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## Cities are at the center of our environmental future

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## Views

# Cities are at the center of our environmental future

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**Abstract** *The global environmental challenge becomes tangible and urgent in cities. Thus, it is critical that we understand the capabilities of cities to transform what is today a negative environmental impact to a positive one. We must make cities part of the solution. One point of entry to this question is to view cities as a type of socio-ecological system that has an expanding range of articulations with nature's ecologies. Today, most of these articulations produce environmental damage. How can we begin to use these articulations to produce positive outcomes – outcomes that allow cities to contribute to environmental sustainability? The complex systemic and multi-scalar capacities of cities provide massive potential for a broad range of positive articulations with nature's ecologies.*



**Keywords:** global, governance, city, multi-scalar, urban ecology, urbanization, environmental, sustainability

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## 1. INTRODUCTION

Cities are at the forefront of a range of global governance challenges. Because of this, many cities have had to develop capabilities to handle these challenges long before national states have signed international treaties or passed national laws to address them. Cities have even shown a willingness to disregard national law when the urgency of confronting particular conditions demands it. In this context, the expanding presence of cities in global networks and the expanding number of economic, cultural and political inter-city networks assume added meaning.

The massive processes of urbanization under way today are inevitably at the center of the environmental future. It is through cities and vast urban agglomerations that mankind is increasingly present in the planet and through which it mediates its relationship to the various stocks and flows of environmental capital. The urban hinterland, once primarily a confined geographic zone, is today a global hinterland. With the expansion of the global economy, we have raised our capacity to annex more and more of the world's land to support a limited number of industries and places. Here I address the multi-scalar character of cities—the diverse terrains and domains, many non-urban, onto which they project their effects and from which they meet their needs. I also address their ecological character, the multiple mechanisms and feedback loops that articulate urban processes and their consequences and, also, the emergent articulations between these urban ecologies and nature's ecologies.

Cities are de facto parts of a whole range of global governance challenges that are typically conceived at the global and national levels. Recognizing this means inserting the urban question into global/national domains that tend to exclude/overlook cities and other sub-national levels

## 2. THE URBANIZING OF GLOBAL GOVERNANCE CHALLENGES

Many of today's major global governance challenges become tangible, urgent and practical in cities worldwide. Urban leaders and activists have had to deal with many issues long before national governments and inter-state treaties addressed them. Cities are sites where these challenges can be studied empirically and where policy design and implementation often is more feasible than at national level. Among these global governance challenges are those concerning the environment; human insecurity, including the spread of violence against people of all ages and a proliferation of racisms; and the sharp rise in economic forms of violence. Cities also constitute a frontier space for new types of environmentally sustainable energy sources, construction processes and infrastructures. Finally, cities are critical for emerging inter-city networks that involve a broad range of actors (NGOs, formal urban governments, informal activists, global firms, and immigrants) that potentially could function as a political infrastructure with which to address some of these global governance challenges.

Cities also enter the global governance picture as sites for the enactment of new forms of violence resulting from various crises. In the dense and conflictive spaces of cities, we foresee a variety of forms of violence that are likely to escape the macro-level norms of good governance. For instance, drug-gang violence in Sao Paulo and Rio points to a much larger challenge than inadequate local policing. So do the failures of the powerful US army in Baghdad to institute order. To explain this away as simply acute anarchy is inadequate and too facile. It will take much effort to maintain somewhat civilized environments in cities. In discussing global governance questions, one challenge is to push macro-level frames to account for, and factor in, the types of stress that arise from violence and insecurity in dense spaces in everyday life—the type of issue that global governance discourse and its norms do not quite capture. Yet, it is critical that such everyday conditions be incorporated in the global governance framing, since some of these may eventually feed into micro and macro-style armed conflicts, which will not solve the matter, but make it worse.

More than nation-states, cities will be forced into the frontlines by global warming, energy and water insecurity, and other environmental challenges (see Warner 2009, Reuveny 2008). The new kinds of crises and, possibly, ensuing violence will be felt particularly in cities because of the often extreme dependence of cities on complex systems. City life depends on massive infrastructures (electricity for elevators and abundant public transport) and institutional support (e.g., hospitals, water purifying plants) apartment buildings, hospitals, vast sewage systems, vast underground transport systems, entire electric grids dependent on computerized management that are vulnerable to breakdown. In a major simulation by NASA of a breakdown in the computerized systems that manage the electrical grid of a major city, it was discovered that the population would be in a fairly desperate situation by the fifth day. We already know that a rise in water levels will flood some of the densest areas in the world. When these realities hit cities, they will hit hard and preparedness will be critical. These realities are overtaking the abstract norm-oriented arguments of global governance debates that consist largely of future-oriented "oughts"—what we ought to do.

