe little to the principles of New Urbanism and its various offshoots that champion the gentle corralling of space into community gardens, heritage-listed buildings, mixed use zones, animated precincts and 'active spaces' in the cities of Melbourne, Copenhagen and San Francisco. They instead cleave closely to the simulated patterns created in CAD software, resuscitated versions of the prototypes of Le Corbusier's *Radiant City*. As Kunstler, Gehl and others have noted, such city designs look wonderful from the distant perspectives of a passing highway, aeroplane, satellite or, increasingly, computer-animated fly-through (Gehl, 2010; Kunstler, 2013). It remains questionable, however, whether they establish the kinds of socially oriented *habitus* so prized by contemporary celebrations of

the city. Up close, it is clear they are designed for consumers of cars, air conditioners, cable television and Internet-enabled devices. High fences, security passes, surveillance cameras and darkened windows shut out exterior relations and the public gaze and refocus familial life towards an interior space. These up-market developments mirror the conditions of security-conscious white suburban communities that fled the down-town blight of US cities such as Detroit in the middle of the twentieth century (Martelle, 2012) and Johannesburg, both before and after the collapse of apartheid (Murray, 2011). Modern-day Dubai, discussed earlier, also typifies how contemporary urban spatial forms continue to replicate racial and class segregation, with expatriates and local Emiratis congregating around showcase shopping malls and hotels in the western suburbs, while a 'far more diverse, mixed-income, and culturally Middle Eastern, African, and South and East Asian (and indeed European)' community congregates in open markets in the older eastern parts of the city (Kanna, 2013, p. 615). The total city, imagined by the high sciences and aesthetics of modernity, is far from extinct.

1.4   Fabrics of a planetary urbanism

The partitioning of cities between a new urbanist Global North and a trenchantly modernist South simplifies to the point of caricature an immensely complex and contradictory tapestry of urban forms, patterns, topographies, political arrangements and affective sensibili-ties now unfolding across the planet. Modernist urban design occurred nearly simultaneously in the cities of Brasilia, Canberra, Chittagong and Moscow. Radical experimentation with urban design and social inclusion is perhaps most advanced in cities of Latin America – examples include participatory budgeting in Porto Alegre and Belo Horizonte (Cabannes, 2004; Sousa Santos, 1998; Souza, 2001), architecturally designed but self-constructed social housing in Lima and Santiago, rapid transit systems in Curitiba and Bogota and public escalators and cable cars in Medellin (McGuirk, 2014). Meanwhile, low density, suburban sprawl and high car usage ensure the United States, Australia and Canada figure as the 10th, 12th and 15th largest per capita carbon dioxide emitting nations, respectively (The World Bank, 2015). This is despite the fact that all three developed and urbanised countries regularly feature their cities among the most liveable in the world. The crisis of the modernist city cuts across

lines of economic development, rates of urbanisation and geopolitical contours.

The muscular, inflexible and sprawling cities of modernity both pose and face challenges in the new millennium. As the previous century has shown, cities woven through the industrialist and modernist eras have not all aged gracefully. Obduracy has given way to obsolescence. Heavy industry, low density living, ubiquitous concrete construction and private transport networks are resource intensive, expensive to operate and environmentally destructive. Joining and extending the discontents of Western cities from the middle of the twentieth century, the emerging urban middle classes in the new cities of the Global South are increasingly agitating against the ecological degradation seemingly implied by industrial world capitalism. New organisations of power, both within and between cities, emphasise novel and not always coherent theories of agility, collaboration, networking and participation.

Accordingly, to proselytise alternative processes of weaving a sociotechnical and global 'urban fabric', further patterns for the city are needed. So long as cities are constructed as unyielding and alien mechanical impositions upon a pre-existing organic landscape, we will be unable to find new and essential threads of connection between a first-order nature and what has termed our 'second nature' (McDowell, 1996; Smith, 2008) – a social life that is increasingly bound up with our urban habits and habitats. These threads need to be sewn. Our cities struggle between the necessity of operating high-performing systems of economic production and consumption and the growing scarcity of resources needed to fuel these systems; between our fervent desires for new forms of stimulation in a globalised and highly interconnected society and the nagging sense that our hubris has exceeded tolerable limits, both environmentally and socially; and between the slow-moving and often reactionary bureaucratic processes that are embodied in our current institutions of power and the requirement for urgent environmental action that also respects the historical accomplishments these institutions represent. Such tensions grow rather than diminish with the burgeoning of the world's invisible cities – overgrown corridors, hubs, towns, ports and entrepôts that continue to swell in absorbing endogenous growth and rural migration.

There are further reasons for looking to reinvest the metaphor of fabric with contemporary relevance. First, it suggests the city is a substance that is permeable, pliable, flexible, composed of both hard and soft

infrastructure. Second, it describes objects that are explicitly designed and crafted: urban fabrics are constructed and also continuously undergo further destruction and reconstruction. Third, the metaphor presents a single image that can bind together the individual city to its habitat, both in its immediate spatial surroundings, and in the configuration of inter-urban relations that make up the world city system. More radically, the city itself dissolves into a series of threads that both bind it together and stretch it out into other kinds of global space. As Andy Merrifield notes in *The New Urban Question*, it is now possible to think of this fabric beyond the extent of a single city, as one instead that 'clothes the whole world' (Merrifield, 2014). Or, as Brenner suggests, the 'urban' is now 'an increasingly worldwide condition in which political-economic relations are enmeshed' (Brenner & Schmid, 2012, p. 13). In their argument, there is no 'non-urban' from which a space called the 'city' can be analytically distinguished. While their exhortation may stretch to hyperbole and in a less nuanced articulation be potentially damaging to an environmental politics that seeks to preserve spaces from further human encroachment, their point is also that urban theory must catch up with a now genuinely global and ubiquitous urban practice. As Merrifield elaborates:

> Within this urban fabric old distinctions between the global North and global South, between inner city and suburb, between city and countryside are redundant, chaotic conceptions, requiring an upgrade and a rethink. Not least because inside the urban fabric today we see centres and peripheries all over the place, cities and suburbs within cities and suburbs, centers that are geographically peripheral, peripheries that suddenly become new centers (2014, p. 9).

Such an injunction motivates much of the argument of the remaining text. This chapter has stayed within the unit of analysis of the city itself. The next chapter takes up the above suggestion to describe an urban fabric that has since stretched out across the planet, to understand how particular areas of high human density and settlement are increasingly interconnected within a scheme of uneven global development.

1.5   Development of the super-suburb: Parramatta, Australia

Adjoining the global city of Sydney, and in 2015 now Australia's fifth largest central business district in its own right, Parramatta is unique in

the country's urban landscape. On the western side of Sydney, it lacks the eye-catching beauty of the harbour, or the coastline beaches of Manly, Bondi and Coogee. Unlike Australia's smaller regional centres, such as Adelaide and Hobart, it has yet to construct a specific identity or brand to lure tourists from other cities or overseas. Sydney tourists rush past on the M4 highway towards the distant scenic beauty of the Blue Mountains. Settled by Europeans at the same time as downtown Sydney, until World War II it operated as the centre of the urban fruit bowl that fed the markets and citizens of the metropolitan centre down river. For decades, it has been marked as the centre of the forgotten West, a source simultaneously of pride and resentment, the heart of vast suburban sprawl and a dormitory feeder for Sydney itself.

In the new millennium, it is beginning to assert itself. Bounded on the east by the Pacific Ocean and on the north by national parks, Sydney's ongoing demographic expansion necessarily heads west. Parramatta is now at the geographic epicentre of the greater metropolitan region. Two million inhabitants spread out to its west as part of Greater Western Sydney, a figure projected to double by 2050. Political expediency and the strain on public service and road infrastructure in Sydney's downtown have encouraged government departments such as the New South Wales Police Force headquarters, in 2004 and Sydney Water, in 2009, to relocate to Parramatta's CBD. Banking and insurance back office processing centres have generated new employment opportunities, leading to the emergence of a small but exuberant offshoot of inner-city gentrification and hipsterism. Signs of sophisticated foodie culture – new wave coffee shops, restaurants boasting local produce and bars supporting local musicians – have joined previous generations of franchise outlets and suburban pubs.

Parramatta is also one of the urban centres of ambiguous multiculturalism that mark Australia's postwar political landscape. Since the Second World War, it has hosted waves of migrants and refugees from South Europe, the Middle East, Africa and South and East Asia. Emerging from the nearby Villawood detention centre, refugees are drawn to the relatively cheap rents in the walk-up apartments that encircle the city and seek entry into the labour market through the informal service sector, hawking at street-side stalls, patrolling shopping centres as security or cutting hair at low-cost barber shops. Waves of successive migration produce neither outright hostility nor multicultural harmony. Instead the city disaggregates into porous and informal enclaves, marked by

constant negotiations. Occasionally contestation over space produces outright conflict: in 2009, in Harris Park, an adjoining suburb, tensions flared between groups of Lebanese and Indian residents, apparently exacerbated by the takeover of the suburb by incoming Indian groups (Kent, 2009). More often, local governments have sought to capitalise on the region's diversity as part of a push to attract tourism and investment, regularly spruiking ethnic festivals and heritage. Food forms a significant part of this 'revitalisation' narrative. Distinct shopping strips showcasing Indian, Lebanese and East Asian cuisine also function as an informal map of ethnic settlement and cultural attraction.

Exclusive apartment complexes are hastily erected along the banks of Parramatta River, targeting investors with disposable cash. A large international hotel chain, Meriton (2015), is developing the most ambitious of these, *Altitude Apartments*, projected to 'rise over 170 m with spectacular views and an unrivalled riverfront location'. Speaking to their aspirational target market, in May 2015 the starting price for a two-bedroom apartment in this complex was 64 per cent more than the median price for an equivalent unit in the area.[2] Other urban plans employ similarly monumentalist architectural designs: the city government itself has proposed the development of the largest residential tower in the southern hemisphere on council land. The 90-storied (and aptly named) 'Aspire Tower' looks like an urbanist vision transplanted from Chicago by way of Dubai, complete with online simulated video clips touting a glistening magnificence that overwhelms the static stick figure humanoids in the foreground (Parramatta City Council, 2015). The architect's marketing literature promises that the development will be 'sustainable' and 'affordable' (Grimshaw Architects, 2015). On the evidence of existing boutique apartment developments, such promises are likely to be directed towards the perceptions of 'affordability' of a discrete few.

The city stands to benefit from its recent rise to economic and political prominence. The 2000 Olympic Games deposited sports and entertainment stadia within 30 minutes' car, train or bike travel from Parramatta's CBD. Westmead hospital and Western Sydney University, the latter increasingly centred in Parramatta, provide large employment and training facilities. Planned redevelopments over central and southern blocks of the city promise new retail, residential and commercial opportunities (Parramatta City Council, 2009). Australia's oldest road, Parramatta Road, currently littered with light industry and large retail warehouses, is the subject of a large-scale 'Urban Renewal Strategy' (New Parramatta

Rd, 2015; NSW Government Planning & Environment, 2015). Other housing projects are planned over the coming decade (NSW Government Planning & Environment, 2015) and will be joined by plans for light rail, ring roads (Parramatta City Council, 2009) and more extensive bike 'cycleways' (Parramatta City Council, 2009).

A similar story of recuperation can be told about the relationship of Parramatta to its natural habitat. Significant civic investment and community volunteer time have been spent on the waterfront of Parramatta River, to retrieve the ecological centrepiece of the city from the ravages of its recent industrial past. Former abandoned land has been reclaimed as part of an interconnected bike path leading towards Sydney. Parramatta's indigenous and early colonial settlements have left traces that are the concern of local Aboriginal advisory committees, heritage societies, environment groups and federal tourism departments (Australian Government Department of Resources Energy and Tourism, 2015). An ambitious plan by the Parramatta River Catchment Group aims to make what is still a highly toxic waterway, with ongoing leakage from former industrial sites (Parramatta Holroyd Sun, 2013), swimmable by 2025 (Parramatta River Catchment Group, 2015). Elsewhere tributary creeks and rivers receive less attention. Some have been retrofitted as storm water drains, protecting neighbourhoods in the surrounding flat topography from flood damage. Others are under sporadic protection, with alternating patterns of public access and private industry frontage. Unlike the more affluent coastal suburbs of Manly and Bondi, no sea breezes soften the extremes of the Australian sun meeting vast tracts of concrete in the basin of Western Sydney. Further development pushes to capacity the ability of available tree coverage to minimise the heat island effect that Parramatta experiences to extremes.

The familiar patterns of gentrifying development abut planned increases in dense housing, nondescript office developments, widened and refurbished roads and the inevitable build-up of traffic through and around the perimeter of the city. Newly constructed cycle paths, sure signs the city is following new urbanist recommendations, nonetheless terminate precipitously at major roads and square curbs. Bike lane ways remain conspicuously absent from most city roads and consequently, compared with inner Sydney or Melbourne, cyclists are an unfamiliar sight. Meanwhile the spatial ghettoisation of the city is visible in the clusters of ethnic groups that seem, if anything, to be further consolidating rather than integrating in the city. Harris Park is increasingly

marked as a micro-suburb of Indian residents. To the south, Granville and Merryville house large communities from Lebanon, other parts of the Middle East and the Pacific Islands. The city centre and parts of the north, host luxury apartment complexes that are aggressively marketed to Chinese investors who can afford properties that are nevertheless still discounted compared with the inner Sydney market. Scattered throughout are enclaves of indigenous and Anglo-Australian residents, along with minorities from Britain, Thailand, Sri Lanka, Fiji, Korea and Iran (.id, 2015). A clear challenge for the city is how it might nurture its growing cosmopolitanism sensibility against a background of uneven economic distribution and changing patterns of political representation.

The complications of Parramatta's unfolding growth show a number of distinct strands of the complex interweaving common to the modern city. Both resident and worker populations – the latter mostly commuting from surrounding suburbs in Sydney's west – are expanding more rapidly than anywhere else in Australia. This places numerous pressures, simultaneously, to develop new housing stock and to preserve existing heritage; to integrate incoming ethnic groups, and to respect cultural difference; to capitalise on periods of high demand for real estate and to ensure basic minimums of service delivery and access to government; and to maintain vibrant parklands, rivers and air quality in the face of increasing commercial and commuter traffic on surrounding thoroughfares. Moreover, its relationship to the established Sydney centre and institutions of power and finance to its east is complex: it is a grateful recipient of government funds and yet proudly declares its independence. This is especially so in the territorial stakes of sport: rugby league, football and cricket teams engaged in regional or nationwide competitions fiercely fight for the 'pride of western Sydney' (Parramatta Holroyd Sun, 2014a). Its early peripheral roles as the fruit bowl, factory, dormitory suburb and back office processing centre of Sydney are slowly being exorcised for an as-yet indeterminate future.

Comparing Parramatta to Pittsburg, urbanist Edward Blakely praised its ability to turn from its industrial past towards a future oriented to the 'creative incubator', the 'education-medical complex' and becoming the 'globally competitive community' (Parramatta Holroyd Sun, 2014b). Yet Parramatta is far from being the sole product of its forward-thinking councillors, fresh from overseas study trips. It is also the beneficiary of housing shortages and poor affordability in Sydney's central suburbs; of the 20-year Australian mining boom that has reverberated from city

centres to outlying suburbs; and from the desire of state and local planners to invest in city regional centres of employment, to release pressures on a struggling urban transport infrastructure. It remains an open-ended experiment, a fiercely parochial urban satellite embedded within a global city.

In other ways, Parramatta is even more closely interwoven into a global tapestry of urban relations than Sydney itself. Its many recently arrived and second-generation migrants frequently maintain strong ties with their countries of origin. Informal evidence of these relations is evident in many Western Union and cheap phone card advertisements in post offices and news agencies, indicators of high-volume remittance transactions and communications to China, India and elsewhere. One marker of these relations is the ubiquitous and often merely ceremonial relationship of sister cities. Parramatta's sister cities showcase its heritage: they include Dekwaneh, a satellite suburb of Beirut, established by the Australian Lebanese Chamber of Commerce (The Australian Lebanese Chamber of Commerce, 2014), and Yiwu, an industrial city of China (Daily Telegraph, 2013). In the 2012 council elections, at least one former councillor had promised to set up an equivalent relationship with an Indian city if re-elected (Indian Herald, 2012). Such signals speak to the deeper cultural, religious and economic networks that are sustained by both old and new migrant communities. These cut across official political links and large-scale economic contracts that might issue from Sydney's centre or the nation's capital, Canberra. They lay the pathways for further migration and return trips to visit family; the spread of religious and political beliefs; the development of businesses, investment and the sending back of remittances; and the strengthening of intercity telecommunication and information networks. In its interior dynamics, its complex relationship to the greater city of Sydney to which it belongs and its international networks, Parramatta represents a quintessentially interwoven city.

Notes

1   The 1984 Penguin translation by Bettenson instead translates the Latin *perplexae* as 'interwoven'.
2    $822,000AUD (Meriton, 2015) compared to $500,000AUD (REA Group, 2015).

2
Spreading Out the Fabric: Urban, Rural, Global

Abstract: *Chapter 2 shifts focus to the urban fabric as it stretches out to regional and global spatial levels. The city's relations to its surrounds – its hinterlands, farms, forests, coasts, rivers, waterways, towns and the encompassing nation state – constitute fragments of its fabric thought large, interconnected with the natural and social habitat from which and with which it is woven. The chapter proceeds with an account of this system along lines suggested most emphatically by Peter Taylor in* World City Network. *Drawing upon Taylor's work, I nevertheless argue here for a global urban fabric in place of alternative vernaculars, in order to retain connotations of spontaneous and sporadic relations that bind cities together in suggestive as well as systematic ways.*

Where the previous chapter sought to understand the development of the city as a discretely fashioned fabric that is either obdurate, in its modernist conception, or pliable and porous, in its new millennial descriptions, this chapter takes up the possibility that cities can be thought of as interconnected and embedded within other geographic scales and systems of relationality. The specificity of individual urban areas depends increasingly on the ways these relations are configured.

The chapter discusses two kinds of specific spatial relations. The first kind concerns those between spaces with high and low population densities – how areas of urbanisation relate to farmlands, hinterlands, coasts, river systems and water ways and smaller surrounding human settlements. In this configuration the urban fabric is imagined as stretched out from the city, gradually thinning, with sporadic knots and twists as it encountered particular points of dependency and influence. These include the extra-urban infrastructure of water reservoirs and catchments, sewerage treatment facilities, power stations, transport courseways and nodes, holiday housing, tourist destinations, farmer markets, peri-urban settlements and feeder towns. Following the recent analyses of Saskia Sassen, Peter Taylor and others, the second kind considers the wider global networks of cities. Here, the fabric takes on a different geometry, a series of strands that stretch across the world's surface, relatively thin over areas of low density and again thickening and binding at other urban points of high density and development. Both kinds of spatial relations constitute the habitats of the city, ways it is situated and constituted within larger networks and fabrics.

2.1   Intertwining town and country

According to classical accounts of urban development, cities grew through the establishment of regulated agriculture, a paradigmatic shift in human relations to the earth (Mumford, 1961). Irrigation techniques for managing water accumulation and flows introduced seasonal and spatial control over crop cultivation. Economic life begins with the production of surplus, which can be traded but first needs to be stored, protected and transported. The city as container comes into being. Stone walls house excess grain and other commodities that are transacted in nearby markets. The differentiation of function that accompanies some degree of systematised agricultural production also introduces

unevenness, a distinction between those who accumulate surplus and those whose economic existence is solely for the purpose of creating it. As coordinators in the flows of produce, city elites can leverage their privileged spatial position in the food supply chain 'from field to fork', creating concentrations of primitive capital and power. Beyond their economic roles, early urban settlements take on other specialised functions: organisation of religious ceremonies, rituals and rites; training of militias to safeguard the settlement or to invade others; and the regulation of the life of the *polis* itself.

Cities also arise through other affordances of geography, politics and culture – along trading routes, at the edge of safe harbours, near forests or quarries, or by way of educated guesswork and authoritarian fiat about the adequacy and desirability of a particular site (Braudel, 2002; Mumford, 1961). In modernity, the science of city building has vastly extended the kinds of geographies feasible for settlement. The megacities of Shanghai and Mumbai are partly built upon enormous tracts of land reclaimed from nearby coastal waters. In spite of these modern geo-engineering capacities, the relationships to hinterlands, coasts, forests, mountains and other landscape features remain critical. As Wilson and Catterall (2014) note, 'the rural is not…a mere "zone" but something fundamental to life that is threatened by over-urbanisation and associated capitalist and neo-colonialist/imperialist developments'. The constituencies between 'town and country' – the peculiar mix of social attitudes and dependencies that mark how the city sees the country and the country sees the city – continue to shape urban economic and political contours. In India and China, the astonishing narrative of mass urbanisation is nevertheless formed against the background of a combined rural population still comprising more than two billion people.

The rampant growth of cities in the twentieth century has massively disrupted these different relations. Successive phases of industrialised and mechanised agriculture have forced waves of farmers off the land and into cities, often to become the latest layer of urban destitution (Sassen, 2014). In an era of global cropping, market liberalisation, volatile prices and high costs of machinery, small landowners are particularly vulnerable to bankruptcy, depression and suicide. In India, farm size, high levels of debt and the fluctuating prices of cash crops such as coffee and cotton have been linked to high suicide rates, widely publicised in local media (Kennedy & King, 2014). In Australia and the UK, less conspicuously, male farmers are also vulnerable to higher than

average rates of suicide (Alston, 2012; Hounsome, Edwards, Hounsome, & Edwards-Jones, 2012). Increased efficiencies in machinery and farm management, market deregulation and supply chain integration have produced what Bronson (2015) has termed the 'corporatization of agriculture'. As a sign of the progressive consolidation of farm ownership, the percentage of the labour force employed in Australia has declined from nine to four per cent since the 1960s, while the average land size of farms has increased by 23 per cent since the 1980s (Australian Government Productivity Commission, 2005). Employment in the agricultural sector is further marked by an ageing population, with younger generations leaving the land for other occupations, usually available only in nearby cities. Such pressures are exacerbated by climatic uncertainty, with the prospects of extended droughts and floods seeming to increase in an era of human-induced global warming. Long idealised as a communitarian and idyllic alternative to the pressures of urbanity, rural life can also be brutal and bleak.

The threads of the modernised city are increasingly paralleled, then, by similar intensifying strands of industrialised rural land use. In agricultural and mining production, small enterprises are challenged by large and well-funded corporations that can operate at scale. Like the city, the space of the countryside is also subjected to aggressive scientific inquiry and the deployment of forms of capital-intensive technologies: earth-moving machinery and explosives, transport logistics, satellite mapping, enterprise IT management systems, pesticides and the growing deployment of genetically modified crops. A recent law case in Western Australia illustrates the incipient territorial conflict between genetically modified and organic crop production, with one farmer losing the right to sell organic certification produce due to the infection of GM seeds from a neighbouring farm (WAtoday, 2014). In at least one respect, labour in the countryside does not function like labour in the city: in the rural context, loss of jobs in one sector cannot be so readily substituted by employment in another (Davis, 2006). Loss of agricultural business, employment and income contribute substantially, if with little publicity, to the heroic narratives of global urbanisation.

2.1.1 Collectivised production

The innovation and scale of agricultural production under free-market capitalism has resulted in a monumental shift in the spatial arrangement and the supply of food to burgeoning urban populations. Yet,

as James C. Scott has shown in *Seeing Like a State* (1999), initial efforts to mechanise and automate the farming industry were disastrous. His case study of early industrialised agriculture demonstrates the equally dire consequences of applying Fordist and Taylorist techniques of the urban factory to farming in both the United States and the Soviet Union during the period 1910–1930. What he terms the 'Soviet–American fetish' was a bilateral effort, albeit along opposing ideological lines, to boost production of grain through the application of the new scientific and engineering methods of modern agronomy. Sharing a 'faith in high modernism', the two nations traded scientists, techniques and practices. Early American industrial farms collapsed under the pressures of the Depression, being 'so highly capitalised that they were vulnerable to unfavourable credit markets and lower farm gate prices' (Scott, 1999, p. 198). The family farm, by comparison, could apparently 'more easily tighten its belt and move into subsistence mode' (Scott, 1999, p. 198). In the Soviet Union, the collectivisation of the 1930s and 1940s systematically removed the 'family farm' from existence altogether. The 'war' on the kulak classes was waged, at a spatial level, from the city to the country, between an advanced scientific proletariat leadership and an apparently backwards, regressive and still deeply religious peasantry. Aside from the atrocious loss of human life, caused by direct military assaults, deportation to forced labour camps and catastrophic famines, collectivisation also failed in its ostensible aim: to increase grain yields.

