

HUMAN SETTLEMENT DEVELOPMENT: THE CENTRAL ROLE OF CITIES IN OUR ENVIRONMENT'S FUTURE—CONSTRAINTS AND POSSIBILITIES

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Summary

Humankind increasingly relates to the various stocks and flows of environmental capital through cities and vast urban agglomerations. Given technical developments, the urban hinterland today is global. This represents a radical transformation in the relation between humans and the rest of the planet. It is at the center of the environmental future. Further, rural populations increasingly have become consumers of products produced in the industrial economy. The rural condition has evolved into a new system of social relations that diverges profoundly from older economic cultures which worked with biodiversity. These developments all signal that the urban condition is a major factor in any environmental future.

Cities and urban regions are a type of socioecological system marked by a whole new set of interrelations between, on the one hand, constructed features and material practices and, on the other, various ecological systems. In the current stage, the systemic characteristics of this interrelation are mostly in the form of environmental damage. A growing number of researchers and activists are calling for the need to use and build upon those features of cities that can make cities into a socio-ecological system with positive outcomes. Specific features of cities with such positive potential are economies of scale, density and the associated potential for greater efficiency in resource use and lower priced options, and dense networks of communication that can serve as facilitators to institute new practices.

The urban and rural condition and their interaction are in good part shaped by systems of social relations that support the current, environmentally damaging configuration. We now have enough evidence to know that beyond adoption of good practices, such as waste recycling, it will take a change in these systems of social relations themselves to achieve greater environmental sensitivity and efficiency. A crucial issue raised by all the above is the question of the scales at which damage is produced and intervention or change should occur. These may in turn differ from the sites where the responsibility for the damage and the sites for demanding accountability lies. The city is, in this regard, an enormously complex multi-scalar system where many of the environmental dynamics that concern us come together and where different policy levels, from the supra to the sub-national, get implemented. Further, specific cross-border networks of mostly global cities, also constitute a key component of the global scale at which these dynamics occur and hence can be thought of as a network of sites for demanding accountability of global economic actors.

Because cities bring together our economic, political, cultural, ideological, and technical systems and practices, the treatment of the subject demands multiple forms of knowledge. Dealing with the question of the environment in the context of cities and rural-urban interactions requires an extraordinary mix of disciplines. Further, because we are dealing with an enormous variety of political and economic systems, levels of wealth and power, cultural understandings and ideological convictions, it is necessary to include analyses that represent many of these differences. It is not a question simply of scientific knowledge and shared theoretical understandings.

This complexity and variety assume even more weight when we consider that the question of urban sustainability requires engaging the legal systems and profit logics that underlie and enable many of the environmentally damaging aspects of our societies. This in turn requires addressing some of the major dynamics of the current era: globalization and the ascendancy of markets. The question of urban sustainability cannot be reduced to modest interventions that leave these major systems unaddressed. And the actual features of these systems vary across countries and across the North-South divide. In brief, non-scientific elements are a crucial part of any discussion of urban and rural sustainability. Questions of policy and pro-active engagement possibilities are a critical dimension of treatments of urban sustainability, whether they involve asking people to support garbage recycling or demanding accountability from major global corporations known to have environmentally damaging production processes.

There are, then, many different ways of organizing a volume on urban sustainability, each one with its own shortcomings. We opted for including a large number of very specific studies by researchers from many different parts of the world and diverse disciplinary backgrounds. We kept general overviews to a minimum because they inevitably need to neutralize the variety and specificity evident across the world. The volume includes eighty case studies by authors from 50 countries. It enables a juxtaposition of differences and similarities in the problems identified and the solutions enacted in many different parts of the world. We have put enormous weight on the specific instantiations of general dynamics. This introductory chapter and the overview articles aim at scaling the issues upwards and constructing a conceptual architecture

where the details of the case studies can be situated and can contribute to illuminate more general trends.

1. Introduction

The massive processes of urbanization under way today are inevitably at the center of the environmental future. Yet they have largely not been at the center of environmental research. It is through cities and vast urban agglomerations that humankind is increasingly present in the world and through which it mediates its relation to the various stocks and flows of environmental capital. The urban hinterland, once a mostly confined geographic zone, is today a global hinterland. This represents a radical transformation in the relation between humans and the rest of the planet.

Having a large number of cities with multimillion populations is a new condition in our history, as is the urbanization of over half the people in the world. Urban agglomerations are today the engines of consumption of the world's environment: they occupy only 2% of the world's land surface, but use over 75% of the world's resources. Humans now consume nearly half of the world's total photosynthetic capacity, and cities are the major factor in this. Cities in the North require an average of 4 to 5 hectares of ecologically productive land per inhabitant. Further, much economic activity that takes place outside cities is geared towards cities. With the expansion of the global economy we have raised our capability to annex growing portions of the world to support a limited number of industries and places. Cities also have a pronounced effect on traditional rural economies and their long-standing cultural adaptation to biological diversity. Rural populations increasingly become consumers of products produced in the industrial economy, one much less sensitive to biological diversity. The rural condition has evolved into a new system of social relations, one that does not work with biodiversity. These developments all signal that the urban condition is a major factor in any environmental future.

Through this enormously distinctive presence that is urbanization, we are changing a growing range of ecological systems from the climate to species diversity and ocean purity and we are creating new environmental conditions of heat islands, desertification, and water pollution. We have entered a new phase in human ecological history. For the first time humankind is the major ecological factor on the planet, in a way it was not in the past. Massive urbanization over the last few decades has created a set of global ecological conditions never seen before. But is it urbanization per se or the particular types of urban systems and industrial processes we have instituted? That is to say, are these global ecological conditions the result of urban agglomeration and density or are they the result of the urban systems for transport, waste disposal, heating and cooling, food provision, and the industrial process through which we extract, grow, make, package, distribute, and dispose of all the foods and services we use?

We can begin by conceptualizing the urban condition as a socio-ecological system in that it creates a whole new set of interrelations between, on the one hand, its constructed features and material practices and, on the other, various ecological systems. In the current stage, the systemic characteristics of this inter-relation are mostly in the form of environmental damage. A growing number of researchers today are calling for the need

to use and build upon those features of cities that can make cities into a socio-ecological system with positive outcomes. Specific features of cities with such positive potential are economies of scale, density and the associated potential for greater efficiency in resource use and lower priced options, and dense networks of communication that can serve as facilitators to institute new practices. More theoretically, one can say that in so far as cities are constituted through various processes that produce space, time, place and nature, cities also contain the transformative possibilities embedded in these same processes.

Because they are at the center of the environmental future, urbanization and the city also must be understood and used as potentially containing the solutions to many of these problems. As has been much documented, cities have long been sites for innovation and for developing and instituting complex physical and organizational systems. It is within the complexity of the city that we must find the solutions to much environmental damage and the formulas for reconfiguring the socio-ecological system that is urbanization. Cities contain the networks and information loops that may facilitate communicating, informing, and persuading households, governments, and firms to support and participate in environmentally sensitive programs and in radically transformative institution building.

Urban systems also entail systems of social relations that support the current configuration. Beyond adoption of practices such as waste recycling, it will take a change in this system of social relations itself to achieve greater environmental sensitivity and efficiency. For instance, a crucial issue is the massive investment around the world promoting large projects that damage the environment. Deforestation and construction of large dams are perhaps among the best known cases. The scale and the increasingly global and private character of these investments suggest that citizens, governments, NGOs, all lack the power to alter these investments patterns. But, as discussed later in this chapter, there are possibilities for acting on these deeply damaging economic operations. The geography of economic globalization is strategic rather than all-encompassing and this is especially so when it comes to the managing, coordinating, servicing and financing of global economic operations. The fact that it is strategic is significant for a discussion about the possibilities of regulating and governing the global economy. There are sites in this strategic geography where the density of economic transactions and top-level management functions come together and represent a strategic geography of decision-making. We can see this also as a strategic geography for demanding accountability about environmental damage. It is precisely because the global economic system is characterized by enormous concentration of power in a limited number of large multinational corporations and global financial markets that makes for concentrated (rather than widely dispersed) sites for accountability and for changing investment criteria. This leaves out a whole range of less central and powerful economic actors responsible for much environmental damage, but are more likely to be controllable through national level regulatory interventions.

A crucial issue raised by all the above is the question of the scales at which damage is produced and intervention or change should occur. These may in turn differ from the levels and sites for responsibility and accountability. The city is, in this regard, an enormously complex entity. Cities are multi-scalar systems where many of the

environmental dynamics that concern us are constituted and in turn constitute what we call the city, and where different policy levels, from the supra- to the sub-national, get implemented. Further, specific networks of mostly global cities, also constitute a key component of the global scale and hence can be thought of as a network of sites for accountability of global economic actors.

These are among the various issues examined in this chapter and developed in detail through the contributions in this Theme. Because cities bring together our economic, political, cultural, ideological, and technical systems and practices, the treatment of the subject demands multiple forms of knowledge. Dealing with the question of the environment in the context of cities and rural-urban interactions requires an extraordinary mix of disciplines. Further, because we are dealing with an enormous variety of political and economic systems, levels of wealth and power, cultural understandings and ideological convictions, it is necessary to bring in analyses that represent many of these differences. It is not a question simply of scientific knowledge and shared theoretical understandings.

This complexity and variety assume even more weight when we consider that the question of urban sustainability requires engaging the legal systems and profit logics that underlie and enable many of the environmentally damaging aspects of our societies. The question of urban sustainability cannot be reduced to modest interventions that leave these major systems untouched. And the actual features of these systems vary across countries and across the North-South divide. While in some of the other environmental themes examined in various volumes it is indeed possible to confine the treatment of the subject to scientific knowledge, this is not the case when dealing with human settlements. Non-scientific elements are a crucial part of the picture: questions of power, of poverty and inequality, ideology and cultural preferences, are all part of the question and the answer. Thus, we have addressed some of the major dynamics of the current era: globalization and the ascendance of markets. Questions of policy and proactive engagement possibilities are a critical dimension of treatments of urban sustainability, whether they involve asking people to support garbage recycling or demanding accountability from major global corporations known to have environmentally damaging production processes.

We opted for including a large number of very specific studies by researchers from many different parts of the world and diverse disciplinary backgrounds. We kept general overviews to a minimum because they inevitably need to neutralize the variety and specificity evident across the world. We have eighty case studies by authors from 50 countries. We have put enormous weight on the specific instantiations of general dynamics. This introductory chapter and the overview articles that will follow aim at scaling the issues upwards and constructing a conceptual architecture where the details of the case studies can be situated and contribute to illuminate more general trends.

There are shortcomings to this approach. We can only hope that the specificity and variety of contributors produces a multiplier effect through the juxtaposition of differences and similarities in the problems identified and the solutions enacted in many different parts of the world. The network of researchers and activists represented by

these 80 authors is itself a resource for change. And the enormous diversity of political views represents an engagement with lived experience.

The next section in this chapter briefly discusses some of the changes in the relation between urbanists and environmentalists. The third section reviews key components of our empirical knowledge about current and anticipated environmental damage linked to cities. The fourth section examines the evidence we have about cities as containing the capabilities for solving key elements of our environmentally damaging practices and ways of organizing the economy. Focusing on cities as a key site for instituting solutions introduces the question of the multiple scales that are present in cities, a subject we return to in the final section. The fifth section discusses issues raised by economic analyses concerned with environmental conditions and examines to what extent environmentally sound initiatives can use market systems, which at this point and certainly in the near future, continue to dominate and articulate economic activity. The sixth section examines key features of economic power, particularly in its global capabilities, that are crucial instruments in both the destruction of the environment and for demanding environmental accountability. A central effort in this section is to show that rather than focusing exclusively on the hypermobility of capital we also need to understand the embeddedness of global economic power in concrete locations which we can then also think of as sites for demanding accountability. Global economic actors need to become part of our efforts to instituting major transformations worldwide. The final section examines scaling as an analytic and policy strategy to address the issues of concern in this chapter.

2. Urbanists and Environmentalists

It is only in the last few years that significant numbers of researchers and policymakers have begun to focus on cities as crucial environmental components. Most of the international attention by environmentalists in the 1980s was focused on issues of “the commons” or those that threaten global tragedy (Hardin 1968; Campbell 1989:173). The more specialized field of ecology tends to exclude urbanization from its research and policy frames. On the other hand, urbanists have also tended to separate urban and environmental issues. Further, in the work of earlier urbanists who had an environmental and ecological interest, the definition of the ecological was far too narrow to match today’s concerns (Mitman 1992).

The 1992 United Nations Conference on Environment and Development (UNCED) held in Rio made an important contribution towards changing this lack of focus. Urban and natural environments came to be seen as an indivisible matrix. Since the Rio conference it has become even clearer that the environmental regulation of cities is crucial to the future of the planetary ecosystem. Perhaps among the most significant outcomes of *Agenda 21*, the action plan that came out of the conference, was the formation of Local Agenda 21 programs in a large number of localities around the world (Lafferty and Eckberg 1998). Yet the momentum generated by the UNCED is weakening (Paarlberg 1999) even as environmental damage grows and has emerged as a major public concern for more and more people, though not quite for governments. (See Appendix 1 for case studies by An and Urge-Vorsatz; Apuzzo; Beall and Crankshaw; Izazola.)

Environmentalists are beginning to address urban questions, particularly through the notion of sustainable cities and more environmentally friendly forms of urban growth (see among others in our volume, Goodwin and Whitehead; Hassan), but the separation of urban and environmental analyses remains strong and problematic (see Gibbs in our volume). Harvey (1996) notes that at best the ecologists can offer some return to an earlier form of urbanization regulated by the metabolic constraints of a bioregional world “as it supposedly existed in the past,” one that for Harvey never really existed. A lot of what passes for ecological when it comes to cities actually consists of quality of life issues for middle- and high-income people. Further, the range of issues posed by urbanization go beyond those typically addressed by environmentalists. For many, the whole notion of “sustainable cities” is faulty in that it fails to name what are the actual dynamics and causalities that are at issue (see Simone 1997).

The articulation of environmental and urban research has not been facilitated by the lack of a clear definition of key categories such as environment and sustainability. One difficulty is that environment has many different meanings, depending on ideology, politics, situation, positionality, and economic and political capacities. Nonetheless, there is a whole range of ecological issues central to how we should be thinking about our rapidly urbanizing world. How we respond to some of the large global scale issues (warming, ozone, emissions) will have profound implications for urbanization processes (Girardet 1999). But these may not be the issues of concern to most people in cities in the South (e.g. Pathak 1999; Safi 1998; Shiva 1988). Thus there are complaints of bias in the environmental agenda being imposed by developed countries (DCs). Nowhere was this as clear as in the 1997 Kyoto conference where the North and the South basically split into what we have come to call (cf. Adams 1990) a “green” and a “brown” environmentalism (see also Sachs, 1993).

Beyond this overall difference, the environmental agenda being developed in the North may neglect issues of household level environmental problems such as sanitation, which may be crucial to sustainability in the South, but have often been solved for most people, though not the very poor (see e.g. Bullard 1994; Florini et al. 1990), in the North. (On these various issues see Satherwaite 1999.) The conditions that create high infant mortality and disease are, for some, of similarly global import as the destruction of forests, and are among the most urgent ones that need to be addressed. The consequences of hazardous indoor air quality (household airborne and water carried diseases) and inadequate sanitation have a far more direct and often fatal impact on large sectors of the world's population than the effects of global warming and emissions. Perhaps in one of the clearest formulations of this position, Gottlieb (1993) posits that we have to shift environmental analysis “from an argument about protection or management of the natural environment to a discussion of social movements in response to the urban and industrial forces of the past hundred years.” A growing range of issues never previously understood in terms of class, such as global warming, environmental damage and destruction of local cultures, can now be interpreted as class questions.

The notion of sustainable cities and sustainable development introduces a broad, often ill-defined range of issues. It is often not clear what the ‘sustainable’ refers to: cities, programs, or existing arrangements (Satterthwaite 1999; Marcuse 1998). There is a difference between those focused on meeting human needs and those who are more

ecocentric and posit that the ecosystem should be allowed to develop on its own terms, without separate reference to the needs of humans. There are different meanings in the literature on sustainable development, though most are centered on ecological sustainability with little mention of development in the sense of meeting human needs (Mitlin 1992). Partly in reaction there is now a second literature that focuses exclusively on meeting human needs (e.g. the Habitat II documents). A third literature, mostly from international agencies, refers to sustainability in terms of the longevity of those projects instituted by these agencies once they themselves leave; there is often little reference to the ecological impact of these same projects.

One of the major contributions of the Brundtland Commission (1987) was its insistence that meeting human needs must be combined with ecological sustainability. It argued that the challenge is to meet today's needs without compromising the future ability to meet needs. Hardoy, Satterthwaite and Mitlin (1992) suggest that 'sustainable' should refer to avoiding the depletion of environmental capital, and that development should refer to meeting human needs. They see this as an elaboration of the social, economic, and political goals coming out of the Brundtland Commission, with a commitment to limit or stop the depletion of major types of environmental capital. Haughton and Hunter (1999) identify three principles that expand on this definition: intergenerational equity, social justice (a form of distributional equity), and transfrontier responsibility. These are principles of justice between generations, social classes and strata, and between places (see also Baker et al., 1997).

Drawing a distinction between ecological sustainability and the development components of sustainable development has the advantage of avoiding the confusions generated by terms such as economic sustainability, social sustainability, and cultural sustainability, where it is uncertain what is being sustained and how it would affect environmental capital (Marcuse, 1998). The same can be said about "sustainable cities," sustainable human settlements, sustainable urbanization. Hardoy, Satherwaite, and Mitlin (1992) note that sustainable development is not about the cities or the social structures in cities today but about the need to meet human needs without depleting the environmental capital; this would require some sharp changes in those conditions. They argue that pursuing this also means seeking international regulatory frameworks in which "democratic and accountable city and municipal authorities ensure that the needs of the people within their boundaries are addressed while minimizing the transferring of environmental costs to other people or ecosystems or into the future." This in turn requires consideration of the kinds of national policies, legal and international frameworks, and international agreements that encourage city and municipal authorities in this direction (see generally Pronk 1997; Weiss 1999; Bartone et al. 1994; Vig and Axelrod 1999).