These challenges are emergent, but before we know it, they will become tangible and threatening in cities. This contrasts with possibly slower trajectories at the national level. In this sense, cities are in the frontline and will have to react to global warming, whether or not national states sign on to international treaties. The leadership of cities is quite aware of this.

## 3. CAN WE BRIDGE THE ECOLOGIES OF CITIES AND NATURE?

The enormously distinctive presence that is urbanization is changing a growing range of nature's ecologies, from the climate to species diversity and ocean purity. It is creating new



environmental conditions—heat islands, ozone holes, desertification, and water pollution. We have entered a new phase. For the first time, mankind is the major consumer in all the significant ecosystems and urbanization has been a major instrument. There is now a set of global ecological conditions that have never been seen before. Major cities have become distinct socio-ecological systems with a planetary reach. Cities have a pronounced effect on traditional rural economies and their long-standing cultural adaptation to biological diversity. Rural populations have become consumers of products produced in the industrial economy, which is much less sensitive to biological diversity. The rural condition has evolved into a new system of social relationships, one that does not work with biodiversity. These developments all signal that the urban condition is a major factor in any environmental future. It all amounts to a radical transformation in the relationship between mankind and the rest of the planet.

But is it urbanization per se or the particular types of urban systems and industrial processes that we have instituted? That is to say, is it the urban format marked by agglomeration and density dynamics or what we have historically and collectively produced partly through processes of path-dependence which kept eliminating options as we proceeded? Are these global ecological conditions the results of urban agglomeration and density or are they the results of the specific types of urban systems that we have developed to handle transport, waste disposal, building, heating and cooling, food provision, and the industrial processes by which we extract, grow, make, package, distribute, and dispose of the foods, services and materials that we use?

It is, doubtless, the latter—the specific urban systems that we have made. One of the outstanding features that are evident when one examines a range of today's major cities is the pronounced differences among them in environmental sustainability. These differences result from diverse government policies, economic bases, cultures of daily life, and so on. In addition to these differences are a few foundational elements that now increasingly dominate our way of doing things. One of them is the fact that the entire energy and material flux coursing through the human economy returns in altered form as pollution and waste to the ecosphere. The rupture at the heart of this set of flows is *made* and can, thus, be *unmade*—and some cities are working on it. This rupture is present in just about all economic sectors, from urban to non-urban. However, it is in cities where it has its most complex interactions and cumulative effects. This makes cities a source of most of the environmental damage, and some of the most intractable conditions that feed the damage. Nevertheless, it is also the complexity of cities that is part of the solution.<sup>1</sup>

It is now imperative to make cities and urbanization part of the solution. We need to use and build upon those features of cities

that can re-orient the material and organizational ecologies of cities to positive interactions with nature's ecologies. These interactions, and the diversity of domains that they cover, are themselves an emergent socio-ecological system that bridges the city's and nature's ecologies. Part of the effort is needed to maximize the probability of positive environmental outcomes. Specific features of cities that help are economies of scale, density and the associated potential for greater efficiency in resource use and important, but often neglected, dense communication networks that can serve as facilitators to institute environmentally sound practices in cities. More theoretically, one can say that insofar as cities are constituted by various processes that produce space, time, place and nature, they also contain the transformative possibilities embedded in these same processes. For example, the temporal dimension becomes critical in environmentally sound initiatives. Thus, ecological economics enables us to recognize that what is inefficient or value-losing, according to market criteria with short temporal evaluation frames, can be positive and value-adding, using environment driven criteria.<sup>2</sup>

#### 4. THE COMPLEXITY AND GLOBAL PROJECTION OF CITIES

As has been well documented, cities have long been sites for innovation and 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 constitute 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 radically transformative institution-building.

Urban systems also entail systems of social relationships that support the current configuration.<sup>3</sup> Aside from adoption of practices, such as waste recycling, it will take a change in these systems of social relationships themselves to achieve greater environmental sensitivity and efficiency. For instance, a crucial issue is the massive investment in large projects around the world that damage the environment. Deforestation and construction of large dams are perhaps among the best known problems. The scale and the increasingly global and private character of these investments suggest that citizens, governments, and NGOs lack the power to alter these investment patterns. However, there are structural platforms for acting and contesting these powerful corporate actors (Sassen 2005). The geography of economic globalization is strategic rather than all-encompassing and this is especially true in the managing, coordinating, servicing and financing of global economic operations. The fact that it is strategic is

1 That it is not urbanization per se that is damaging, but the mode of urbanization also is signaled by the adoption of environmentally harmful production processes by pre-modern rural societies. Until recently, these had environmentally sustainable economic practices, such as crop rotation and foregoing the use of chemicals to fertilize and control insects. Further, our extreme capitalism has made the rural poor, especially in the Global South, so poor that for the first time, many now are also engaging in environmentally destructive practices, notably practices that lead to desertification.

2 One key component here is ecological economics. For some of the foundational concepts and logics of ecological economics, see Daly (1977), Daly and Farley (2003), Gund Institute (2009), Rees (2006), Schulze (1994), and Porter (2009).