Future experiments in agricultural collectivisation were not necessarily to follow the same spatial trajectory of power from city to country. The Khmer Rouge agrarian revolution in Cambodia began on the eastern borders of the country, precipitated by US bombing and abetted by neighbouring Chinese and North Vietnamese forces. It swept across the countryside before invading Phnom Penh in the west. In a reversal of the Soviet experience, the Khmer Rouge coerced the professional classes and urban elite into a new agricultural labour force. To install a pure and total socialist environment, the new regime forced the complete eviction of the city's population, reforming its diversity into a simple de-professionalised mass, made to be visible, dependent and manageable on rural rice paddies and water works (Bultmann, 2012). In contrast to Soviet collectivisation, inflicted by a repressive urban elite, the Khmer Rouge synthesised nationalism, intense xenophobia, anti-intellectualism and anti-urbanism into an ideology of agrarian socialism. The peasantry were idealised as the 'Old People' who tilled the land; urban intellectuals

and scientists joined Chinese and Vietnamese migrants as caricatured 'New People', needing to be identified, re-located and re-educated through work on large-scale irrigation projects (Tyner & Will, 2015). In spite of its differences, the rapid reorganisation of the population and the attempt to re-engineer the landscape did however produce similar genocidal effects to the Soviet experiments: death by execution or famine and the rapid spread of malaria, malnutrition and other disease. Tyner and Will further argue the effects of such 'environmental violence' towards both people and land endured beyond the end of the Khmer Rouge regime itself and were complicit in the famine of 1979–1980 that led to another 600,000 deaths. Ironically Khmer Rouge agrarian socialism exerted control through the city, with its first formulations taking place in Paris in the 1950s, and its later execution presided over by a leadership installed in an otherwise depopulated Phnom Penh.

Soviet collectivisation and Khmer Rouge de-urbanisation represent the extremities to which rural and urban populations, respectively, could be dehumanised under totalitarian regimes. In both cases the social fabric made up of familial, commercial, religious and cultural ties, binding heterogenous communities across the urban–rural continuum under the apparatus of the nation state, was for a period irreparably rendered. Exact causality and the locus of responsibility for both atrocities remain politically contentious, as recent receptions of Timothy Snyder's *Bloodlands* (Wildt & Plamper, 2013) and the controversial Khmer Rouge Tribunal (Abe, 2013) illustrate. The directions and flows of power across geographical space are only part of a much wider causal explanation. Both cases, though, demonstrate how the pure spatial arrangement of high and low human density produces sets of relations, of economic complementarity and political suspicion that can become amplified or disrupted under totalitarian force and technological leverage. The more recent history of these relations between town and country are less marked by the implausible mix of political ideology and immature agronomic science that led to such catastrophic loss of life and environmental degradation. Yet this history too has generated its contestations.

2.1.2   Industrial production revisited

The Green Revolution, in India and elsewhere, produced vastly different results. Refinement of crop selection, improved irrigation methods, the introduction of pesticides and rural education and literacy programmes raised agricultural productivity from the 1960s onwards. This constituted

a novel form of relationship between city and country. Rather than direct control, democratic capitalist states began to see their role as influencers of land use and production through a variety of less intrusive instruments: policies, alternatively, to regulate or deregulate markets, technical advice, education reform, upgraded transport infrastructure and promotion of agricultural, forestry, geological and environmental sciences through universities and institutes. Globally, these instruments have produced extraordinary increases in agricultural yields. According to authors of the International Food Policy Research Institute's *2012 Global Food Policy Report* (2012), over a 50 year period (1961–2011) world agricultural production tripled at the same time as the global population doubled. In the same period, the areas of land used for crop cultivation increased by only 12 per cent. The rise in productivity was matched by lowering costs: food prices decreased in real dollar terms one per cent every year across the twentieth century, a trend that has only recently been arrested by the apparent plateauing of world production (Fuglie & Nin-Pratt, 2012). Coupled with the global decline in employment in the agricultural sector, these set of figures suggest that global capitalist free trade, the corporatisation of production and the technical transfer of agricultural practice from developed to developing nations have been vastly more successful in boosting food outputs than prior experiments in totalitarian collectivisation.

Yet over the same period many of the world's most politically contentious issues concern the impacts of land use for the production of food and other goods. Deforestation in Brazil and Indonesia continues to threaten critical ecosystems and biodiversity. Massive dam construction in China exposes rural communities to greater risk of both flood and drought in coastal delta regions. Political control of the Yangtze River has raised concerns among neighbouring South East Asian countries dependent on the river for fresh water. Globally, the rising use of pesticides has threatened air, water quality and non-targeted species, along with the health of consumers. Similarly, genetically modified crops have introduced concerns about the resilience and long-term health side-effects of these newly engineered species. The shipwreck of oil container *Exxon Valdez* in 1989, massive oil spills from the BP *Deepwater Horizon* rig in the Gulf of Mexico in 2010 and ongoing pipeline leaks from Shell's Nigerian operations have destroyed populations of flora and fauna and left residual pollution with enduring local ecological effects. Industrialised mining and forestry have also threatened native species,

degraded soil quality and wrought long-term ecological damage. Such impacts suggest that unrestrained capitalist growth from natural resources and production, disproportionately benefiting the urban elite, comes at a devastating cost.

2.1.3   The urban ecology

Cities themselves occupy ambiguous positions with respect to global environmental impacts. Concentrated populations lower transport usage, electricity consumption and carbon emissions. They deliver water, power, food, housing and other essential services more efficiently; and they also concentrate scientific research into alternative and more eco-friendly systems. Protected urban boundaries and high-density cities can lessen human impacts on the surrounding ecology. At the other extreme, the endless sprawl of human habitation, extensive use of private transport, poor tree coverage and high levels of conspicuous consumption create further pressures on local environments and exacerbate heat island effects on the city itself. Such effects and pressures are exacerbated in industrial megacities in tropical zones, where high pollution and humidity combine to create a toxic atmosphere for its human population, and stifle the life of flora and fauna in the surrounding hinterlands.

Globalisation has meant that some of the impacts of high consuming cities are effectively outsourced to regions with less political regulation and opposition. Perversely, this becomes a source of competitive differentiation, with poorer nations, regions and cities prepared to trade off environmental goods for the economic benefits of toxic and destructive industries. Global consensus on emissions has so far floundered upon the differential levels and composition of the world's major economies. Forum after frustrating forum produce limited updates on existing protocols for protecting the global environment and the local ecological systems that permeate in and around world cities.

Meanwhile, as cities in China and India grow in size, wealth and relative political influence, demand has grown to alleviate the smog, congestion, pooling of waste and other blights of concentrated urban life. Approximately half a billion people, or seven per cent of the world's human population, have entered the middle class in these two countries in the past three decades. Much of this new affluence has congregated in the emerging conurbations of the Yangtze River Delta (83 million), Pearl River Delta (48 million), the National Capital Region around New Delhi (45 million) and Mumbai Metropolitan Region (21 million).

According to the UN Habitat, the newly defined concept of 'mega-region' encompasses even larger interconnected city areas – the largest, Hong Kong–Shenzhen–Guangzhou, now encompasses a population of 120 million people (United Nations Human Settlements Programme, 2010). The structure of such megaregions consists of a tightly interwoven fabric of what are already megacities, linked by massively trafficked highways, rail links, bridges and shipping lanes. Along these corridors, townships and farms both feed off and feed into the nearby urban masses. These agglomerations of people, infrastructure, resources and production deliver immense challenges, but also new possibilities for a renewed ecological relationship.

2.1.4   Sustainable production: A new 'urban-ruralism'?

Cities draw in raw and processed materials, from neighbouring and remote land and sea. In return they generate human, solid and particulate waste. While cities house 50 per cent of the world's population, the *Megacities Carbon Project* reports that they generate over 70 per cent of its carbon emissions (Jet Propulsion Laboratory, 2015). Developing renewable inputs alongside less harmful and reduced outputs is critical to minimising the impacts of urban life on its surroundings.

A wide range of alternative social and technical mechanisms now exist for doing so. Renewal energy sources, such as solar, wind and hydropower increasingly supplement and in many cases, replace coal as sources for powering and sustaining modern social life. Revitalised public transport networks thread themselves back through the urban fabric in cities otherwise tailored for the automobile. Farmers markets are being invited back into city spaces to offer locally grown alternatives to mass produce. Fair trade channels provide choices for ethical consumption, with transparent supply chains giving guarantees that farmers and labourers be rewarded equitably for their work. Urban agriculture seeks to develop skills, reduce the costs of food delivery and provide nutritious and low cost options for addressing food security in low income neighbourhoods. Not-for-profit organisational networks thrive across the spectrum of developing and developed cities: NGOs, social enterprises, cooperatives and savings groups pool resources, share talent and generate novel approaches for addressing community problems. Cities are conducting experiments in alternative arrangements to money-based transactions, with time-banking systems being developed in Portland, USA and Kobe, Japan (Gibson-Graham,

Cameron, & Healy, 2013). As Gibson-Graham, Cameron and Healy further argue:

> Perhaps in a community economy we can experiment with increasing our direct connections through alternative and nonmarket transactions. We can shift to market transactions in which impacts and relationships are more visible or cut back on our market relationships if the face of the human or earth other is obscured (Gibson-Graham et al., 2013, p. 109).

Alternative economies may constitute a small fraction of global trade, minor threads in the dominant fabrics that increasingly bind town and country together. However, they suggest ways to make these relations transparent, or 'more visible'. Cities can be no longer understood only as hermetically sealed containers of people, infrastructure and goods. The metaphor of layered fabrics suggests an alternative, a means for imagining the urban as interwoven with or threaded through the rural, the regional and the ecological. A planetary urbanism, *pace* Brenner and Schmid, would then need to be supplemented by other 'planetaries': a ruralism not so much 'non-urban' as an imbricated 'with-urban'.

Evolving these relations so they become visible, equitable and reciprocal rather than agonistic and exploitative constitutes, then, one of the normative challenges for cities in the new millennium. This depends, though, upon a reconceptualising and reconfiguring of how cities relate through one further spatial configuration. Cities must not only concern themselves with their internal and regional relations. They are equally interconnected with each other, in systems of profound complexity, forming feedback loops that are simultaneously vicious and virtuous.

2.2   The emergence of the global city

Under the auspices of European colonialism and US expansionism, prior periods of globalisation featured strong city-to-city relationships. At the height of the British empire, London, Liverpool and Manchester imported raw produce shipped through the harbours of Boston, New York, Barbados, Cape Town, Bombay, Singapore, Hong Kong, Sydney, Melbourne and Auckland, and sent back finished goods (Hobsbawm, 2010; Hunt, 2014). As much as European wars were marked by nation-state rivalries and interests, they also featured specific internecine conflict and cooperation between cities. Dicken's *The Tale of Two Cities*

showcased London and Paris, rather than England and France, as the relevant geographic sites where new ethical dilemmas of democracy arose. Buzon and Lawson (2013) describe nineteenth century globalisation as consisting of 'an intertwined configuration of industrialization, rational state building and ideologies of progress'. They could also add a further dimension of urbanisation, since the cities of London and Paris and later New York, Berlin, Chicago and Melbourne, were integral to the consolidation of power, capital, innovation and diplomacy that fomented the rise of political empires and industrialised economies.

In 1941 Henry Luce (1999) coined the term the 'American Century' as part of a new imperialist programme to become a 'powerhouse from which the ideals [of Justice, Truth and Charity] spread throughout the world'. While the domination of two nation states during the Cold War period centred attention on Washington and Moscow, other American cities figured prominently in the emerging global productions of media, technology, manufacturing and instruments of high finance. In place of the colonial urban topology, a new intra-national configuration emerged. New York continued to function as the transactional clearing-house for world trade. Chicago and Detroit developed as global centres of industrial production. As the heart of the US film and television industry, Los Angeles occupied the centre of US media production and, therefore, the export of cultural influence and soft power. Nearby Silicon Valley and San Francisco together established themselves as global havens of alternative culture and incubators of the new information technology revolution. These different fields of activity were at the same time mutually self-reinforcing. New York and Washington could coordinate together a world politico-economic agenda; Los Angeles could rely upon Silicon Valley for a steady stream of innovation in graphics processing to drive ever more ambitious cinematic special effects; and technology CEOs and film producers could fly from West to East coasts to lobby for immigration reform, attend shareholder meetings and negotiate financing. Moreover, each of these cities had specific connections with other world cities: New York with the financial centres of London, Tokyo and Paris; Washington with Moscow and also London and Paris; Los Angeles with numerous regional distribution centres; and Silicon Valley, increasingly with other global 'Silicon' offshoots such as Hyderabad and Bangalore. In place of the typical 'primate' city configuration (Taylor, 2004), in which a single city assumes disproportionate size and influence within the nation state, the United States developed

an eclectic yet complementary peerage of cities, specialising in particular functions and industries.

Writing half a century after Luce, Sassen's coinage and analysis of the 'Global City' (1991) effectively brought into high relief the specific roles of New York, London and Tokyo in concentrating global trade and the agglomeration of specialised financial firms. The work of Sassen and other global urbanists, coincident with the collapse of the Cold War, arguably responded to the rising awareness of alternative, and more granulated, constellations of global power and influence. Countries other than the United States and the USSR had risen to prominence; regions outside North America and Europe, particularly in Asia, asserted themselves economically and politically; growing use and penetration of the Internet made alternative cultural productions from other parts of the world more conspicuous; and more exotic travel and tourism patterns brought people to hitherto forgotten locations.

In Sassen's argument, a global city represents one of the very few hubs through which an advanced, globalised and postindustrial capitalism is dictated. Paradoxically, the decentralisation of the global economy is paralleled by the centralisation of economic accumulation. The managerial clustering of multinational corporations favours agglomeration of the executive classes and the subsidiary industries that service them: advertising and design agencies, information technology providers and accountancy and legal firms. Such agglomerations generate an increased intensity of links between a spatially dense and tightly connected group of economic producers. This generative assemblage functions further as a powerful conduit for the issue of instructions through a global system of dependent circuits – national stock exchanges, transport hubs, diplomatic channels, entertainment networks – which pulse excitedly to an ever-growing frequency. New York continues to epitomise this idea of the global city – the centre of the world's financial system, the place where daily trade values rival the size of many national economies and where trade execution speeds are measured in microseconds. Accordingly, the speed and capacity of Internet connectivity figures ever more prominently in the criteria of the global city. The high speed computer networking of cities produces a further paradox: as Glückler (2007) has observed, firms are now choosing to settle in cities that help them service 'distant clients', as well as add value to those services through local supply chains. The concentration of data centres, fibre optic and wireless networks and other information

infrastructure accelerates the rates and frequencies with which the city and its firms can reach out to the globe.

In the 25 years since *The Global City* was published, cities have become increasingly central to the new hegemony of global power. Mayoral figures such as Rudolph Guilani, Michael Bloomberg, Emmanuel Rahm and Boris Johnson have assumed world attention, symbolic metonymies of the cities they lead, in ways unthinkable previously (Barber, 2013). New York, London, Tokyo and Paris continue to figure prominently in discourses of the global city. The changing organisations and patterns of the world economy, and in particular the pivoting of trade towards East Asia, is at the same time bringing new zones, regions and cities into prominence.

This produces complications for Sassen's original contention: in the new millennium, the four global cities have lost little of their critical mass, yet Singapore, Hong Kong and increasingly Beijing and Shanghai, now rival those cities for influence. With more contenders, parts of a global city hierarchy appear to be flattening, while at the same time other spatial relations are becoming more hierarchical. National average growth rates in China and India have continued at rates of 7 and 5 per cent, respectively, since the early 1990s. Much of this growth has been concentrated in the specific industrial and service zones of Shanghai, Guangzhou, Hong Kong, Beijing, Bangalore, Hyderabad and Mumbai, while rural areas have been relatively dormant or even experienced negative growth. Further complicating the picture is the emergence of new geographical entities, interconnected urban clusters, megalopolises and megaregions, linked by common business, linguistic, interjurisdictional and infrastructural ties (see for example Ross, 2009, especially chapters 2–4 and 11). These, along with other evolving forms of urban arrangements, can simultaneously dilute and reinforce the roles of individual cities in planetary flows of power and trade. As the next section begins to illustrate, cities are increasingly enmeshed in different and fast changing global configurations, systems and networks.

2.2.1   The networked condition of the global city

Since the middle of the twentieth century, the multinational service firm, specialising in banking, finance, advertising and law, has played an ever more prominent role in the economic exchanges between cities. In place of bilateral relationships between distant merchants importing and exporting goods, the multinational firm operates in a wide global web

of locations, often correlating with regional centres where other firms, service industries and highly sophisticated labour markets reside. While Sassen's work identifies the strong firm networks that exist within global cities, it is comparatively silent on the thickening of commercial relationships between them. Bringing to the foreground the economic networks through which cities operate, Peter Taylor's analysis of what he termed the *World City Network* (2004) has sought to redress this gap.

Already by the 1980s, Friedmann had suggested these 'key cities', the 'basing points' of global capital, could be arranged 'into a complex spatial hierarchy' (1986, p. 71). Taylor's account examines in more detail how professional service organisations – such as law firms, advertising agencies and accounting, insurance and banking companies – are spread out across these 'basing points'. Rather than treating the city itself as a primary unit of analysis, it is the locative actions of firms, choosing to set up offices in one place rather than another, that for Taylor is pivotal in the establishment of urban links and networks. Indeed he warns explicitly against the temptation to 'reify cities – that is, to treat them as actors in situations where they do not have agency' (Taylor, 2004, p. 57).

To convey some sense of how this network might function, it is helpful here to trace Taylor's specific methodological steps. To identify the core and peripheral extents of this network, his analysis first counts and weights the location of 100 firms in 315 cities. The result of this analysis produces what Taylor terms a 'service value matrix' (2004, p. 62), in which each firm is given a value ranging from 0 (no firm presence) to 5 (firm headquarters) in each city. From this matrix, Taylor then identifies cities that are closely connected, through the shared presence of individual firms. For any given city, the aggregate of these links to other cities constitute its 'global network connectivity'. Following this procedure through, the most globally connected city becomes London, followed by New York, Hong Kong, Paris, Tokyo and Singapore. Allowing for the rise of Hong Kong and Singapore as new millennial 'global cities', this list largely replicates Sassen's previous findings and lends further credence to the presence of a dominant pattern of urban structuration of the world's economy. Taylor further compares the log of city network connectivity with the log of their connectivity ranks, a variation of an established analysis of city size (Berry & Garrison, 1958). With the exceptions of London and New York, this analysis produces a pattern that resembles a relatively flat clustering of cities, all with similar degrees of connectivity, rather than a top-down hierarchy (Taylor, 2004, p. 69). Taylor uses

this result to claim that these flattened interconnected networks, rather than hierarchies, are now the dominant geometric form of world city relationships. He further proceeds to describe how these networks are layered into a series of concentric 'arenas', with the more connected cities at the core and the less connected spanning out in a series of five outer concentric rings.

Taylor's analysis provides an important contribution in bringing together a general account of how these relations can be mapped and described and further demonstrating that such relations need not be hierarchical. It does however only examine the formal economic connections between cities, identifiable through the explicit and measurable 'locative actions' of firms. Other formulations of networks, co-dependencies, affiliations and associations also stitch together the multithreaded global fabric. Much non-service sector economic activity continues to drive processes both of urbanisation and of more particular, derivative, and arguably more hierarchical urban networks. One example is what Ciorciari (2013) has termed the highly asymmetric 'patron–client' relationship between Beijing and Phnom Penh. Here, political expediency has driven China to donate aid and invest heavily in 'hydropower, textiles, garments, agriculture (especially rubber), tourism, minerals, finance and transportation' (Ciorciari, 2013, p. 25), in turn creating employment and driving further rural migration to Cambodia's industrial centres. The focus on stated firm locations in Taylor's analysis also obviously ignores black market and other unstated economic activity that frequently feature in the connective trade between cities.

Emphasising only the formal and multilateral economic relations risks obscuring, then, parts of the global city network involving singular and informal relationships that are, however, no less intense or critical. This concentration produces, effectively, a severing world space into the smooth cores or centres where service-oriented firms can ply their trade and the striated peripheries where their consultancy businesses are less able to capitalise on lucrative contracts, or attract specialised skills in law, finance and marketing. Unlike network cores, operations in the peripheries incur time and cost penalties in having to adapt the rituals, norms and standards of world capitalism to local idiosyncratic practice. These penalties appear as frictional forces; yet just as easily they may create hooks of resistance for other kinds of cultural, political and economic ties to latch onto.

In some sense then, Taylor's analysis of the world city network ends up repeating what it sought to avoid: the conceptual reification, not of the

city, but of one particular form of network, *the* network that coordinates and dominates the global economic system (Smith & Doel, 2011). As the example of Phnom Penh and Beijing suggests, this glosses over other kinds of particular urban relations that are often contingent, overlaid upon geographic proximity, cultural exchanges, diplomatic engagements, political manoeuvrings and allegiances, and linguistic and historical commonalities. In another example of diverse urban relations that are no less systemic, Simone notes how, with the experience of cultural and political 'blackness' across diverse urban space:

> the appropriation of a common 'blackness' can operate as a vehicle through which black residents in Dakar, Brooklyn, Kingston, Bangkok, London and Recife not only compare their distinctive urban experiences but cultivate a discourse through which they generate particular understandings of the city and their place and possibilities within it. Here, blackness becomes a device of inter-urban connection – a device for approaching one's urban existence in terms larger than the specificities entailed by a particular place of residence. It is a way of seeing oneself as part of a larger world of operations, powers and potentials (Simone, 2010, p. 49).

Elaborating upon Taylor's analysis, it is possible to see how, rather than a singular system or network, a far more supple set of interwoven and imbricated relations are at play in the dynamics between cities. These complex entanglements, where many relations continue to operate through cultural or tribal identifications, nepotistic patronage, politico-religious institutions and informal trading ties, overlap and weave across the formal operations of global systems. While these are less amenable to rigorous quantitative analysis, their role in shaping forms of a global or planetary urbanism needs to be estimated alongside the more conspicuous operations of international firms.

2.2.2   Relationships and rankings

In addition to the stark narratives of a world landscape coordinated by a small subset of elite global cities or a single world city network, new global urban relations now proliferate rapidly along alternate lines and axes. Bolstered by significant political investments, the flows of capital, labour and commodities between Chinese and African cities, for example, have attracted considerable recent attention (Moyo, 2010). Many other emergent threads also exist: between 'dormitory' cities of South Asia that supply workforces to the modern metropolises of the

Arabian peninsula, Dubai, Abu Dhabi and Doha; between cities that share a perceived stewardship of natural regions and resources, such as the Antarctic cities of Punta Arenas, Ushuaia, Hobart, Christchurch and Cape Town (Roldan, 2011); between cities along drug-trafficking routes from Latin America, Africa and southern Europe; and between cities of numerous transnational associations. The latter group includes UN-led sister city initiatives, past and present military associations such as NATO and former empires such as the Commonwealth. Other indicators of a more complex, integrated and multilateral tapestry of inter-urban relations include airline traffic, migration shifts, Internet flows, trading volumes and worker remittances. Connections across sociotechnical infrastructures demonstrate how, far from being self-contained, cities are increasingly organised into series of quilt-like ecologies that stretch across, and increasingly produce, different geographies and spaces.

Rather than being irrelevant or superfluous in an era of new millennial hyper-urbanism, the nation state remains a significant agent in these geographical arrangements. Formal bilateral urban relations continue to be negotiated through broader national channels. Equally, though, alongside existing *international* organisations new and prominent city *inter-urban* networks have now emerged. Since 1985 the following global city associations have been established: *Metropolis* (1984/85), *ICLEI – Local Governments for Sustainability* (1990), the *Cities Alliance* (1999), the *UN Global Compact Cities Programme* (2002), the *City Mayors Foundation* (2003), *United Cities and Local Governments* (2004) and the *C40 Cities Climate Leadership Group* (2005). Though marked by different participating cities, agendas, emphases, principles and regional biases, the mission statements and sales pitches of these organisations show striking similarities. More significantly their diverse membership points to the strong desires of city governments to join global networks. Castell's thesis of the 'rise of networked society' lives large through the wishes of urban elites to form liaisons and alliances that also constitute new forms of world leadership.

These multilateral associations are joined by a large number of regional groupings and bilateral city relations. Most recognisable are the 'sister cities' or twin towns, fostered by organisations such as Sister Cities International (2012). Formulated in the years after the Second World War (Clarke, 2009), the concept of pairing cities, based on often tenuous ties, has transitioned into another set of networks that allow for political pressures to be exerted, economic interests pursued and cultural ties

established. These urban sororities also mark migratory patterns: as the *Chapter 1* case study example showed, Parramatta, Australia, is joined with Dekwaneh, Lebanon, in recognition of strong familial ties between them (The Australian Lebanese Chamber of Commerce, 2014). Regional and national associations such as EUROCITIES (2015), the Council of European Municipalities and Regions (2014), the US National League of Cities (2013), the Australian Local Government Association (2013) and the UK Local Government Association (2014) add further layers to the vast fabric of interwoven global urban relations.