Key yet rarely examined assumptions in the literature on sustainability and in the politics around it are population growth and poverty and their role in environmental damage. (For an excellent critique see Satherwaite 1999.) There is a tendency to assume that a city's or nation's population size is the main influence on its depletion of natural capital and that the rate of population growth is the main influence on the rate of change of this depletion. But a significant share of the urban population in the South, including population in rapidly growing cities, have consumption levels that are so low that they

contribute little or nothing to the use of non-renewable resources, and the generation of waste and greenhouse gases. Worldwide most waste and resource use happens through the consumption patterns of middle and upper income households (which, in fact, tend to have very low fertility rates) and those producing for them. Further, it is precisely those countries in the South with the fastest development rates and rapidly declining fertility rates which are also the ones with the fastest growth in the use of natural capital. In terms of sustainable development, addressing population growth is important, but it may also lead to a greater consumption of resources as income levels rise (see generally on these various issues Bailey 2000; Blumberg and Gottlieb 1989; Sale 1985).

Besides the matter of cities as sources of environmental damage for the broader biosphere and cities as containing hazardous conditions for large sectors of the poor, there is a third issue, one that involves understanding cities as a socio-ecological system. The history of twentieth century urbanization is one of the most significant processes of environmental transformation of modern times, and we have seen emerge new ecologies created by our urbanizing activities (Campbell 1999; Ferry 1995; Foster 1999; Huggett 1997). Harvey (1996) has perhaps given us the most radical formulation, positing that a city does not stand outside the environment, but is in itself a set of environmental conditions. Its built structures and infrastructures, the practices of its inhabitants and users, its socioeconomic configuration, the extent of poverty and disease, each of these is an environmental condition replete with specificities and consequences. For Harvey (1996), the created environments of an urbanizing world, their qualities and difficulties, their proneness to new configurations for the development and transmission of new diseases, their extraordinarily difficult problems of sustainability in all senses, “have to move to the center of our attention relative to much of the contemporary preoccupation with wilderness, peripheral peasant movements, preservation of scenic landscapes.”

This is certainly underlined by some of the familiar figures on urban growth. In the twentieth century the global urban population grew from 15% to nearly 50% of world population. Even the non-urban population is increasingly dependent on cities and towns for economic survival, including the role of cities as markets and redistribution nodes among different types of rural locations. Much has been said also about the growth of the size of cities. In 1800 there was only one city of a million people: London, and the largest 100 cities in the world together had only 20 million inhabitants, with each city extending usually just a few thousand hectares (Girardet 1999). In 1990 there were hundreds of cities of 1 million inhabitants and the world's 100 largest cities accounted for over half a billion people, with many of these cities extending for hundreds of thousands of hectares. In the nineteenth and early twentieth century most urban growth was happening in the North as a result of industrialization; today the fastest growing urban populations are in the South due to sharp urban-industrial development and, often, due to rural decline.

A growing number of scholars are arguing that it will require radical reconfiguration of planning values and goals to manage what lies ahead. The ecological footprint of the global economy is already larger than the planet (Rees 1992), even though a quarter of the world's people still live in poverty and consume little. Population is expanding by 90 million a year and a good portion of it will raise the demand for resources associated

with western lifestyles and economic practices. To accommodate anticipated economic growth safely would require a tenfold reduction in the energy and intensity of economic activity. This has led some observers to ask whether large-scale urbanization and sustainable development can be reconciled (Rees, 1992; Girardet 1999; see generally World Resources Institute 1999a).

There is a growing consensus, and not only among a deep green minority, that our mode of technological economic development is unsustainable (Brundtland Commission, UNCED 1992; Business Council for Sustainable Development, various years; World Resources Institute 1999a,b; UN Intergovernmental Panel on Climate Change, various years; Commission on Global Governance 1995). The up to fivefold increase in world economic activity since the Second World War (World Bank 2000) has produced an unprecedented level of material and energy exchange between the eco-sphere and the human economic subsystem. Humankind now is a major consumer in all the significant ecosystems. It appropriates or otherwise diverts 40% of terrestrial and 25% of coastal marine photosynthesis to its own use, and the economic demand for non-renewable energy and material commodities is rising (Girardet 1999). The entire energy and material flux through the human economy returns in altered form as pollution and waste to the ecosphere. The sheer volume of these human induced flows is accelerating the deterioration of major ecosystems and is now capable of disrupting global life-support functions essential to the maintenance of life itself.

One of the major responses to this type of analysis is the fact that we have developed enormous technical resources that are capable of substituting nature with technology. Among the main contributors to this line of thought are economists. There are at least four positions: neoclassical, traditional natural resource economists, environmental economists, and ecological economists. Much of the debate comes down to questions of substitution. Thus neoclassical economists posit that all that needs to be preserved is productive capacity in that natural capital can be replaced by produced capital (Solow, 1992). The second and third type of economics draws the line between substitution and depletion on different points of a continuum. But the fourth type, ecological economics, does not accept the proposition of substitution. The fundamental question for ecological economics is whether remaining stocks of natural capital are adequate to provide the resource flows and waste sinks that will be required by the anticipated population of the future. Environmental goods are seen as complements, not subject to substitution (Daly, 1998). According to Rees (1998) this question cannot be answered and measured in terms of monetary analysis; it can only be approached through measures of physical stocks and flows, and hence cannot be accommodated in conventional neoclassical economic models.

3. Cities and Damage

There is today a growing recognition among specialists that cities are the places where critical components of ecological modification associated with development come together. There may be sites that more directly reflect the sharpest environmental transformation, e.g. the desertification of once fertile land, but it is in cities where the multiple dynamics intersect and interact with complex multiplier effects. It is the concentration of intense economic processes and high levels of resource consumption

that mark the urban condition. Unlike natural systems, cities are highly dependent on external supplies, both natural and man-made. Practitioners and researchers have focused on several aspects of these developments. For instance, Burgess, Carmona and Kolstee (1997) identify the following: a) the specific characteristics and effects of urbanization on the deterioration of local environments and on their contribution to global environmental change; b) the socioeconomic impacts of urban environmental degradation; c) the significance of environmental issues for the efficient and effective provision of urban goods, infrastructure and services; d) the environmental impacts of different architectural and planning practices and policies; e) the significance of environmental issues for the sustainability of cities and development models.

Worldwide urban growth is associated with increased resource consumption, especially in cities in the North. Increases in human living standards tend to bring increased resource consumption. Moving from a rural, agricultural and craft based production economy to an urban-industrial economy raises the level of consumption of resources. We can see massive increased throughput of fossil fuels, timber, metals, meat, and manufactured products in urban areas, along with poor waste management and hence additional environmental damage. In the South, poor waste management can lead to often serious health threats, as is evident with the epidemic dimensions of cholera, tuberculosis, and typhoid (WHO 1997; World Resources Institute 1999b). Current accelerated urban industrial growth in Asia will add an enormous amount of demand for resources. For instance, China is planning to double the number of its cities to 1200 by 2010 with an expected 300 million people moving into cities in that country alone.

There is a growing body of research that documents the role of cities in producing environmental damage at various scales. (See Table 1 for more detailed information and sources for data). Atmospheric changes associated with urbanization include: changes in radiation and rainfall levels; increased cloud cover; the creation of “urban heat islands” that produce dust domes; and convectional wind systems that circulate pollutants over the city (Burgess, Carmona and Kolstee 1997). The most significant transformation is the generation of pollution, particularly acute in the South, which has 5 out of the 6 cities with the highest level of air pollution. The main sources of air pollution are the domestic burning of firewood and coal for heat and cooking; motor vehicle emissions; power station combustion; industrial emissions; and emissions from toxic and hazardous materials and waste (White 1993; World Resource Institute 1999a; Connolly 1999).

Environmental problems,	Damage to Health	Dimension of the Damage to Health
Waste, and water contamination	Poor sanitation is responsible for health hazards through several routes, including direct exposure to feces near homes, contaminated drinking water, ingestion of fish from polluted waters, and ingestion of produce that has been fertilized by wastewater. As a	An estimated 2 million fewer children would die from diarrheal disease each year if all people had access to adequate water and sanitation facilities. Diarrheal diseases alone killed more than 3 million children in 1993, and causes some 1.8 billion episodes of illness

	<p>consequence of inadequate access to clean water and sanitation facilities, intestinal diseases transmitted by feces are prevalent in developing countries. Two of these diseases, diarrhea and intestinal worm infections, account for an estimated 10% of the total burden of disease in developing countries. Other diseases related to poor sanitation are trachoma (one of the major causes of blindness) and tropical cluster.</p>	<p>annually.</p> <p>In the developing world, 90% of sewage is discharged directly into rivers, lakes and coastal waters without treatment of any kind.</p>
Urban air pollution	<p>Chronic and infectious respiratory diseases are a direct consequence of the bad quality of the air in many cities. Indoor and outdoor pollution can damage children's lung tissues, predisposing them to viral or bacterial infections, as well as aggravating or initiating childhood asthma.</p> <p>Air pollution figures prominently as a contributor to not only chronic respiratory diseases, but also to cardiovascular diseases and respiratory tract cancers.</p>	<p>More than 1.1 billion people live in urban areas where they are exposed to a number of pollutants released from industrial, energy, and vehicular sources. Air pollution is particularly severe in megacities such as Beijing, Seoul, Mexico City and Cairo. It is estimated that the total global mortality from suspended particulate air pollution exposures is 3 million people, annually.</p> <p>The World Bank estimated that if particulate levels alone were reduced to WHO guidelines, between 300 000 and 700 000 premature deaths could be avoided globally per year (i.e. roughly 2 to 5% of all deaths in urban areas that have excessive levels of particulates).</p> <p>Respiratory infectious diseases are the second most common cause of death among children—it accounts for 63% of deaths. Chronic coughing in urban children under age 14 could be reduced by half, or about 50 million cases annually, reducing the chance that these</p>

		children will face permanent respiratory damage.
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Sources: World Resource Institute, World Resources 1996–1997: A Guide to the Global Environment; World Health Organization, “Removing Obstacles to Healthy Development”, 1999; World Health Organization, “Health and the Environment in Sustainable Development: Five Years After the Earth Summit”, 1997, World Resources Institute, Health and Environment, World resources 1998–1999.

Table 1. Health and environmental problems

At the geographic scale of the planet, we can see changes in land and water systems associated with the demand for resources coming from cities, and their sharp escalation over the last few decades (Aplin *et al.* 1995; Bailey 2000; Hinrichsen 1998; Huggett 1997; Lodha 1993; Miller 1996; Phillips 1999). Global transport and communication systems, and organizational forms such as the multinational corporation and global markets for commodities, have meant that a city can become dependent on world-wide resources and in-turn utilize enormous resources to bring them in. Demand for energy is a key and defining condition for cities. Most conventional transport is inter- and intra-urban. Transport has long been crucial to urban and national economies, but perhaps never as much as now. Much of transport relies on fossil fuels. According to Girardet (1999), no city of over a million has ever managed without fossil fuels except medieval Tokyo (Edo) and ancient Rome, both of which relied on sea transport. The other side of this intensive use of fossil fuels is waste gases (such as nitrogen dioxide and sulfur dioxide), discharged by chimneys and exhaust pipes, which affect the city and its surrounding forests and farmland. A large proportion of the increased carbon dioxide in the atmosphere is attributable to combustion in cities. This is enormously significant if we consider that climate change results mainly from fossil-burning. Clearly, much of the environmental damage evident in non-urban sites, such as rain forests and water systems is directly linked to resource consumption in cities and the industrial systems for extraction, production and distribution meeting urban demand.

There is a significant interaction between urban consumption and urban impacts on the biosphere. Rees (1992) has given us the concept of the biological footprint of cities, showing the land required to supply them with food and timber products and to absorb their CO₂ output via areas of growing vegetation. Rees uses land area as a proxy for natural capital, and estimates the area of productive land required to produce/absorb the material/energy flows associated with particular patterns of consumption. For instance, Girardet (1999) found that London’s footprint today extends to about 125 times its surface area of 159 000 hectares, or nearly 20 million hectares. Thus, with 12% of Britain’s population, London requires the equivalent of the entire productive land of Britain. In fact, these 20 million hectares constitute a geography that stretches worldwide.

Using this measure, Rees (1992) finds that the average Canadian or U.S. person needs between 4 and 5 hectares (10 to 12 acres) to support his/her consumer lifestyle. Using such data he can estimate the ecological footprint for an entire population or economy—the aggregate land area required to continuously produce the resource inputs and to assimilate the waste outputs of that population and economy (Rees 1992; 1994a; Rees

and Wackernagel 1994). Industrial regions and whole countries survive by appropriating the carrying capacity of an area of land vastly larger than the area they physically occupy. They “may seem ecologically prosperous, but are in massive ecological deficits with the rest of the planet.” If the present North American lifestyle were to be that of the almost 6 billion people in the world, it would take about 24 billion hectares of ecologically productive land using existing technologies. But the world has only 8.8 billion hectares of such land on the planet.

At the scale of the city, perhaps one of the most damaging dynamics is the discontinuity between the input of resources and the associated outputs, i.e. waste. Waste is measured and handled as largely unrelated to the systems that measure and handle inputs. A critical challenge is to institute modes of organizing the urban system that factor in the type of waste produced by different types of inputs. The current system contrasts sharply with the circular metabolic system of nature, where every output of an organism is also an input for another one. Cities need to adopt circular metabolic systems to support the natural systems on which they depend. Girardet (1999) notes that the local effects of urban resource consumption inside cities increase their actual weight, mostly through inert materials: concrete and tarmac, and others, such as heavy metals, which eventually leach from the roofs of buildings and pipes and accumulate in the local environment. Cities differ in all these measures: cities with similar populations supply their needs with different levels of resource throughput.

4. Cities as Solutions

There are two aspects to the notion of cities contributing to a more environmentally sound mode of development and settlement. One is to develop and institute better techniques for managing the variety of environmentally damaging processes one finds in cities today, e.g. waste recycling and controls on emissions. The other is to use the distinctive features of cities to address the more fundamental challenges we face: reducing the consumption of non-renewable resources, altering the criteria through which we measure economic advantage or profit making, and so on. These can, clearly, be very different types of approaches.

Much more has been done in terms of research and implementation with the first type of contribution. Some of these measures are modest, e.g. voluntary garbage recycling programs; others have been far reaching, such as the massive air clean-up in Tokyo or the transformation of Curitiba into a model city when it comes to recycling (see in our volume Heller; Priemus; Rabinovitch; Trevisiol; Wadhwa; Wan and Wan; Hough). HABITAT II emphasized cities as solutions. The Best Practices and Local Leadership program was one of the major initiatives of HII. In the course of two years it collected some 700 examples from around the world in 14 categories of best practices, from poverty reduction and job creation to innovative use of technology. This program seeks to make itself available to all those interested, through any means of communication all over the world; some of the poorest urban communities are being reached. We need to extend people's participation and this will require strengthening relevant institutions and urban democracy through: neighborhood forums, action planning, consensus building. All of these can lead to better decisions and easier implementation if they have a widespread presence in a city.

As for the second type of challenge, cities can actually be beneficial. The fact of a vast human population will entail demands on natural resources no matter what the form of settlement might be. But density can contribute to minimizing the inevitable damage: density can allow for greater efficiency in home heating and transport, and can make it easier to organize waste systems. Well-developed urban agriculture could feed vast numbers of people, create jobs, minimize transport/road use, and therewith minimize use of fossil fuels. Cities are dense nodes for communication that can help to reach, educate, organize, and persuade people and organizations to adopt new measures.

To make cities more environmentally sound requires a whole range of new resource-efficient technologies: combined heat and power systems, heat pumps, fuel cells and photovoltaic modules. Since cities today depend on fossil fuels, a crucial question is whether renewable energy technologies can reduce this dependence. The chapter by Droege in our volume shows us how they can. For instance London, with 7 million people, uses 20 million tons of oil equivalent per year, or two supertankers a week, and discharges some 60 million tons of carbon dioxide. Its per capita energy consumption is among the highest in Europe. We have the know-how to bring down this level of use by 30 to 50% without affecting living standards and by creating jobs. Enormous reductions in fossil fuel use can be achieved by the use of photovoltaics. According to British Petroleum, London could supply most of its current summer electricity consumption from photovoltaic modules on the roofs and walls of its buildings. The technology is still expensive for this, but large-scale production will massively reduce per unit costs. Fuel efficient and lower emission vehicles are beginning to be produced on a much larger scale, and possibly reaching mass markets in the near future. Rapid urban transit systems are being installed in a growing number of cities worldwide. Table 2 describes multiple ways in which cities can contain the solution to the environmental problems they produce.

Ambient Air Pollution		
Geographic levels implicated	Effects	Causes
Community City-wide Regional Transnational	Health problems Economic costs from health care costs and productivity losses Amenity losses (aesthetic, cultural, and recreational)	Industrialization with urbanization Increase in motorized fleet and congestion (see "Urban Transport Externalities") Use of highly polluting fuels (leaded gas & high sulfur coal) Energy pricing policies
<i>Solutions/Case Studies</i> [fuel pricing; regulations, standards, emissions charges; demand management; transport planning; appropriate technology]		
In Cubatao, Brazil, since 1984 state and local government, and some local businesses have combined to reduce air pollution and have enforced tougher		

regulations.

In Los Angeles, a program was introduced in 1989 to reduce air pollution. Policies with ambitious targets have been established to increase car occupancy rates, to encourage more telecommuting, and to increase low- and zero-emission vehicles. Regional growth management measures are proposed to help bring about a distribution of future jobs and employment compatible with reducing vehicle emissions.

In small German cities, natural ventilation systems help to improve urban climate. Vegetation plans for improving the climate are now made in several European cities. Such plans involve vegetation zones linking built-up areas with the periphery in order to improve air-circulation.

Berlin has implemented its most comprehensive climate protection strategy, placing strong emphasis on energy policies. According to preliminary estimates, reduction in CO₂ emissions between 1993 and 1995 reached 10%. Berlin aims to reduce CO₂ emissions by 50% per head between 1990 and 2010. A plan of action has been developed and DM 430 million have been committed to the project.

Degradation of Forested and Agricultural Land

Geographic levels implicated	Effects	Causes
Peri-urban Regional	Declining agricultural productivity Reduced renewable resource base (deforestation, lost soil fertility) Erosion and siltation Amenity losses Loss of natural habitat	Changes in relative value of land uses Uncontrolled urban growth (no zoning/enforcement, no alternatives for squatters) Land tenure system Woodfuel, land pricing, and mining activities Heavy metals production

Solutions/Case Studies [internalize ecological value in land prices; designate special areas for management; local participation; security of tenure; economic resource planning]

Fish and livestock, vegetables and fruit can be grown or raised together in small urban courtyards. Even in Shanghai, China's most populous city, there are increasing numbers of backyards, roofs, balconies, walls and vacant spaces near houses being used to develop such agroforestry systems as orange tree-vegetables-leguminous plant, grapevine-gourd and melon-leguminous plant and Chinese tallow tree-vegetable-leguminous plant.

The importance of urban food production was shown by a study of six Kenyan towns completed between October 1984 and July 1985. In a survey of over 1500 urban households, almost two thirds of respondents grew some of their own food or fuel and about half kept livestock. The importance of urban subsistence farming is in part due to poverty; 57% of the households interviewed were in the

<p>“very low income” category.</p> <p>The 1980 US census found that urban metropolitan areas produced 30% of the dollar value of US agricultural production. By 1990, this figure increased to 40%. Singapore is self-reliant in meat and produces 25% of its vegetable needs. Bamako, Mali, is self-sufficient in vegetables and produces half or more of the chickens it consumes. Dar-es-Salaam, one of the world’s fastest growing large cities, now has 67% of families engaged in farming, compared to 18% in 1967. In Moscow, 65% of families are involved in food production, compared to 20% in 1970. There are 80 000 community gardeners on municipal land in Berlin, with a waiting list of 16 000.</p>		
Inadequate Sanitation		
Geographic levels implicated	Effects	Causes
Household Community City-wide	Health impacts (diarrheal diseases, parasites, high infant mortality, malnutrition) Related economic costs Eutrophication Amenity losses	Inappropriate technology Pricing (no cost recovery) Poor management (lack of operations & maintenance, uncoordinated investments) Household hygiene
<p><i>Solutions/Case Studies</i> [gear sanitation options to willingness to pay; community approaches; cost recovery (pay for operation and maintenance, new investments); hygiene education]</p>		
<p>Sewage can also be a major urban output. In Bristol, Wessex Water now dries and granulates all of the city’s sewage. The annual sewage output of 600 000 people is turned into 10 000 tons of fertilizer granules.</p> <p>Community- based Management in Northeast Brazil: In the cities of northeastern Brazil, communities have been managing condominial sewerage systems that connect inexpensively to a block of houses. Success depends on residents jointly allowing the systems to be built on their land—thus the term condominial. Instead of digging under the streets in front of the houses, a short grid of small, shallow “feeder” sewers are run through backyards.</p>		
Groundwater Pollution and Depletion		
Geographic levels implicated	Effects	Causes
Community City-wide Regional Transnational	Reduced water quality from saline intrusion , biochemical seepage Health impacts Economic costs (damage from land subsidence, health costs,	Pricing policies “Tragedy of the Commons” Poor regulations and/or enforcement for sanitation, municipal and industrial waste disposal

	increasing marginal costs of supply)	practices Unsustainable extraction Poor demand management
<i>Solutions/Case Studies</i> [LRMC pricing (sustainable extraction, aquifer recharge costs); waste management; regulations, standards, licensing, charges; appropriate technology, demand management]		
<p>In Singapore, water tariffs are recognized to be one of the ways of curbing demand growth and encouraging the efficient use of water. To encourage customers to conserve water, block tariffs are used for domestic consumption. In addition to the water tariffs, a water conservation tax of 5% on all consumption above 20 m²/mth for domestic consumption and 10% on all non-domestic consumption was introduced in April 1991. With effect from April 1992, this tax has been revised to 10% and 15% for domestic and non-domestic customers respectively.</p> <p>In the People's Republic of China, the policy of stressing both water resource development and water conservation started in the 1980s in order to balance supply with the increased demand. Since the mid 1980s cumulative total water saving of the cities all over the country has reached more than 10 000 million m³. Industrial water reuse has increased to over 50% from 20% in 1983 and the water consumption per 10 000 Yuan industrial product has been reduced by more than 40% in real terms. Significant economic, social and environmental benefits have been achieved. In Beijing, over the past 15 years, the total volume of conserved water was over 1500 million cubic meters. Specific efforts to address the goals of water conservation in the industry have enabled a substantial increase in production per unit of water. Over the past 15 years the municipal government has made an investment of over 15 billion Yuen to build more than 2000 industrial water conservation facilities. The city and government policy is to prove the feasibility and enforce rigid water conservation policies to change the historical concept of supply management.</p> <p>In Korea, the government has launched a water conservation program since 1990 in an attempt to control the ever-increasing water demand. Industries which suffer from shortage of water have embraced measures like: recycling cooling water through cooling towers, changing production processes, reuse of water washing operations, reuse of waste water, installation of water saving devices.</p>		
Coastal/Lake Pollution		
Geographic levels implicated	Effects	Causes
Community City-wide Regional Transnational	Health effects Loss of recreational & tourism resources, revenues Damage to fisheries Amenity losses Eutrophication	“Tragedy of the Commons” Poor regulations and/or enforcement for sanitation, municipal and industrial waste disposal practices Shipping related pollution

<i>Solutions/Case Studies</i> [regulations, standards, licensing, charges; appropriate technology; coastal zone management/preservation; port facilities]		
The Don River in Toronto, Canada, once regarded as the most polluted and ecologically degraded river in the region, has over the last ten years or more become the focus of major strategies to return it to state of health. This has happened mostly through citizen action. The strategy for restoring the Don River has involved a multi-faceted and integrative planning and design process for restoring a unique urban waterway, once forgotten but now very much a part of Toronto's urban life.		
Solid Waste Pollution		
Geographic levels implicated	Effects	Causes
Community City-wide	Health impacts Costs related to blocked drainage and flooding Water pollution from leachates Air pollution from burning Amenity losses	Poor management (improper collection and disposal, little resource recovery) Pricing (no cost recovery) Disposal impacts external to community
<i>Solutions/Case Studies</i> [privatization of collection and disposal; waste minimization (recycling, recovery, source reduction); expanded coverage; institutional strengthening]		
In many Third World cities, the “management of waste” is a source of income for many people. In Calcutta, an estimated 40 000 people make a living from recovering and using (or selling) resources picked from wastes—and many thousands more make a living from intensive farming using composted household wastes, and fish-rearing in ponds fertilized by city sewage. But it is not only in the poorer Asian cities where the reclamation and recycling of wastes are important sources of employment. In Bogota (Colombia), this is how an estimated 30 000–50 000 people earn a living including cart drivers, small-scale waste dealers, people reclaiming materials from street waste and the employees of the municipal waste disposal and street-cleaning department.		
In some cities, there is a recognition that people previously regarded as “scavengers” and “pickers” are in fact recyclers and reclaimers who can be incorporated in citywide waste-management schemes in ways which benefit them and the city environment. In Bogota, waste pickers have formed co-operatives that have successfully bid for some municipal waste collection contracts. In Cairo, the Environmental Protection Company that developed out of a group of informal garbage collectors (the <i>zabbaleen</i>) and local contractors have been awarded the contract for waste collection in several parts of the city and the Cairo Government is seeking to extend this company's services to other parts of the city. An increasing number of initiatives, most started by Southern NGOs, are seeking to improve solid waste collection and recycling and improve conditions for low-income groups which make a living as waste pickers.		

- In Curitiba, two innovative programs were instituted in order to deal with problems of trash generation and collection. The first initiative, “Garbage that is not Garbage”, involves curbside collection and disposal of recyclable materials that have been sorted by households. The second initiative, “Garbage Purchase” program, designed specifically for low-income areas, seeks to clean up sites that are difficult for the conventional waste management system to serve by exchanging garbage bags collected by the local residents for bus tokens, parcels of surplus food, and children’s school notebooks. Another initiative, “All Clean,” hires retired and unemployed people temporarily to clean up specific areas of the city where litter has accumulated.
- The Shanghai Municipal Environmental Sanitation Administration serves a 150 km² city (Shanghai) plus 6035 km² of suburbs and rural areas around the city core, with a population of some 12 million. Since 1957, it has developed into a state complex retrieving materials and marketing the reclaimed products. A network of 502 purchasing stations and 1500 purchasing agents in rural areas acquires material for reclamation and recycling. Twenty-six integrated recycling centers reclaim or recycle material from industrial and consumer wastes and a network of sales departments and retail shops sell reclaimed products. Over 3600 people are employed to work directly with factories—for instance, advising them on setting up containers for wastes and establishing systems by which the company can collect them.
- The recent landfill tax is increasing recycling in the UK, helping to achieve the government target of 25% household waste recycling by the end of 2000. This taxation should be extended, with the purpose of achieving a recycling rate of at least 50% which is already the norm in other countries. In some British cities, such as Bath and Leicester, where recycling has advanced a great deal, the benefits for people and the local environment are clear.
- In USA, states (along with local governments) play an important regulatory role in the management of waste facilities (thus increasing their costs and making recycling more attractive). They have developed a solid waste management plan aimed at promoting environmentally sound practices. In addition, many states have set up departments, within an agency of environmental protection, to provide technical assistance, coordination and educational projects to facilitate recycling. At the city level: Seattle operates a municipal compost operation and provides bins for backyard composting. Food packaging which is neither biodegradable nor recyclable is banned in Minneapolis and St. Paul; polystyrene packaging has been banned from Berkeley.

Urban Transport Externalities

Geographic levels implicated	Effects	Causes
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Community City-wide	Road accidents Vehicular air pollution	Increasing motorization Precarious public transport systems Poor road maintenance Insufficient bicycle paths and walkways Inadequate traffic management Lack of enforcement and education
<i>Solutions/Case Studies</i>		
<ul style="list-style-type: none"> • In Freiburg, Germany, cycle traffic has been continually expanded since the 1970s. The cycle path network has recently been expanded from about 30 km in 1992 to about 150 km in 2000. Also, there are 250 km graveled cycle paths, which are being used increasingly by commuters from small towns to the East and West for the daily journey from home to work. In addition, approximately 3000 new bicycle parking spaces have been made available, and a special cycle port is under construction at the railway station in order to make it easier for passengers to directly transfer to the train system. • Utrecht in the Netherlands serves as a good example of a positive relationship between real estate development and public transport. In the Utrecht Center Project (a 1.6 billion Euro project) provides 350 000 m² of office space, 1500 dwellings, 40 000 m² of shopping space, and an urban entertainment center (including casino and a mega-cinema), the renovation of Utrecht central station, and a bus station:. The renovation of the station at Den Bosch is another interesting example. The future stations for high speed trains (HST) are seen as opportunity rich locations where public transport and real estate operations can reinforce each other. • Thanks to the integration of transport and land use policies evolving land use legislation that enforced higher densities around major transport corridors and roads, Curitiba has now one of the lowest rates of ambient air pollution in Brazil; fuel consumption has been reduced by 25%, and gasoline use per vehicle is 30% less than in other Brazilian cities. Moreover, public transportation has greatly improved. Main roads have an express bus lane; different lines are integrated for rapid transfers; the system is faster and cheaper than those in other Brazilian cities. Now, the bus system serves 1.3 million passengers daily, or 75% of all commuters. People spend about 10% of their income on transport, on of the lowest rates in Brazil. • In Bangkok, Thailand, there are restrictions on the entry of four and six-wheeled freight trucks into the Greater Bangkok Area during peak hours. Restriction hours are longer for ten wheelers and larger trucks. Similar restrictions are applied in Jakarta, Indonesia, where trucks heavier than 3.5 tons in gross weight are not permitted to enter the downtown area of the city during peak hours. Overly large vehicles face even more severe 		

restrictions. In Manila, trucks are banned in eleven specific routes in Metro-Manila in rush hours from Monday to Friday.

- The Australian and Canadian cities are showing an interesting trend towards reducing automobile dependence. In the 1960s, Australian cities' vehicle kilometers traveled grew by 4.5% a year, by 2.3% in the 1970s and by 1.2% in 1980s. If projected, according to Peter Newman, this would mean zero growth in the 1990s. Toronto is similar with just 1.6% growth per year in 1980s (873 kilometers of growth per capita). This reduced growth in car use in Australian and Canadian cities (especially compared to US cities) may be due to the re-urbanization of older suburbs which leads to reduced travel, the development of nodal sub-centers in outer suburbs that also reduce the need for travel and makes transit more viable, to the reduced dependence on automobiles. Better urban environments have encourage both the reduction and the need for car journeys to "leapfrog" unsafe urban areas (as in US cities) . More walking and cycling are also characteristics of Australian and Canadian cities
- The *Hoy no circula* programme (day without a car) , launched in México City in 1989 saw air pollution emission fall 21% in its first year.

Sources: Josef Letitman, Carl Bartone and Vanis Bernstein, "Environmental Management and urban Development: Issues and Options for Third World Cities", *Environment and Urbanization* , vol. 4, No. 2, October 1992; . Graham Haughton and Colin Hunter, *Sustainable Cities*, 1994; Deelstra, Tjeerd, chapter on Western Europe, in Richard Stren, Rodney White and Joseph Whitney, *Sustainable Cities: Urbanization and the Environment in International Perspective*, 1992; UNCHS , *Best Practices Database*, <http://www.bestpractices.org>; Jorge E. Hardoy, Diana Mitlin, and David Satterthwaite, *Environmental Problems in Third World Cities*, 1992; Herbert Girardet, "Sustainable Cities: a contradiction of terms?", in *Environmental Strategies for Sustainable Development in Urban Areas: Lessons from Africa and Latin America*, Edesio Fernandes (ed.), 1998; Carl Bartone, Janis Bernstein, Josef Leitmann, and Jochen Eigen, *Towards Environmental Strategies for Cities: Policy Considerations for Urban Environmental Management in Developing Countries*, Urban Management Programme, UNDP/UNCHS/World Bank, 1994; Arlosoroff, Saul. "Water Demand Management", *UNCHS (Habitat) Regional Conference on Sustainable Consumption Patterns in Asian Cities*, 1998, www.fukuoka.unchs.org/information/occasional/water-arlosoroff.html; Michael Hough, "The Don River, Toronto, Canada: A Case Study", Unesco volume on urban sustainability, forthcoming, 2001; UN Centre for Human Settlements, "Resources: Resource Conservation and Waste Management", *The Earthscan Reader in Sustainable Cities* , David Sutterthwaite (ed.), 1999; Jonas Rabinovitch, "A Positive Preference for Urban Development" in UNESCO Volume on Urban Sustainability, forthcoming ; .Herbert Girardet, "Sustainable Cities: a contradiction of terms?", in *Environmental Strategies for Sustainable Development in Urban Areas: Lessons from Africa and Latin America*, Edesio Fernandes (Ed.), 1998; van Vliet, Willem, chapter on the United States, in Richard Stren, Rodney White and Joseph Whitney, *Sustainable Cities: Urbanization and the Environment in International Perspective*, 1992; Peter W. Heller, "Sustainable Human Development in a Medium-

sized City: The Examples of Freiburg, Germany”, Unesco volume on urban sustainability, forthcoming, 2001; Foo Tuan Seik, “Sustainable Urban Transport in Asia: The Role of Demand Management Instruments”, in *Sustainable Cities in the 21st Century*, A.F. Foo and Belinda Yuen (eds.), 1999; Priemus, Hugo. “The Long Way Towards Sustainable Mobility” in UNESCO Volume on Urban Sustainability, forthcoming, 2001; Peter Newman, “Reducing Automobile Dependence”, Unesco Volume on Urban Sustainability, forthcoming.

Table 2. Cities as possible sites of solutions for environmental problems

Some cities, most famously Curitiba, but now also a growing number in Europe, are making circularity and resource efficiency a top priority: Austrian, Swiss, Danish and French cities have taken the lead. Germany is constructing dozens of composting plants. Key components of any ambitious strategy in this regard should be self-financing investments in end-use efficiency and reducing resource use whilst simultaneously generating urban jobs and business opportunities. All of this entails a refocus from resource extraction to resource conservation and recycling or re-use. Reducing resource extraction would eliminate jobs in mining, for example, but add jobs in end use efficiency for building, environmental technology industries, the electronics sector, and many service activities in cities. These types of policies are aimed at making what is now a waste output into the input of another industry and at synergies among various business sectors.

Energy efficiency should be given top priority. Much can be done by governments to promote efficiencies in this domain through legislation at the national, local, and, supranational level, planning regulation, and budgetary tools. Much can be done to increase the energy efficiency of buildings, and in the process create more local jobs. Government policy should encourage installation of photovoltaic modules on buildings that would also add to local jobs. New materials and concepts of architectural design make for greater energy performance and reductions of environmental impact of materials use in building. Regulating the energy supply industry so as to push for higher energy efficiency and reduced discharges of waste gases could lead towards the use of environmentally sound types of energy production in cities. These can also be used to enhance urban agriculture, which would contribute to reducing long distance transport for agricultural products (see Rajan 1993).

Sewage contains valuable nutrients, such as nitrates, potash and phosphates. There are several excellent initiatives in this regard. In Bristol, UK, Wessex Water now dries and granulates all of the city’s sewage: the annual output of 600 000 people is turned into 10 000 tons of fertilizer granules. In contrast, Thames Water in London is building incinerators for burning the sewage sludge produced by 4 million Londoners. This is particularly inefficient given that phosphates, only available from North Africa and Russia, are likely to be in short supply within decades. This is no minor matter: for instance, crops cannot be grown without phosphates.