Not all inter-city relations are convivial. Cities as much as nations and corporations are locked into a range of economic rivalries, and the rise of urban indexes exacerbates a global competition for attention, capital, talent and labour. Coupled with low cost housing and tax incentives for businesses, the shifting demography of the United States towards southern and western states is partly the product of a national re-centring of industry around low cost air travel and new airport hubs in Atlanta, Dallas, Houston and Phoenix (Kasarda & Lindsay, 2011). Metrics on employment, housing prices, weather patterns, crime and ethnic composition play a pivotal role in coordinating these demographic shifts. At a global level, as Moonen and Clark note in a review of 150 city indexes and benchmarking studies, the securing of 'large numbers of multinational firms' correlates highly with 'much more liveable city centres, higher investment rates, more tourism and greater public and commercial recognition' (2013, p. 34). In this global race, the city is both instrument and agent. Conversely, corporate employers themselves use liveability ranking systems, such as the *Monocle*'s 'Most Liveable Cities Index', the *Economist*'s 'Liveability Ranking and Overview' and the *Mercer*'s 'Quality of Living Survey', to entice expert talent to businesses located in the more convivial of world cities.

Global competitiveness and liveability rankings do not entirely overlap. New York, London, Paris and Tokyo continue to lead economic lists, along with recently arrived global cities of Singapore and Hong Kong, in size, rates of growth and investment gravitational pull (Moonen & Clark, 2013, p. 19). In 2014, only 2 of the top 10 global economic cities, Sydney and Toronto, also feature in the top 10 most liveable city lists compiled by the *Economist* (2014), while only one, Tokyo, ranks highly (second) according to the different criteria applied by the *Monocle* (2014). The proliferation of lists and rankings by various global consultancy firms increasingly set agendas to which cities are expected to respond: to be

more powerful, competitive, exciting, creative, sustainable, liveable and secure. At the same time, they create new cognitive associations: Melbourne and Vancouver are linked symbolically by their presence at the head of the *Economist* liveability index, while the heavy weighting of Latin American cities in lists of homicide rates problematises, by association, the broader region. Indexes therefore become agentive, self-fulfilling, establishing fine-grained semantic fibres of affective connotation that reinforce the material attributes of cities. Global cities become more global; creative cities more creative; liveable cities more liveable. At the other end of the spectrum, cities languishing at the bottom of rankings, or left off altogether, become fraying strands with minimal ties to the greater world economic and political fabric.

2.2.3   The risks of the city and the politics of planetary urbanism

The politicised militarisation of urban space overlaps and complicates these networks of economic influence and dependency. Cities seemingly ignored and peripheral to these networks can be nonetheless caught up in powerful webs of surveillance, contestation and conflict. *Fragile cities* is a concept borrowed from security and development literatures on fragile states to characterise urban spaces that experience 'profound disequilibrium and ruptures in the social contracts that bind city governments and citizens' (Muggah, 2014, p. 4). These not only include cities suffering from 'conventional warfare', but also those where 'urban elites' and 'authorities' no longer have unilateral control over the 'legitimate use of violence' (Muggah, 2014, p. 4). Alternative structures – gangs, militias, proxy security forces, rival political parties, outside aggressors – claim rights over parts of the city.

Recent work has detailed countless examples where the interior urban fabric has deteriorated. Israel's systematic bulldozing of buildings and infrastructure in Gaza trialled techniques for subduing potential insurgencies that the US military was later to borrow and apply in Baghdad (Graham, 2011). The differing interests, structures and control between state and local gang actors overlap and conflict in the favelas of Rio de Janeiro (Perlman, 2010). Post-apartheid Johannesburg is marked by a combination of inner-city 'ghettoes' and suburban 'siege architecture', creating 'a patchwork city of dispersed territorial enclaves' (Murray, 2011, p. 211). Urban centres of narco-trafficking in Latin America have experienced war-like fatality rates at the height of gang turf-wars, in Medellín

in the early 1990s, in Ciudad Juárez in late 2000s (Bowden, 2010) and now in other urban zones in Central America. Mugabe's 'urban cleansing' of the poor in Harare in 2005 involved demolition of shanty town informal housing, resulting in large-scale unemployment and forced resettlement (Beall & Goodfellow, 2014).

Such examples appear to be 'zones of exception': products of poor governance, the breakdown of law, political repression, or regional conflict. Yet as Muggah argues, fragile cities also 'are fundamentally enmeshed with the global economy – linked to international financial and commodity exchanges, overseas assistance and diaspora communities' (2014, p. 4). Frequently internal conflicts reflect growing regional interests and pressures. The often-cited cases of urban areas that line narco-trafficking trading routes in South and Central America and in North West Africa, respond to cocaine demands from North American and European consumers. Urban conflict also generates migrationary pressures to surrounding cities, countries and regions. Refugees fleeing Aleppo and other Syrian centres, for example, have accentuated the economic strains and political tensions in nearby Beirut. As Graham (2011) and others have noted, US military interventions in Kuwait City in 1991 and in Baghdad in both 1991 and 2003, were at least partly motivated by the need to continue the seamless flow of oil into the American and world economies. Russian incursions into Ukraine in 2014, linked to territorial control over the Crimea and the associated gas and oil pipelines into Europe have been explained as motivated by similar financial incentives (Allison, 2014). The spatial uneven development of Johannesburg continues to reflect the long shadow of nationwide apartheid, abolished in 1994 but still woven into the segregated seams of the city (Murray, 2011).

Global cities have also become sites of both real and perceived insurgent conflict. The terrorist attacks on the New York World Trade Centre in 2001 reflect a careful and planned choice to target the symbolic heart of American values as well as the centre of the world economy. Subsequent attacks nominated the public transport networks in Madrid (2004) and London (2005) to cause both loss of life and damage to key parts of the urban infrastructure. The Charlie Hebdo massacre in Paris in 2015 targeted the symbolic value of a satirical and subversive media outlet in another of the world's global cities. In response, national forces have increasingly deployed militaristic tactics to manage key urban spaces and potentially disruptive populations. Graham notes that United

States and United Kingdom tactics acquired in hostile urban zones have been brought back home: 'The construction of "security zones" around the strategic financial cores and government districts of London and New York directly import the techniques used at overseas bases and green zones' (2011, p. 13).

The securitisation of the city is increasingly installed in its infrastructure. Permanent and increasingly ubiquitous video surveillance of populations has become thoroughly embedded. In a bizarre twist on the discourses of city rankings, VinTech (2011), a 'Chicago-based, full-service, electronic security solutions provider', boasts a list of the top five cities with the 'largest surveillance camera networks'. Though the company admits exact counts are impossible, as the number of cameras is itself often secret, the list counts the cities of Beijing, London, Chicago, Houston and New York. In a further irony, the article cites a Director of the US Immigration and Customs Enforcement as acknowledging video surveillance is used to bypass Houston's 'don't-ask-don't-tell' policy towards potential illegal 'suspects'. Just as the risks of terrorism have gone urban as well as global in the new millennium, the tactics and technologies for locking down the city, placing it 'under siege', are increasingly shared across global military and corporate security networks.

The militarisation of urban space cuts across lines of fragility and globality: the Global South and Global North; fixed and mobile populations; risks of political and criminal violence; and notions of home or foreign territory and populations. It constitutes a further dimension or layer along which planetary urbanism extends, a strangely consistent mode through which the world's fabric is sensed. Airport security, identity checks, x-rays, pat downs and electronic surveillance are part of a now universal experience when transitioning from one city to another. Diasporic populations in Sydney protest about interventions in Middle Eastern cities. Exoticised fictional and real urban 'hot' zones become the settings for Western masculinity to test itself in cinematic renditions of comic strips, action films and video games. Forced resettlement of neighbourhoods and communities to make way for modernisation and gentrification constitutes an unfortunate 'design pattern' that is readily copied and replicated throughout global urban space.

2.2.5   Evening out the urban fabric

As geographers David Harvey and Neil Smith have noted, domestic and foreign military operations frequently follow paths of uneven

development in the production of political space. The control and regulation of urban zones, increasingly enacted through diffuse global networks of inter-city coordination, cooperation and influence, constitutes one of the preeminent fields of unfolding contestation in the new millennium. Intersecting with other layers of economic, cultural and ecological practice, installing a form of political justice that attenuates the violent excesses of both state and non-state power within and across city borders is critical to the maintenance of a global urban fabric.

   This chapter discussed two ways a city reaches out beyond its limits: in a direct, quasi-radial way through its surrounding ecology and geography; and indirectly, through the various economic, cultural and political strands that connect it to other urban concentrations of capital. It has also illustrated ways these strands can be unevenly spread and frayed. A sustainable global urban fabric requires reweaving its threads, designing alternative patterns, releasing tensions, untying intractable knots and relieving frictional forces. The next chapter begins to unfold an analytic of that fabric, pulling apart its more abstract layers in order to imagine how new processes of weaving might be practiced.

2.3   Tangled threads of land registration: Phnom Penh, Cambodia

Land tenure for marginalised urban communities is frequently a complex and highly contested issue; and this is especially so in Phnom Penh, the capital of Cambodia. In 1975 the city was forcibly emptied and land, both urban and rural, was appropriated by the state under a policy of brutal and near total agricultural collectivisation (Un & So, 2011). In 1979, after the fall of the regime, people returned slowly to Phnom Penh to reclaim their property, their houses and to the extent possible, their ways of life. In the decades since, Cambodia has seen totalitarian communism give way to a softer form of Vietnam-led socialism in the 1980s, followed by progressive, if slow, movement towards liberal capitalism and integration into the broader global economic and political community (Un & So, 2011). Much of this transition has taken place under a nominal democracy that, in practice, is presided over by Hun Sen's Cambodian People's Party. Land reform has become a centrepiece of Sen's government in the 2000s. While international pressure has been one causal factor, ownership of land is an increasingly politicised issue within Cambodia

itself. According to one source, 420,000 citizens out of a population of 14 million have recently been involved in land disputes across the country (Sisovann, 2008). In Phnom Penh, an estimated 133,000, or 11 per cent of the city's residents, have been evicted from homes since 1990, with 80 per cent of these evictions occurring since the early 2000s (Un & So, 2011). Noticeably these evictions have spiked during non-election years (Un & So, 2011), with land grabbing conducted by political figures being a major cause for complaint. As a belated response to address such abuses, since 2001 Sen's government has introduced a range of laws and registration processes covering land ownership.

Urban communities continue to face uncertainties about whether a determination about their claims to the land they live on will be resolved in their favour, as well as when, exactly, such a determination will take place. 85 per cent of Cambodia's population is rural, constituting the power base of the Cambodian People's Party (CPP). Authorities have accordingly directed processes of systematic land registration, first announced in the 2001 *Land Law*, towards questions of rural ownership. Urban land settlements have been endlessly deferred.

This deferral exacerbates existing tensions over land tenure in the city. Phnom Penh is witnessing a common dilemma of industrialisation: as economic growth causes standards of living to rise, a new underclass of unskilled rural migrants is growing on the urban periphery and in remaining inner-city pockets of undeveloped real estate. And while mean rates of poverty in the city might be relatively low (Hughes, 2008; Un & So, 2011), its underclass is vulnerable in ways that rural populations, with stronger community ties and moderately stable incomes from agriculture, are not. Economic exploitation, exposure to crime and violence (both domestic and institutional), prevalence of child trafficking and sexually transmitted diseases (especially HIV), land disappropriation and forced evictions are among the chief threats faced by Phnom Penh's more vulnerable citizens. As Mgbako et al. note, the city's speculative land market prior to 2008 has made it particularly susceptible to forced evictions through use of 'threats, intimidation, violent force and police detention to suppress community resistance' (Mgbako, Gao, Joynes, Cave, & Mikhailevich, 2010). Resettlement to marginalised and remote areas of the city, accompanied by usually underwhelming compensation (Un & So, 2011), has impacted negatively on the health, education, social cohesion and income opportunities of those resettled (Mgbako et al., 2010). While, on the whole, land ownership seems a less pressing

concern than health, education, safety and income, for urban communities it is intimately connected with these other dimensions of wellbeing. Constant threat of eviction compounds other forms of insecurity and precarity.

Recent Cambodian land rights history is marked by a complex series of legal reforms, pronouncements and projects. Legal provisions to property are stipulated in the most recent *Land Law* legislation of 2001 (The Royal Government of Cambodia, 2001). This has since been supplemented by a number of sub-decrees, circulars and directives, which further specify and adapt legislation to areas in which the original law is vague or silent. The *Land Law* itself distinguishes between 'private' and 'public' forms of ownership and does not recognise any claims to land prior to 1979 (Article 7). 'Public' land is owned by the State, or 'public territorial collectives, public institutions and any legal persons or entities recognized as such by public law' (Article 13). State land, in turn, distinguishes between 'state public land' and 'state private land' (Article 14). Whereas 'state public land' includes land that is of 'public interest use' (including environmental habitats, public utilities, historical or archaeological sites and certain royal properties), 'state private land' can be 'the subject of sale, exchange, distribution, or transfer' (Article 17). The conditions under which these events can take place are covered by subsequent Social Land Concession (SLC) (The Royal Government of Cambodia, 2003) and Economic Land Concession (ELC) (The Royal Government of Cambodia, 2005) sub-decrees. The transfer of property under ELCs, which grant contracts to 'private state land' for purposes of 'agricultural and industrial–agricultural exploitation', has proved particularly contentious, with such transfers frequently linked to key government figures.

In recent years, two further government pronouncements, *Circular 03* and *Directive 01BB*, have sought to clarify land legislation. The circular states that 'local authorities' will pursue identification of 'illegally occupied' State land more aggressively, while at the same time seeking to work with those found living on such sites to 'find solutions'. Similarly *Directive 01BB* appears to respond to criticism of ELCs. It calls for authorities to 'provisionally suspend the providence of ELC' and begin re-evaluating ELC contracts to ensure they do not infringe upon indigenous land and 'citizens' way of life' (Rabe, 2013). In the event that companies with existing concessions are not compliant with their contractual conditions, the Directive also authorises State reclamation of the relevant land. However,

current ELCs are still able to be processed – 33 ELCs have been granted since the Directive was issued (Ky & Agostini, 2013). The combination of the *Land Law* and subsequent clarifications in various circulars and directives appear, then, to offer some legal support and hope to land ownership claimants, including those found residing illegally on State land.

Yet recent commentary suggests conditions on the ground have been markedly different. NGO and academic literature has been critical of the gulf that separates government rhetoric from reality. Critics have accused Sen's *Cambodian People's Party* of presiding over a highly corrupt and nepotistic regime, what Un and So (2011) term a 'neopatrimonial state' that further features 'a combination of a modern bureaucracy and personalized patron–client relationships within a traditional system of patrimonialism'. Underneath a thin layer of respectable democracy and rule of law, authorities are able to act with 'impunity' (Brinkley, 2009). Land grabbing is just one form of a generalised and systemic practice of corruption, which covers almost every sphere of everyday life: employment, taxation, education, health and the ubiquitous presence of beggars (Feinberg, 2009). As Ear notes, corruption is endorsed and exercised even at the highest levels of government: Hun Sen is 'able to use his power and wealth to control the entire democratic process' (2013). A widely documented case of dispossession of 4,250 families from the Boeung Kak Lake area presents a brazen example: reportedly, the Phnom Penh Municipality sold land to a government senator at a sharply discounted rate and existing residents were forcibly evicted (Hughes, 2008). This case highlights the more general contestation over land between 'developers and the dispossessed' in both rural and urban areas (Hughes, 2008; Mgbako et al., 2010). In urban sites, Un and So (2011) note the effects of resettlement are especially acute, as 'displaced settlers are usually forced to relocate to sites far from the city, without access to water, electricity, schools or sanitation and with limited employment opportunities'.

The government's handling of land has been prominent enough to draw attention from international agencies that are usually more conciliatory in tone. Of its decision to withdraw from a jointly operated *Land Management and Administration Project*, despite the successful registration of more than one million households, the World Bank stated it had been 'due in part to delays or lack of implementation of some project activities' (2009). More recently, the World Bank linked its withdrawal directly to the Boeung Kak Lake case, claiming its residents 'were denied access to

due process of adjudication of their property claims and were displaced in violation of the policies the Bank agreed with the Government for handling resettlement' (World Bank Board of Executive Directors, 2011). The UN Human Rights Council has also issued several reports and news releases complaining specifically of the abuse of human rights in cases of economic land concession grants (Office of the High Commissioner for Human Rights, 2007, 2013). While both organisations do note the economic and social improvement effected by the Cambodian Government in the past two decades (Office of the High Commissioner for Human Rights, 2013; World Bank Board of Executive Directors, 2011), clearly these improvements have been unevenly distributed.

'Hard' economic and political measures, such as the World Bank's withdrawal from the LMAP land initiative, have proven to be less effective in light of Cambodia's own economic growth and strengthening links with non-Western powers, notably China (Ear, 2013). It does appear, however, that internal pressure, at least from Cambodia's large rural body, have had some success in forcing the government to increase the speed of systematic land registration. A number of NGO reports have consequently recommended a range of community-oriented campaigns – information sessions on rights, specific land law training, meetings between communities and government, the development of forums for community 'voices to be heard' – as well as the continuation of international pressure and advocacy (Feinberg, 2009; Ky & Agostini, 2013; Mgbako et al., 2010; Rabe, 2013). Several critics have also noted that corruption is not the only problem: 'low technical expertise in land management' and more generally, weak governmental institutions are in part to blame (Ear, 2013; Feinberg, 2009; Un & So, 2011). For Un and So, this is a direct and ongoing legacy of the Khmer Rouge regime, which decimated an educated and professional middle class (Un & So, 2011). Ear (2013) has also suggested that the large number of international NGOs contribute to a crisis in administrative expertise, providing international funds and legitimacy that attract intellectual talent away from government departments and into their own national offices.

The enduring spectres of the Khmer Rouge regime, the large international NGO presence, and the complex overlays of regional neighbours, urban–rural relations and elite interests in Phnom Penh act to complicate and confound the rights of its poor to negotiate better housing conditions. Small-scale agricultural farming operating in the interstices of the rapidly developing city seems likely to be crowded out or

forced out. At the same time, coalitions between NGOs and community groups have begun to advocate publicly for recognition of land rights as an urgent issue. Communities in different corners of the crowded landscape are cooperating to apply pressure to local and city governments, to prosecute their rights to the city. The very act of protest signals the emergence of new political actors into the urban fabric. The situation remains open, convoluted, interwoven.

3

Upholding the Urban Fabric

Abstract: *This chapter begins with discussions of recent treatments of cities as* dispositifs *and* assemblages *and I tease out the implications of these treatments for the more colloquial proxy of fabric. I expand the preferred weaving metaphor into a schematic for articulating how the urban fabric can be analytically understood, stretched across three spatial dimensions and one temporal. I connect this schematic with recent work on a framework,* Circles of Sustainability, *that seeks to describe the domains of cities that warrant sustaining. The resulting matrix offers a pragmatic instrument for critique, assessment or evaluation and suggests ways that a craft of city-making can be rethought. The remaining two chapters take up this challenge in relation to specific areas closely related to craft: technology and aesthetics.*

The preceding two chapters offer largely descriptive accounts of the different forms of relations within and between cities. Both as cause and effect, the multiplication and intensification of these relations have coincided with an extraordinary and dynamic mobilisation of populations, economies, technologies, modes of power and forms of cultural life. Interconnected urban megaregions in Japan, China and India, with populations from 80 to 120 million, approximate to the estimated inhabitants of Europe in 1700, the age of Newton, Leibniz and Jonathon Swift. The combined number of people living in the Tokaido corridor (incorporating Tokyo, Nagoya and Osaka), the Pearl and Yangtze River Deltas and the emerging Mumbai–New Delhi corridor, at around 400 million, now probably exceeds the total world population in 1300, the age of Dante and Chaucer. By conservative estimates, world urban growth is expected at least to double, from three to six billion, by 2050. Much of this growth will accumulate in already large megacities, or in satellite secondary cities that will continue to self-organise into clustered megaregions, in Asia, Africa, the Middle East and Latin America.

Many of the urban spaces expected to house these populations lack the hard infrastructural forms of the modernist city, as well as the emerging modes of sustainable urbanism that sometimes supplement, and sometimes replace, those forms. Informal settlements and unplanned sprawl, coupled with global and local industries, exert new pressures on rural ways of life and ecological habitats that surround these cities. In spite of their demographic growth, they remain on the obscure and insignificant periphery of global attention, except in times of extreme, and therefore newsworthy, humanitarian crises and conflict. Where development takes place, it introduces immense environmental and epidemiological risks. The capitals of India and China, New Delhi and Beijing, rival each other as the most polluted cities in the world.

At the same time, global cities and their tightly woven networks look set to become more rather than less significant to the world's economy and polity. Updates to Sassen and Taylor's studies show New York and London continue to operate as centres of global trade networks, with North American, West European and selective Asian cities remaining at the vanguard of networks of economic and political flows. The world city network is at the same time expanding and embracing new urban regions of considerable wealth and power, especially in Asia, but also in Brazil, parts of Africa and the Middle East. Meanwhile, a separate urban demography is burgeoning in megacities and also in secondary

cities that feed into and from, these globalised urban regions. While the spreading fabrics of the global economy and politics overlap, they are not entirely commensurate with the clustering of human populations into emerging spaces of rapid urbanisation. These new urbanites experience fragmentary and partial glimpses of a dominant world system, through an ever-present mass media culture, the aggressive corporate acquisition of urban land, the proximity of conspicuous middle-class consumption and the growing permeation of mobile telephony. Existence in embedded urban slums, or in basic tenement housing, entails acute awareness of these two spatially overlaid but politically and economically disjunctive world zones. This awareness poses, as Merrifield suggests, a 'new urban question' of how a critical, sustainable and properly transformative new urbanism could be delivered for all world citizens.

Neither the reorientation of Enlightenment ideals under various forms of cosmopolitan theory, nor the coordination of collective action against the impending perils of climate change are possible in a world of stark and multi-layered structural inequality. In theory and in practice, a new kind of global urban fabric needs to be woven. Following Lefebvre and Harvey, under the rubric of 'planetary urbanism' critical geography has sought to articulate its possibilities (Wilson & Catterall, 2014). In a different discursive vein, Ben Barber (2013) and Ed Glaesner (2011) have extolled the possibilities of cities leading the world into a more equitable and sustainable future. A critical and ongoing task is to connect these abstractions with the everyday practices, actions, imaginings, designs, policies, measurements and indicators that signify urbanism at work: to experiment with methods of political and environmental change through world city networks, creating an urbanist variant of what John Law (2004) has called a 'messy' science of the social.

This chapter traces a possible outline through which that science, in the loosest sense, might be practiced. It begins with an extended reflection of the ways the metaphor of 'fabric' can be weaved in with other alternative and more contemporary metaphors of the city. The purpose is to illustrate the complementarity rather than rivalry that such schemes can exhibit, enlarging the range of kaleidoscopic perspectives through which cities and their networks can be viewed. As examples of more theoretically inflected concepts, I contrast recent characterisations of urban *assemblages* and *dispositifs*, and how they might be put to work to treat 'fabric' as a more politically active and theoretically nuanced concept. I then restate more formally the three kinds of relations discussed in the

preceding two chapters and in conjunction with Harvey's theorisation of space and time, discuss how these might be extended with themes of temporality and sustainability. One such possible extension is via work by Paul James, Andy Scerri and myself on an approach called *Circles of Sustainability*. Described in greater detail elsewhere (James, 2015; James & Scerri, 2011; Magee et al., 2013), this approach is introduced here to augment the fabric analytic of urban space and in turn review how the approach itself can be elaborated into the spatial specificity of cities. The chapter concludes by reflecting upon the pragmatic import this analytic device has for the task of sustaining a global urban fabric and considering how practices of city craft might look to remake this fabric in an era of environmental threat and political inequality.

3.1   Reconditionings: *dispositifs*, assemblages, fabrics

Recent efforts to reconceptualise the complexities of the new millennial city offer ways to enrich the metaphor of fabric with further discursive attributes. Two particular examples are worth examining in detail.