Urban food production is another important issue (Smit, 1996; Foeken and Mwangi 1998; FAO, various years; Garnett 1996; in our volume Yoveva *et al.*). In USA, metro areas produced 30% of the dollar value of US agricultural production in 1980; by 1990

this had grown to 40%. Singapore is fully self-reliant on meat and produces 25% of its vegetable needs. Dar-es-Salaam, one of the world's fastest growing large cities, now has 67% of families engaged in farming compared with 18% in 1967. Berlin has 80 000 community gardeners on municipal land, with a waiting list of 16 000 (see Tables 3, 4, and 5).

World population actively engaged	800 million
Farmers producing for market in the world	200 million
Employment in production and processing in the world	150 million

Source: Jac Smit, "Urban Agriculture, Progress and Prospect: 1975–2000", IDRC Research Project: Cities Feeding People, Report 18, March 1996.

Table 3. Level of urban agricultural activity: global estimates, 1993

Cost savings	Cost savings can be achieved because of proximity to consumers and less need for an extensive and expensive infrastructure for transportation and preservation of perishable products.
Room for quality increase	Quality increases because of greater responsiveness to consumer preferences as well as availability of products that cannot be obtained from rural producers, such as wood energy.
Diversity of horticultural crop species (many advantages)	The broad diversity of horticultural crop species allows for year-round production, employment and income. Intense horticulture can be practiced on small plots, making efficient use of limited water and land resources. Differently from other food crops, horticultural species have a considerable yield potential and can provide up to 50 kg of fresh produce per m ² per year depending upon the technology applied. Also, due to their short cycle, they are a quick response to emergency needs for food. Leafy vegetables provide a quick return to meet a family's daily cash needs to buy food.
Productive use of under-utilized resources	Using under-utilized resources, such as vacant land, treated wastewater, recycled waste, and unemployed labor increases efficiency. It is reported that productivity can be as much as 15 times the output per acre of rural agriculture.
Low level of post-harvest processing	One reason for the growth of peri-urban horticultural production is less need for storage, refrigeration, and transportation infrastructure, compared to food coming from rural areas.
Links between farm cultivation and small-scale enterprises	Urban farming links farm cultivation with small-scale enterprises, such as street food stands, fresh milk outlets, and maize roasters. Some urban and peri-urban farmers are moving towards intensive production of high value-added produce.
Increased food security, especially in times of crisis	Poor urban dwellers often lack the purchasing capacity to acquire adequate amounts of food. Through urban agriculture, food insecurity is then reduced by providing direct access to home-produced food to households and to the informal market. Although much urban agriculture production is for own consumption, occasional surpluses are sold into the local markets. During times of crisis and severe scarcity, urban agriculture plays an important role in providing emergency supplies of food.

Reduced need for artificial fertilizers	Due to the intensive use of organic wastes from household garbage, the need for artificial fertilizers is significantly reduced or eliminated.
Risks involved	Environmental and health risks from inappropriate agricultural and aquacultural practices; increased competition for land, water, energy and labor; reduced environmental capacity for pollution absorption.

Sources: Food and Agriculture Organization of the United Nations, Report on Urban and Peri-Urban Agriculture, www.fao.org/unfao/bodies/COAG/COAG15/X0076e.html. Jorge E. Hardoy, Diana Mitlin and David Satterthwaite, *Environmental Problems in an Urbanizing World: Local Solutions for City Problems in Africa, Asia and Latin America*, forthcoming, 2000.

Table 4. Urban agriculture: general aspects

Urban agriculture initiatives	Environmental and social outcomes
London, UK	Almost 10% of Greater London's area is farmland; there are around 30 000 active allotment holders and an estimated 1000 beekeepers. Some 650 000 people go to London's city farms and community gardens each year. Around 14% of Londoners already grow some food in their own gardens. Estimates suggest that London could produce around 320 000 tones of fruit and vegetable, which would supply Londoners with 18% of their daily intake (in healthy conditions).
Bogota, Colombia, city gardens experience	A cooperative of more than 100 low-income women produces hydroponic vegetables on rooftops, earning the women up to three times more than their husbands make in semi-skilled jobs.
East Calcutta, India, city gardens experience	The rich, composted soils of old garbage dumps in the main dumping site of East Calcutta produce 150 to 300 tons of vegetables per day and generate employment for about 20 000 people.
Chinese cities, city farmers.	China's urban and peri-urban farmers provide 85% of the vegetables and more than half of the meat and poultry consumed in 18 of the country's largest cities, while recycling the majority of those cities' human wastes. In 1991, Shanghai was collecting 90%—about 8000 tons—of the city's human waste each day, treating it, and selling it to farmers in the metropolitan area.
Cuba: promotion of urban gardening.	Cuba has begun to promote urban gardening as a way to achieve nutritional self-sufficiency in response to economic decline and the ongoing U.S. embargo. Food gardens in Havana now supply about 5% of the city's food, and officials at the Australian Conservation Foundation, which sponsors an urban gardening project in Havana, estimate that the figure could be raised to 20%.
Singapore cities, urban agriculture supported by the Primary Production Department of the Ministry of Agriculture.	Singapore's successful urban agriculture system uses both ancient and modern technology. Urban agriculture can be found between the high rises, in the suburbs and the in the areas surrounding seas. This country is self-reliant in meat production and produces 25% of the vegetables it consumes.
Sofia, Bulgaria	Approximately half of Sofia's households are engaged in cultivating, fruit, vegetables and spices. About 14% of the households in Sofia are self-sufficient.

La Paz, Bolivia, urban farming	For several years and also because of the cholera epidemic, supermarkets in La Paz have sold lettuces and fresh vegetables grown in community gardens and solar greenhouses either in the city or on the outskirts. This guarantees the quality of the products. Urban agriculture is primarily a survival strategy practiced mostly by women—sometimes widow's or women who were abandoned by their husbands and struggle to provide food and essentials for their children.
Dar es Salaam , Tanzania, Urban Farming	Urban agriculture is an important source of income for many families, who produce staple such as maize and cassava in addition to milk, meat, poultry and dietary supplements such as vegetables. Not only the unschooled and illiterate engage in this activity. It is reported that more than 40% of the urban farmers are secondary school graduates, business owners, professionals and doctors.
Kenyan cities, Urban Farming	About two out of every three households cope by growing their own food. 29% of these farmers are located in urban areas. In Nairobi, farming is done everywhere: in backyards, along roadsides, rivers, railways, in parks, industrial areas, and even in the center of the business district.

Sources: Tara Garnett, "City Harvest: The Feasibility of Growing More Food in London", Growing Food in Cities Report, 1996; Toni Nelson, "Closing the Nutrient Loop", World Watch, Nov-Dec 1996 v9 n6 p10(8) ; Jac Smit, "Urban Agriculture, Progress and Prospect: 1975-2000", Cities Feeding People Report Series, Report 18, March 1996; Antoneta Yoveva, Boriana Gocheva, Galya Voykova, Boris Borissov, Al Spassov, "Sofia: Urban Agriculture in an Economy in Transition", Resource Center on urban Agriculture and Forestry, www.ruaf.org/Reader/Papers/Sofia.PDF; Andre Lachance, "Chasing Away Hunger in

Bolivia", IDRC Report Archives, vol. 21, No. 3, October 1993; Marilyn Lee, "Breaking New Ground in Dar es Salaam", IDRC Reports Archive, Vol. 21, No. 3, October 1993; Dick Foeken and Alice Mboganie Mwangi, "Farming in the City of Nairobi", IDRC Research Program, Cities Feeding People, ASC Working Paper 30, 1998.

Table 5. Urban agriculture: facts for selected cities

A focus on the subject of cities as sites for solutions indicates that a more environmentally sound policy, one that would maximize re-use, is also a more labor intensive form of economic organization. Labor, in its various forms in terms of skills, knowledge, and operating of machines, would increasingly replace growing components of capital. This represents a strong divergence from our standard economic thinking and our standard way of measuring, both of which value capital and value declining units of labor per unit of capital. But this standard way of operating is not reducing environmental damage nor solving the massive growth of unemployment. Insofar as the available evidence suggests that environmentally sound ways of proceeding are likely to be more labor intensive than our current ways, and insofar as poverty and lack of work reduce various types of quality of life conditions, the question of work must be taken seriously. Several of the chapters in our volume address the matter of employment and poverty in cities. Lack of work and the degradation of work for growing masses of people are a major factor in the deterioration of the quality of life at the individual, household, and community levels, and, sooner or later, for the city as a whole. The spread of western modes of development and consumption will only exacerbate these various trends. We will need to change some of the key components of Western culture and that means changing the underpinning values and economic criteria.

We need to revive the vision of the city as a place of culture, creativity, and some argue as places for sedentary living in contrast to today's overwhelming dominance of consumption and traffic. The creativity possible in complex urban milieux needs to be enhanced, promoted, and directed towards these types of issues. Further, cities are centers of communication connecting to the globe, and located on various global circuits (Sassen, 2001b). They are enabling settings for instituting more environmentally sound policies and criteria. Their enormous environmental and global reach today needs to be matched with communication systems that monitor adverse impacts and early warning systems that enable city people to act to prevent or stave off undesirable outcomes. Cities can function as effective nodes for monitoring and for ameliorating urban impact on the biosphere. Governments, firms, and civic organization can develop cultural feedback systems, responding to the challenge of achieving sustainability by limiting urban resource consumption and waste output through technological and organizational measures. Urban digital intranets could be set up to enhance the communication flow among various sectors of a city (Lovink and Riemens 2001).

Some of the circular logics we want to bring into cities will entail spatial circuits that extend beyond the city and connect various places around the globe. This will be one of the necessary challenges, not only internal recycling. Cities are such complex systems that we will not get away from using specific types of sites worldwide in the urban system. Cities are also well placed in that regard to handle this, and at the global level the strategic geographies of resource use and waste. Cities are the engines for economic growth, intellectual and cultural centers, and important spaces for civic engagement. But they are also modes of pure consumption in ecological terms—"entropic black holes of industrial society". Cities cannot become independent from their global hinterland but should function as the site where the greatest opportunities exist to make a fundamental change. There is an "urban sustainability multiplier." Because of complex system linkages, even addressing a single issue in the city—e.g. public vs. private transport—forces engagement with a broad range of inter-related issues.

Achieving sustainability is not primarily a technological issue, even though we need to redo so many of our production and consumption technologies. We need to set policy and planning goals that provide the social context and public purpose for new regulatory regimes and technical fixes. This means that cities are a good place to try to institute the measures to educate and inform people. Harvey (1996) finds that is a mistake to argue that coming up with resources to address urban problems depends on the prior solution of technological, economic, and population growth problems. He opposes this, the idea that cities have always been about innovation, and that getting it right in the urban context is the only real path towards technical and economic improvements for the majority of the world's people.

5. The Power of Markets?

Markets are crucial institutional components in cities and have been proposed by many as one of the ways for addressing the environmental challenges we confront. If one could institute environmentally sound modes of conducting our economies and our lives through the use of markets, so the argument goes, most negative environmental outcomes could be made into undesirable costs. Without too much fundamental change

production, distribution and consumption could be reoriented toward environmentally sound choices, because these would be the less costly ones. It is important to understand the underpinnings of this view. In discussing the market, its logics and its boundaries, it is useful to have a contrast with what has been described as a “steady-state” paradigm more attuned to environmentally sound logics (Rees 1999; Daly 1998).

The ecosphere provides at least four categories of goods and services to the economy: material and energy resources, waste assimilation, life support services, and aesthetic and spiritual values (Jacobs 1991). Markets deal reasonably well with only the first of these, which are mainly non-renewable resources. Many of the biophysical stocks, flows and functions associated with the others are difficult to quantify and price, and others are simply invisible to conventional analysis (Rees 1991; Rees and Wackernagel 1994; Schulze 1994). It is important to note that some stocks which are today valued highly by the market had not previously been recognized by economists at all, e.g. the ozone layer (Vatn and Bromley 1993). The latter argue that efforts to derive hypothetical values for natural income and capital stocks—essential inputs to conventional analyses—are undermined by this lack of information.

Notwithstanding these limitations, markets remain today and in the foreseeable future the main institutional dynamic through which economic activities get articulated and economic value constituted. Thus it is important to understand what it is that markets can and cannot do, and can and cannot register, especially since urban economies pivot on markets. One of the most useful analyses for the purposes of the subject at hand is that by William Rees.

Rees (1999) compares the economic paradigm underlying neoclassical economics with the steady-state paradigm underlying ecological economics. A key feature of neoclassical economics is that it treats the economy as separate from and independent of nature; analytical models usually lack any physical representation of the material and energy transformations and the structural time-dependent processes of the ecosphere (see Christensen 1991). Ecological economics, on the other hand, sees the economy as a dependent integral sub-system of the ecosphere that should be analyzed as an “extension of human metabolism. Crucial to sustainability is understanding the physical/material transformations that bind the economy and ecosystems, maintaining essential ecosystem functions, and recognizing the lags and thresholds characterizing ecosystems behavior” (Rees 1999).

Starting points for neoclassical economics are the flows of exchange value between firms and households (and, I would add, increasingly in today's models, between firms as well). For ecological economics the key issue here is the unidirectional and irreversible flows of energy/matter from nature through the economy and back in degraded form as waste. This means that ecological economists must factor in the actual stocks and flows of environmental capital and register levels of depletion and time frames for renewability.

When it comes to the role and ecological efficacy of markets, neoclassical economics posits that free markets stimulate (through raising scarcity value and corresponding prices) both the conservation of depletable assets and the search for technological

substitutes; free markets and technology can thus help to decouple the economy from nature. This is a crucial issue in this model. For ecological economics, markets work as described for a limited range of familiar non-renewable resource commodities but prices for renewable flows are inadequate indicators of ecological scarcity. Market prices reveal only exchange value at the margin and do not reflect the size of remaining natural capital stocks, or whether there are critical minimal levels below which stocks cannot recover, nor the ultimate contribution of such stocks to human existence or survival. Most important, there are no markets for many biophysical goods, notably the ozone layer, and essential life support systems, such as photosynthesis and waste assimilation, which have enormous positive “eco-nomic” value.

On the substitutability of natural capital, another crucial issue, neoclassical economics posits that natural capital and manufactured capital are near perfect substitutes. Technology can make up for any depleting resource, thus exhaustible resources do not pose a fundamental problem. For ecological economics, natural capital is complementary and often a prerequisite for human made capital. Given the market's failure to factor in the variables mentioned in the preceding paragraph, standard measures of scarcity (prices and costs) may fail absolutely to induce either conservation of vital stocks or technological innovation. Further, ecological economists argue that it is unlikely that we will design technological substitutes for many ecospheric life support functions.

For neoclassical economics, growth in both poor and rich countries is essential, and is the only practical way to alleviate poverty and to address material inequities among countries. For ecological economics, growth cannot be relied on as the only means to solve poverty. It will require significant inter-and intra-national redistribution of wealth and access to nature's services. Political, social and economic reforms are needed to institute the needed changes, including very importantly the need for effective education of the public on sustainability issues. As for the ecological impacts of growth, neoclassical economists find that growth in the developing world will increase the market for the products of the developing world, which will in turn give the latter the money for the rehabilitation and future sustainable use of natural capital. According to Rees, there is a tendency here to see depletion of natural capital and local pollution as a Third World problem (see also the earlier discussion on population growth and poverty as variables in ecological damage.) For ecological economics, we cannot reach sustainability through more growth. The global economy is already running a massive hidden ecological deficit attributable mostly to DCs. According to Rees (1999) “material growth based on current economic assumptions and technology does not provide the surpluses needed to rehabilitate natural capital, but rather depends on its further depletion, increasing the sustainability deficit and leading to accelerated ecological decline”.

For neoclassical economists there are practical limits on human population growth, but no constraints on economic growth (i.e. on per capita GDP). Technology is generally seen as able to substitute for depleted natural capital; over time the economy can be dematerialized by increases in economic and technological efficiency. For ecological economists there are real biophysical constraints on both population and material throughput growth; humankind must live on the natural income generated by remaining

stocks of natural capital. Total human impact or load is a product of population multiplied by average per capita material consumption, including waste output, and cannot be reduced below critical maximum safe levels by efficiency gains in the foreseeable future. This is a radically different position than that of neoclassical economists. For the latter there are no limits to regional or global carrying capacity; trade can relieve any locally significant limiting factors, and technological advances can replace more general scarcities. For ecological economists, carrying capacity is finite and declining and should become a fundamental component of demographic and planning analysis. Trade and technology only appear to increase local carrying capacity, while actually reducing it on a global scale. According to ecological economists, today all trading regions exceed their own ecological carrying capacity, become dependent on imports of depletable resources, and ultimately reach the same limiting factor.

One of the crucial measures used as a welfare indicator in much research is GDP. GDP or per capita GDP, though imperfect, is understood to correlate well with standard measures of population health and is seen as the best overall measure we have of human welfare. For ecologists, GDP is inadequate as a measure of social and ecological welfare. It says nothing about the distribution of the benefits of growth. Worse, it includes both the depreciation of manufactured capital and defensive expenditures against pollution or other ecological decline as positive entries, and says nothing about the depletion of natural capital (Daly 1991). GDP can continue to increase, creating the illusion of increasing well-being while economic, ecological, and geopolitical security are all being eroded. Herman Daly captures this in his notion of “anti-economic growth,” or growth that makes us poorer (Daly 1991b: 242).

For neoclassical economists, deregulation, global markets, and free trade will enhance economic efficiency and contribute to greater social equity and international security through expansive growth in world product. For ecological economists, on the other hand, these three types of development will indeed raise growth, but under current assumptions and terms of trade they will also increase income disparities and accelerate the depletion of natural capital. This in turn, will reduce ecological and geopolitical security.

One of the most significant contributions of neoclassical environmental economists, as distinguished from mainstream neoclassical economists, to the sustainability debate, has been the shift from treating natural resources as mere free goods of nature to recognizing that “resources” comprise a unique class of productive capital, capable of producing a stream of income indefinitely into the future. This enables greater analytic rigor by elevating so-called natural capital to the same theoretical status as the more familiar man-made capital and human-social capital (knowledge, social infrastructure, etc). There seems to be general agreement that no development path is sustainable if it depends on the depletion of productive assets. From the perspective of capital theory, society can be said to be economically sustainable if it passes on an undiminished per capita stock of capital from one generation to the next (Pearce 1994a; Solow 1986; Victor 1991). Ecologists and economists are debating various interpretations of a “constant capital stock” condition for sustainability. The major disagreement centers on the degree to which manufactured capital can be substituted for natural capital.

Traditional environmental economists assume close substitutability and favor a weak sustainability criterion in which the aggregate stock of manufactured and natural capital must be held constant (Nordhaus 1992; Pearce *et al.* 1989, 1990; Pezzey 1989). A weak sustainability criterion holds that for natural capital assets can be depleted but part of the returns are invested in creating an equivalent value of manufactured capital. Ecological economists, on the other hand, generally regard natural and manufactured capital to be complements rather than substitutes and that there are many essential life-support services for which there is little chance that technology can find adequate substitutes. This is a strong sustainability criterion. Both renewable natural capital and manufactured capital need to be held intact separately (Costanza and Daly 1992; Daly 1990; Rees 1990; Victor *et al.* 1994). The constant capital stocks criterion implies that humankind must learn to live off the interest generated by remaining stocks of essential natural capital (Rees 1990).

One of the key issues raised by a market approach is the assumption that prices can provide an adequate measure of ecological scarcity. Yet, for many researchers today the key to sustainability is not the money value, but the absolute stocks and flows of natural capital. So even an increase in the price could create the illusion of a constant stock, albeit it a more highly priced one, even as the stock is increasingly depleted. Thus prevailing systems of prices, market incentives and costs, fail absolutely to measure ecological scarcity or to determine the appropriate levels of natural stocks. The risks of their depletion are unacceptable in certain cases, and we may not even know which exactly, and there may be no possibility for a technical substitute. Some environmental economists have argued that “conserving what there is” could be a sound, risk-averse strategy (Pearce *et al.*, 1990: 7).

6. The Strategic Geography of Global Economic Power: Identifying Accountability and Capacities for Change

If the prior section tried to understand how we can use the power of markets to address some of these issues, this one examines how we can use the “power of power” in order to institute urgent changes. The purpose of this section is to show that some of the key features of economic globalization could, in principle, facilitate the task of reallocating a good share of investment capital to environmentally sound projects rather than for the destructive large-scale projects it typically does to today. The reason for this has to do with the organizational architecture of the global economy, characterized by a highly concentrated command structure that controls growing shares of worldwide investment capital. It is the fact of this enormous concentration which is a key element in thinking about transforming the destinations of this investment capital, a task that would seem almost impossible if investment capital were widely diffused among small investors. Further, these features also suggest that economic globalization could, in principle, accommodate a broader range of forms of state participation in the governance of the global economy than is generally recognized in analyses of how privatization and deregulation bring about a declining significance of the state. State institutions remain extremely important for the implementation of new environmentally sound regulatory criteria and standards.

We can begin to think of these concentrated command structures also as concentrated sites for demanding accountability. Table 6 describes some of these.

There are at least two distinct sets of issues here. One concerns the actual organizational and command architecture of the global economic system. Here the key is that it is highly concentrated and consists of a complex set of operations largely located in a network of global cities. Albeit with enormously varied levels of power, this network today includes about 40 cities, some full fledged global cities and others with global city functions. This network of cities constitutes the strategic geography for the management, servicing, financing, and designing of what we call the global economic system (Sassen, 2001c). One of the mechanisms for the expansion of the global economy is the inclusion of more and more countries as these deregulate and privatize and thereby have something to “offer” to investors. The leading financial and business centers in these national economies become the nodal articulators of national economies (through specific sectors and firms) with the global economic system. Further, the extent of cross-border transacting among cities in this network and the range of economic sectors involved have both increased significantly (Sassen 2001b).

The second set of issues concerns the participation of national states in the governance of the global economy. Here the key issue is that although the state has lost many forms of regulatory power, it still plays a far more important role in the governance of the global economic system than is suggested in main accounts about globalization and the hypermobility of capital. Hence, states could introduce more environmentally sound policies regarding global investment patterns than we often think they can. There are two sets of issues when it comes to state participation in the governance of the global economy. On the one hand, the current condition marked by deregulation, privatization and what I conceptualize as the partial “denationalization” of state functions is but one possible mode of several in which nation states can be articulated with the global economy; there are other possible ways of participation, some of which would enhance state authority. On the other hand, even if this current condition could not be changed, there still is room for new forms of participation by the state as well as new forms of cross-border state collaboration in the governing of the global economy (see, e.g., Aman 1998). Both of these would require administrative and legal innovations.

There are three features of the global economy that matter in the light of these issues. First, the geography of economic globalization is strategic rather than all-encompassing and this is especially so when it comes to the managing, coordinating, servicing and financing of global economic operations. The fact that it is strategic is significant for a discussion about the possibilities of regulating and governing the global economy. Second, the center of gravity of many of the transactions that we refer to in the aggregate as the global economy lies in the North Atlantic region, a fact which also facilitates the development and implementation of convergent regulatory frameworks and technical standards. If the geography for the management and financing of globalization were a diffuse condition at the planetary scale, and one involving countries and regions with a much broader range of differences than those evident in the North Atlantic, the question of its regulation might well be radically different. Third, this strategic geography for the management of globalization is partly embedded in national territories, i.e. global cities. The combination of these three characteristics

suggests that states may have more options to participate in governing the global economy than much of the focus on the loss of regulatory authority allows us to recognize.

There are sites in this strategic geography where the density of economic transactions and the intensity of regulatory efforts come together in complex, often novel configurations. Two of these are the focus of this section. They are foreign direct investment, which mostly consists of cross-border mergers and acquisitions, and the global capital market, undoubtedly the dominant force in the global economy today. Along with trade, they are at the heart of the structural changes constitutive of globalization and the efforts to regulate it. These two processes also make evident the enormous weight of the North Atlantic region in the global economy. The key implication for our purposes here is that this is a crucial and concentrated target for pushing global economic actors to change their environmentally damaging practices.

Both foreign direct investment and the global capital market bring up specific organizational and regulatory issues. There is an enormous increase in the complexity of management, coordination, servicing and financing for firms operating worldwide networks of factories, service outlets, and/or offices, and for firms operating in cross-border financial markets. For reasons I discuss later, this has brought about a sharp growth in control and command functions, and their concentration in a cross-border network of major financial and business centers. This in turn contributes to the formation of a strategic geography for the management of globalization. Nowhere is this as evident as in the structure of the global capital market and the network of financial centers within which it is located.

While this strategic geography of globalization is partly embedded in national territories, this does not necessarily entail that existing national regulatory frameworks can regulate those functions. Regulatory functions have shifted increasingly towards a set of emerging or newly invigorated cross-border regulatory networks and the development of a whole array of standards to organize world trade and global finance. Specialized, often semi-autonomous regulatory government agencies and the specialized cross-border networks they are forming, are taking over functions once enclosed in national legal frameworks, and standards are replacing rules in international law. The growth of these specialized cross-border networks can emerge as a helpful institutional framework for implementation and monitoring of environmental standard by firms given the cross-border nature of so many environmental conditions and the global scale at which many of the relevant firms and markets operate

The empirical patterns of foreign direct investment and global finance show to what extent their centers of gravity lie in the North Atlantic region. The northern transatlantic economic system (particularly the links among the European Union, the USA and Canada) represents the major concentration of processes of economic globalization in the world today. This holds whether one looks at foreign direct investment flows generally, at cross-border mergers and acquisitions in particular, at overall financial flows or at the new strategic alliances among financial centers. By the end of the twentieth century this region accounts for two-thirds of worldwide stock market capitalization, 60% of inward foreign investment stock, 76% of outward investment

stock, 60% of worldwide sales in M&As, and 80% of purchases in M&As (for detailed information and sources on these facts see Sassen 2001c: chapters 3, 4, and 7).

There are other major regions in the global economy: Japan, South East Asia, and Latin America. But except for some of the absolute levels of capital resources in Japan, they are dwarfed by the weight of the northern Trans-Atlantic system. Western Europe and the US still invest more in developed countries even though we can see a growing and complex use of less developed countries in the international organization of production of its companies. But the environmental impact of their investments in the South is in many cases far larger than it is in the North because many of these investments go for projects that have been shown to produce much environmental damage, and because it is not uncommon for firms in the North to locate their more environmentally damaging operations in the South (see Table 6 for facts on some of these trends.)

Environ- mental problem	Place	Facts	Responsible parties	Sites of accountability
Oil drilling	Ecuador - Amazon area	Indigenous tribes of Ecuador are fighting for their lands and rights, which have been jeopardized in the last 20 years by oil companies—primarily US. Texaco and Ecuador's state-run company Petroecuador. Several tribes are calling for a moratorium, claiming that the oil drilling, which included the dumping of oil and contaminated water into the Amazon basin, has resulted in the death of thousands of people. Some tribes are currently suing the US Oil Company, Texaco for \$1.5 billion in damages. NOTE:(1) In 1990, Texaco withdrew its operations from the region. (2)Pollution created in the oil exploration process has entered the Amazon region in other South American countries.	U.S. Texaco and Ecuador's state-run company Petroecuador	Texaco's worldwide headquarters in White Plains, NY and Petroecuador, in Quito.
Oil drilling	Tropical rainy forest of Nigeria, Western Africa	Foreign oil companies who dominate the oil exploration, drilling, and shipping in Nigeria (such as Shell Oil, which controls 60% of the	Shell Oil and other companies such as AGIP, Texaco,	Oil companies headquarters—Shell: ; Texaco: White Plains, NY, USA; AGIP:

		domestic oil market) are accused of not only devastating the local environment, but also of destroying the economic viability of the region for local farmers and producers. The Nigerian Federal Government was charged for failing to enact and enforce environmental protection against oil damage by Shell and other oil damages.	Chevron, and Mobil	Rome, Italy; Chevron: San Francisco, USA; Mobil: Fairfax, VA, USA.
Deforestation	Sierra Madre, Mexico	The forests of Sierra Madre are being attacked on several fronts. In addition to illegal logging practices, another severe threat to the Sierra Madre old-growth stands was a 1989 World Bank loan to Mexico of \$45.5 million for a logging and forest management project. The plan to log more than 4 billion board feet lumber from 20 million acres of forest over six and a half years was put in place to help Mexico correct its trade deficit by reducing its dependence on imported paper pulp.	World Bank, Mexican government	Washington, D.C. and Mexico City
Deforestation	Tropical rainy forest of Colombia	Colombia is experiencing large-scale deforestation due to its ambitious plans to develop its economy in order to become a competitive trade partner in the international market. Between 1.5 and 2.2 million acres are deforested each year and, at this rate, Colombia's woodlands will be depleted in forty years. Such deforestation has increased the rate of extinction for many plant and animal species, many of which are endemic to the country. Furthermore, the social and economic fabrics of indigenous peoples who inhabit the forests are rapidly being	Colombian government	Bogota, Colombia, and possibly Washington D.C., where the IMF and the World Bank are located.

		<p>destroyed. Already one-third of the country's original forestlands have been felled (Republic of Colombia National Planning Department, 4). Under Colombia's ambitious plans to develop their economy, the area has become targeted for the extraction and exportation of natural resources in the last ten years. The scheme is known as Plan Pacifico (Barnes, 135). Under the plan, 160,000 hectares (about 2.2% of the total forest area) are destroyed each year for wood and paper or to make way for agro-industrial production of African palm. There has been a considerable drop in mangrove coverage with the installation of commercial shrimp farms, and massive sedimentation and mercury contamination in rivers has been caused by deforestation and uncontrolled mining. Riverbanks have also been eroded which has caused river beds to drop, threatening fish stocks and the ability of communities to transport goods (Barnes, 135-136). Another objective of Plan Pacifico is to link a 54 km missing section of the Pan-American Highway between Colombia and Panama in order to foster trade. Road construction, along with rapid regional development that will ensue, will result in massive deforestation.</p>		
Deforestation	Mallaganes Region, Chile	<p>The US corporation, Trillium, has invested in a large-scale project to harvest timber from the lenga forests of the Mallaganes Region of</p>	Trillium Corporation, its American sponsors—Goldman Sachs and	Trillium headquarters in Bellingham, WA. Goldman Sachs' and Bayside Ltd'

		<p>Chile. The project called Rio Condor plans to harvest both lenga and the coigue de Mallaganes. Harvesting began in 1996. The \$12.5 million project (US 1995) will cover a total of 257 929 hectares, of which less than half is initially targeted for timber harvest. The project has been accused of not being environmentally sustainable. The Trillium's Rio Condor project was proposed in 1995 and was financed by capital from Bayside Ltd (60%) and Goldman Sachs (40%), both from the USA. This project which represents an investment of \$ 1.2 billion, intends to cut native forests and export wood products. Approximately 30–60% of the wood would be used for the production of wood chips and sawn wood principally for export to Europe.</p> <p>Trillium corporation has received the support of the Chilean government to facilitate this investment. Trillium was even able to purchase the land at a price significantly lower than the market value to utilize government subsidies in the form of tax rebates and exemptions.</p>	Bayside Ltd, and the Chilean government	HQ in New York, and Santiago (federal capital of Chile).
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Sources: Trade and Environmental Database (TED), Case Studies, vol. 1, N. 1, September 1992; TED Case Studies, vol. 3, N. 2, June 1994; TED Case Studies, vol. 5, N. 2, June 1996; TED Case Studies, vol. 4, N.1, January 1995; TED Case Studies, vol.8, N. 1, January 1998.

Table 6. Environmental problems, responsible parties, and sites of accountability: some examples

In order to capture the impact of the largest transnational corporations, it is important to understand that many of the actual operations of these firms take place outside the country of nationality, and include many locations in the South. The transnationality index shows us the high levels of foreign operations by these firms; the index is an

average based on ratios of the share that foreign sales, assets, and employment represent in a firm's total of each. If we consider the world's top 100 TNCs, the EU has 48 of these firms and the US 28; many of the remaining ones are from Japan. Thus together the EU and USA account for over two-third of the world's 100 largest TNCs. The US, the UK, France, Germany and Japan together account for three-quarters of these 100 firms in 1997; this has been roughly so since 1990. Most of the US and EU TNCs in this top 100 list have very high levels of foreign assets as a percentage of total assets: for instance, 51% for IBM, 55% for Volkswagen Group; 91% for Nestle, 96% for Asea Brown Boveri, 62% for Elf Aquitaine, 91% for Bayer, 79% for Hoechst, 77% for Philips Electronics, 43% for Siemens, 45% for Renault, 98% for Seagram, 67% for Rhone-Poulenc, 59% for BMW, 69% for Ferruzzi/Montedison, 97% for Thomson, 85% for Michelin, 71% for Ericson, 58% for Exxon, 85% for Unilever, 55% for MacDonald, 68% for CocaCola, and so on. The share of foreign in total employment is often even higher. The Index has grown for the 100 largest TNCs in the world since it was first used in 1990. (See OECD 1998 for the full listing and Sassen 2001c for summary Tables and analyses.)

This heavy concentration in the volume and value of cross-border transactions raises a number of questions. One concerns its features, the extent to which there is interdependence and in that sense the elements of a cross-border economic system. If there is considerable interdependence in the northern Trans-Atlantic system then the question of regulation and governance is likely to be of a different sort than if globalization for each of these major regions has meant in practice strengthening its ties and presence in their respective zones of influence. The US and western European countries have long had often intense economic transactions with their zones of influence. Some of these have been reinvigorated in the new economic policy context of opening to foreign investment, privatization and trade and financial deregulation.

In my reading of the evidence, both the relations with their respective zones of influence and the relations within the northern transatlantic system have changed. We are seeing the consolidation of a transnational economic system that has its center of gravity in the North Atlantic system both in terms of the intensity and value of transactions, and in terms of the emerging system of rules and standards. This system is articulated with a growing network of sites for investment, trade, and financial transactions in the rest of the world. It is through this incorporation in a hierarchical global network that has its center in the North Atlantic that the relations with their zones of influence is now constituted. Thus, while the US is still a dominant force in Latin America, several European countries have become major investors in Latin America, on a scale far surpassing past trends. And while several West European countries have become leaders in investment in Central and Eastern Europe, U.S. firms are playing a role in this region they never had before. In a similar vein, Japan plays a significant role, mostly as a capital exporter, in this North Atlantic system, though its influence over the South East Asian region has probably diminished in the 1990s.

What we are seeing today is a new grid of economic transactions superimposed on the old geo-economic patterns. The latter persist in variable extents, but they are increasingly submerged under this new cross-border grid which amounts to a new, though partial geoeconomics. In my own research I have found that these new

configurations are particularly evident in the organization of global finance, and, though to a lesser extent, in direct foreign investment, especially cross-border mergers and acquisitions. Global trade is far more diffuse and de-centered than global finance and foreign direct investment (Sassen 2001).

The fact of systemic conditions in the new geo-economics is a significant factor for the question of regulation, and hence, for the key issue here—how to redirect significant components of global investment towards more environmentally responsible projects. The orders of magnitude and the intensity of transactions in the north-Atlantic system facilitate the formation of standards even in the context of what are, relatively speaking, strong differences between the US and Continental Europe in many of their institutional frameworks. The challenge then is how to implement standards that are environmentally sound. The architecture for imposing such environmental standards on firms worldwide would be embedded in the architecture of the global economic system itself, with its center of gravity in the North Atlantic.

If the strategic central management functions—both those produced in corporate headquarters and those produced in the specialized corporate services sector—are located in a network of major financial and business centers, the question of regulating what amounts to a key part of the global economy is not the same as it would be if the strategic management and coordination functions were as distributed geographically as the factories, service outlets and affiliates generally. However the type of regulation it involves is evolving along more specialized and cross-border systems than is the case with most conventional regulatory systems. Similarly, a crucial issue for understanding the question of regulation and the role of the state in the global capital market is the ongoing embeddedness of this market in a network of financial centers operating within national states, not offshore. This is not sufficiently recognized in studies that emphasize deregulation and liberalization; and it is important for the analysis here because it allows for targeting. Further, this locational embeddedness of key components of the global economy is also evident in the fact that the global financial system has reached levels of complexity that require the existence of a cross-border network of financial centers to service the operations of global capital. Each financial center represents a massive and highly specialized concentration of resources and talent in very specific locations; the network of these centers constitutes the operational architecture for the global capital market. The North Atlantic system contains an enormous share of the global capital market through its sharp concentration of leading financial centers. Further, as the system expands through the incorporation of additional centers into this network, the question of regulation also pivots on the existence of dominant standards and rules, i.e. those produced by the economies of the North Atlantic.