In the first example, Bruce Braun (2014) adapts Foucault's term *dispositif* to the urban situation. Meaning more than its standard English translation of 'disposition', *dispositif* here refers to the 'system of relations' between various mechanisms and discourses of power (Foucault, 1980). For Braun, it is necessary to introduce a new conceptual apparatus precisely because governmental power is itself increasingly preoccupied with different spatial scales and relations: 'with global urbanization continuing apace, it is the "city" and the "globe" – and the relation between them – that increasingly presents itself as the most pressing concern, such that government today frequently involves strategies by which to understand and manage the effects of each on the other' (2014, p. 61). It is through the discourses of climate change particularly that Braun observes these different relationalities emerge, in the negotiations between urban citizens, local and national governments, multinational corporations and global governmental forums. In contemporary discussions of urban resilience, Braun locates the development of an 'eco-cybernetic' urbanism, where the city is linked through a series of feedback loops to global climatic and governance systems. Resilience discourse marks the complicated agenda of managing these systems of

relations, 'with its concern to keep humanity within its "safe operating space" (the system observed in terms of carbon emissions and their *global* effects) while at the same time producing flexible institutional, social and spatial forms that can withstand shocks (the system observed in terms of climate variability and its *local* effects), that today connects diverse and at times contradictory urban practices into a *dispositif* or "system of correlation" ' (Braun, 2014, pp. 50–51 – author's emphasis). The variegated and 'multilinear' aspects of the urban *dispositif* mean that a 'singular politics of "opposition" ' (Braun, 2014, p. 52) is no longer sufficient for enacting change in the world city system. Braun instead cites Agamben's claim that we have reached a point of the 'eclipse of politics', a point at which a form of bi-partisan and 'postpolitical' managerialism holds sway. The only response is to make tactile the various lines and interconnections of the *dispositif*, to wrest out alternatives to the current self-replicating *status quo*. This involves interpreting and modulating different forms of materials and practices that this *status quo* produces, engaging in what Braun terms, again following Agamben, 'profanations': new uses of those materials, alternative practices, play and experimentation.

In the second example, Colin McFarlane (2011) employs the closely related concept of *assemblage*. In its concrete elaboration as a conception of the city, assemblage has three 'starting points'. First it sees urban 'sites and actors' as not simply 'relations' but as constituted by 'depth'. Depth here has two senses: a temporal depth of historicity, under which present 'trajectories' or 'alignments' of the city have been shaped; and a further depth of potentiality, a sense in which these same trajectories could have been, and could yet still be, otherwise (McFarlane, 2011). Assemblage here differs from networks, which for McFarlane still connote a conceptually unproductive and atemporal rigidity, with little room for residues of the past or promises for the future. The second starting point emphasises the processual character of urban assemblages, consisting of 'doing, performing and events' (McFarlane, 2011, p. 655). Assemblages here encompass a broad range of temporal happenings, from Braudel's *longue durée* periodisations through to the minutiae of 'random juxtapositions and disruptive events and predictable daily and nightly rhythms of activity, atmosphere, and sociability' (McFarlane, 2011, p. 655). The third starting point is that urban assemblages are marked by uneven relations of 'power, resource and knowledge' (McFarlane, 2011, p. 655). This political relationality simultaneously produces and destroys different urban 'ways of life'. These three starting points of depth, temporality and power

relations offer an analytic that can 'serve to expose which groups and ideologies have the greater capacity to render urbanism in particular ways over others, and therefore offers a ground for thinking how the city might be assembled differently' (McFarlane, 2011, p. 668).

While examining the city through different theoretical optics, both Braun and McFarlane's accounts lend critical attributes to the home-spun alternative of the urban fabric. Braun's discussion of resilience, eco-cyberneticism and multilinear opposition can be carried across to the idea of a multiplicity of fabrics that endure or fray, that encompass natural and social complex systems with feedback loops and that also are woven together in different ways, requiring different strategies to intersect or sever them. The temporality and potentiality of McFarlane's assemblages cross over to fabrics that also accumulate histories, residues and accretions that vibrate, quiver and hum with potential activity. If, for McFarlane, networks lack flexibility, this need not be a criticism that adheres to fabric and other products of woven craft: these are, quint-essentially, foldable, stretchable and pliable. Finally, the metaphor of fabric operates also as a way for conceptualising power relations and indeed relationality as such. Relations can bind individual actors in ties that are either strong or weak (Granovetter, 1973) and can knit together communities either tightly or loosely (Putnam, 2001). While power is often understood through metaphors of physical fluids and liquidity, as a substance that influences and is exerted and exercised, it also can be conceptualised relationally through the pulling of strings, arrangements that are binding, politics of entanglement and ties that can be forged or severed.

3.2   An analytic for a global urban fabric

While ostensibly dealing with the themes of urbanisation and globalisa-tion, the first two chapters also describe three different modes through which relations of urban spaces are mediated. Termed here the *metro-politan*, *ecopolitan* and *cosmopolitan*, these modes are now formulated in a more systematic fashion. This treatment prepares the way, in turn, for how the fabric object might be remodelled, in the remaining two chap-ters, through computational procedures and alternative design patterns.

Metropolitan relations: The *metropolitan* characterises how people relate to the city itself: to residential, commercial, industrial and

government buildings; to facilities for education, health, retail and recreation; to transport and logistical networks; to the semi-visible infrastructure for delivering power, water, communications and waste removal; and to clubs, groups, societies, associations and other networks, both formal and informal, that cut across lines of age, class, gender and ideology. The singular city is the central unit of analysis of urban studies; from a vast literature, examples already discussed include Harvey's (2003) account of Haussmann's reengineering of Paris, Kidambi's (2007) study of transitions in Bombay and Murray's (2011) analysis of post-apartheid Johannesburg.

Ecopolitan relations: Adopting the term from Downton (2008), the *ecopolitan* describes relations between the city and its ecological surrounds: its intersections with coast, hinterlands, rivers, parks and atmosphere; demands it places upon its environment, in terms of energy inputs and waste outputs; its engagements with local and imported flora and fauna; its affective associations with the natural habitat; and its myriad of familial, social and cultural ties to the encompassing rural land and communities. The rise of environmental movements, and public concerns about fuel emissions, heat island effects and the sustainability of cities, have brought renewed attention to questions of urban ecology. As Wachsmuth (2014) notes, divisions between city and country are endemic to 'urban social science'. While ecopolitan relations encompass this traditional distinction, it is also imagined as extending to encompass global as much as local or regional spatial spans, bringing into focus the impacts of cities on global climate change and pollution. Examples of the complex interplay between cities and their environments include Braudel's (2002) analysis of Mediterranean cities, illustrating how cities as diverse as Barcelona and Beirut, Marseille and Cairo, and Rome and Tripoli were linked together through their shared relations to the same body of water; and Ross' (2011) more recent study of the ecological sustainability of Phoenix, Arizona, including the pressures brought to bear by urban growth on water politics throughout the United States.

Cosmopolitan relations: The *cosmopolitan* describes how one city intersects with others, through transnational links of trade, political and historical associations, expatriate networks and migration patterns and artificial sororities; how global flows of power, goods, tourists, media and military interventions create new and complex networks; and how cities increasingly participate in shared territorial and ecological custodianship. Such inter-city networks have been studied as far back

as Thucicides' history of the Pelopennesian wars, conducted between rival city states. Sassen's account, discussed in Chapter 2, represents a significant pivot point at which the city could be understood to relate to a global system without mediation through the nation state. In the two decades since, critical attention has been directed towards processes of agglomeration and concentration in global cities; comparative studies between cities; the proliferation of city ranking systems; and the rise of new cosmopolitanisms.

Although presented as analytically and categorially distinct, as with any set of categories, the boundaries between these relations are blurred. Suburban sprawl, peri-urban and informal settlements, and the *desakota*-style build-up of business and residences around road and riverine arterials extend the city distantly into its hinterlands. In the extreme cases of conurbations and megaregions, the hinterlands are overlaid completely, becoming a sparse interstitial space – the metropolitan encompassing the ecopolitan. The broader ecological footprint of cities also continues well beyond the territorial extent implied by the traditional geographical concept of 'hinterland'. Here, the ecopolitan influences and becomes imbricated in the cosmopolitan. Global climate change is the now paradigmatic case of the combined outputs of cities impacting upon a system functioning well beyond their territorial limits. The networked economy and mass media culture represent, at the other extreme, how cosmopolitan relations end up permeating almost every human society, regardless of its inclusion in or identification with urban settlements. The ecopolitan and cosmopolitan relations both have global effects, but these are expressed in different ways: the ecopolitan extending out from, and returning back to, the physical site of the city; the cosmopolitan instead connecting out through networks where influence need not correlate to physical proximity. To take the base case of the two leading global cities, New York and London have tremendous regional influence over the North East of the United States and South East regions of the United Kingdom respectively. Yet despite being separated by the Atlantic Ocean, in other fields, notably in finance, media and international diplomacy, they exert tremendous influence over each other. Their mutual connectivity is stronger than with other cities – for example, Toronto in the case of New York, or Copenhagen in the case of London – that are geographically more proximate.

These three sets of relations are, then, themselves closely interwoven; together, they help articulate how different forms and scales of urban

fabrics can be understood as they stand, and imagined as they could be otherwise. They also refer to a number of prior formulations of urban spatialities. They correspond, for example, to the global, regional and metropolitan scales of 'spatial polarisation' identified by Friedmann (1986, p. 76), or, in the case of ecopolitan and cosmopolitan, to what Taylor has distinguished as the 'hinterlands' from his neologism of the 'hinterworlds'. Whereas for Friedmann, these scales progressively radiate out from the core of the city, here the ecopolitan and cosmopolitan relations operate along different spatial geometries. Taylor's nomenclature approximates more closely, though again the term 'hinterworld' appears like a spatial extension of 'hinterlands', rather than a different form of relationship entirely. A further relevant distinction, discussed again below, is that which Taylor draws from the work of Castells. Here, the ecopolitan can be seen as corresponding to the tessellated mosaic pattern Taylor associates with Castells' 'space of places', while the cosmopolitan corresponds to the synaptic network pattern of 'space of flows' (2004, p. 31). Spencer's (2015) recent discussion of 'patches' and 'corridors' is yet another possible conceptual overlay.

Temporal relations

To these three modes of relation, this chapter adds a fourth, that of temporality, and the closely associated theme of sustainability. If the metaphor of fabric holds descriptively for how the world's cities can be characterised, here it begins to be operationalised in a normative sense: *sustaining* a global urban fabric over time begins to involve the ethical injunction to lift up and carry the world. This temporal dimension is at the heart of much sustainability discourse. As a critical example, the most influential definition of sustainable development, devised by the Brundtland Commission (Burton, 1987), includes two key normative concepts. The first seeks to address the 'concept of "needs", in particular the essential needs of the world's poor'. This responds to issues of uneven development across all spatial scales, touched upon earlier in the discussion of urban relations. The second invokes the problem of time: 'the idea of limitations … on the environment's ability to meet *present* and *future* needs' (Burton, 1987 – my emphasis). Transposed to the metaphorical schema developed here, to sustain the global urban fabric involves both distributing resources across its threads and layers more equitably in the

present and ensuring that it can be continually rewoven and refabricated equitably in the future. First space, then time: in this canonical definition of sustainability, both are intrinsic.

Concerns about the temporality of cities haunt the popular and critical imagination. As markers of the fragility of civilisation, the urban ruins of Pompeii, Rome, Angkor Wat, Machu Picchu and Tenochtitlan have long held a fascination for poets, painters and writers. The bombing of Nagasaki and Hiroshima announced the possibility of instant annihilation of a city and instigated a new genre of apocalyptic art and fiction. A recent spate of articles and documentaries dramatically illustrate 'Life after People' (Vries, 2008) or 'Earth after People' (Weisman, 2005). More mundane anxieties have amplified in the light of terrorist attacks on major world cities, setting in motion aggressive new forms of technological surveillance and prompting a revisiting of questions of multiculturalism and religious tolerance. Global warming also acts as a provocation to city mayors, to consider what impacts an increase of two to three degrees might have on infrastructure, health and the economy. As much as the processes of urban expansion continue to demand attention, equally the diminishing of populations in Detroit, Baltimore and other former industrial centres in the North East of the United States raises questions concerning the future of cities bypassed in the shiftings of world trade. While the modern urban built environment encourages images of permanence and stability, in practice cities continue to adapt, reassemble and sometimes even shrink.

3.2.1   Elaborating Space and Time

The one temporal and three spatial relations presented here can be further developed. One possible elaboration is via the theorisation of the abstract categories of space and time that comes through the recent Marxist geography tradition, represented in the work of Harvey and Lefebvre. In *Cosmopolitanism and the Geographies of Freedom*, Harvey (2009) offers an extended discussion of these categories.

Following Lefebvre, Harvey introduces his discussion with distinctions between *sensed*, *conceptual* and *lived* space. Sensed space is what is perceived, how material objects appear to us, as they are felt, seen, heard or otherwise acknowledged in some distant or proximal location in relation to our bodies. This only approximates to conceptual space,

of what can be measured and represented objectively through 'codes, concepts and abstractions' (Harvey, 2009, p. 142). As Descartes famously illustrated, sensory perception can be mistaken or deluded – conceptual space aims to correct that fallibility through scientific instrumentation. Lived space stands in contrast to both: it identifies the affective space as experienced by humans, replete with fears, hopes, desires, memories, anticipations and aspirations (Harvey, 2009, p. 142). In the language of Husserl and Habermas, both sensed and lived modes reflect the phenomenal space of the *lifeworld*, or how *I*, as a particular ego in the world, experience and relate to space. Conceptual space is instead the space that is scientific, quantifiable and measurable, belonging to the objective *system* that stands in conceptual opposition to the subjectivity of the *lifeworld*.

This more abstract formulation intersects obliquely with the three kinds of *urban* spatial relations presented above. Metropolitan, ecopolitan and cosmopolitan relations can each be sensed, conceptualised and lived. Canonical accounts of the cosmopolitan, Sassen's global cities and Taylor's world city network, have been analysed through the abstraction of financial flows between cities, paradigmatically through the locations and transactions of the amorphous postindustrial provider service firm. Here it might appear that the cosmopolitan can be best understood conceptually, through measured and abstracted forms of space. Where and how a legal, accountancy or advertising firm sets up business may have little immediate connection with the intimate concerns of people working and living within the city's confines, or moving back and forth between town and country. While a thin layer of the global urban elite might sense and live across multiple world cities on a continual basis, these are hardly constitutive of the broader world urban experience. Indeed, Harvey argues, cosmopolitan*ism* risks becoming a form of universalism projected by the jetsetting classes, an 'ethical and humanitarian mask for hegemonic and neoliberal practices of class domination and financial and militaristic imperialism' (2009, p. 84). Yet this should not suggest firm networks are the only lens through which the cosmopolitan, global or world space can be viewed. As Sassen has argued more recently, globalisation also consists of 'multisited, transboundary networks and formations' that include 'networks of activists', 'international human rights instruments' and 'forms of global politics that remain deeply attached to or focussed on localized issues or struggles' (2006, p. 3). As Harvey also notes, an egalitarian cosmopolitanism

involves 'a radical transformation in its geography', or in the terms outlined here, a democratising of the global as much as other levels at which cities increasingly operate. Even the cosmopolitan, then, can be constituted as sensed and lived, as well as conceptualised, space.

As with the three spatial dimensions, the *time* of cities is not a simple category. The basic trichotomy between past, present and future tenses are not mere parts of a chronological timeline or tale of a city. As Harvey notes in relation to Marx, 'in revolutionary situations, such as that of 1848, he worried, for example, that the past as memory might weigh like a nightmare on the brain of the living' (2009, p. 148). The anticipated and projected futures of a city determine similarly the planning of government departments, the relocations of firms and the hopes and fears of its citizens. Both pasts, recorded and imagined, and futures, planned and desired, bear upon a city's present. Again, from what Taylor has termed the 'egological' perspective of a single city, different relations surface and subside according to not entirely predictable rhythms. The collapse or weakening of regimes can simultaneously weaken bilateral and multilateral relations between cities. In the several decades since the fall of the Soviet Union, Moscow's relations to domestic affairs and neighbouring state cities have grown rather than diminished, while its attention to satellite communist cities such as Havana have fluctuated without disappearing entirely (Bain, 2006). Isolationism in general can be seen as a trading off of the significance of cosmopolitan for ecopolitan and metropolitan relations. Expanding globalisation, in turn, entails a thickening of the cosmopolitan relations between urban centres of world trade. At least since the nineteenth century, the periodicity of this expansion has had tremendous effects on ecopolitan and metropolitan relations. These fluctuations further warrant the attachment of the temporal dimension to an expanded theorisation of sustainability.

As with space, Harvey's presentation of time is also presented as a triplicate of temporal modalities. Here he distinguishes between absolute or Newtonian space and time, relative Einsteinian space-time, and what he terms, following Whitehead, relational space-time. In the first of these, objects fill the otherwise void of *absolute space*; and they occupy space along a continuum of *absolute time*. The second modality takes up Einstein's fusion of *relativised space-time*, in which the elapsing of time can vary for an object depending upon its velocity relative to an observer and the presence of strong gravitational force. Rather than

things enduring *in* space and *over* time, they occur as events in four-dimensional space-time. The third modality Harvey introduces is *relational space-time*. This modality follows philosophical hints in Leibniz and Whitehead, in which 'space and time are internalized within matter and process' (Harvey, 2009). In Whitehead's abstract formulation, entities are intrinsically relational, where 'a "relation" between occasions is an eternal object illustrated by the mutual prehensions by virtue of which those occasions constitute a nexus' (1978, p. 194) and 'this nexus includes its locus of judging subjects and also its logical subjects' (1978, p. 195). For Harvey, this particular relational modality offers a privileged way for understanding the intersubjective 'idea of the city', since 'there are certain topics, such as the political role of collective memories in urban processes, that can be approached only in this way' (Harvey, 2009, p. 140).

These modalities cut orthogonally across Harvey's earlier discussion of three kinds of space and equally could cut across the three kinds of spatial relations of the metropolitan, ecopolitan and cosmopolitan introduced above. The precision of where these abstractions align is less critical than the acknowledgement of how the different modalities might operate across different relations, constituting also different political contestations over how urban space and time are best utilised and experienced.

3.3 Weaving sustainable urban futures

Returning to the analytic fabric, from the perspective of what Taylor terms the 'egological' perspective of the city itself, each of these four relations corresponds to a broad connective strand, reaching out through space or over time, that is itself a myriad of threads that compose the city's interwovenness. Summarising the previous sections, these strands include:

- ▸ The interior, *metropolitan* relations the city has to itself
- ▸ The outwardly-radiating *ecopolitan* relations the city has to its surrounding natural and social habitat
- ▸ The interlinked *cosmopolitan* relations the city has to other cities
- ▸ The continuing *temporal* relations the city has towards its history and future

The interconnections and dependencies between these strands suggest questions of urban sustainability cannot be thought simply as the maintaining of a given spatial area over a linear period of time. It must instead be imagined as multiplicitous, suspended across different sets of relations, tying in with different groups of actors operating with assorted goals and stretched out along different spatial and temporal horizons. It is no longer adequate to see cities simply as self-contained entities, ignoring the increasingly critical ways in which they are embedded in ecological and cosmopolitan relations. The traditional separation of urban studies from disciplines that employ alternate framings of nations, international relations, globalism, demography and environments risks, in Taylor's words, 'reifying' the city, undertaking a form of methodological individualism that ignores the ways in which the urban object is affected, intersected and becomes multiple. The success or failure of the city comes to be viewed as the success or failure of its powerful elite, its business culture, or more often, its errant inhabitants. The city of Detroit is all too easily critiqued for its shortsightedness in not predicting the collapse of its car manufacturing industries (Martelle, 2012). Conversely, the local government of Parramatta is praised for its enterprising leadership guiding the city forward. Both Taylor's emphasis on networks and Harvey's considerations of relationality point to the limits of this separation. Against such simplistic judgements, Detroit and Parramatta are both clearly subject to demographic shifts, political dependencies and the ravages of an unpredictable world economy – manufacturing relocating to East Asia, with a corresponding mining boom in Australia – as well as a range of other causal forces. Opening out the frames of reference for thinking about cities encourages more pluralistic explanations and explorations.

To introduce other qualitative dimensions into this analytic of interwoven cities, in the remainder of this chapter I summarise an approach termed *Circles of Sustainability*. First articulated by Paul James and Andy Scerri (2011) and later developed by those authors, myself and others (James, 2015; Magee, Scerri & James, 2012; Magee et al., 2013), the approach is coordinated within a broader program of what, following Clifford (1983), we have termed 'engaged theory' (James, 2006): theory as a instrument for change as well as a system of categories for interpretation.

The case for *Circles of Sustainability* begins with a critique of the well-known *Triple Bottom Line* (Elkington, 1998), a widely used accounting model that adds social and environmental 'bottom lines' to the conventional financial practices employed by corporations and governments. James and Scerri (2011) argue these additional categories simply extend an existing audit culture and calculus, losing their qualitative distinctiveness in becoming subordinate to the dominating quantitative logic of finance. In its place, they recommend a schema consisting of four domains of social practice: economics, ecology, politics and culture. These operate according to distinct registers that are irreducible to each other. In particular, ecological health, political rights and cultural meanings cannot be treated as mere economic or transactional commodities. These other domains therefore do not have bottom lines, though as the *Circles* approach has it (2015, p. 53), they may be quantifiable. These are framed by the master category of the *social*, an inescapable background that orients all discussion of sustainability: 'social life should be understood holistically across these interrelated domains' (James, 2015, p. 53). James ventures definitions of each of these four domains as follows:

▸ *Ecology*: The ecological is defined as a social domain that emphasises the practices, discourses and material expressions that occur across the *intersection between the social and the natural realms* (James, 2015, p. 52 – my emphasis).
▸ *Economics*: The economic is defined as a social domain that emphasises the practices, discourses and material expressions associated with the *production, use and management of resources* (James, 2015, p. 52 – my emphasis).
▸ *Politics*: The political is defined as a social domain that emphasises practices and meanings associated with basic issues of *social power as they pertain to the organization, authorization, legitimation and regulation* of a social life held-in-common (James, 2015, p. 53 – my emphasis).
▸ *Culture*: The cultural is defined as a social domain that emphasises the practices, discourses and material expressions, which, over time, express the *continuities and discontinuities of social meaning* of a life held-in-common (James, 2015, p. 53 – my emphasis).

Each of the four domains additionally disaggregates into a range of seven 'perspectives' and further 'aspects', and are also cut across by a set

of seven 'social themes' that add a normative basis for 'judging what is ethically good' (James, 2015, p. 78). As one example, the domain of *ecology* contains the following seven perspectives:

- ‣ Materials and Energy
- ‣ Water and Air
- ‣ Flora and Fauna
- ‣ Habitat and Settlements
- ‣ Built-Form and Transport
- ‣ Embodiment and Sustenance
- ‣ Emission and Waste

This generalised schema can be applied to a broad range of social systems and units of analysis, but its most systematic elaboration is the twin context of globalisation and urbanisation, in a volume by James (2015) that also features contributions from Scerri, myself and others.[1] As James argues, globalisation carries at least three dimensions: it is relational, spatial and variable. This generalised process intersects with cities: 'cities are crossed by different kinds of globalization processes' and are 'increasingly global whether they like it or not' (James, 2015, p. 30). Yet they are not inert; they 'have choices – constrained choices – about how they deal with these different forms of globalization' (James, 2015, p. 30). Reading against the grain of discourses that extol those cities that are more or less global according to the extent of their economic gravitational pull, for James *all* cities now necessarily participate in networks that reflect forms of economic, ecological, political and cultural practice. Just how they enact and adapt these practices in turn reacts back upon the stitches and seams of the relational global fabric they are enmeshed within. The contemporary character of globalisation ensures cities are interwoven.

In joint work, we have looked to connect this theoretical framework with a series of methodological instruments for measuring, assessing and evaluating urban sustainability (James, 2015; Magee et al., 2012, 2013). James has also acknowledged that his 'analysis needs to be accompanied by recognition of the possibility of the changing and layered nature of spatiality across all kinds of locales' (James, 2015, p. 83). Precisely at the urban level, however, the approach has lacked a detailed treatment of what this 'layered nature of spatiality' might consist of. Combined with the temporal dimension, the distinctions between metropolitan, ecopolitan and cosmopolitan 'layers' provide one possible elaboration.

Table 3.1 presents both sets of four concepts in a matrix format. Building upon the relational character of the urban fabric presented above, it also suggests example questions for interrogating these relations qualitatively or quantitatively and across manifold levels of space and time.