This is, then, the strategic geography for the management of the global economy and for the disposition of key portions of our environmental capital. In some ways it is an extension of the early Western colonization period, but on such a different scale and with such higher levels of institutionalization that we need to recognize its specificity. This strategic geography also signals the existence of a hierarchy of responsibility/power: decision-makers in the leading global cities have a lot of power to make a difference for the environment by changing their own modes of operating. This,

in turn, would also suggest the validity of a distinction between North and South regarding environmental obligations and responsibility for damages. What this amounts to is a highly concentrated management of a very large share of worldwide capital. This capital can and has been deployed for projects that we think of today as environmentally destructive. A few institutions can cause significant depletion of often non-renewable stocks of environmental capital. At the same time, this also suggests that a few institutions can make an inordinate difference in terms of altering these patterns of investment. This is a very different type of analysis from the far more common view that focuses exclusively on the hypermobility of capital.

One important question is whether this concentrated power to manage the decisions to invest worldwide—the strategic geography of global economic decision-making—can also become the site of concentrated efforts to alter the criteria. It is not an endless array of small, dispersed investors. The growing concentration through the institutionalizing of small scale individual investments into global funds and the concentration of firms through M&As and strategic alliances of markets, creates a parallel landscape of density and scale economies for the work and necessary resources to mobilize for changes in how markets and the new legal regulatory frameworks linked to globalization price inputs and outputs, and evaluate the desirability of an investment. It is, then, in the space of power constituted by the network of global cities, that we need to concentrate one of the key struggles to attain more environmentally sound economic practices. While this encompasses a minority of firms and markets, it is those that account for the majority of global investments and set the standards for what is a desirable investment.

7. Scaling

There is a diversity of geographic scales at which different kinds of city-related ecological questions operate and/or become present and recognizable to us. For the majority of those writing about the ecological regulation of cities, the strategic scale is the local one (Habitat II; Local Agenda 21). For a minority of others, the ecological regulation of cities today can no longer be separated from wider questions of global governance (Low, 2000). Beyond cities, this latter position is also emerging in more general analyses about what is represented as the “economy and the environment.” Thus Esty (1998; 1999) argues that environmental regulation can only be effective at the global scale.

The city is a key scale for the implementation of a broad range of environmentally-sound policies and also a site for struggles over environmental quality and quality of life for different classes. Air, noise, and water pollution can all be partly addressed inside the city, even when the policies involved may originate at the national or regional level. But while in the recent and not so recent past such environmental struggles could largely be scaled at the city level, today there are at least two major conditions that set limits to that scaling. First, the current phase of economic globalization puts a new set of pressures on cities as part of the overall race to the bottom. The World Trade Organization’s subordination of environmental standards to what are presented as “requisites” for global trade illustrates this well, as do most of the international trade agreements. Further, privatization and deregulation reduce the role of government, especially at the national level, and hence weaken its mandatory powers regarding

environmental standards. The second major condition is global ecological change, notably ozone depletion and climate change, which will require efforts at the national and international scale, even when much of the implementation will take place at local levels.

Many goals can be achieved at the local level. Local authorities are in a strong position to pursue the goals of sustainable development as direct or indirect providers of services, as regulators, leaders, partners, and as mobilizers of community resources. For instance, instituting a sustainable consumption logic can be aided by zoning and subdivision, regulations, building codes, planning for transport, for water and waste, recreation and urban expansion, local revenue raising (environmental taxes, charges, levies) and through the introduction of environmental considerations when designing budgets, purchases, contracting and bidding) (Satherwaite 1999). The local scale also is crucial when it comes to international and national standards. These standards are likely to have to be implemented and enforced at the local scale. Each local combination of elements is unique—as is its insertion within local and regional ecosystems—thus we need the optimal use of local resources. Some authors emphasize the importance of knowledge and skills linked to the local and regional ecological carrying capacity.

But there are limits of what can be done at the local scale. This might be especially the case in the South where the power of local governments and their resources severely limit their capacity to act on these goals. The trend towards the decentralization and increasing transparency of urban governments since the late 1980s has generated important mechanisms for raising their prominence and authority. Yet most local authorities have limited funds (UNCHS, 1996). The combination of greater responsibilities and no additional funds has made many local governments even more dependent on higher levels of national government support or foreign aid transferred through the latter. While privatization has become one mechanism of reducing responsibilities and obtaining a one-shot infusion of funds, it does often mean that the new owners are interested only in those aspects of environmental responsibility that can be charged to users that can pay. All of these variables contribute to the difficulty of developing long-term plans for the intelligent and responsible use of environmental capital.

International agreements of a variety of sorts are crucial. Among these are agreements that set enforceable limits on each national society's consumption of scarce resources and their use of the global sink for wastes. These standards would overwhelmingly affect the North given its extreme concentration of consumption of such resources. The North has been very effective at implementing policies that restrict the effects of environmental damage directly felt in major urban areas and water systems. But this is a radically different issue from that of its level of consumption of resources. And it is at this juncture that international agreements will be necessary.

Further, international agreements are also necessary to prevent some countries and cities from taking advantage of others that are instituting environmentally sound policies. Implementing such policies is likely to raise costs, at least for the short term thereby possibly reducing the "competitiveness" of such cities and countries, even if in the long term this is likely to enhance their competitiveness. Further, countries and cities that

succeed in instituting such policies should not carry the costs of the absence of such policies in other countries. This will at times require policies that restrain the transfer of environmental costs to other locations. Thus the vast fires to clear big tracts of the Indonesian forests in order to develop commercial agriculture (in this case, palm oil plantations geared to the world market) have regularly produced thick smoke carpets over Singapore, a city-state that has implemented very stringent air pollution controls at often high tax costs to its inhabitants and firms. Countries that institute sound environmental policies should be rewarded rather than penalized.

Redclift (1996) posits that we cannot manage the environment at the global level. Global problems are caused by the aggregation of production and consumption, much of it concentrated within the world's urban centers. For Redclift first we need to achieve sustainability at the local level; he argues that the flurry of international agreements and agencies are international structures for managing the environment that bear little or no relation to the processes through which the environment is being transformed.

Not everyone agrees. Thus Satherwaite argues that we need global responsibilities and cannot do that without international agreements (Satherwaite 1999). And Esty (1998) argues that increasingly the only effective way is to operate at the global level and override boundaries just like nature and pollution do. Low (2000) notes that we have a global system of corporate relations of which city administrations are increasingly part. This complex cross-border system is increasingly responsible for the health and destruction of the planet. Today's processes of development bring into focus the question of environmental justice at the global level, which was at the national level, if at all, in the early industrial era. Low (2000) has shown us how "the spatially-fetishized notion of the individual city handed down from another era "has led us to focus on city competitiveness and city marketing, rather than networks of cities which could be collaborating in their efforts to govern the operations of global capital. Cities must be viewed in their global economic context and the problematic of cities must be reconfigured and placed in a context of global governance, as the preceding section argued.

I would make two observations here. One is that what we refer to or think of as the local level may actually entail more than one scale. For instance, the operations of a mining or manufacturing multinational corporation involve multiple localities, scattered around the globe. Yet these localities are integrated at some higher organizational level into what then reemerges as a global scale of operations (see preceding section). Much clean-up and preventive action will indeed have to engage each locally produced set of damages. But the global organizational structure of the corporation involved needs to be engaged as well. The second observation is that an enormous share of the attention in the literature on urban sustainability has been on how people as consumers and as household-level decision makers damage the environment. When considering the urban context, individuals and households are by far the most numerous units of analysis. Yet there are clearly shortcomings to this focus. In terms of policy it leads to an emphasis on household recycling activities without addressing the fundamental issue of how an economic system prices modes of production that are not environmentally sound. In this regard, an urban focus can easily leave out global economic and ecological systems that are deeply involved yet cannot be addressed at the level of households or even many

individual firms. For instance, those who insist that greenhouse gas emissions will have to be controlled at the local level are, in many ways right. But these emissions will also have to be addressed at the broader macro levels of our economic systems.

These various questions can be analytically conceived of as questions of scale. Scaling can be seen as one way of handling what are now often seen as either/or conditions: local vs. global, markets vs. non-market mechanisms, green vs. brown environmentalism. I have found some of the analytic work on scaling being done among ecologists very illuminating in the effort to conceptualize the city in this context. Of particular relevance is the notion that complex systems are multi-scalar systems as opposed to multilevel systems, and that the complexity resides precisely in the relations across scales. “When broad overarching events appear to be closely related to details, a system requires treatment as a complex system.” These authors find that tension among scales is a feature of complex ecological systems, a condition that would certainly seem to hold for cities. Understanding how tensions among scales might be operating in the context of the city might strengthen the analysis of environmental damages associated with urbanization, and the ways in which cities are also the source for solutions. “Until ecologists become adept at addressing the scale issue, the discipline will remain stuck in detailed descriptions at one level. Trying to deal with everything at one level, on the other hand, is unwieldy and messy”. One could clearly make a parallel argument for the case of cities, particularly in the insistence on emphasizing the local scale for research and implementation.

A crucial analytic operation involved here is giving spatio-temporal scaling to the object of study. This also entails distinguishing that object of study from contextual variables, which in the case of cities might be population, economic base, etc. Executing such analytic operations would help us avoid the fallacy of holding “the city” guilty of environmental damage. Eliminating cities would not necessarily solve the environmental crisis. We need to understand the functioning and the possibilities for changing specific systems of power, economic systems, transportation systems, and so on, which entail modes of resource use that are environmentally unsound. The fact that these various systems amalgamate in urban formations is an analytically distinct condition from the systems involved. The distinction between specific systems and background or contextual variables also helps us avoid the fallacy of seeing “the city” as a container, and a bounded closed unit. In my research on cities and globalization, I conceptualize the city as a multiscalar system through which loop multiple highly specialized cross-border economic circuits. In the case of environmental dynamics, to some extent, the city is also a multiscalar system through which loop multiple specific socio-ecological circuits. It is not a closed system. Cities are amalgamations of multiple “damage” circuits, “restoration” circuits and policy circuits.

There are a set of specific issues raised by research on ecological systems that point to possibly fruitful analytic strategies to understand cities and urbanization processes both in terms of environmental conditions and in terms of policy. One of the reasons this may be helpful is that we are still struggling to understand and situate various types of environmental dynamics in the context of cities and how to engage policy. When it comes to remedial policy and clean-up there is greater clarity in understanding what needs to be done. But understanding the city as a broader system poses enormous

difficulties precisely because of the multiple scales that are constitutive of the city, both as a system of distributed capabilities and as a political-economic and juridical-administrative system. That is to say, the individual household or firm or government office can recycle waste but cannot address effectively the broader issue of excess consumption of scarce resources; the international agreement can call for global level measures to reduce greenhouse emissions but depends on individual countries and individual cities and individual households and firms to implement many of the necessary steps; and the national government can mandate environmental standards but it depends on systems of economic power and systems of wealth production. A key analytic step is to decide which of the many scaled ecological, social, economic, policy processes are needed to explain a specific environmental condition (whether negative or positive) and design a specific action or response. Another analytic step is to factor in the temporal scales or frames of various urban conditions and dynamics: cycles of the built environment, of the economy, the life of infrastructures and of certain types of investment instruments. The combination of these two steps helps us deconstruct a given situation and to locate its constitutive conditions in a broader grid of spatial, temporal, and administrative scales.

The connection between spatial and temporal scales evident in ecological processes may prove analytically useful to approach some of these questions in the case of cities. What may be found to be negative at a small spatial scale, or a short-time frame, may emerge as positive at a larger scale or longer time frame. For a given set of disturbances, different spatio-temporal scales may elicit different responses from ecosystems. Using an illustration from ecology, we can say that individual forest plots might come and go but the forest cover of a region overall can remain relatively constant. This raises a question as to whether a city needs a larger system in place that can neutralize the impact on the overall city system of major disturbances inside the city. One outcome of the research by ecologists in this domain is that movement across scales brings about change which is the dominant process: it is not only a question of bigger or smaller, but rather that the phenomenon itself changes. Unstable systems come to be seen as stable; bottom-up control turns into top-down control; competition becomes less important. This also is suggestive for thinking about cities as the solution to many types of environmental damage: what are the scales at which we can understand the city as contributing solutions to the environmental crisis.

An important issue raised by scaling in ecological research is the frequent confusion between levels and scales: what is sometimes presented as a change of scales is actually a translation between levels. A change of scale results in new interactions and relationships, often a different organization. Level, on the other hand, is a relative position in a hierarchically organized system. Thus a change in levels entails a change in a quantity or size rather than the forming of a different entity. A level of organization is not a scale, even if it can have scale or be at a scale. Scale and level are two different dimensions.

Relating some of these analytic distinctions to the case of cities suggests that one way of thinking of the city as multi-scalar is to note that some of its features, notably density, alter the nature of an event. The individual occurrence is distinct from the aggregate outcome; it is not merely a sum of the individual occurrences, i.e. a greater quantity of

occurrences. It is a different event. The city contains both, and in that regard can be described as instantiating a broad range of environmental damage that may involve very different scales and origins yet get constituted in urban terms: CO₂ emissions produced by the micro-scale of vehicles and coal burning by individual households becomes massive air pollution covering the whole city with effects that go beyond CO₂ emission *per se*. Air and water borne microbes materialize as diseases at the scale of the household and the individual body and become epidemics thriving on the multiplier effects of urban density and capable of destabilizing operations of firms whose machines have no intrinsic susceptibility to the disease. A second way in which the city is multiscalar is in the geography of the environmental damages it produces. Some of it is atmospheric, some of it internal to the built environment of the city, as might be the case with much sewage or disease, and some of it in distant locations around the globe, as with deforestation.

A third way in which the city can be seen as multiscalar is that its demand for resources can entail a geography of extraction and processing that spans the globe, though it does so in the form of a collection of confined individual sites, albeit sites distributed worldwide. This worldwide geography of extraction instantiates in particular and specific forms (e.g. furniture, jewelry, machinery, fuel) inside the city. The city is one moment—the strategic moment—in this global geography of extraction, and it is different from that geography itself. And a fourth way in which the city is multiscalar is that it instantiates a variety of policy levels. It is one of the key sites where a very broad range of policies—supranational, national, regional and local—materialize in specific procedures, regulations, penalties, forms of compliance and types of violations. These specific outcomes are different from the actual policies as they get designed and implemented at other levels of government.

Important also is the need to factor in the possibility of conflicts in and between spatial scales. Environmentalists can operate at broad spatial and temporal scales, observing the effects of local activities on macro-level conditions such as global warming, acid rain formation and global despoliation of the resource base. Environmentalists with a managerial approach often have to operate at very short time frames and confined levels of operation, pursuing clean ups and remedial measures for a particular locality, remedial measures that may do little to affect the broader condition involved and may, indeed, diminish the sense of urgency about larger issues of resource consumption and thereby delay much needed responses. On the other hand, economists or firms, will tend to emphasize maximizing returns on a particular site over a specific period of time.

Cities are complex systems in their geographies of consumption and waste-production and this complexity also makes them crucial to the production of solutions. Some of the geographies for sound environmental action in cities will also operate worldwide. The network of global cities described in the preceding section becomes a space at the global scale for the management of investments but also potentially for the re-engineering of environmentally destructive global capital investments into more responsible investments. It contains the sites of power of some of the most destructive actors but potentially also the sites for demanding accountability of these actors. The scale of the network is different from the scale of the individual cities constituting this network.

All of the above brings out the multiple ways in which the city scale is present. The city is a multi-scalar system in the double sense of what instantiates there and of the different policy frameworks that operate in cities—national, supranational, sub-national. The circular logic environmentalists want to introduce in the functioning of cities, i.e. maximum re-use of outputs to minimize waste, will entail spatial circuits that operate at different scales. Some will be internal to households, others will be city wide and yet others will go beyond the city and run through places around the globe.

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Appendix

Abiko, Alex Kenya and Marco Antonio Placido, “Environmental Sanitation Indicators for Upgrading Shantytowns: The Case of Jardim Floresta Shantytown in the City of Sao Paulo”

Focus/Subject: Paper presents a method to verify if the upgrading process in shantytowns promotes environmental regeneration in such a way as to raise sanitation levels to acceptable standards, that would make it feasible for them to stay in their original location, without compromising the environment or the health of the population. The method is based on the use of sanitation, public health, urban and socio-economic indicators.

Authors: Abiko is Civil Engineer Professor at the Escola Politecnica of the University of Sao Paulo (USP); and Placido is a Civil Engineer and Professor of Architecture at the University of Sao Paulo (USP).

Conclusions/findings/summary: The ESI/I indicator developed by the authors can be deemed a useful tool to help in the process of decision-making in the municipality, especially dealing with housing programs related to shantytowns, that will result in working benefits and more agility in: the monitoring of the environmental sanitation conditions in upgraded shantytowns; the identification of problems that can occur in the shantytown in consequence of the occupation, especially with regard to conservation, durability and maintenance of executed work, this, facilitating quick action and solutions; establishing a shantytown hierarchy in accordance with sanitary conditions, so as to give priority to intervention areas for upgrading works; and the indicator can contribute to ensuring a more refined and rational definition for using public money.

Ahmed, Musleh Uddin, “Sustainable Metro Planning and Governance in S. Asia: A case study on Dhaka Metro City in Bangladesh”

Focus/subject: Impact of decentralization on implementation of urban sustainability programs.

Author: He is based at the University of Dhaka in the Dept. Public Admin.

Conclusion/finding/summary: Political organization and coordination (or lack thereof) between national-local, and local-local, within pre-existing governmental structure has effect on implementation. Bangladesh is in the political and economic position to decentralize, but there is a lack of coordination between national policy, ‘city corporations,’ and still other para-statal

bodies that manage and implement policies which impedes service delivery and implementation.

Al-Shiri, Faez and John F. Benson, “The National-Local Policy Vacuum in Sustainable Land Use Planning: Al-Qatif Oasis, Saudi Arabia.

Focus/subject: They examine the “vacuum that exists between national policies and implementation at the local level” with reference to the Al-Qatif oases in Saudi Arabia.

Author: Faez Al-Shiri is from the Department of Urban and Regional Planning at King Faisal University, Dammam, Saudi Arabia.

Conclusion/finding/summary: Despite efforts made by the national government for environmental protection, many of the national policies have failed to protect the natural resources in the Al-Qatif oasis because of “an absence of comprehensive and integrated policies, a lack of effective implementation of existing policies, a lack of effective cooperation between governmental agencies, and finally through a lack of public participation and education”.

An, Maia and Diana Urge-Vorsatz, “Mineral extraction, economy and the urban environment: the role of foreign direct investment in economies in transition and developing countries”.

Focus/subject: This paper discusses the impacts of the mineral extraction industries financed through FDI in transition economics and examines two recent case studies in gold mining related to major environmental accidents, one in Kyrgyzstan and one in Romania. Paper covers issues of relationship between mineral extraction and urbanization, social and environmental impacts of mineral extraction on human settlements.

Authors: Dept. of Environmental Sciences and Policy, Central European University.

Conclusions/findings: (not determined yet)

Apuzzo, G.M., “Urban Poverty and the Need for a New Urban Ethics: The Case of Sao Paulo
Focus/subject: He focuses on the “right to the city” and the inequalities/exclusions that rapid urban development have created in Sao Paulo.

Author: He is at the Gregorian University, Italy in the Department of Human and Social Future Studies.

1.1 Conclusion/finding/summary: The future city requires the definition of a new urban ethics centered on human beings for a fair development. He argues that social and geographical peripheries are closely related and that the discourse of marginality has shifted from an imbalance between resources available and population to a conflict and contradiction between policies and population’s needs.

1.2

1.3 Barrett, Alison J. and Richard Beardmore

Focus/subject: This paper examines the usefulness of ILO’s “rules for successes against poverty” in urban the context drawing on World Bank and DFID’s (Department of International Development of the British Government) experience in India, arguably the country with the fastest growing group of urban poor in the planet.

Author: Barrett is South Asia Regional Coordinator for Cities Alliance and Beardmore is Senior Urban Specialist, World Bank, Washington.

Conclusion/findings/summary: The paper suggests that the rules for anti-poverty projects, developed by Lipton and his colleagues do provide a framework to help systematize thinking and which one can usefully employ as a form of a checklist.

Beall, Jo and Owen Crankshaw, “Victims, Villains and Fixers: the Urban Environment and Johannesburg’s Poor

Focus/subject: She explores the relationship of Johannesburg’s poor to the urban environment

<p>specifically to three key urban services: water supply, sanitation and electricity. Author: Jo Beall is from the Department of Social Policy, LSE; Crankshaw is from the Dept. of Sociology, University of Cape Town. Conclusion/finding/summary: “The conclusion we draw is that there are significant opportunities for policies that address urban poverty, inequality and environmental management in an integrated way.”</p>
<p>Belazie, Jalal R., “Urban Growth and Change and their Effect in Conservation area with reference to Tripoli City (Libya)”</p> <p>Focus/subject: A look at the historical Tripoli city and the ways in which its historical areas are being transformed as a result of rapid urbanization – the historical sites in Tripoli have been seen as providers of space for land demands. This paper examines the conflicts between modernization (understood in terms of urbanization and economic development) and the conservation of historical and cultural value found in the architecture and planning of the old city quarters in Tripoli. Author: Jalal Belazie is a graduate student in the Department of Town and Country Planning, University of Newcastle, UK. Conclusion/finding/summary: Sustainable planning “should be in agreement in tackling urban problems of today through the adoption of the traditional town planning principles with a necessary modification to shape our new cities while at the same time enhancing and preserving the cultural and physical elements of the olds city”. That sustainability should incorporate cultural value is critical, and instead of viewing old historical areas as irrelevant planning should look to them for reference as they “make it a place for pedestrian movement”.</p>
<p>1.4 Brooks, Ethel., “Children, Citizens, and Labored Questions: The MOU and the Bangladeshi Garment Industry”</p> <p>Focus/subject: Examination of Bangladeshi garment industry as an example of the problems with imputing innocence or victim-hood to child and/or women laborers in the Third Word. Discussion of the Memorandum of Understanding passed to phase out child labor in Bangladesh and its impacts, as well as the garment industry as a source of employment. Author: She is at the Department of Women’s Studies, Rutgers University. 1.5 Conclusion/finding/summary: Implies that mass boycott, and the “framing” of the industry through the lens of anti-sweatshop activists and US policy makers poses problems for economic infrastructure of Bangladesh. Treatment of the question of ‘sweatshop labor’ as narrated by the laborers themselves reveals the need to reconsider framework within which activists policy makers address the sweatshop question.</p>
<p>1.6 Buechler, Simone, “The Degradation of Work in the Global Economy: Low Income Women and the Precarious Labor Market in Sao Paulo, Brazil”</p> <p>Focus/subject: The main focus of the article is the significant rise in employment that is unstable, poorly remunerated, and often without signed workers card especially among the women of Sao Paulo. Author: She is a post-doctoral candidate at Colombia University. 1.7 Conclusion/finding/summary: This paper discusses the degradation in the quality of work both within the formal and informal sectors of industrial Sao Paulo, Brazil. The author claims that in the face of unprecedented global competition multinationals and national industries left for cheaper production sites, engaged in subcontracting, lowered wages, and hired part-time workers.</p>
<p>1.8 Chambers, Valerie, “Bangkok: Are Industries Generating a Sustainable City?”</p>

<p>Focus/subject: The focus is on economic development and urban pollution problems in Bangkok.</p> <p>Author: She is at the Graduate Institute of International Studies, University of Geneva.</p> <p>1.9 Conclusion/finding/summary: Industrial pollution and urban environmental degradation are presently prominent features of Bangkok. Thai businesses are actively attempting to reduce emissions and to manufacture goods in a more environmentally friendly manner.</p>
<p>Cherni, Judith, “Protection of environment and health in wealthy Houston, US”</p> <p>Focus/subject: Air pollution and health in Houston.</p> <p>Author: She is at Imperial College, Environmental Policy and management group in London.</p> <p>Conclusion/finding/summary: She finds that there is a relationship between affluence and air pollution. She also examines the health care system in Houston and relates it to the poor quality of air in the city.</p>
<p>Delgado, Javier, “The rurbanization in the regional periphery of Central Mexico”</p> <p>Focus/subject: summary of the phenomenon of rurbanization (i.e. rural-urbanization or the relocation of some urban activities to a wide mixed urban-rural fringe surrounding the major dynamic metropolis) in Mexico’s Central Region.</p> <p>Author: Research Associate , Instituto de Geografia , Universidad Nacional Autonoma de Mexico.</p> <p>Conclusions/findings/summary: “Traditional concept, particularly those based on rural-urban conflicts and center-periphery model are unable to describe the new spatial structure that is emerging around cities. Concepts such as rurbanization, new rurality, periurban agriculture and agrocities are proposed to explain these activities” – dialogue among disciplines is needed to work on specific territorial configurations.</p>
<p>Droege, Peter, “Renewable Energy Policy, Planning and Practice in Cities and City Regions”</p> <p>Focus/subject: Focus is on fossil fuel depletion and man-made climate change and the need for renewable energy resources. Also, the changing nature of the built form as a result in changes/ revolutions in energy sources.</p> <p>Author: Peter Droege is professor of Urban Design, University of Sydney.</p> <p>Conclusion/finding/summary: Claims that cities and urban form has changed as a result of changes in energy sources: that, “<i>because</i> of the very impacts of fossil fuel we live in a rapidly urbanizing world”. Argues that cities and city regions are “crucial and fertile settings for effective energy policies, programs and projects”. “It is clear that in the long run, efficiency and conservation measures are not sufficient to halt the powerful world-wide rise in emissions”. There are new “global hinterlands”, which “are the former supply regions of pre-fossil villages and towns, now increasingly defunct, with their population streaming to the rising globally networked urban centers.”</p>
<p>1.10 Enne, Giuseppe, Salvatore Madrau, and Claudio Zucca</p> <p>Focus/subject: This paper presents the case study of competition between agricultural and urban land use in the Alghero municipality (Italy), where during the last 50 years a rapid expansion of urban areas has caused a loss of lands suitable to agricultural use.</p> <p>Authors: Centro Interdipartimentale Nucleo di Ricerca sulla Desertificazione – Universita degli Studi di Sassari, Sassari, Italy.</p> <p>Conclusion/finding/summary: The case study of the Alghero municipality has pointed out that the competition among urbanization, environment and agriculture in Mediterranean coastal areas can result in severe land degradation f development policies are unsustainable and based</p>

on exclusive models, such as the tourist one.
<p>1.11 Gibbs, David, “Urban Sustainability: Theoretical Perspectives on Integrating Economic Development and the Environment”</p> <p>Focus/subject: This paper addresses the incompatibility that lies between the push toward urban sustainability on one hand and economic competitiveness on the other.</p> <p>Author: He is a professor in the department of geography.</p> <p>1.12 Conclusion/finding/summary: The author posits that while one emphasizes participation and local democracy, the other depends upon privatization and reduced citizen involvement in urban affairs. Using examples from the United Kingdom, Gibbs tries to prove that sustainability and the social concepts associated to it have important implications for an overhaul of current economic development strategies.</p>
<p>1.13 Goodwin, Mark and Mark Whitehead, “Interpreting the Regulatory Geography of Sustainable Development: The Rise of the Sustainable City in the UK”</p> <p>Focus/subject: This work investigates the emerging regulatory significance of sustainable forms of development to the re-regulation of urban economies.</p> <p>Author: Both are lecturers at the University of Wales, Institute of Geography and Earth Sciences</p> <p>1.14 Conclusion/finding/summary: Within the scalar translation of the meanings attached to sustainable development, and the different politico-institutional frameworks created to implement sustainable development programs, the regulatory geography of the sustainable city will be an uneven one.</p>
<p>Hamza, Mohamed, “The Political and Social Agenda in Policy-making in the Urban Sector: The Case of Egypt (1950s–1990s)”</p> <p>Focus/subject: Examines policy making, especially in the shelter sector, with regards to the impact of the macro-level political economy on the micro-level intervention. It examines the role of the state “as an interest mediator throughout different periods.”</p> <p>Author: Mohamed Hamza is a professor in the disaster management center at Cranfield University, UK.</p> <p>Conclusion/finding/summary: Argues that in order to attain an accurate understanding of the urban shelter question it must be placed in its “broader socio-economic and political context. Claims that often, “policy making is an outcome of the interaction among the needs of the state and external forces which determine policies according to a different agenda (geo-political); outcomes, therefore, may not be generated by a conscious policy making process, but rather, directly, from political impact.”</p>
<p>Hao, Jiming and Ye Wu, “Air Pollution and its Control Strategies in Beijing, China”</p> <p>Focus/subject: This piece deals with air pollution in Beijing including: data assessing current air pollution (type, quantity), a section dealing with sources of air pollution, a section covering measures which have been taken to abate the problem, and a section with proposals.</p> <p>Author: Jiming Hao and Ye Wu are at the Department of Environmental Sciences and Engineering, Tsinghua University, Beijing.</p> <p>Conclusion/finding/summary: Urban growth in Beijing has increased the city’s demand for energy and transportation which leads to the consumption of large quantities of fuels which in turn causes air pollution. They propose the use of advanced technologies and participation of NGOs and the public to relive the problem.</p>
1.15 Hassan, Ahmad Sanusi, “Sustainable Future Urban Pattern and Socio-Economic

Activities of Tropical Wetlands in Southeast Asia.”

Focus/subject: “Large areas are being converted, subjected to urbanization needs without first determining their suitability for this purpose or their existing role in local, regional and global environmental functions and processes.”

Author: He is a professor at the University of Science, Malaysia.

1.16 Conclusion/finding/summary: “The objective is to identify courses of action that need to be taken in order to promote sustainable “wise use” of tropical wetlands in order to ensure protection of their natural resource functions and provision of socio-economic benefits and urban patterns to the local communities.”

Heller, Peter, “Sustainable Human Development—Freiburg”

Focus/subject: He presents the new tram network which is a part of the larger Local Agenda 21 efforts in his city.

Author: He is the mayor of Freiburg.

Conclusion/finding/summary: Outlines the sustainable strategies for the key sectors of urban life that Freiburg has chosen to address: land use, transport policy, energy, water and waste management.

1.17 Higgitt, David L., “Urbanization and Environmental Degradation in Jordan”

Focus/subject: This is a historical account of urbanization and population growth in Jordan – “a dryland environment” and their effects on sustainability in three particular respects: water resources (Jordan River), air pollution, land degradation including water pollution and soil erosion. However, the best parts of this paper are those dealing with urban-rural dynamics and the “marginalization of rural areas by the dominance of urban issues in the national consciousness.”

Author: David Higgitt is from the Department of geography, University of Durham in the U.K

Conclusion/finding/summary: The claim in this paper is that the impact of urban growth on environmental degradation “goes far beyond issues that arise within city limits”. The city is portrayed as the catalyst for a great deal of land degradation that takes place in Jordan as a result of increased population growth and the increased demand which this engenders.

1.18 Izazola, Haydea, “Mexico City: Individual and Collective Responses to Urban Environmental Deterioration”

Focus/subject: This article is more concerned with perceptions of sustainability related issues across classes, than with policy issues.

Author: She is in the department of methods and systems, at the Autonomous University of Mexico City.

1.19 Conclusion/finding/summary: Lifestyle, community, and society-related factors contribute to middle income households’ out-migration from Mexico City in response to deteriorating environmental conditions. Low-income households do not migrate, but for a diverse array of possible reasons, some having to do with the fact that the poorer families are usually just migrating in to Mexico in search of economic opportunity.

Karim, Mohammad Iqbal, “Female Migration in Bangladesh: Urban Integration Process and Implications”.

Focus/subject: female migration to Bangladesh, social assimilation, housing, employment, and sexual exploitation.

Author: Transport Specialist, The World Bank

<p>Conclusion/summary/findings: Poor rural women (predominantly young and unmarried) migrate to urban areas for economic reasons. Some change their lives for the better economically and in terms of behavioral character. However, the process through which female garment workers are integrated into the urban society “has been unpleasant by any civil standard, or norms. The consequences of long working hours, part-time sex trade to overcome poverty and early retirement are far reaching. The damages are irreparable and often beyond control”. While female migrant workers influenced the creation of new employment opportunities for many urban unemployed and rural migrants, there has not been any policy initiative to address their basic needs (housing, education and training).</p>
<p>1.20 Koyuncu, Basak, “The Role of Clientilism in Sustainable Development”</p> <p>Focus/subject: The author focuses on examining this new type of clientelistic network and its role specifically in the success of Kocaeli’s sustainable development efforts in oil, water and industrialization.</p> <p>Author: He is based at Mugla University in Turkey.</p> <p>Conclusion/finding/summary: In this article the author argues that after the 1984 reforms in Turkey, clientelistic relationships in some big cities of the country – like Kocaeli – reappeared in a new guise in order to facilitate cooperation among public and private partners through informal arrangements for the achievement of sustainable development goals.</p>
<p>1.21 Krüger, Fred W., “Livelihoods, urbanization, and the rural-urban interface in African growth-based economies: The case of Botswana.”</p> <p>Focus/subject: This paper describes the importance of rural-urban links for many of the inhabitants of Botswana’s cities.</p> <p>Author:</p> <p>1.22 Conclusion/finding/summary: This is described in more detail for Old Naledi, a low-cost, self help settlement in Botswana’s capital, Gaborone. A third of all house-holds their own cattle, half retain land in the village from which they come and the proportion of households with such rural assets does not decline with people’s length of stay in the city. These rural assets are valued both in monetary and social terms and serve as a valuable safety net for households with low incomes and uncertain livelihood prospects within the city.</p>
<p>Lan, Teo Yee and Maria Choy, “ Land Transport Policies and Strategies for Sustainable Transport System” [Singapore]</p> <p>Focus/subject: Land transport policy in Singapore – sustainable transport network , land use and air quality.</p> <p>Author: Transport authority, Singapore</p> <p>Conclusion/finding/summary: “Solutions to be adopted regarding transportation need to consider people’s aspirations, acceptance of rational policies, social contracts between the Government and the people and the prevailing political will”</p>
<p>1.23 Marcotullio, Peter J., “Urban Sustainability and the regional city system in the Asia Pacific”</p> <p>Focus/subject: Urban sustainability can only be achieved through addressing the economic, ecological and social health of the city. He is linking economic/financial issues with urban sustainability.</p> <p>Author: He is the director of the Institute of Advanced Studies at the UNU.</p> <p>1.24 Conclusion/finding/summary: He gives a regional view of urban development in the Asia-Pacific Region, touches on the effects of globalization (flows of FDI) on urban sustainability by looking at air quality, poverty and industrial pollution, water pollution, etc.</p>

May, Ann, “Rural-Urban Migration and Sustainable Childhoods: Leaving home to stay alive in Tanzania”

Focus/subject: This is a theoretical piece on how the concept of sustainable development could be applied to qualitative anthropological investigations by examining whether the concept of sustainability can be used to help understand the process by which “young rural Tanzanian boys migrate to the urban informal economy”.

Author: Ann May is a doctorate student at the University of Colorado and currently living in Tanzania doing field work.

Conclusion/finding/summary: This is mostly a theoretical piece on what ‘sustainability’ means. She claims it needs to be understood in cultural terms as well as political and economic ones and further that it should take on a more-interdisciplinary approach.