As Harvey notes, matrices flatten out the complexities of theoretical formulations (2009, p. 145). The table ignores, for example, the different

TABLE 3.1   *Combining* Circles of Sustainability *with the urban fabric analytic*

	Ecology	Economics	Politics	Culture
Metropolitan	How does the city relate to its interior natural resources – parks, rivers coast and wildlife?	How does the city relate to its budget, rates, inequality and use of resources?	How does the city relate to issues of governance, participation and corruption?	How does the city relate to diversity, arts, entertainment and ideologies?
Ecopolitan	How does the city relate to the surrounding hinterlands – farms, forests, lakes, deserts and events such as climate change?	How does the city relate to the surrounding regional patterns of production, consumption and distribution?	How does the city relate to different layers and levels of power – state, national and regional?	How does the city relate to neighbouring cultures, differences and ideologies?
Cosmopolitan	How does the city relate to the geographies of other cities, along with transit routes between them?	How does the city relate to competition for labour and industry, as well as opportunities for partnership and collaboration?	How does the city relate to shifting configurations of power and allegiance with other cities?	How does the city relate to the beliefs, laws and world-views of other cities?
Temporal	How does the city relate to future patterns of environmental and climate change?	How does the city relate to its own financial forecasts projections as well as anticipated shifts in the world financial system?	How does the city relate to planned or eruptive changes in power and authority?	How does the city relate to its memories and heritage and look towards its future destiny and symbolic place in the world?

spaces Harvey adopts from Lefebvre (sensory, conceptual and lived space) and the temporal modalities he then elaborates (absolute time, relative space-time and relational space-time). It also ignores the more detailed perspectives, aspects and social themes that James unfolds, as well as his own categorial presentation of 'lived space' – what he terms different 'ontological formations', the 'ontologically different dominant patterns of living' that 'constitute how one inhabits that space' (James, 2015, p. 83).

There is, however, value in the very simplicity this matrix depicts. It offers one way of interpreting the city multidimensionally, along different spatial and temporal dimensions and against different domains of sustainability – one means for making good on the interpreting of the city as an object of a 'messy science' (Law, 2004). The questions that fill out the matrix cells suggest ways individual cities can be examined against these dimensions. Other questions, methods, indicators and models could be readily substituted, attuned to specific cities, projects, issues and complaints. A central requirement is the participation of multiple urban actors in discussing and determining what these questions might be: how, in the specific instance of the city, it imagines its ideal conditions over time and space and how these might be arrived at or enacted across different fields of economic, ecological, cultural and political activity. A critical accompaniment to the construction of sustainability issues and indicators is therefore the incorporation of robust processes that seek greater democratic involvement and inclusion (James, 2015, pp. 107–121; Magee et al., 2013). As the next two chapters illustrate, other processes of inclusion – open source movements, participatory budgeting, co-designing of urban space, 'bottom-up' determinations of funding and resource allocations and cross-sector collaborations – constitute significant threads in the weaving of a renewed urban fabric.

3.4   Refabricating the interwoven city

Modern cities are commonly imagined as impressive and awesome, but equally, as forlorn and austere arrays of concrete vertical towers, a spectacular but inhuman theatre. Beyond the city perimeters, the massed connections to its surroundings and to other cities increase the daunting task of imagining how they might be configured otherwise. In place of metaphors of hardness, obduracy, solidity and concreteness that have

traditionally accompanied urban development, this chapter has looked to elaborate the possibility of an alternative metaphorical scheme based on weaving, cloth, texture and tapestry, at once familiar and renovated through recent contributions to critical urban theory and sustainability. The arguments for global cities, world city networks and planetary urbanism imply the city is hollowed out of its substantive content and is instead increasingly defined by its relationality. The city is imagined as a complex interwoven arrangement of these relational threads stretching across three spatial extents, a temporal dimension and four domains of social life. The concept of sustainability is similarly reimagined as a task of sustaining these fabrics over space and time, an active process of reworking, recrafting, restitching and reassembling. This basic pattern can be further layered with different divisions of space and time, in the ways suggested by Harvey (2009), or with further elaborations of perspectives, aspects and formations, as suggested by James (2015).

As metaphors for urban relations, fabrics suggest numerous extensions. As suggested earlier, strong ties bind together human relations into networks and weak ties can associate across these networks (Granovetter, 1973). Bonding social capital resides within tight-knit communities; bridging capital links disparate groups (Putnam, 2001). They describe equally, the quilt-like mosaic patterns of Castell's 'space of places', where place 'is a locale whose form, function, and meaning are self-contained within the boundaries of physical contiguity' (Castells, 2011, p. 423) and the tangled web-like network patterns of the 'space of flows', where flows are 'purposeful, repetitive, programmatic sequences of exchange and interaction between physically disjoint positions held by social actors in the economic, political, and symbolic structures of society' (Castells, 2011, p. 412). Fabrics stretch from the city to the planetary; speaking of the 'neo-Haussmannization' occurring in the new millennium, Merrifield argues the combined forces of corporate elites and national governments 'create a global orthodoxy, one that's both creating and tearing apart a new urban fabric, one that clothes the whole world' (2014, p. 6). They can also be malevolent; they are surfaces that can suffocate, induce frictions, become entangled, frayed, or severed and develop sporadic or sustained frailties and tensilities. 'Uneven development' (Smith, 2008), 'fragile cities' (Muggah, 2014), 'geographies of nowhere' (Kunstler, 2013), and 'splintering urbanism' (Graham & Marvin, 2001) are examples of spatial and urban figures of speech that can be readily reappropriated to metaphors of fabric, textiles and interwovenness.

Equally, fabrics lend themselves to being reworked. In a recent discussion about assemblages, Saskia Sassen and Aihwa Ong (2014) invoke the craft occupations of 'the carpenter and the *bricoleur*' to describe their scholarly work. For Ong, 'the space of problematization and intervention is the space of the assemblage and this is not true of the scholar but also of practitioners – the experts, as it were – whose job it is to configure a space of problematization and they do this through the assembling, reassembling, disassembling of different tools, different ideas that can work to solve the problem' (2014, p. 5). Having found 'a space of problematization' the *bricoleur* picks up 'the tools that are at hand' (2014, p. 28). Along similar lines, people – 'scholars', 'practitioners', 'experts' and also anyone whose path intersects with the threads of the city – can also adopt and adapt tools 'that are at hand', to mend, weave, thread and sew different strands. If cities are like complex interwoven objects – if they come together, as the most common articulation of the metaphor suggests, as an urban fabric – then it must be simultaneously possible, when the design of a city runs astray, to unwind, unweave, unstitch, untie and untangle them. An interwoven city is an object that can equally be unwoven and rewoven again.

This is not to ignore what is an obvious counterexample: sustainable cities are also clearly physically resilient and durable in important ways. Brick houses, concrete highways and steel and glass office towers are not accidental impositions of a particular set of aesthetics and technologies, but real and material protections and efficiencies a city affords its citizens. Rain is less liable to wash away housing; bushfires are less likely to ravage timber constructions; concreted stormwater drains limit flooding. Fortressed constructions withstand internal and external security threats (Graham, 2011). Multilevel concrete, steel and glass constructions support higher concentrations of populations, which in turn accelerate and intensify technical innovation and industrial production, minimising the cost and complexity of administering and distributing water, power, health, education and other essential services. The firm foundations of modern cities therefore provide some measure of resilience against natural and social hazards. It is precisely the relative permanence, the obduracy of cities that renders them so useful to contain and house an ever increasing number of people.

Yet just as this obdurate character, which inheres in the modernist city *par excellence*, is not only the result of technology and aesthetics,

these two fields constitute critical vectors along which the city form has developed and is open to development in the future. Afforded by steel and reinforced concrete in the late nineteenth century, the possibility of buildings soaring above six stories coincided with the rise of the quintessentially global city, New York. It brought about the sudden production of a new austere aesthetic sensibility, lauded in the skyscraper and the city skyline. The permanence of their form and function is an illusion. Skyscrapers are estimated to have lifetimes of 50 to 100 years and their purposes can be drastically adapted, famously in the case of Torre David, to become a vertical slum. Even these most iconic features of the urban landscape remain, so to speak, woven: the stitched-together blueprints created with drag-and-drop CAD software; the artificial materials of steel, reinforced concrete and glass; the infrastructural plumbing, wiring and wave frequencies that transmit telephony, radio, television and data; and the social practices of engaging with elevators, escalators, electronic doors and other conveniences that adorn modern buildings. These sociotechnical entanglements are products of complex design and fabrication processes – processes that are continually being rewoven under the pressures of technical innovation and changing taste.

On the one hand, as Böhme argues, the invasion of 'technification', in various guises, brings considerable risks to fabric of cities. Macro processes of technification, globalisation, urbanisation and trade liberalisation may be irreversible, at least within the time frames of global 'tragedies of the commons' like climate change. On the other, technological and aesthetic experimentation is vital to alternative global urban design and practice. Whatever the prospects might be for a global 'urban revolution', in Harvey's terms, other options need to be canvassed. Examples of these options include numerous forms of innovative urban practice: low-cost fabrication methods, maker cultures, nondeterministic approaches to urban simulation and modelling, open source movements, hacktivism, cross-pollinated technology transfer, participatory budgeting and acknowledgement of greater global eclecticism and heterogeneity in the arts and related affective infrastructures. All of these present some level of remedy to the economic disparities, political inequities and ecological damages the unfettered growth of the modernist city has produced. The next two chapters consider these emergent critical instruments in the craft of the urban.

3.5   Child trafficking on the new front of global urbanism: Siliguri, India

Siliguri is a fast growing city located in the narrow stretch of land, the so-called 'chicken's neck', connecting the North East to mainland India. It is close to the borders of Nepal (80 km) and Bangladesh (10 km) and provides a rail and road transit point from mainland India to China, Bhutan and South East Asian neighbours. It is one of hundreds of cities emerging across the Asian continent in response to rapid market liberalisation, the increasing mechanisation of agriculture and the lure of 'bright lights', heralding freedom, excitement and new prospects. Its population exceeds those of Baltimore and Detroit, yet aside from being a tourist drop-off point, it barely registers on the world lists of cities. It is quickly acquiring the transport infrastructure to support its role as a hub or liaison point for trade and tourism. In and around its connective apparatus of railway stations, highways and hotels, old and new slums accumulate with minimal access to sewerage, fresh water, formal employment and education. Young people and children congregate around railway stations and highways, selling wares or trying to extort 'fares' from passing vehicles. Rural poverty, corruption and porous borders act as inducements to child trafficking. The prevalence of infrastructure accelerates the ease with which child trafficking networks can move human cargo to the larger urban centres of Kolkata, Mumbai and New Delhi. Demand for domestic servants, small hands for textile factory labour and child prostitutes provide incentives for agile operative chains to seduce children, bribe parents and authorities and intimidate opposition. Government corruption, acknowledged by NGOs but difficult to prove and prosecute, smoothes over the hitches that police, security and NGO forces might present.

The increased trade within India and with neighbouring nations has led to Siliguri experiencing tremendous growth over the past 20 years, from a population of about 250,000 to somewhere in excess of one million today. This growth has manifested itself in several visible ways in the city. Unlike more established Indian cities, Siliguri has little colonial-era architecture or evidence of heavy manufacturing industry. Instead it presents itself as a bustling commercial city, with nondescript downtown hotels, office blocks, ubiquitous board advertisements, congested traffic on narrow roadways and street side traders. The Darjeeling tea-growing district, and beyond, the foothills of the Himalayas, draw foreign tourists.

To accommodate them, the city has developed extensive transport links, including a nearby airport, a major railway line and roads connecting through to the northeast area of India.

Informal slum settlements sprawl in the interstices of the established city, as well as on its newly formed fringes. Relatively established slums contain brick buildings and some semblance of communal infrastructure: running water, basic schooling facilities and religious buildings. Communities are more cohesive and leverage their collective voting power to negotiate with the city. Elsewhere, such as in the fields near the main railway station, New Jalpaiguri Station, conditions are far more basic. Houses are makeshift and there is neither running water nor sewerage. Young men act as informal authorities policing cars driving towards the station, looking to extort 'fees' or 'fines' from unwary vehicles. In other outskirts of the city, new waves of apartment blocks are under construction.

Both internal resettlement, much from the North East regions of the country, and external migration, from Nepal and Bangladesh, fuel rapid growth in Siliguri. The cultural composition of the city is accordingly eclectic, with over 46 distinct languages spoken. This growth has also produced administrative pressures, as Siliguri now straddles the neighbouring districts of Darjeeling and Jalpaiguri and must therefore account to two government bodies. The city's gateway status continues to draw in further migration, as growing regional throughputs of trade and produce stimulate formal and informal economic activity alike.

3.5.1   Insidious networks: child trafficking

The trafficking of children represents an insidious manifestation of Siliguri's strategic position in India's corridor to the North East. Demand for young bodies to work as indentured domestic servants, sex workers or factory hands in far off cities of New Delhi, Mumbai and Dubai has created a lucrative local trade in acquiring children to be trafficked through the city's extensive transport infrastructure. According to local NGOs, Siliguri acts as source, hub and destination in the trafficking trade.

Here the unevenness of infrastructural development is acutely felt. Road, rail and plane creates channels for transmitting children quickly to and from the city. The well-known red light district, Khalpara, resides

compound-like within a surrounding stone wall, its sole entrance under constant surveillance (anon., 2014; zouthai, 2008). Meanwhile, inadequate housing, crowded schools, insufficient support services and porous borders with Nepal and Bangladesh place immense pressures on governments and NGOs to house trafficking victims, orphans and transient street children.

The child trafficking trade itself is highly fluid, often one step ahead of law enforcement efforts to curtail it. Children can be transported from destitute Bangladeshi villages, occasionally with the help of corrupt border protection guards. In rural communities, young men are hired to seduce teenage girls from middle-class families. Promised marriage, once they relocate to the bright lights of the city, they are instead sold into prostitution. Child sex workers regularly migrate from Nepal and neighbouring Indian states of Sikkim and Assam. Some but not all of these cases involve forcible removal by organised gangs. In other cases, children gamble calculatedly on the prospective income of sex work over rural impoverishment. Conversely, children are sometimes transported *from* Siliguri through Nepal to Kathmandu airport, for overseas destinations.

Nor are all cases of trafficking clearly identifiable. The closure of tea gardens in Darjeeling over the past decade has sent children travelling to Siliguri to work in semi-formal begging gangs, as domestic labourers or in other forms of informal labour. Parts of their journeys to and through Siliguri may be alone, in groups, through trafficking organisations or even with the assistance of the state or NGOs. Their transit may be voluntary, in whole or in part; only at their destination may it become evident they have been conned or forced into exploitative conditions of employment or slavery. In other cases, children, rescued and returned home by authorities, may through necessity or constrained choice revisit the same streets, the local railway station, or NGO drop-in centres where minimal food, clothing and shelter is available.

Against the demand for their services, such centres are woefully under-resourced. Across India, some 100 million children under the age of 18 are estimated to be involved in some form of labour. No official figures exist in Siliguri for the numbers of children who may be, variously, homeless, out of school, involved in some form of illicit labour (forced or voluntary) or a permanent or temporary victim of trafficking networks. Certainly, local NGO and government officials complain of having only facilities to treat dozens of children at a time, chronically

underfunded for the basic provision of housing, beds and food. This is even more so for counselling and relocation services, which are time intensive and require highly qualified staff. In addition to some government funding, frontline NGOs are reliant upon receiving considerable volunteer support in the city. Beyond Siliguri, NGOs operating on the borders of Nepal are similarly dependent upon informal community support both to provide information and to assist in rehabilitation and repatriation of trafficking victims.

Trafficking networks exploit the physical infrastructure, the financial and political affiliations and, increasingly, the mobile telephony and data networks of the city to hide and move children through its nodes and connections. The city, in turn, is using the same affordances to respond. NGOs have formed an anti-trafficking network (World Vision Centre of Expertise for Urban Programming, 2014) and are connecting with communities, children, government, schools and businesses to raise awareness and promote Siliguri as a child-friendly city. Online journalism, such as *I Love Siliguri* (2015), seeks to expose local corruption through websites, blogs and social media. The main NJP railway station displays prominent advertisements for *Childline*, a nationwide toll-free number for child protection, as well as the faces of well-known child traffickers on a notice board. Children themselves are increasingly using cheap mobile devices to keep in contact with each other, operating as informal peer protection networks across the city's laneways, roads and train services.

3.5.2   The new front of global urbanism?

Such efforts to police and prevent child trafficking networks, using a mix of traditional community associations and new millennial communication networks, speak to the highly relational character of the city. Along with its demographic and economic growth, and even its comparative obscurity beyond India, this relationality marks Siliguri as an example of the new front of global urbanism. A commercial, retail and transport hub, it is postindustrial; at the crossways of international traffic between India, Nepal, Bangladesh and, more distantly, China, Bhutan and Myanmar, it is international. According to the Siliguri Municipal Council, the city is 'considered one of the fastest growing in the country' (2015). The Corporation lists the population as of 2011 as 509,709, an

increase of only 8 per cent over 10 years since 2001 (472, 374). Anecdotal reporting of the city's population in 2013 suggested current population was instead between 1 and 1.5 million, including informal settlements. Still far from being a global city or national megacity, its very anonymity is representative of where much of the world's urbanisation is taking place – in oversized corridor towns, struggling to scale with the explosive influx of rural and neighbouring country migrants. Its rapid transitioning and its reliance upon its regional, national and global connectivity mark it as an archetypally interwoven city.

Note

1   The book's central arguments and associated methods and tools can be found at the accompanying website: http://www.circlesofsustainability.org.

4
Refabricating the City

Abstract: *Chapter 4 considers how, contiguous with the rise of automated machines, systems, networks, algorithms and circuits, technology is weaving new fabrics into and between cities. It then discusses ways in which computational models increasingly suggest or proscribe contemporary urban formations. Technological methods for appraising and sensing the city are now dominant and, through the use of simulations and games, offer both new limits and affordances for how the multiple dimensions and domains of unfolding urban fabrics can be rendered visible. The chapter further proposes the methods of crafting software itself suggest ways of opening up these urban fabrics to refactoring and reweaving.*

Long before Bruno Latour had claimed 'technology is society made durable' (1990), US urbanist Lewis Mumford had drawn similar conclusions about the specific technological accomplishment represented by the city: 'What the shepherd, the woodman, and the miner know, becomes transformed and "etherealized" through the city into *durable* elements in the human heritage' (Mumford, 2014, p. 31). He continued:

> Cities are a product of time. They are the molds in which men's lifetimes have cooled and congealed, giving lasting shape, by way of art, to moments that would otherwise vanish with the living and leave no means of renewal or wider participation behind them. In the city, time becomes visible: buildings and monuments and public ways, more open than the written record, more subject to the gaze of many men than the scattered artifacts of the countryside, leave an imprint upon the minds even of the ignorant or the indifferent (Mumford, 2014, p. 31).

The city is, then, technology writ large; it houses and also *is* the record that materialises human achievement, the manifestation of 'wider participation'. At the same time, Mumford argues this quality of durability is not the same as permanence. Writing of the worst excesses of the modernist city, he concludes: 'Nothing is permanent: certainly not the frozen images of barbarous power with which fascism now confronts us ... As life becomes insurgent once more in our civilization, conquering the reckless thrust of barbarism, the culture of cities will be both instrument and goal' (Mumford, 2014, p. 38). The act of enduring, or of sustaining, a city is not identical with leaving it in place, untouched. It requires instead, 'by way of art', an ongoing process of 'renewal'.

Today cities are even vastly more 'etherealized' through technology. Examples of urban technification abound. According to the International Telecommunication Union (ITU), radio frequencies, transmitted through mobile telephony towers, connect nearly 7 billion mobile device subscriptions, 19 for every 20 people on the planet (ITU, 2015). Since 2005, subscriptions in the so-called developing world have grown from 23 to 90 per cent, a fourfold increase in a decade. The ITU also reports 'active mobile-broadband subscriptions', a measure of data-enabled smartphone use, have risen even more dramatically, from 3 per cent in 2009 to 21 per cent in 2014. The world is 'mobilising', in this sense, even faster than it is urbanising. As mentioned in Chapter 2, cities such as Beijing and London boast numbers of surveillance cameras in the hundreds of thousands, more than one per hundred of the civilian

population. Development of skyscrapers may have peaked in the global cities of New York, London and Tokyo, but aspiring architects have found new demand for CAD-inspired neofuturist buildings in Dubai, Mecca, Melbourne, Kuala Lumpur and Shanghai, with numerous more planned for emergent cities in China, India and Saudi Arabia.

Meanwhile the interstices of terrestrial, ocean and air space between cities are increasingly laced with connective infrastructure. Since the launch of the Sputnik satellite in 1957, according to the UN Office for Outer Space Affairs (2015) a total of 7,110 'objects' have been launched into space. As of 2015, more than 80 countries operate 1,265 active satellites in orbit (Union of Concerned Scientists, 2015). Over 50 per cent of these satellites are listed as having a 'Communications' purpose and more than a third are commercially operated.[1] The vast majority of Internet and telephony data, however, is carried through overland and undersea cables: 277 submarine cables now connect the world's cities, with a further 22 planned (TeleGeography, 2015). Parts of this network follow similar routes to nineteenth century British telegraph cables, across the Atlantic to the United States and through the Suez Canal to India, Australia and other parts of the Commonwealth. Taylor's world city network is faithfully represented in the cable count and capacity of coastal global cities: New York, London, Tokyo, Singapore and Sydney continue to constitute the major hubs of online finance as well as other data 'freight'. At the same time, the extensive connections across and along the Pacific, over channels in Europe and around the continental contours of Latin America, Africa and South Asia illustrate that these networks are becoming more evenly distributed across the earth's surface, in line with rising global demand and availability.

Communications and data infrastructure, supporting an 'informational age' but equally anchored in material geography, continue to add new layers and fibres to a global urban tapestry. They suggest, too, new interpretive metaphors, models and methods for understanding and intervening in this fabric. The remainder of this chapter samples some of the emerging literature and practice that informs and responds to these novel forms of entwining. The discussion of technology is naturally cursory and particularly ignores much of the significant ongoing material transformations in the fields of construction, agriculture, energy, transportation, medicine and domestic appliance in favour of information technologies. Aside from exigencies of space, it is also a response to the specific turn of cities themselves towards data and informational

sciences in the new millennium. Becoming actively entangled in these newly formed webs constitutes one means for crafting the concretely physical and social, as much as the digital, fibres of that broader tapestry differently.

The chapter examines first how devices of complexity – electrical circuits, computer networks, data systems and algorithms – not only operate, but increasingly stand in for descriptions of, the new millennial city. It then looks at how one class of algorithms, agent-based modelling, is being used to simulate dimensions of city growth and habitation. The discussion broadens to consider how open source, a movement originating in software development cultures, is also becoming a motivating and practical force in urban development. The chapter concludes with a brief reflection on the problematic or 'Janus-face' character of technology: at once both the aetiological cause for the ills of the modernist city, and their potential remedy.

4.1   Urban complexities: circuitry, networks, algorithms

In Chapter 1, the quote from Merrifield laid the theoretical foundation for an exploration of ways the urban fabric could be understood. Yet in its place have arrived a series of new metaphorical schemes for imagining the city, largely predicated on the digital revolution. Just as the watchmaker seemed a fitting image for describing the workings of God in the 18th and 19th Centuries, recent technological inventions and preoccupations now direct our ways of grasping the much older artefacts of human production such as cities. The fit of digitisation to the urban form seems a compelling one. Games such as *SimCity* and *Minecraft* have gone from being commodities of leisure to pedagogical tools employed to educate students in principles of urban planning and construction. *Grand Theft Auto* constructs luridly retro cityscapes and scenarios into which the player is invited to roam vicariously. The work of Michael Batty and others on adapting cellular automata and agent-based models to simulate urban growth patterns presages a 'new science of cities' – the city here becomes a self-replicating and rule-following mechanism an algorithm can emulate (Batty, 2007, 2012). In contrast to steady-state deterministic models, pseudorandom variables introduce surprising events, the stochastic mess of the city, into simulations and games.

It is even tempting to view this relationship as more than metaphorical, to acknowledge the city itself as a digital artefact. Satellite maps on mobile devices, QR codes affixed to landmarks and networked sensors are precursors to the promised 'Internet of Things', a world where a vast number of objects are assigned IP addresses and will be capable of receiving and transmitting data. Living inside a city made of these objects, constantly geocoded and networked, will feel more and more like participating in a simulation, as parameters to functions that operate over the entire civic grid. Our default mode in such circumstances is to behave like accidental tourists admiring the self-regulating and self-administering efficiencies that accrue when nothing is ever lost, when vehicles liaise with each other for optimal travel routes, when electricity grids automatically calibrate supply with the demand of human bodies and weather patterns and when civic disturbances are predicted, just like the weather, in advance.