Mohapi, Tsepiso, “Urban Environmental Problems: Implications for Rapid Urbanization Without Adequate Urban Governance in Lesotho”

Focus/subject: implications of rapid urbanization without adequate urban governance and service provision on the urban environment in Lesotho , with particular reference to low-income settlements within Maseru.

Author: Institute of Southern African Studies, National University of Lesotho.

Conclusion/findings/summary: “The implications of which are largely felt by the urban poor who bear the dissatisfaction with the rate of urbanization and its implications for urban environmental housing conditions, the government therefore needs to develop explicit settlement strategies to guide the process of urbanization in Lesotho.”

1.25 Msoka, Colman Titus

Focus/subject: This paper examines how survival strategies can evolve into development strategies within formal urban centers. By reviewing the experience of the development of kiosk business in Moshi municipality , Tanzania,

Author: Department of Sociology , University of Minnesota

Conclusion/findings/summary: The economic crisis pushed many Tanzanians to go for survival strategies like kiosks businesses and urban agriculture. But survival strategies are no longer about survival as soon as they start attracting a social class, which is less affected by the crisis. Although survival strategies might have the potential to become developmental strategies, it might be difficult for city policy makers to quickly see the turning points.

Myers, Garth Andrew, “Planning the Sustainable City: A Political Ecology of Urban Growth in Zanzibar”

Focus/subject: Inserts politics into the discourse on sustainability by focusing on Zanzibar and its sustainable cities program and how it implemented issues from Agenda 21- “I attempt to open up ground for a political-ecological approach to urban development”. The issue of democratic sustainability.

Author: Garth Myers is from Kansas State University.

Conclusion/finding/summary: Claims that the outcome of sustainable urban policies depend on issues that are more political-economic than environmental. “The question of whose attitudes are going to be reformed and whose environments are going to be regulated in these contexts is inherently a question tied to the uneven political geography of state power as much as to the uneven distribution of sensitive physical environments.”

1.26 Ogu, Vicent I.

Focus/subject: Drawing from the experience of Benin City and Ibadan and from supporting data on Nigeria, the paper argues for greater emphasis on the development of basic urban infrastructure.

Author: Faculty of Built Environment, University of South Wales, Sydney, Australia.

Conclusion/findings/summary: The paper stresses that strategies for planning and managing the urban environment should acknowledge social and economic realities and the dynamics of the spatial expression, and also act on this recognition in order to counter the problem of poor services and environmental deterioration.

1.27 Parnreiter, Christof, "Free Trade and Changing Patterns of Cityward Migration: The Case of Mexico"

Focus/subject: Looks at the relationship between internal migration and its impacts on urban sustainability in Mexico City.

Author: At the University of Vienna, Department of Geography and Dept. of Social and Economic History.

1.28 Conclusion/finding/summary: Each of the economic transformations in Mexico have helped to generate waves of emigration. Locations for economic activities oriented to the world market emerged as new centers of immigration, as they demanded labor for the maquiladora industries or tourism.

1.29 Patel, Sujata, "Bombay/Mumbai: An Urban Crisis"

Focus/subject: She focuses on local political movements, industrialization within the city of Bombay, and the rise in urban violence/radical political movements.

Author: Department of Sociology, University of Pune, India

1.30 Conclusion/finding/summary: The continuing inequalities and lack of access to resources in the city (such as housing and access to space) has resulted in the rise of radical political movements (Shiv Sena).

Patel, Zarina, "Technical Process, Political Realities: Sustainable Development and the South Durban Strategic Environmental Assessment"

Focus/subject: The paper examines the role and effectiveness of sustainable development as a planning and policy tool in the post-apartheid reconstruction of South African Cities --- Case study of the Sotuh Durban Strategic Environmental Assessment . "It is argued that interventions supporting a sustainable development agenda fall short of attaining their goals, as these initiatives are often reduced to technical processes, whereby inadequate attention is paid to the politics of the environment."

Author: Phd Student, Department of Geography, University of Cambridge, UK

Conclusions/findings/summary: "The formulation of environmental policy is a discursive process, and (...) although attempts at engendering sustainable development do not achieve consensus, the conflictual nature of such processes are not necessarily a reflection of a lack of support for the ideals of sustainable development itself. But rather are symptomatic of a more general, and often historically rooted distrust in formal institutions of government, as well as the instrumental means by which policy is formulated". Also, the scientific language and framings of environmental problems and solutions serves to create barriers between actors. It is not that all science is bad "but rather that there needs to be a democratization of science to ensure that specific groups are not "talked out" of policy and planning debates and to reduce the knowledge and hence power differentials that currently exist between various actors in the policy process."

1.31 Priemus, Hugo, "The long way towards sustainable cities – the Dutch case"

<p>Focus/subject: This piece was supposed to have been about the Brundtland Report, but it wasn't very informative, so instead we will use it for his focus on light rail and urban mobility.</p> <p>Author: He is the managing director of the Research Institute for Housing , Urban and Mobility Studies in The Netherlands.</p> <p>Conclusion/finding/summary: Priemus points out that with the publication of Brundtland Report, environmental sustainability and policy became a popular topic for lawmakers and politicians in Europe. But despite this interest little has changed. Change will depend on major political and economic restructuring and also on local level initiative and participation.</p>
<p>Rabinovitch, Jonas, "Curitiba, Brazil: A Positive Reference for Urban Development"</p> <p>Focus/subject: selected principles, procedures and lessons from the experience in Curitiba.</p> <p>Author: Senior Urban Development Adviser, United Nations Development Programme, New York.</p> <p>Conclusions/findings/summary: (1) priority should be given to public transport rather than to private cars; (2) emphasis on conservation; (3) creativity can substitute for financial resources; (4) participation and partnerships may enhance sustainability.</p>
<p>1.32 Rogerson, Christian M., "Supporting urban small-scale manufacturers: South Africa"</p> <p>Focus/subject: He is looking at small to medium sized enterprises in Johannesburg.</p> <p>Author: He is at the University of Witwatersrand, Johannesburg.</p> <p>Conclusion/finding/summary: The key themes addressed are market constraints, concentrated market structures and of the need for an expansion of business linkages and of inter-enterprise cooperation in Johannesburg.</p>
<p>1.33 Schiffer, Sueli Ramos, "The Challenge of Sustainable Development Facing Globalization: The Sao Paulo"</p> <p>Focus/subject: She looks at how uneven economic growth in the city has caused urban, environmental and socioeconomic problems that can be seen in extremely segregated urban structures.</p> <p>Author: She is based in Brazil.</p> <p>1.34 Conclusion/finding/summary: The goal of achieving more balanced social development and a less exclusionary social structure is not impossible if it is included in the national economic model and simultaneous becomes a major objective of the Brazilian society.</p>
<p>Takahashi, S., "Coping with urban social vulnerability to hazards in Tokyo: current status of disaster mitigation plans and its implications"</p> <p>Focus/subject: Examines the issue of urban social vulnerability to hazards for the metropolitan area of Tokyo. Argues that natural hazards, which can have large ramification for sustainability in urban areas, effect different social groups in different ways and that mitigation plans overlook and even exacerbate this. How disasters such as earthquakes affect neighborhood groups, who are the most vulnerable groups on Tokyo and the role of NGOs and volunteers in mitigating the negative effects of these situations.</p> <p>Author: S. Takahashi is professor, department of economics, Aoyama Gakuin University, Tokyo.</p> <p>Conclusion/finding/summary: The large concentration of people in cities makes the consequences of natural disasters much more profound. Disadvantaged groups are effected more than others by natural hazards and have a more difficult time recovering, they require additional support. This support can not realistically come from the government because of budget</p>

<p>constraints and because of this voluntary groups and NGO's are crucial for assistance. However there is a need for better coordination amongst these individual groups. Two categories of people emerged to indicate vulnerability to natural disasters: those defined by their physical characteristics and those defined by their social isolation. Disaster mitigation policies have lower priority in public spending. Thus, it will be important to find a way to include more positive consideration of vulnerable groups into disaster mitigation and recovery planning with external resources such as from NGOs.</p>
<p>Trvisiol, Erich Roberto, "Non-Conventional Technologies for Management of the Water Cycle, Case Study "Caduti Della Resistenza-Ater" Neighborhood, Padua, Italy"</p> <p>Focus/subject: new approach to protection of surfaces associated with water utilization; collection and non-conventional treatment of waste water, possibilities of water conservation during distribution and use, protection of water bodies, taking account landscape characteristics and local population.</p> <p>Author: Trvisiol is an Environmental Planner, Italy</p> <p>Conclusions/findings/summary:</p>
<p>1.35 Uitto, Juha I., "Rural Development: Participation and Diversity for Sustainability"</p> <p>Focus/subject: He considers rural development especially from the point of view of sustainable development in developing countries.</p> <p>Author: He is at the World Bank.</p> <p>1.36 Conclusion/findings/summary: A case is made for broad-based participation and appreciating the diversity that is inherent in locally-evolved production systems.</p>
<p>Wadhwa, Lal C., "Transportation and Urban Sustainability"</p> <p>Focus/Subject: OVERVIEW. Paper presents short- and long-term strategies to achieving sustainable transportation, including those which represent deliberate attempts to covertly influence human behavior through shift in values and attitudes.</p> <p>Author: Head, Civil and Environmental Engineering , James Cook University, Australia</p> <p>Conclusions/findings/summary: Technological solutions alone will not deliver sustainable transportation and it is essential that all key elements of transportation system are targeted . "bold pricing and regulatory measures will have to be adopted if the goals of sustainability are to be realized."</p>
<p>Wahid, Julaihi, "Urbanization and Cultural Continuity in Housing Development, The Case of Sarawak, Malaysia".</p> <p>Focus/subject: Changes in the structure and design of houses as a result of economic changes.</p> <p>Author: Julaihi Wahid is professor, school of housing building and planning, University Sains Malaysia.</p> <p>Conclusion/finding/summary: Changes in the design of a house are the result of the original design not meeting the needs of its inhabitants. "The design of the conventional house does not fulfill the basic requirements of the user while the old physical conditions of the village house do not meet the current social demand and lifestyle of the occupants.</p>
<p>1.37 Wan Ibrahim and Wan Hashim</p> <p>Focus/subject: The paper illustrates a case study of traffic light juncture in Ipoh City (Malaysia) in order to determine the percentage of pollutants decrease as a result of improvement in the design of traffic light junction.</p> <p>Author: School of Civil Engineering , Universiti Sains Malaysia, cewhi@kcp.usm.my</p>

1.38	<p>Conclusion/findings/summary: “Pollutant emissions will be reduced if traffic congestion at the traffic light is reduced. In this paper, the reduction in traffic congestion is obtained by improving the signal coordination of the traffic light junction”.</p> <p>Wegelin, Emiel A., “Informal Settlements and their Upgrading: Building On the Lessons of Three Decades of Experience”</p> <p>Focus/subject: recognition of value of capital formation, combined with the growing awareness of the severe operational constraints on the policy option of government driven urban planning and housing development in developing countries led to upgrading as alternative housing policy approach. Author analysis possibility of participatory upgrading.</p> <p>Author: Director Institute for Housing and Urban Development Studies, Rotterdam, Netherlands.</p> <p>Conclusions/findings/summary: “Municipalities need to enhance the intrinsic cost-effectiveness of informal settlements upgrading schemes by ensuring that such neighborhood schemes are adequately linked into major trunk infrastructure. Therefore, at city-wide level, too, municipalities must increasingly plan and program the development of municipal services in an integrated participatory way, with the maximum extent of community participation possible.”</p>
	<p>Williams, Eric., “Environmental Life Cycle Assessment and Municipal Solid Waste Management”</p> <p>Focus/subject: Examines the role of Life Cycle Assessment in discussing the following questions: What are the environmental and economic implications of the different municipal solid waste management systems (Landfills, Recycling, Incineration). What government policies are appropriate to minimize environmental impacts.</p> <p>Author: Eric Williams is a research associate at the United Nations University / Institute of Advanced Studies, Tokyo.</p> <p>Conclusion/finding/summary: Life Cycle Assessment has an important role in the debate regarding the environmental implications of Municipal Solid Waste management but there will always be uncertainties. This is in part because LCA singles out only a few environmental issues. Some issues such as global warming potential can be analyzed by LCA but others such as biodiversity can not be appropriately analyzed using LCA.</p>
1.39	<p>Wu, Weiping., “Migrant Housing Choices and Patterns in Shanghai”</p> <p>Focus/subject: Focuses on the impact of migration on urban development, specifically housing patterns in Shanghai.</p> <p>Author: She is a professor at Virginia Commonwealth University. Chinese by origin.</p>
1.40	<p>Conclusion/finding/summary: This paper analyses migrant housing choices, conditions, and geographical locations in Shanghai. She focuses mostly on individual-level determinants of housing choices.</p>

Appendix 1. Case studies

Glossary

Biodiversity:

An umbrella term used to describe the number, variety and variability of living organisms in a given assemblage. The term encompasses different ecosystems, species, and genes. There are 1.7 million known species, though it is estimated that 4–11 million exist. The UN Convention on Biodiversity (1992) commits 155 countries to the conservation and

	sustainable use of biological resources.
Deforestation:	The destruction of the Earth's forests. The Earth has just over 32 million km ² of forests which is being destroyed at about 0.3% per year. The Forest Principles signed in the Earth Summit Conference in Rio 1992 have yet to be implemented due to conflicts between nations with vested interests.
Desertification:	Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. Processes that lead to desertification are soil erosion, nutrient depletion, crust formation, salinization, reduction in pasture and agricultural productivity, loss of biodiversity, and reduction in vegetation cover. The UN Convention to Combat Desertification came into force in December 1996 and has been ratified by 160 countries.
Ecocentric:	Ecocentrism is a socially constructed view of the environment that has its roots in nineteenth century romanticism. Ecocentrics believe that human activities are harming the environment and advocate the precautionary principle. Solutions to environmental degradation include decentralisation and "small is beautiful" solutions. Ecocentrics believe both in the intrinsic and instrumental value of nature.
Ecological footprint:	First mentioned by Mathis Wackernagel and William Rees in <i>Our Ecological Footprint</i> (1995). It refers to the corresponding area of productive land and aquatic ecosystems required to produce the resources used, and to assimilate the wastes produced, by a defined population at a specified material standard of living, wherever on Earth that land may be located.
Ecological system:	Or "ecosystem," is a community of organisms and their associated environment. There are no limitations in spatial and temporal scales, from ancient forests to short-lived pond ecosystems. The physical features of the habitat, such as soil, slope, aspect, plus climatic differences determine which species form the basic structure of the ecosystem.
Ecologically-productive land:	Also known as biologically-productive land, is all land on Earth excluding deserts, degraded land and pavement/roads. Ecologically-productive land must provide all agricultural products, produce energy (ethanol, palm oil and sustainable energy) and absorb by-products of human activities for everyone on Earth
Global hinterland:	How the development of international trade and globalisation has led to the ability to use the whole world to supply one's needs.
Global warming (climate change) :	Increase in mean global temperature as a result of the "greenhouse effect." Consequences are as yet unknown but could consist of increased variability and unpredictable global weather conditions and sea level rise. The Kyoto Protocol

Green and Brown environmentalism:	<p>(1997) commits Annex 1 countries (OECD countries and economies in transition) to an overall reduction of 5.2% of greenhouse gases from 1990 levels.</p> <p>Environmentalism has different conceptions depending on one's circumstances. Developing countries subscribe to Brown Environmentalism, which emphasizes the importance of sanitary levels, disease control and infant mortality. Policies that enable them to reach higher technological standards and improve their standard of living, such as technological transfers, are favored. Green environmentalism is the stance taken by developed countries that have seen their ecological systems irreversibly destroyed by industrialism. Here habitat preservation, 'back to basics' living and reforestation are advocated. The Kyoto Protocol (1997) has been the focus of differences in opinion between the Green and Brown Environmentalists, most seen in the conflict over the Joint Implementation and Clean Development Mechanism schemes.</p>
Greenhouse gas emissions:	<p>The main greenhouse gases are carbon dioxide, methane, tropospheric ozone, water vapour, chlorofluorocarbons and nitrous oxide. They cause the "greenhouse effect" by trapping heat within the earth's atmosphere thereby causing mean temperatures to rise. Agriculture and fuel burning are the main human activities that emit greenhouse gases.</p>
Hazardous indoor air quality:	<p>Also known as indoor air pollution. Indoor air often contains higher concentrations of hazardous pollutants than outdoor air because buildings have been made more airtight to conserve energy which prevents pollutants from escaping. Common indoor pollutants are environmental tobacco smoke, biological contaminants, pesticides, formaldehyde, and particulates. Adverse effects on humans include cancer, allergies and asthma.</p>
Heat island effect:	<p>The heat island effect is the warming of local/regional climates and reduction of air quality because of the development of urban areas at the expense of forested areas.</p>
Ozone:	<p>There are two types of ozone. Tropospheric ozone is located at ground level where it causes photochemical smogs that are a health risk to humans. 90% of ozone is stratospheric ozone, which is located high up in the earth's atmosphere. Stratospheric ozone forms the Ozone Layer which protects the Earth from excessive ultraviolet radiation.. The Montreal Protocol signed in 1987 was intended to reduce emissions of chlorofluorocarbons that destroy the ozone layer.</p>
Photosynthetic capacity:	<p>Photosynthesis is the conversion of solar energy into chemical energy by green plants following the equation: 6CO_2 (carbon dioxide) + $6\text{H}_2\text{O}$ (water) + Light Energy \rightarrow $\text{C}_6\text{H}_{12}\text{O}_6$ (carbohydrates) + 6O_2 (oxygen). Photosynthetic capacity is the maximum efficiency of photosynthesis that a plant can</p>

	perform under current conditions.
Urban hinterland:	The surrounding land that provides vital resources to an urban area.
Waste recycling:	Reprocessing used materials for further use. Recycling is done by industry (remoulding used glass bottles into new ones) or domestically (reusing used plastic bags).
Water pollution:	Water pollution is the introduction by humans into water bodies of substances liable to cause hazards to human health, harm to living resources and ecological systems, damages to structure or amenity, or interference with legitimate uses of the environment.

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