Substantial recent literature has debated the mixed blessings that attend the arrival of the 'smart city'. At one extreme, a startlingly enthusiastic assessment comes from former city officials in Bloomberg's tenure as Mayor of New York (Goldsmith & Crawford, 2014). In *The Responsive City*, they herald the alignment of IT and progressive urban governance that can deliver near-corporate levels of service (Goldsmith & Crawford, 2014). Citizens are upgraded in this process to the status of customers and clients, whose requests can be serviced in real time by systems that mesh together what had hitherto been standalone silos of data. To be sure, such systems need safeguards against invasions of privacy (Goldsmith & Crawford, 2014). But for these authors, such protections and their associated risks are small prices to pay for the delivery of efficient services and for the disparate voices of communities to be heard. At the other extreme, critics like Gernot Böhme (2012) warn of the 'invasive technification' of modern life, where technology creeps virus-like into every pore of the social and political as much as the human body: into children's uptake of gaming devices over more traditional play; into government and corporate surveillance of citizen and consumer behaviour; and into an infinite collective archive, beneciary of the cheap and capacious memory of computer systems that permit nothing to be forgotten or erased. His diagnosis, though, seems almost to extol the neoromantic remedies of earlier critics of technology, championing a simplified life, walks in the forest or runs through the park, the acts of chopping wood and building a fire (Borgmann, 1999; Heidegger, 1977). These might offer psychological

escape and philosophical contentment, but are unlikely to yield a political foundation to the perplexing problems of the city that is becoming ubiquitously technified.

As responses to the problematic encroachment of technology, improving habits and habitats have their place. But they ignore the monumental character and associated challenges of global urbanisation in the new millennium, which needs to sustain 7–11 billion human beings. Cities are already extraordinary assemblages of technologies for gathering people and distributing resources. They are sites of enormous interconnected logistics. Here, at another level, informational metaphors resonate. Through the porous borders of cities, ships, planes, trucks, trains, power lines, wires, water ways, cables, radio waves, satellite signals and data feeds constitute a vast and interconnected series of what Ned Rossiter (2005, 2014) has termed 'organised networks' and 'logistical worlds'. A new era of technological infrastructure makes possible the management of such networks at scale. As Rossiter and others further argue, fibre optic cables, enterprise resource planning (ERP) systems and databases go along with shipping routes, ports, warehouses and freeways in structuring the conditions of modern global trade and production (Easterling, 2014; Rossiter, 2014). Levinson's (2006) account of the development of the shipping container vividly recounts early steps in the standardisation and commodification of many parts of modern-day supply chains, geared towards the smooth functioning of such logistical worlds. In the past several decades, standardisation has become equally crucial to the software industry, in spite of occasional resistance from vendors (Blind, 2011; Egyedi & Koppenhol, 2010; Magee & Thom, 2014). The ability for different logistical hardware and software components to snap together, to create a seamless web for information to flow through, is now another critical component of commercial infrastructure, lowering information transaction costs and improving interoperability between different system components (Egyedi & Blind, 2008). To participate fully in the world economic system cities, equally, need to be standards-compliant – components with standardised interfaces and sometimes for that very reason, interchangeable and replaceable. The recently published International Organization for Standardization (ISO) standard, 'Sustainable development of communities – Indicators for city services and quality of life' (2014), responds to the need for cities to 'measure their performance', since 'existing indicators are often not standardized, consistent or comparable over time or across cities'. In addition, urban

firms and governments need to enrol in and comply with a vast number of further standards for managing communications, accounting, risks, environments, quality controls, health, corruption and labour.[2] As Smith (2008) notes, standardisation, conformity and compliance, as much as competitive differentiation, are pivotal to how cities and city organisations function as components in global networks of exchange.

Under this technified imaginary, the city is here again quintessentially an entrepot, a quasi-container, an in-between place where goods are stored, transacted and forwarded on elsewhere. It functions, in other words, much like a hub or router switching and forwarding data packets on a computer network. In this role, its complex and shifting set of relations translate into input parameters and output indicators, monitored and regulated through software. Such visions update early cybernetic descriptions of circuit-like urban systems marked by goal-setting, actuators, sensors, logic gates and feedback loops (Goodspeed, 2014) and accordingly signal an environment that can only be subdued by a technocratic elite who can negotiate the engineering, economic and political complexities that constitute the smart city. IBM's Intelligent Operation Center is a leading example of the kind of digital dashboard necessary to decipher and manage these entangled urban operations. According to its marketing literature, it 'help[s] city leaders gain insight into various aspects of city management' and 'manage large complex environments, communicate more effectively with citizens, understand the state of the city and collaborate between departments' (Abdel-Hafez et al., 2014). Deployed in Rio de Janeiro to respond to mud slides in favelas, it also functions to maintain social control among the city's poor, helping to solve a long-standing problem of how to monitor a porous geography. A proprietary system, it cannot be downloaded and installed, nor can its code be inspected. Instead, according to its 400 page Programming Guide, it 'provides several extension points that allow IBM Business Partners and IBM domain teams to extend the base product' (Abdel-Hafez et al., 2014). Common to the software industry, what appear to be innocuous and derigeur licensing conditions nevertheless ensure the algorithms and data that drive the future smart city remain accessible only to those willing and able to 'partner' with the global vendors who develop them: organisations with economic means and technological expertise, though not necessarily with democratic or egalitarian impulses.

Circuitry, networks, algorithms: these objects have become so embedded in the city that they can be taken as adequate metaphorical

substitutes. It may no longer be possible to take flight from their necessities in managing the complexities of world urban configurations and interconnections. Neither unbound technological optimism nor a fashionable and often reactionary dystopianism seem an adequate response. Yet too often the deployment of information technology entails that the city becomes again withheld and locked up, shrouded in non-disclosure agreements, impenetrable technical manuals and expensive licence arrangements. Moreover the digitised, virtualised, disembodied, data-driven city seems at odds with, or at best, only a minor part of our total phenomenal experience. In Lefebvre's distinctions of forms of space, the city becomes primordially and purely conceptual, a machinic black box that receives inputs and generates outputs. Sensing and living in urban space are secondary. Reiterating with a new force the antiseptic urban prescriptions of modernity, the digitised city becomes strangely denuded of its homeliness, its serendipity and auratic character. Lost is the sense of knots, frictions and fibres that mark the urban fabric: the accumulation of layers through different phases of sometimes ancient or medieval, modern and now postmodern design and planning; the insertion of new threads of urban life through waves of invasions, migration and cultural transmission; and the creases, folds and ruptures that signal different modes of transport, old and new technological capacities, and altering economic and political configurations. The complications of the city are smoothed into a single spreadsheet, spreading out infinitely with the colossal accumulation of data.

While a return to the alternative but antiquated trope of fabric might in turn sound out a false nostalgia, a yearning for a place of homeliness that never was, even this blanketing affect signals an important quality: the bright lights of the city attract those from beyond and comfort many of those who reside within them. A conception of fabric that incorporates webs of digital data transmission can reintroduce a sense of technicity that is less removed from specialist abstractions, and more connected with existing materialist practices of crafting. This is not to deny the role of technical expertise: the theoretical knowledge, creative innovation and embedded 'know-how' of experts are indispensable to the modern as much as ancient city. It is to suggest, however, this expertise itself must be variegated, attentive to complications and multiplicity as well as the simple operations of a machinic city. It also requires that, rather than be beholden to proprietary and necessarily partial interests, this expertise remain in constant negotiation and constructive dialogue with the

city's citizenry. New exploratory models and collaborative methods offer possibilities for how this dialogue might be conducted.

4.2   Computational epistemologies of the city

Accompanying the advent of computational metaphors are new models that seek to replicate, if not explain, the complex dynamics of cities. In the 1950s, Berry and Garrison (1958) suggested that a 'rank size rule' could estimate a city's size based on its relative ranking with respect to other cities. More recently, building upon cybernetics, chaos theory and, in particular, new appreciations for how to represent and model complex multivariate and nondeterministic phenomena, Michael Batty and others have sought to rejuvenate a possible 'new science of cities'. One direction of this science has sought to discover specific scaling power laws under which urban features emerge and scale with respect to size (Batty, 2012; Bettencourt, Lobo, Helbing, Kühnert, & West, 2007). The use of such scaling laws – sub- or super-linear exponents – hypothesises that it is possible to predict road size, crime rates, levels of innovation, economic outputs and a range of other metrics from population size based on identified correlations in known city data sets.

Such faith in a new positivist epistemology of cities needs to be strongly qualified. In Michael Batty's (2012) formulation, such a science itself undergoes an epistemological transformation, inflecting deterministic predictions into probabilities emerging from complex interactions between parts. Cities are 'open systems' rather than closed. To understand them entails open-ended and multidisciplinary methods of inquiry: 'what is being forged is a much more comprehensive set of structures that allow us to understand the many perspectives on the city that reflect its diversity and plurality' (Batty, 2012, p. S10). More directly, such structures might help to illustrate, through data, equations, algorithms and simulations, how certain urban tragedies of the commons emerge: pollution as a product of increasing commuter activity and inefficient transport routes; urban sprawl as a function of poor medium-density housing options; and uneven distributions of wealth between cities as a response to size and agglomerations of industry. As Batty notes, more than half-a-century of scientific enquiry has investigated such phenomena empirically. What 'agent-based, cellular automata and micro-simulation' models add is the ability to develop experimental

conditions under which both the current state-of-affairs and alternative counterfactuals can be constructed and visualised through adjusting parameters. Just as significantly, models laid down in code help make explicit the assumptions that underlie them and allow for other assumptions to be explored (Epstein, 2008).

Agent-based modelling (ABM) represents one of the possible tools of this new urban science. An ABM model consists of a two-dimensional world, decomposed into a grid of cells; a series of mobile agents randomly distributed on cells; a series of iterations during which agents may move or undertake other actions; and an interface component for setting up, running and monitoring the output of a model. Each iteration of the model introduces some stochastic variation and each simulation run is unlikely to be identical to another. Collections of simulations conducted under the same parametric conditions therefore exhibit regular and probabilistic tendencies rather than deterministic outputs. This approach makes the methodological assumption that simple actions and interactions between individuals can help explain aggregate emergent behaviours. Basic rule-following behaviours programmed into agents can simulate, for example, the emergent patterns of flocking. Similarly models that simulate generic tendencies for traffic to flow and jam can be developed and evaluated without needing to incorporate into the models the full complexity of human agents.

The spatial form of the city has made it an attractive object for simulating through ABM techniques, with examples in urban land use (Filatova, Parker, & Van der Veen, 2009), criminal activity (Fonoberova, Fonoberov, Mezic, Mezic, & Brantingham, 2012), traffic (Kumar & Mitra, 2006), sprawl (Schwarz, Haase, & Seppelt, 2010), waste management (Tucker & Smith, 1999), slum formation (Patel, Crooks, & Koizumi, 2012), political insurgency (Bennett, 2008) and ethnic segregation patterns (Hatna & Benenson, 2012). Other ABMs have also simulated scenarios at citywide, regional and planetary geographical scales (Arneth, Brown, & Rounsevell, 2014; Halim, Tavasszy, & Seck, 2012; Tian, Ouyang, Quan, & Wu, 2011). More complex multi-tiered and heterogeneous models have introduced higher-order social constructs for modelling institutions and hierarchical structures (Silverman, Bijak, Hilton, Cao, & Noble, 2013; Wijermans, Jorna, Jager, Vliet, & Adang, 2013). While empirical validation of such complex multi-tiered models becomes progressively more difficult with the increase in variables and interactions, these models can realise other goals: illuminating the dynamics between agents at

different levels, demonstrating the role of perturbations, tipping points and equilibria and offering visual illustrations of theoretical possibilities (Epstein, 2008).

Manuel DeLanda is one of the few to draw explicit connections between theorisations of society and space, and the affordances of simulation for representing social theoretic constructs. In *Philosophy and Simulation* (2011), he looks to establish points of connection between the conceptual apparatus of the assemblage and efforts to model phenomena at different scales. DeLanda plots a series of connections between algorithmic approaches – cellular automata, genetic algorithms, neural networks and multi-agent systems – and progressively complex physical, chemical, biological, neurological and, eventually, social kinds of assemblages. Drawing from similar theoretical traditions as McFarlane, discussed in Chapter 3, here the assemblage, for DeLanda, is an entity that has properties of both 'irreducibility and decomposability' (2011, p. 185). Further, it shares resemblances with other assemblages without losing its 'individual singularlity' and thence becoming a simple object of a given kind, category or type. The exact identity of a particular assemblage is set through a series of 'parametrising' settings; the change in these settings over time constitutes the assemblage's life history. Various parameters such as territorialisation, mobility and coding further determine the boundaries (strict or fuzzy), range of capacities and degree of genetic determination of the assemblage.

As DeLanda has identified, the conceptual developments of assemblages have an appropriate computational analogue in the nondeterministic, fuzzy and open approaches adopted by agent-based modelling and other simulation techniques. These make possible ways of visualising, for example, McFarlane's elaboration of city assemblages, as well as new ways these assemblages or fabrics can be 'parameterised' and configured. As one example, the associated case study presents a model to illustrate the analytic developed in Chapter 3. More generally, the animated fractal patterns that unfold through agent-based models and other simulation techniques offer new forms of representing the city, allowing for visualisation and argument for or against another round of policy and development for planners and experts. More radical uses can also be imagined. Open data and open source software make it possible for anyone to run simulations and, indeed, for the simulations themselves to be constructed, hacked and extended. A critical formulation of a new science of cities would, then, see the data and instruments for constructing and testing

hypotheses opened up to an audience of students, tinkerers, autodidacts and any citizen, with an interest in how cities work and how they could work differently. Increasingly, such models are not merely descriptions of the city; they predict and prescribe its future operations. Ensuring they remain open, accessible and adjustable forms one of the greater ethical and political demands to which a new millennial global urbanism must respond.

4.3   Open fabrications

'I have long thought that all the major infrastructures, from sewage to electricity and broadband', writes Saskia Sassen, 'should be covered by transparent walls and floors, so if you are waiting for the bus, you can actually see how the city all works and begin to get engaged' (2011). Written in an article entitled *Open Source Urbanism*, this expression of ultimate infrastructural transparency perhaps glosses over what remains hidden in this openness – that, for example, see-through glass and plastics are produced through processes that are themselves often inscrutable. Transposed to the space of information technology, open source software and open standards can be completely 'transparent' in Sassen's sense and yet remain completely opaque in others. The ISO OOXML standard, as one example, is expressed in 7,000 pages that scrupulously document the more baroque intricacies of word processing typography and spreadsheet formulae. Its ratification does not necessarily mean the standard, nor the means by which it *became* a standard, is any more transparent (Magee & Thom, 2014). Other ISO standards, including those related to urban development, have similar complicated entailments of procedural accountability, accessibility and cost and requirements for technical proficiency (Easterling, 2014).

In other circumstances, the transparency of the city can become susceptability, invasiveness or unwanted publicity. As Rossellini's famous film *Rome, Open City* memorialised, the declaration of 'open city' once meant defeat, a citywide white flag waved at an incoming occupier to signal the rounding up of civilians and the destruction of buildings would not be necessary. The complaints of informal slums can also be interpreted as problems of openness in a literal sense: sewers are all too visible, households lack privacy and security, the rights of citizens and labourers are open to abuse. Openness here takes on unwanted

connotations of vulnerability, exposure, weakness – connotations that city leaders, in an age of anxiety about the viral spread of disease, violence and other contagions, are keen to avoid.

Yet the possibilities for open source cities, in the various senses of accessing, deriving from, or contributing to their software and hardware, remain tantalising. The programmatic definition and translation of 'openness' into pragmatic techniques to weave new sustainable fabrics would first need to be undertaken. Richard Sennett's (n.d.) essay, *The Open City*, begins this task. Imagining the city as a system that is open, complex and autopoetic, he advocates for urban designs that create:

1   *Ambiguous edges* 'between parts of the city', focusing on 'porous borders' (n.d., pp. 8–10).
2   *Incomplete forms* 'in buildings', where they are 'less tightly fit-for-purpose' and more 'living, evolving structures' (n.d., p. 11).
3   *Unresolved narratives* 'of development', where there is both 'problem-solving but also problem-finding, discovery rather than merely clarity', 'stimulations of differences, both visual and social, which produce openness' (n.d., p. 14).

These three injunctions loosely map to the level of the single city, the *metropolitan* relations presented in Chapter 3. *Incomplete forms* describe individual buildings; *ambiguous edges* imagine zones, areas, suburbs or districts; and *unresolved narratives* concern everything up to the city as a whole. At a global level, they might equally be lifted up, in the same order, to the *metropolitan*, *ecopolitan* and *cosmopolitan* levels. Cities as wholes might be understood as incomplete forms; their relations to their habitat, as containing porous *ambiguous edges*; and the global structures of cities as having open *unresolved narratives*, without the determinate logic that has seemed to characterise many of the developmental histories of the twentieth century. Sennett's encouragement, that 'we have to challenge unthinking assumptions now made about urban life, assumptions which favor closure' (n.d., p. 14), applies as much to the unfurling of an open global urban fabric as they do to the singular instance of the city.

These injunctions could be further extended from urban design to the pragmatics of construction and development. Principles of open source software have increasingly been extended to hardware, the raw materials of the city. One example is the *Open Source Ecology* project, which has released a series of 50 open source blueprints for 'industrial machines' as part of what it has termed a *Global Village Construction Set*

for building a 'small, sustainable civilization' (Open Source Ecology, 2015). What initiators of the project, Thomson and Jakubowski, call 'Fabrication Diagrams' detail machine prototypes from a 'Bakery Oven' to a '3D Printer' (Thomson & Jakubowski, 2012). These diagrams can be freely downloaded to construct basic housing, manufacturing and agricultural facilities, at an estimated average saving of 45 per cent over commercial alternatives (Open Source Ecology, 2015). Fostering what Karin Bradley (2014) has termed 'postscarcity anarchism in the making' or the establishment of 'self-sustaining communities around the world', the ready transmission of machinic intellectual property across spatial boundaries and zones is arguably even more significant than the lowering of cost. Yet this is only one of a number of concrete examples of 'open source urbanism'. Alberto Jiménez (2014) has documented the work of *Inteligencias Colectivas*, a Madrid-based experimental project in prototyping urban infrastructure such as 'self-instructable' offices and public 'grandstands, toilets or various community-garden structures'. Open source architecture, with similar aspirations to improve the sustainability and affordability of housing, informs urban design and development through projects such as *WikiHouse* (Parvin, 2013) and *Collectif Exyzt* (Bradley, 2014). Enabled by online collaboration platforms and global peer-to-peer networks, open source hardware has followed software into practices of reviewing, installing, tailoring and deriving from, or 'forking', urban blueprints and materials.

Even with these examples, obstacles to an open fabric remain. Documented cases of hardware hacktivism and 'tactical urbanism' (Lydon & Garcia, 2015) come largely from US or European cities and even there still face challenges of viability, compliance, legality and insurability within existing economic and political frameworks (Jiménez, 2014). They also rely heavily upon forms of embedded sociotechnical capital – high levels of engineering, planning, architectural and computational 'knowhow', aligned with emerging political cultures of 'green utopianism' – that are the generated by-products of global 'creative cities' (Florida, 2002; Landry, 2008), with concentrations of universities, corporate and social enterprises, and at least relatively hospitable governance structures. Scaling up hardware experiments has proven difficult, as the 2015 filing for bankruptcy of the US offices of *Architecture for Humanity* demonstrates. In spite of their small scale, prototypical and often local character, such experiments suggest ways that critically informed technologies can actively condition diverse urban textures. They point the

way towards what Jiménez has called, following Lefebvre, a 'right[s] to infrastructure', wherein 'such rights take expression and "ground" themselves in concrete infrastructural conditions' (2014, p. 28). This 'concrete' or, in Mumford's words, 'durable' character of infrastructural intervention in urban form is at the same time increasingly transportable and transmissible, precisely through the soft infrastructures of digital media and communications that mark the emergence of an interconnected global urbanism. Standardised file formats, open source tools for design, geomapping and simulation, collaborative content management systems and the near-universal permeation of Internet connectivity are available through and help condition world cosmopolitan space. The enlargement and maturation of this still-fledging field of non-proprietary technology generates considerable potential for Sennett's open city, full of 'ambiguous', 'incomplete' and 'unresolved' prototypes, to be replicated and adapted, and for that openness to be extended across and through the many filaments and threads of a global urban fabric.

4.4   The 'Janus Face' of technification

Viewed from a standpoint of qualified technological determinism and optimism – in contrast to Gernot Böhme's more pessimistic premonitions – the self-replicating experimentation and interplay of open source hardware and software, of differently configured and interdependent infrastructures, present instead a more welcome form of 'invasive technification'. This standpoint is deterministic in the sense that it argues only novel sociotechnical arrangements of a possible future can address the unsustainable conditions that past and present human activity, largely enacted through industrial and postindustrial cities, have produced. Either the continued expansion of current technological practice or, conversely, a retreat from technology altogether seems only likely to perpetuate and exacerbate current inequities and unevenness across the contours of global urban development. It is cautiously optimistic, in the sense that there is now significant momentum, in the new millennial era, towards the refurbishing of urban space through 'appropriate technologies' that can help open it up along the lines that Sassen, Sennett and others have suggested.

   Yet the history of the infiltration of technology, commensurate with the rise of modernist urbanism, warns against unqualified optimism.

In the postwar era, the contrast between pessimism and optimism was more marked. The modernist city was in full swing; the designs of Le Corbusier were yet to be subjected to the critiques of Jacobs and others; and yet the possibility of complete annihilation, at the beginning of the nuclear era, suggested to some the Enlightenment project of rational development through science and technology had instead collapsed irrevocably. With the visceral possibility of nuclear holocaust after the bombings of Hiroshima and Nagasaki, one potential outcome of technology's invasiveness was the literal 'etherealisation' of the species, a danger that required constant ongoing vigilance. In published correspondence with Claude Eatherly, one of the US air force pilots who flew on the Hiroshima mission, technology critic Gunther Anders wrote that the 'atomic situation' meant its 'apocalyptic danger could not be abolished by one act [that of disarmament], once and for all, but only by daily repeated acts' (1962, p. 20). Echoing the concerns of other prominent postwar critics of technology – Mumford, Bertrand Russell, Herbert Marcuse and Martin Heidegger, among others – Anders concludes that sustaining contemporary societies now involves what are essentially negating 'acts', requiring the 'firm resolution never to take the step although it will always be possible' (1962, p. 20).

For Anders, what he describes elsewhere as the 'Janus face' or two-sided character of technology necessitates maintaining a permanent orientation towards ethical equivocation and determination and to address the unimaginably devastating 'superliminal' effects of what we produce, a constant re-posing of Heidegger's 'question concerning technology' (Van Dijk, 2000). The positioning of an ethical subject over and against the objects it produces seems anachronistic when everywhere technologies infiltrate and overdetermine the urban fabric, and by extension, the human subjects wrapped within it. At a tactical level, however, the proliferation, selection and adaptation of low-cost and non-proprietary fabrication techniques perhaps can contribute to the slow unfolding, thinking and practicing of alternate urbanisms. In place of the closed narratives that detail an inevitably tragic course of spatial inequity, depicted for example in Davis' (2006) *Planet of Slums*, the crafting of more equitable, sustainable and open cities makes plausible other twists of the urban development plot, resolving instead with more 'comedic' consequences. The next chapter hints at the kinds of aesthetic affects and productions this might involve.

4.5   Simulating the interwoven city: Fierce Planet

The 'interwoven city' articulated in Chapter 3 is revisited here through a series of simplified agent-based models. The final model illustrates how metropolitan, ecopolitan and cosmopolitan relations of cities can be generated through relatively simple procedures and starting conditions. The series of models is accessible, along with links to source code and technical documentation, via http://www.fierce-planet.com.

The models are displayed using a custom WebGL-based city-building tool (Magee, 2012), which loads GIS data collected by NASA satellite,[3] and renders the data as three-dimensional terrain. Particular constructs of the models – agents, buildings, patches and networks – are then drawn upon the terrain. Following Isaac's (2011) cumulative approach, here each model variant will build upon the proceeding one, adding layers, further patterns and refinements.

4.5.1   Model 1: A basic settlement pattern

The first model begins with a three-dimensional terrain, representing in this instance the Sydney basin and coastline. Agents can randomly walk in any direction across this terrain, but they are bound by minimal physical constraints: they cannot descend below the terrain or ascend above it. They also cannot cross large areas of water. If they hit the edge of the grid, they seek an alternative path.

Each agent is able to construct one single-storey building representing their home. They may do so at any time, but use the following rules:

1.1   If no buildings exist, then the first agent to 'activate' in a given iteration will construct one if they are on land rather than water.
1.2   If one or more buildings exist, then an agent will construct a building only if they are exactly at a radius of two cells of an existing building.[4]

Beginning the simulation, a certain number of agents are randomly allocated to points on the terrain. Following the above-mentioned rules, after a certain number of moments or 'ticks' they construct a basic settlement. The rate and size of the settlement development depend upon the initial number of agents.

Figure 4.1 shows one possible outcome of the simulation, showing the emergence of a very basic city-like form.
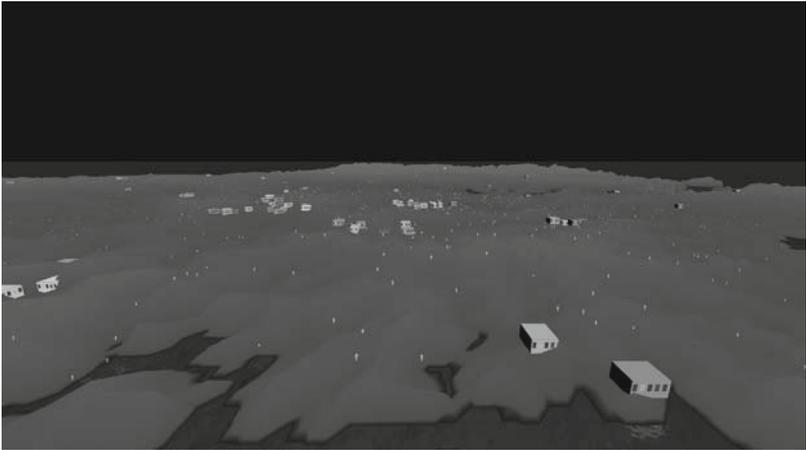
FIGURE 4.1   *A basic settlement pattern*

4.5.2   Model 2: A city skyline

In Model 2, buildings can be built with variable widths, lengths and heights. When this model is run, a more varied city skyline emerges, as shown in Figure 4.2.
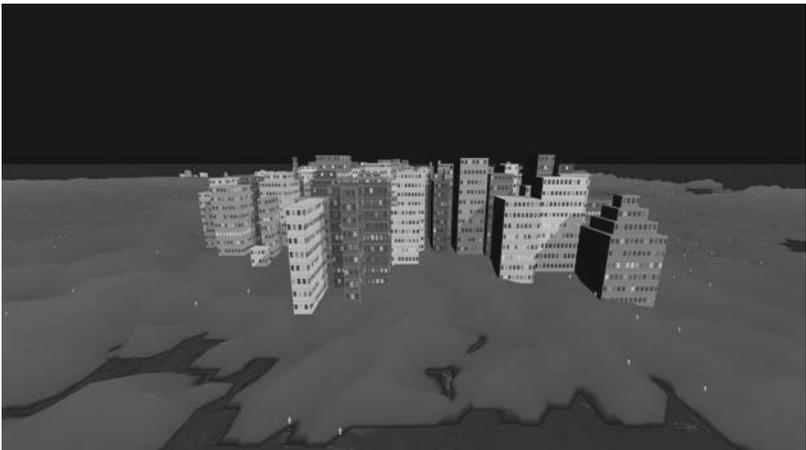
FIGURE 4.2   *A city skyline*

4.5.3 Model 3: Metropolitan relations

Model 3 builds upon Model 2 by allowing for explicit urban clusters to emerge. Here, the parameters of developing buildings are altered so that the presence of existing buildings conditions the likelihood of whether a given agent will construct a building of their own. Once an initial 'seed' building is constructed, an agent will only seek to build if they are close to an existing building or at least a certain distance away. This produces a series of urban clusters – the basis for a city system or network.

Figure 4.3 shows a clustered urban settlement pattern.
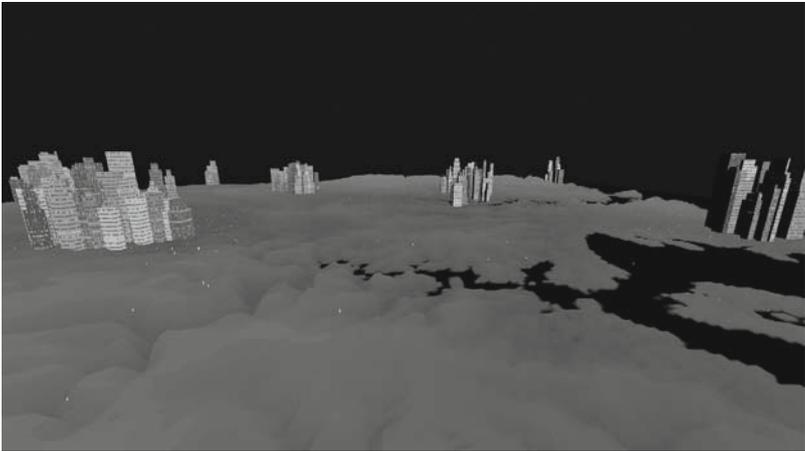
FIGURE 4.3 *Metropolitan clustering*

4.5.4 Model 4: Social networks

Model 4 extends the model by allowing agents to develop links and networks. Two agents may form a link if they pass through contiguous physical space on the terrain. The likelihood of link formation can also be increased if one or both agents have previously constructed a building – a parameter with relevance to future models. These links then remain permanent. For the purpose of this model, 'links' represent simple associations, without particular qualities of strength, kind or direction.

Figure 4.4 illustrates how these networks can be presented; they strengthen around the urban clusters that agents inhabit.
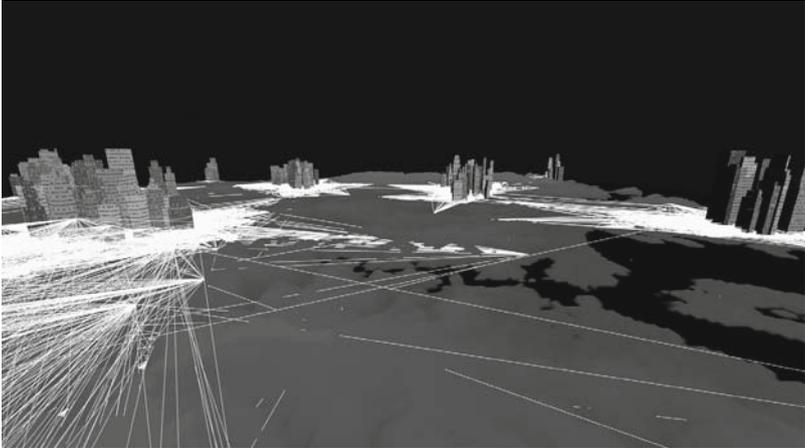
4.5.5   Model 5: Ecopolitan relations

Model 5 divides the terrain into a series of patches, each representing some territorial area. The darkness of the patch indicates some kind of human impact on the land. What this impact consists of is arbitrary, but could reflect agriculture, forestry or mining land use; pollution; loss of biodiversity; heat islands or mere human intrusion. What is significant is the sense that this impact emanates from areas of high human concentrations and radiates outwards through areas of low human concentration. This illustrates the way the ecopolitan relations, discussed in Chapter 3, can be understood.

Figure 4.5 here shows how the clustered settlements impact the landscape or hinterlands immediately surrounding them. Over long runs of the simulation, in parts these impacts meet up and overlap. This could suggest the formation of an emergent megaregion, for example, where interstitial areas of sparse settlements act as agricultural service areas to the encompassing cities. The spread of the patchwork pattern resembles the thick and quilt-like 'ecopolitan' relations.
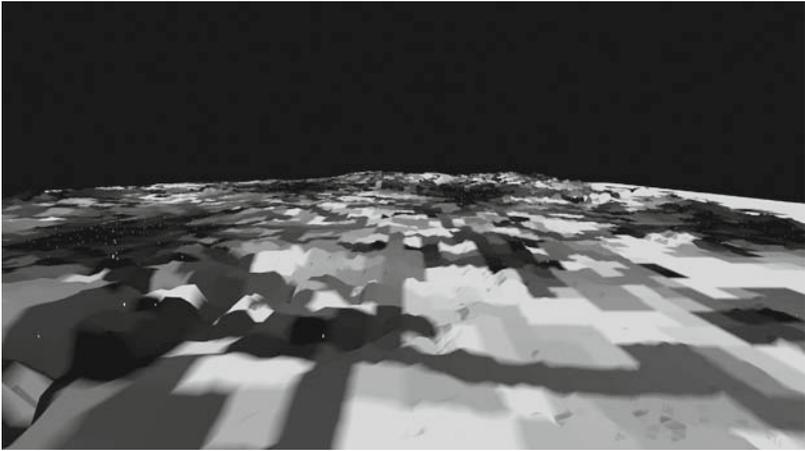
FIGURE 4.5   *Ecopolitan relations*

4.5.6   Model 6: Cosmopolitan relations

Model 6 builds upon the links introduced by Model 4. Here, agents can interrupt their random walk to pursue a computed path towards either their own building or the building of another agent they have been linked to – returning home, or visiting the home of an associate or friend.

Figures 4.6 and 4.7 show this model after a relative long 'run'. In this particular configuration, agents initially form close networks within and around their own urban cluster. Over time, the combination of random and directed walks ensures agents from different cities meet and visit each other. The thin white lines here depict these directed paths, the majority of which look to connect cities together. An interpretation of these paths, which during the simulation form and disappear constantly, is of the thin and web-like cosmopolitan fabric stretching between world cities.

4.5.7   The virtual interwoven city

These six models illustrate the possibility of developing, from relatively simple assumptions and rules, a progressively refined computational and graphical representation of the urban spatial relations described in Chapter 3. Their primary aim is to simulate a plausible constellation of cities, or urban fabric, with the three different spatial dimensions.
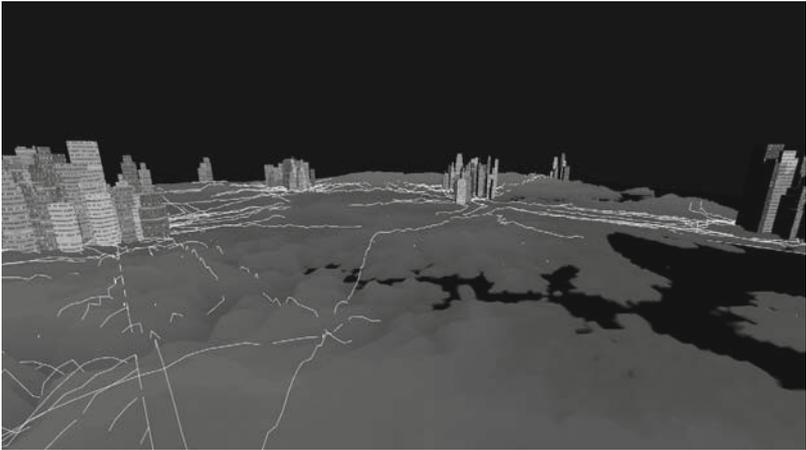
FIGURE 4.6   *Cosmopolitan relations*

FIGURE 4.7   *Cosmopolitan relations – overhead image*

Altering the parameters, even of the simple final model developed here, also shows that other kinds of cities – forms of counterfactual urbanism – are possible. Other more rigorous tests could also be constructed: how well these models begin to accord with empirical observations, and

what could they offer an urban public as a basis for questioning policies, structures and power relations.

While these illustrations are necessarily limited, they point the way towards considering how software simulations could be adapted to other purposes than the spruiking of urban space for new shiny developments. Simulations can equally model and reflect upon conditions of equity, sustainability, openness, participation, collaboration and technology adaptation. If a radicalised and messy 'science of cities' can consider pliable as well as determined and predictive futures, a critically oriented software practice could prove crucial in divining how those futures might be arrived at.

Notes

1   Union of Concerned Scientists (2015); own analysis conducted in R (an integrated suite of software facilities for data manipulation, calculation and graphical display).

2   World standards and standards bodies relevant to cities include International Organization for Standardization (n.d.), International Electrotechnical Commission (2015), United Nations Environment Programme (n.d.), World Health Organization (2015), Deloitte Global Services Limited (2015) and World Wide Web Consortium (2015).

3   NASA's Shuttle Radar Topography Mission (SRTM) (Jet Propulsion Laboratory, 2014) provides digital elevation models (DEMs) of the world's topography.

4   Measured using Moore's neighbourhood – a cell is adjacent if it is above, below, to the left or right or on a diagonal line.

5
Sensing the Urban Fabric

Abstract: *Drawing upon the more literal connotations of fabric, Chapter 5 is concerned with the sensory, affective and craftlike aspects of cities. Reviewing Bahktin's formulation of the 'carnivalesque', it ventures into a series of different urban aesthetic 'modes', intentionally fragmentary and kaleidoscopic, to draw out some of the many ways cities are sensed, felt, experienced, lived in and travelled through. The chapter continues by reflecting on the possibility of a city craft and, following Alexander's work in the 1970s, of the global urban design patterns that might guide it. The chapter concludes with an exhortation to design new 'comedies of the commons', patterns for a reciprocally rewarding collective urban life together.*

Metaphor – the literal 'carrying across' of meaning from one object to another – has been a central concern of this text. Throughout the image of cities, increasingly interwoven, has gained an accretion of new strands, fibres and layers. The urban fabric discussed in Chapter 1, became, in Chapter 2, global; in Chapter 3, sustainable; and in Chapter 4, open, at least in its technical apparatuses and operations. In this chapter, the by-now-convoluted metaphorical scheme comes to gain a further and, in this context, final layer – a layer of tactility, embodiment and responsiveness. For the various promises held out in earlier chapters to be delivered, urban aesthetics, so long bound up in visual appreciation from afar, needs to come down to earth, to the senses of skin, feet and hands, to the blends of crafts needed to weave together alternative, sustainable, durable and at the same time, often unseen and unfelt, fabrics through our cities. These crafts include those apparently disembodied disciplines of budgeting, software and urban planning, which now increasingly invoke principles of participation and co-design, and therefore the commingling of bodies in shared space.

This chapter begins by considering the transition from what Scott has termed the 'resolute singularity' of 'high-modernist optic' (1999, p. 347) to a multiform assemblage of crafts that produces and conditions these affects. The various languages of affective practice, film, literature and the arts document the impressions a city makes upon modern subjectivities, and some of these are referenced here to illustrate such effects. I then revisit the associated idea of design patterns, and how these might be applied to the constitution of an urbanism that is simultaneously global, regional and local in its outlook. Given this excursion into the arts, fittingly the chapter concludes with considerations on what a comedy – rather than tragedy – of a global and urban commons might entail.

5.1   Opening up the forbidden city

Much of the malaise of the modernist city stems from its forbidding of tinkering and tailoring, its corralling of everyday practices into strictures of coercion and control. Space is patrolled, surveyed, regulated, forbidden. A global graphical language has evolved to direct human bodies to and from urban space, to prevent both local and foreign populations from entering regions that are sanctioned for specific state or private use only. Kasarda's celebration of what he imagines is the emergence of the

'aerotropolitan' urban form – cities built around and solely rationalised by the presence of airports – represents a contemporary gloss on the modernist dream of the total city, founded upon infrastructures that are accessible only to authorised personnel. Techniques of simulation, discussed in Chapter 4, offer to rationalist modes of planning what could only be dreamed of throughout much of the 19th and 20th Centuries: real-time representations of the flows of the urban totality.

This aspiration of total visibility suggests a certain kind of openness, but one quite different from that imagined by Sassen and Sennett. In this variation, the whole city is open, but only to a chosen few. The increased professionalism and expertise that the modern city requires introduces further hurdles to the ability of citizens to reengineer or recraft it. The separation of experts from lay citizens becomes further entrenched.

The political challenge of re-aestheticising the city, keeping it in touch, tangible and fungible, involves recuperating the crafting of the city from the sole preserve of specific organisational forms of expertise. As Chapter 4 outlined, the rise of open source software and hardware, alongside an ever-broadening range of creative commons licensed texts, manuals and education materials, act as significant and liberatory countertendencies. As significant are the emergence of peer networks, assemblages of disparate expertises that cut across hierarchical organisational structures in area of software, design, consultancy, engineering and housing construction. These are increasingly managed through lightweight and agile organisational forms: social enterprises, participatory forums, community groups, local NGOs and ad hoc networks. Such social formations and movements constitute a vital counterbalance to the concentration of expertise in state governmental and multinational corporate structures. They make thinkable and practicable alternative modes of craft that might address urban challenges, both global and local.

The next section dwells more directly upon some of the modes of affective subjectivity and experience produced by the city. This then leads to a consideration of the skills and crafts that might remake the urban fabric anew.

5.2   A carnivalesque urbanism

Bakhtin's famous description of the carnivalesque accompanies his detailed analysis of Rabelais' fifteenth century comedic omnibus,

Gargantua and Pantagruel. Rabelais' sprawling description only loosely touches upon the form of the city. At the same time it celebrates the eclectic social and cultural diversity that had begun to appear through trade with other regions of Europe, the Mediterranean, Africa and Asia Minor. The severe Biblical accounts of civic and urban life become heavily refracted and distorted through the Rabelaisian ecclesiastical vision. Absurdity, satire, exaggeration, grotesqueness, tall tales, classical and mythical allusions, neologisms, the intentional breaking of the 'fourth wall' to address the reader, and narrative sidetracks and detours heap upon each other in a rambling ode to an Epicurean and joyous way of life. For Bakhtin, Rabelais is less an advanced instance of medieval epic than the exemplar of the Renaissance 'grotesque realism', who, alongside Cervantes and Shakespeare, was able to fuse together a generous and profound humanism with political critique and satire, scatological humour with philosophical purpose, and a 'carnivalized Catholicism' with the Epicurean 'liberating and renewing principle of laugther' (1984, p. 57). The bodily grotesque corresponds to the social carnivalesque: the assembling of human bodies at celebratory rituals and festivals is a reminder of our fleshly commonality and equivalence. Social status is effaced or inverted in the adoption of masques, the parades of illusory caricatures, collective intoxication and wilful gluttony. In Rabelais, the carnivalesque transcends particular moments and events and becomes a continuous attitude, a constant rolling laughter that seeks to embrace what it mocks. Modern satire, by contrast, already begins by the seventeenth century to 'degenerate into static "character" presentation and narrow "genrism"', a degeneration that is entirely commensurate with the rise of the 'bourgeois world outlook' (1984, p. 52).

While Bakhtin does not dwell upon the spatial form that facilitates the carnival, in Rabelais' own text it corresponds to the real and mythical settlements his eponymous heroes visit. The fictional *Abbey of Theleme*, constructed by Gargantua to reward a helpful monk after battle, represents a libertarian utopia that contrasts with the bureaucratic enclosures of Renaissance cities (Rabelais, 2004, chapter LVII). There its citizens would be exhorted to 'Do What Thou Wilt', with the consequence 'all their life was spent not in laws, statutes, or rules, but according to their own will and pleasure' (Rabelais, 2004, chapter LVII). In the manner of Jonathon Swift's *Gulliver's Travels* and Lawrence Sterne's *The Adventures of Tristram Shandy*, the rambling and whimsical adventures to distant cities are designed as moral and normative correctives to the governance

and conduct of life in actual cities. Among its other functions, *Gargantua and Pantagruel* act as a form of evacuative to the stifled digestion of Renaissance Paris. Imaginary cities become instruments of critique to dissect the anatomy of the actual urban form. In Bakhtin's interpretation, Rabelais' 'carnivalesque' is not simply a literary celebration of medieval diversity – it presents critical patterns for imagining and weaving the city otherwise.

The global proliferation of urban aesthetics continues to generate affective similarities and differences across diverse planetary contours. In refabricating the city, novels, film, music and visual art register these affects. The schematic relations of *Chapter 3* here become distended and convoluted: in the contemporary global urban imaginary, time and space are embroidered according to different rhythms and patterns. Teleological narratives, including those of the sustainable, resilient or liveable city, twist and distort into the altered tropes of the gothic, the burlesque, or the apocalyptic metropolis. The paragraphs below follow some of the threads of this 'affective infrastructure' that register these experiential folds in the fabric (Bailey, 2014).

The city is inherently cinematic. Cinema, an art form historically coincident with the rise of the modernist city, has often sought to document its alienating effects. Fritz Lang's *Metropolis* is the canonical and cinematic departure point for this conception. Even when these become, through more recent film incantations, objects of directorial reverence, they remain problematically melancholic, settings of human confusion, isolation and miscommunication. Allen's *Manhattan* (New York) and Coppola's *Lost in Translation* (Tokyo) are two examples that read the city in this wistful way – colossal backgrounds to human actors and actions that can only fail to measure up.

The city is a place and space of law. Kafka's anonymous antiheroes stand before the law as they are before the guarded gate, endlessly refracted through a spatial geometry of ever more interior, and forever inaccessible, gates that protect a secret source of power. An infinite ziggurat that is an imagined city, an urban fabric folded in on itself, stifling and suffocating, yet at the same time desirable, unyielding, impossible. The 'right to the city' is also one that must be denied. In Conrad's *Heart of Darkness* and Melville's *Moby Dick*, the city stands as an implied background to the lawless drama that unfolds in the strange wildernesses of the African jungle or the Indian Ocean. In the beginning and in the end, the city wraps around all that happens in between. Conrad's narrator returns to

the port to tell others, in a civilised space that at the same time envelops them in a foggy solemnity which mimics and reflects the darkness that purportedly lies elsewhere.

The city invokes an imagining of its own demise. Augustine's *City of God* is written in the days of the collapse of the world's greatest city, Rome. Fear not, says Augustine: the real city is not of this world. The twenty first century retells this narrative with an ironic twist; Eliot's *The Wasteland* is littered with the imagery of a thriving city that is yet spiritually bereft. More recently, the cinematic *City of God* is instead a literal wasteland, a thread tangling from the outskirts of the city, where children fight for control of the only trade and power available to them: the drug business. Vistas of the decline of the city are reflected in modernity's obsession with ruination.

The city speeds up life. In J. G. Ballard's *Crash*, the freeways and arterials, fibres running through the city, are sites where vicarious and forbidden fetishes are played out at high speed before an onlooking audience locked in the bordering apartment blocks. Following the power law functions identified by Batty and others, the larger cities also offer an acceleration of the rate at which the threads, seams and filaments are stitched and unstitched. In Mumbai, Dubai and Shanghai, buildings are fabricated and destroyed on a rapid cycle. Tokyo stretches itself out to the other great cities of Nagoya and Osaka on *shinkansen* trains that have travelled in excess of 250 km per hour for 30 years. More recently Shanghai accelerates its incoming and outgoing visitors at even faster rates on its Maglev train. *Aerotropolis* explains the economic and therefore the demographic transitions in the United States according to the speed with which flights can be dispatched. New York imprints itself as the foremost global city on the basis of nanosecond fiber-optic connectivity between the offices of stockbroking firms and the nearby Wall St exchange.

The global city never sleeps. The hum of traffic connecting Sydney's logistical networks sound out along the M4 through to neighbouring Parramatta perennially. Mumbai's semi-itinerant construction workforce and delivery services work through the night, while new entrants to the middle class enjoy the burgeoning nightlife. The late hour that bars and clubs will continue to serve is one marker of a city that considers itself global.

The city fosters its own outsiders. In *Un Bout de Souffle*, Jean-Paul Belmondo's Michel is free to ostracise himself, to untangle himself from the constraints of class and conformity. But the freedom is temporary, an

illusion; the city and its officials, still adhere to him like filaments, trapping him in its streets, fatally. The inverse image of the same city shows itself in *Alphaville*, at once both hero and background, the logical and nightmarish unwinding of the hidden premiss of Le Corbusier's Radiant City. In its other variations, the outsider is ensnared in a more wistful and transitory dream: the lovers of *Lost in Translation* have fallen for projections of themselves cast by the faded lights and askew reflections of Tokyo's urban mirage.

The city ignores its own designers. No design patterns of sedate and balanced urban planning interfere with the hyperbolic development of Dubai. Instead it throws up new spectres: the *Burj al Khalifa* introduces a new strident poetry for the metropolis, a building that so egregiously outstrips even its skyscraper neighbours that it single-handedly imprints an unprecedented morphology of the city. On the flat topology of Dubai's coastline, it can be seen from anywhere. At the end of a nausea-inducing elevator ride, tourists appreciate momentarily what its residential elite must experience daily: the urban as a two-dimensional patchwork, with dimly seen cars slowly threading their way along its seams, a city that simulates a randomised computer simulation.

The city is an aural amplifier. The white noise of the power grid, of background traffic, of computer fans, of weekend lawn mowers, of televisions, radios, air conditioners and public announcements, becomes an indispensable soundtrack that accompanies the rapidly moving cinema of daily life. In its absence sleep is impossible. The irregular beats of jazz, the assonance of hip hop arise in response to the special acoustics of concrete surroundings, as well as the possibility of being 'alone together', in Shelly Turkle's phrase – isolated through headphones in the midst of a library, a train station, a cafe.

The city self-replicates. The arrival of the modern city demanded its refraction through a thousand different lens through which it could view itself, to imagine itself differently. Romanticism was born in the city; a yearning for its opposite or, in the case of the celebration of ruins, its demise. Cinematic and computational renderings offer violently projected distortions, ways to vicariously conquer the city through, almost prototypically, the figure of the gangster who 'runs New York', or completes violent missions on the open world of Liberation City in *Grand Theft Auto*. In the endless duplication of chain stores, malls and prefabricated experience, many of the accomplishments of the 'global city' can be found, in fact, in every city. Global trade has all but vanquished the

need to travel to acquire cultural exotica. In response, as Zukin (2009) notes with precision in the *Naked City*, the most previous virtue of urban space is now its 'authenticity' – its unique character, identity, idiosyncrasies. Yet these too – bohemian chic fashion stores, new wave coffee cafes, ethnic cuisine, vinyl record stores, beatnik book stores – readily propagate along lines of mimetic influence: San Francisco, Portland, Seattle, Melbourne, Greenwich Village in New York and Shoreditch in London being temporary placeholders of global hipster distinction.

The city is a frictional fabric, one which rubs up against and abrades itself. It is a site of revolutions, insurrections, repossessions. The French Revolution announced the city as the space of confrontation between power and populations. The Haussmannisation of Paris in the 1850s included the military objective of subduing an unruly poor: barricades are much harder to erect across boulevards. The arrival of automated surveillance has turned innocuous spaces of the city into potential infiltrators. Mobile devices are tracking devices; as studies of the geotagging of Twitter feeds demonstrate, entire ebbs and flows across the city can be visualised, plotted, predicted. Sentiment analysis of tweets can be further plotted against the likelihood of protest, revolt and uprisings.

The city cleaves to patterns of standardisation. It is locked into plans, protocols, agreements and contracts that are replicated throughout urban space, in all global cities. This tightly bound coordination is partly an illusion. The kind of global fabric that cities now weave collectively is available to be cleaved apart as well as cleaved to. The threads can split, proliferate, re-entangle. Old and new crafts will be needed to ensure the ensuing fabric is one where the multitude of layers, patterns and patchworks manage to weave together in parts as much as they might fray elsewhere. Forgoing the utopic vision of a monochrome and uniform fabric for one which is continually reworked is itself an experience of urban crafting that remains to be learned.

The city is global light. As another form of the urban imaginary, satellite time lapse imagery of the world at night shows urbanisation as delicate tracery of light upon a dark and mostly vacant earth, and further offset by the infinite dark beyond. Here the global urban fabric is at its most visceral. The cities are lightness, warmth; societies huddle under their protective glow. Viewed from the dark side of the earth, diurnal rhythms are marked by the synchronised switching on and off of cities along longitudinal lines. Rather than the reverse, it almost seems that this collective coordinated movement is programming, instead, the earth's

rotation. Up close, the networked filaments of the city make a tightly woven quilt. Further back, some of its strands, faint traces of highways, reach out towards the vacant darkness. At a further remove again, these traces connect up to other agglomerated points of illumination.

5.3   *Metis* and the city

These impressions and affects point to the conditioning of body and senses by the city. In *Flesh and Stone*, Sennett (1996) describes further this close relationship between urban form and human bodies. The Roman method of urban land division had as its centrepoint an *umbilicus agri*, representing the navel of the settlement. Athenian public space was marked by the form, elevation and orientation of buildings. In the arenas needed for political discussion and voting, architectural design accentuated the visibility and amplified the acoustics of the human speaker. The rigorous application of geometric measurement in ancient cities applied techniques to accommodate the individual body in the crowded multitude of the *polis*. Sennett argues the introduction of technologies of physical comfort, commensurate in time with the modern city, instead adapt the city to the body, enabling individuals in sealed physical spaces to be separated from the excessive stimulation and 'disturbing sensations that potentially loom in a diverse multi-cultural community' (1996, p. 365). Further immense spatial scales can be now be traversed by the eye and ear through telecommunications, and the body itself through automated transport. This comes at the expense, for Sennett, of activity: the transported body is passive, the experience 'monotonous'. The old crafts that fashioned works for immediate human apprehension and appreciation have, accordingly, gone into decline. His remedy is for a kind of collective masochism: the re-introduction of a therapeutic 'pain', a deliberate discomfort that would reawaken a 'civic' sensibility and a tolerance for the pain of others. Elsewhere, in *The Craftsman*, Sennett links this sensibility to a rediscovery of crafts and the pursuit of perfection.

In a similar vein, Scott (1999) argues for the inclusion, in public life, of *metis*: practical 'wisdom', 'skill' or 'craft'. He opposes *metis* to the 'imperial knowledge' of high modernist planning schemes (Scott, 1999, p. 339). Instead *Metis* includes prescriptions to 'take small steps', 'favour reversibility', 'plan on surprises' and 'plan on human inventiveness' (Scott, 1999, p. 345). What Scott intends here for states applies, as Walter Magnusson argues (2010),

even more emphatically to the city. For Magnusson, the city is the spatial level at which, as citizens, 'we have to position ourselves as inhabitants, not governors, and come to terms with an order that often appears chaotic' (2010, p. 47). Opposed to state-driven technocratic planning, *metis* and its accompanying pragmatist epistemological alignment is more appropriate to addressing this chaotic order of the urban fabric.

There are countless contemporary examples of *metis*-infused practices where non-state actors actively intervene in the city's functioning. Pop-up, temporary, tactical, interventionist or guerrilla urbanism all describe ways designers, planners and community groups are testing new ideas, products and practices on the city – and also testing its limits (Melendrez, 2015). Architect Marco Casagrande (2012), along with Curituba's former mayor, Jaime Lerner (2014), have championed a similar concept, 'urban acupuncture', to describe small-scale yet targeted interventions or incisions in the urban fabric. While such terms can conjure up visions of marketing group think-tanks rather than organic DIY acts organised by communities, they also point to alternative practices of city-making to those that necessarily involve top-down processes approved by the state and conducted by highly paid consultants and technicians. Such interventions entail risks: physical and social infrastructure like roads, sewers, electrical cabling, rate collections and elections reflect decades or centuries of scientific and policy experimentation. Yet the possibilities of refashioning urban space remain available. As Casagrande (2012, p. 18) notes in discussing community-led transitions, 'the gardens of Taipei, these acupuncture points, are penetrating through the industrial surface of the city and reaching the original ground'. With admirable hyperbole, he claims 'now the anarchist gardeners are regulating the industrial city' (Casagrande, 2012, p. 18).

Urban activism is vital to a rejuvenation of the city. But city craft cannot remain limited to the small scale, to designs that remain limited to the fringes or even to the city itself. If, as Sassen, James and others have argued, cities are now interconnected at planetary scale, forming a kind of everpresent global urbanism, then the global structures of power and finance that play such a determinate role in the conditions of life need at least the same sorts of tactical critique, intervention and careful experimentation. Here a city craft might look towards reworking, reengineering, or refactoring how interurban networks are constructed. Such work is ambitious. Yet the transport and communication links that increasingly bind cities together also generate opportunities for collaborations, for designs that work in one city to be tried in another, for better

care to be organised of the land, air and seascapes that separate and surround them, and for alternative and less inequitable arrangements to be negotiated.

5.4   Patterning the interwoven city

Experiments in and around the city weave diverse patterns in its fabric. They speak a language, a localised *patois* of practice that expresses disruptive as well as time-honed craft work. Such expressions are sensed through the auratic character of the city. Some experiments are irrepressibly situational, site-specific: their imitation elsewhere a sign of cultural appropriation and inauthenticity (Zukin, 2009). Others instantiate candidates for what might be termed 'replication with variation': pieces of urban vernacular that, like slang, can be translated with local adaptation and accent. The mechanism of the *design pattern*, introduced and discussed in Chapter 1, looks to incorporate the essential functional parameters of these pieces into modular and reusable templates. In response to the homogeneity of modernist design, already by the 1970s Alexander (1977) had assembled a number of proposed patterns into a distinct grammar and lexicon. In the new millennium the need for a global city craft or *metis*, adhering to but also actively reworking and refactoring patterns, is even more pronounced. Technologies and techniques for collaboration across urban space continue to be refined. At the same time, cities evolve as sites of growing political insecurity and environmental risk. The repatterning of the material and social relations across a planetary canvas, coordinated through a geometry of what Friedmann termed 'basing points', becomes both possible and critical.

In Alexander's formulation, each pattern includes a context, a problem the pattern solves, instructional text for solving the problem, and a discussion of how the pattern relates to others (Alexander et al., 1977). Preceded by a long history of construction blueprints, designer drawings and instruction manuals, the format itself is not especially novel. Moreover, despite widespread influence, his work has not had the effect of systematising the study of urban planning, architecture, design and construction. As Alexander himself noted in the late 1990s:

> The pattern language, how much has it influenced the environment of the world? A few thousand buildings have been influenced … meanwhile, we've still got this gigantic amount of construction out there which is defining the

world that all of us live in that is still going on in exactly the same fashion (Alexander, 1999, p. 80).

Ironically, but perhaps portentously, the audience he addressed here consisted of software programmers, for whom design patterns, following the publication of *Design Patterns: Elements of Reusable Object-oriented Software* (Gamma, Helm, Johnson, & Vlissides, 1994), are foundational parts of the software craft. As the urban environment itself increasingly embeds software into its infrastructure and operation, it is tempting to view patterns as once more the means for articulating the renovation of its fabric. In its adaptation to software, the structure of a pattern has been significantly extended. In Gamma et al.'s (1994) elaboration of Alexander's format, the design pattern is comprised of the following data elements:

- ▸ *Pattern Name and Classification*: A descriptive and unique name that helps in identifying and referring to the pattern.
- ▸ *Intent*: A description of the goal behind the pattern and the reason for using it.
- ▸ *Also Known As*: Other names for the pattern.
- ▸ *Motivation (Forces)*: A scenario consisting of a problem and a context in which this pattern can be used.
- ▸ *Applicability*: Situations in which this pattern is usable; the context for the pattern.
- ▸ *Structure*: A graphical representation of the pattern. Class diagrams and Interaction diagrams may be used for this purpose.
- ▸ *Participants*: A listing of the classes and objects used in the pattern and their roles in the design.
- ▸ *Collaboration*: A description of how classes and objects used in the pattern interact with each other.
- ▸ *Consequences*: A description of the results, side-effects and trade-offs caused by using the pattern.
- ▸ *Implementation*: A description of an implementation of the pattern; the solution part of the pattern.
- ▸ *Sample Code*: An illustration of how the pattern can be used in a programming language.
- ▸ *Known Uses*: Examples of real usages of the pattern.
- ▸ *Related Patterns*: Other patterns that have some relationship with the pattern; discussion of the differences between the pattern and similar patterns.

This format suggests a possible starting point for documenting and sharing 'what could be termed interwoven city design patterns'. Terms like 'motivation', 'applicability', 'structure', 'participants', 'collaboration' and 'related patterns' have specific application to the configuration of software coding structures, but share an obvious affinity with the recommendations of new, sustainable, tactical or guerrilla urbanist movements. They also would necessarily extend to new political and economic arrangements: the structure of social enterprises, the models and procedures of participatory budgeting, the coordinating of protest and activism, and the alternative formations of public 'commoning' (Gibson-Graham et al., 2013). Other examples of contemporary software practice – peer-to-peer repositories and version control systems, lightweight formats and protocols, open source license arrangements, collaborative design tools – could also build distributed information architectures for sharing, reviewing and adapting common urban design patterns, as examples in *Chapter 4* illustrated. Equally they could provide empirically testable cases through which to examine and explore the kinds of questions proposed in the analytic matrix of the urban fabric, put forward in *Chapter 3*.

On the other hand, an uncritical celebration of patterns risks re-introducing the very modernist systematicity that it critiques. As Alexander (1977) also had noted, the affordances of design patterns in the software industry had been largely instrumental, intended to improve efficiency and maintainability, and had ignored the 'moral component' that motivated his own work. The coining of the term 'anti-pattern', to describe inefficient and inelegant code arrangements, would, in an urban context, imply a normative design aesthetics all too familiar in the contemporary obsession to sweep the streets clean of the homeless and other undesirable 'stains' on the urban fabric. Yet one of Alexander's patterns, 'Sleeping in Public', advocates the provision of 'ample benches' for both the homeless and the general public to use – respite of the body from the harshness of the city's stone. A broader role for patterns in cities might begin to look at how to safeguard such normative, moral dimensions. Certain 'meta-patterns' might offer coordinating support, ensuring patterns are co-designed through participatory processes, shared through peer-to-peer networks, also subject to peer view and critique, and opened to local democratic deliberation. Under these regulatory auspices, what at first appear as disruptive anti-patterns might become, as in the case of street art, recognised instead as the new vital patterns of urban life: intervening openings, or interstices, for weaving things otherwise.

Adaptive and multithreaded patterns generate rich combinatorial alternatives to both the chaos of unplanned growth and the stringent order of modernist development. Opposed to the strictures of deterministic blueprints and models, available only to a cabal of sanctioned technicians and experts, patterns can be stitched together or unravelled by a broad constituency of craftspeople, according to the logics of specific geographies and cultures. Apparent anti-patterns and accidents can produce beneficial ruptures and disjunctions in the fabric of the city, new negotiations in form and alternative juxtapositions of practice. Patterns can be durable and dynamic, without the pretence of permanence and obduracy. In Sennett's (1996) formulation, the stone of the city is laid down in ways that both follow and condition the form and function of the human body. Yet stone materials are relatively undifferentiated in how they might press against the flesh. As Alexander's example illustrates, patterned layers of fabric, at once pliable and firm, concealing and revealing, smooth and abrasive, are needed to intervene, to suggest a greater range of haptic experience for the city. Like during times of carnival, where the naked human figure is disguised in motley of richly patterned costumes, the eclecticism of contemporary urban forms and patterns also fashions novel aesthetics, new ways in which the city rubs up against the body.

5.5 Urban comedies of the commons

Trends towards modernisation, globalisation, corporatism and technification suggest the city has become increasingly sealed, a closed container rather than an open fabric. The alternative modalities discussed in this chapter speak to a city that instead remains tactile and impressionistic. Layers of technological 'interfaces' – sleek mobile devices, data visualisation techniques, video surveillance – are additive rather than subtractive in their effects on the urban fabric. They produce, also, new perturbations on the relations between flesh and stone. Passengers awaiting a train switch their gaze listlessly between the scrutiny of a mobile phone screen and the distant apprehension of the railway line. The concrete platform, steel tracks, and surrounding buildings of brick and glass hold little interest, as they change little day to day. The miniaturised pane in the hand offers an alternative sequence of rapidly changing information, in bright colours, controlled by gestures on sleek interfaces of

aluminium and glass. The fatigue in the legs climbing steps after a long walk to the station contrasts starkly with ease of fingers scrolling across virtual keyboards and panning through news feeds. Yet the lurid gleam also induces its own exhaustion, a tiring of the eyes and a soreness in the knuckles. Checking for an oncoming train brings, then, its own form of relief – a straightening of posture, a saturation of ambient light, an awareness of a crowd of others going through similar motions.

Even in these most mundane of situations, exemplifying the *ennui* of modern urban life, these distinct fabrics are visible and tangible. They exhibit an aesthetics. The challenge of remaking world urban culture, a sustainable and open cosmopolitanism, lies in ensuring these fabrics are also pliable. The comedy of carnival, a time of masquerading in costume through the city, a parade in which every participant weaves some novel strand into a larger emergent tapestry, contrasts with both the chaos of urban warfare and the rigid order of a military march. The carnival in turn invokes the commons, the time when the common people take back the streets of the city. Predating the widespread adoption of open source software and creative commons licensing, Carol Rose (1986) has argued that many urban situations indeed exemplify a 'comedy of the commons', inverting the more familiar 'tragedy'. Echoing Jacobs' portrayal of benevolent urbanism involving a 'ballet of the sidewalk', Rose introduces the example of a communal 'periodic dance', in which 'each added dancer brings new opportunities to vary partners and share the excitement' (1986, p. 767). This example also serves to illuminate more prosaic cases of the commons: public roads and waterways that enhance the returns of private enterprise and other public or communal goods. In technological circles, such happy examples abound in the escalating benefits of larger networks, the accumulation of value in products that 'go viral' and the economies of scale that accrue through vertical integration. Such virtues are today hardly unnoticed. Yet, as the many examples in recent urban literature argue, greater global urban connectivity does not unconditionally bring about unmitigated goods. Ecological degradation and social inequity represent tragic side-effects of certain benefits accruing to a few, the fortunate one per cent, through ever-heightening cycles of global production.

The challenge for a systemic and global new urbanism lies beyond, then, the elegant designs of homes and the liveability of streets. It is also to develop a deep aesthetic in which collective tastes align with other beneficial intended consequences. Oxfam's slogan, 'Buy fair, feel good'

(n.d.), is an example of endeavouring to connect a particular consumer sensibility and feelings with benevolent social outcomes. Exhortations to 'think global, act local' place a similar onus on individual purchasing agents. Yet the emphasis on cheap cognitive-behavioural adaptation only goes so far. To return to the language of the Triple Bottom Line, social and environmental effects surely cannot be left to the dispositions of individual economic agents alone. More systemic and structural change is necessary and contemporary conjunctions of technology and aesthetics offer appealing alternatives for action at these levels. A planetary urbanist attitude that emphasises 'cities under fabrication' rather than 'cities under siege', that seeks to exploiting multidimensional comedies rather than tragedies of the commons in the relations within and between cities, and that continues to experiment with an eclecticism of open sourced urban patterns and techniques at a variety of temporal scales suggest some of the preconditions for a sustainable global fabric. The sites for the deployment of such an attitude need also to include the growing urban space rapidly filling in the interstices of megacities in Asia, Africa and Latin America – sites of conspicuous modernism, but whose fabrics are still pliable to alternate localised and tailored designs. Precisely the absence of a determinate built form and heritage, of inchoate or emergent civic structures, and of desperate material and immaterial needs mean these sites also present opportunities for novel urban techniques and aesthetics to emerge. A new 'messy', or, to paraphrase from Nietzche, 'gay science' for cities would not only consist of novel computational models for understanding theories of mass behaviour and various transactional flows, but would also seek to reengage, through diverse arts and crafts, with the problematics of utopic design, open civic formations and a wider sense of what sustaining the urban fabric might mean.

Conclusion: Reweaving the Global Urban Fabric

Abstract: *The Conclusion recapitulates briefly the book's argumentative trajectory and concludes with an exhortation to consider possibilities for repatterning and reweaving the global urban fabric, as is described in the text.*

▶

Modernity has left a monumental and ambivalent legacy on the cities of the world. Multinational firms and international agencies, targets of frequent critique and protest, continue to dominate the establishment, operation and regulation of global urban space. Infrastructure coordinated by national governments and regional unions link and determine the routes across major metropolitan centres. Threats to natural and social ecologies, including the pressing challenges of climate change, continue to spin out of the fluctuating patterns and productions of world diplomacy and trade. Yet these same institutional practices, infrastructural systems and dynamic flows of capital and power, constitutive of global urbanism and driving further rapid waves of migration to cities, also form the underlying fabrics through which other types of worldly affiliations can be threaded and sewn. To do so requires what I described in Chapter 3 as the different metropolitan, ecopolitan and cosmopolitan relations of cities be made open and transparent. Following Sennett, these relations must be able to tolerate ambiguity, incompleteness and lack of resolution. A radical openness also involves a critical orientation towards prevailing and emergent global structures and networks. Making perspicuous their patterns, the designs against which they are plotted and woven, also makes possible the crafting and tweaking of alternatives.

A politics espousing openness to cities is easy to profess, its enactment far more difficult. The arguments for 'multiple modernities', promising for each city what Robinson (2002) has termed its own 'ordinary' and unique destiny, offer a powerful narrative for framing an egalitarian global urban politics through which similarly intractable global knots, entangling economies, ecologies and cultures, might be rationally debated and decided. This framing must, however, contend with the uniformities and reciprocities between cities, discussed in Chapter 2. Some of these are evident, in the form of multinational retail chains, shared infrastructural and technical standards and multi-region media distributions chains; others remain shrouded in the veiled language of diplomacy, the encrypted channels of networked communications, the inscrutability of international financial exchanges or the covertness of unacknowledged military operations. The tensions between various forms of transparency and secrecy wind down to the level of the individual city. As I outlined in Chapter 1, activist, artisanal and hipster cosmopolitanisms arrive alongside the deployment of mass surveillance devices and evidence of widespread monitoring of civilian communications – trends that share little

beyond their simultaneous appearance. Cities become more open, and more closed, seemingly at the same time. Nor, as I argued in Chapter 4, is openness itself a property immune to functioning as a token in a game of large corporate interests. As Sennett and many others have begun to do, as a political urban objective it needs careful calibrating and refining.

As Merrifield (2014) has suggested, the revival of the metaphoric of fabrics can help in the reimagining of this objective at local and global levels. A city surrounds its citizens with concrete curtains, asphalt ribbons, infrastructural seams and attenuated but highly tensile threads of power and influence. These stretch out beyond, with varying consistencies and densities, throughout world space, urban and rural. As I discuss further in Chapter 3, The question of sustaining these fabrics, precisely through their mending, reworking and refashioning, is critical to the addressing of climate change and other global dilemmas of collective social life. An opening of the urban cannot therefore proceed through a tearing down of these diverse fabrics, unveiling some hidden scene behind the drapes designed to conceal it. If the metaphor is to hold, the urban assemblages, constellations and networks must be understood as fabrics and fabrications, all the way down. Citizens of the city are not then an audience at the theatre, apprehensively awaiting the raising of the curtain. Like cautious customers at a haberdashery store, putting aside one garment to browse those beneath it, they are involved rather as wearers, weavers and tailors of the costumes and canvases that make up the urban spectacle. Just as the tales of Rabelais, postmodern *avant la lettre*, reveal the art of the tale in the telling of it, their technique and craft are also on display and part of the act. The argument here has been that urban fabrics reveal as much as they conceal; openness is not then so much a taking away or denuding of those fabrics, but rather a showing forth, a disclosing, of the patterns that compose them.

In Chapter 4, I suggested that even more contemporary ways of seeing the city – as networks, circuits or algorithmic software – still resonate with fibrous tendencies. An irony of an increasingly procedural urbanism, monitoring with digital dashboards, implementing sophisticated algorithms exploiting big data to further optimise smart cities, are the countertendencies within technical industries themselves towards guild-like medieval working units and processes. Extreme programming and agile development methods, open source software and DIY maker cultures espouse small collaborative teams, individual autonomy and relatively flat organisational structures. Celebration of the unfettered

release of these productive forces from stultifying large-scale institutionalism is surely premature; nor is a return to feudalism a likely remedy to the effects of large institutional actors. Yet in spite of the divergence of their techniques and outputs, knitting circles and open source hackathons share considerable overlaps as models of collaboration and cooperation: the passing around of expertise, the manifestation of labour and craft into materials and the being-together with others. What were once opportunities only afforded by the physical proximity of human settlements now can, still with awkwardness and constraints, extend out across global urban space. These constitute novel renderings of old patterns of social design and organisation: pair programming and peer review mimic forms of Socratic dialogue and cooperative crafting, rewoven into contemporary work practice. There, too, lurk imbalances and disequilibria of power; but their temporary, experimental and situational status looks to alleviate its worst excesses.

Is there scope to extend these experimental forms, limited seemingly to the creative classes of artists, programmers and designers at the core of the new millennial metropolis, to the grand dimensions seemingly demanded of global cities and the infrastructures that connect them? Do the evocative precedents set by cooperatives operating renewable power grids, sustainable agriculture and closed loop or communitarian economies scale to the needs of the millions agglomerating in dense urban spaces? Are there threads that lead beyond a lockstep modernity, to enable those caught in webs of apparent dependency in urban slums to design alternative futures, patterns without social exploitation and environmental degradation? Beyond the two-sided faces of these sociotechnical innovations, euphoria and scepticism amplified by today's social networks, here too there needs to be openness to further experimentation with crafts, arts, designs and techniques, including the crafting of different patterns of an urban political economy. Equally, as argued in Chapter 5, cities cannot become, through designerly preoccupations, anaestheticised; luxuriating in their manifold complications, becoming refabricated ourselves within them, constitutes one of the difficult pleasures of being urban. The right to the city, in Lefebvre's phrase, must then include the reciprocal rights to remake it and to be remade by it.

I have argued that in the new millennium, irretrievably, cities are interwoven. The scope, scale and complexity of the effects of flows across their many threads are, in Anders' phrase, 'superliminal', beyond limits of comprehension. Untangling existing knots and weaving new

patterns, requires, as Anders (1962, p. 14) notes elsewhere, the 'courage to be afraid' of the consequences of technological production. Nuclear holocaust, courageously feared by Anders and brutally depicted in the film *Threads*, incinerates the earth. By comparison, climate change and other environmental threats may present themselves as slow, unevenly distributed and even adaptable threats. Yet they require the same questioning and critical vigilance, and demand similar common actions to address them. Reweaving the global urban fabric suggests one orientation through which more sustainable theory and practice might be enacted. The complexity of this fabric seems certain to increase; equally, though, its threads must be capable of being unwoven and rewoven, with the patterns of its weaving open to all with a say in the state of the city – which is to say, open to the whole world.

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