3 This is a broad subject. For studies that engage a range of aspects see Sassen (2001, 2005), Satterthwaite (2007), Girardet (2008), Beddoe et al. (2009), and Morello-Frosch et al. (2009).

significant for a discussion of the possibilities of regulating and governing the global economy. There are sites—the network of global cities—in this strategic geography where the density of economic transactions and top-level management functions come together to form a strategic geography of decision-making. We can see this also as a strategic geography for demanding accountability for environmental damage. The global economic system is characterized by an enormous concentration of power in a finite number of large multinational corporations and global financial markets. This makes for concentrated (rather than widely dispersed) sites for accountability and for ease in changing investment criteria. Engaging the headquarters is a very different type of action than engaging the thousands of mines and factories and the millions of service outlets of such global firms. This engagement is facilitated today by the recognition of an environmental crisis by consumers, politicians and the media. Certainly, it leaves out millions of small local firms that are responsible for much of the environmental damage. However, they are more likely to be controllable by means of national regulations and local activism.

A crucial issue raised by the foregoing is the question of the scale at which damage is produced and intervention or change should occur. This 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 which, in turn, constitute what we call the city. It is in the cities where different policy levels, from the supra- to the sub-national, are 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.

Urban complexity and diversity are further augmented by the fact that urban sustainability requires engaging the legal systems and profit logics that underlie and enable many of the environmentally damaging aspects of our societies (Sassen 2008, Chapters 4 and 5). The question of urban sustainability cannot be reduced to modest interventions that leave these major systems untouched. The actual features of these systems vary across countries and across the North-South divide. While, in some of the other environmental domains, it is possible to confine the discussion of the subject to scientific knowledge, this is not the case when dealing with cities. Non-scientific elements are a crucial part of the picture. Questions of power, poverty and inequality, ideology and cultural preferences, are all part of the question and the answer. One major dynamic of the current era is globalization and the spread of markets to more and more institutional realms. Questions of policy and proactive engagement possibilities have become a critical dimension of treatments of urban sustainability, whether they involve asking people to support garbage recycling or demanding accountability from major global corporations that are known to have environmentally damaging production processes.

## 5. TOWARDS A MULTI-SCALAR ECOLOGICAL URBAN ANALYSIS

City-related ecological conditions operate on a diversity of geographic scales. Importantly, cities incorporate a range of scales on which a given ecological condition functions and, in that sense, cities make visible the fact itself of scaling. Further, cities make the multiscalar properties of ecological systems present and recognizable to its residents. This urban capacity to make visible should be developed and strengthened as it will become increasingly critical for policy matters not only of cities, but also at regional, national and global levels. For the majority of those who write about environmental regulation in, and of, cities, the strategic scale is the local (Habitat II, Local Agenda 21). Others have long argued that the ecological regulation of cities can no longer be separated from wider questions of global governance (Low, 2000). This is also a long-standing position in general, non-urban, analyses of the “economy and the environment” (e.g., Etsy and Ivanova 2005).

Beyond regulation, the city is also a key scale for implementing a broad range of environmentally-sound policies and also a site for struggles over the environmental quality of life for different socio-economic classes (e.g., Satterthwaite et al, 2007, Redclift 2009; Van Veenhuizen and Danso 2007). 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. Indeed, thousands of cities worldwide have initiated their own de facto environmental policies to the point of contravening national law, not because of idealism, but because they have been compelled to, as national governments are far more removed from the immediate catastrophic potentials of poisoned air and floods and have been slow to act. The acuteness of environmental challenges at the urban level has been further sharpened by the current phase of economic globalization, which puts direct pressures onto cities. One example of these pressures is the global corporate demand for the extreme type of constructed-environment epitomized by Dubai. The other side of this is the sharply increased demand for inputs, transport and infrastructure for mobility the enormous demand for wood, cement, non-renewable energy, air transport, trucking, shipping, and so on. A second element that the current global corporate economy has brought is the World Trade Organization’s subordination of environmental standards to what are presented as “requisites” for “free” global trade and proprietary “rights” (e.g., Gupta 2004; Mgbeogi 2006). Finally, privatization and deregulation reduce the role of government, especially at the national level, and hence weaken its mandatory powers over environmental standards.

The city becomes a strategic space for the direct and brutal confrontation between forces that are enormously destructive to the environment and increasingly acute needs for environmental viability. Much of what we keep describing as global environmental challenges becomes tangible and urgent in cities. It is likely that international and national standards will need to be



implemented and enforced at the urban scale.<sup>4</sup> There are limits to the urban level, especially in the Global South where local governments have limited funds. However, this is one of the scales at which many specific goals can be achieved. Local authorities are in a strong position to pursue the goals of sustainable development as direct or indirect providers of services, as regulators, leaders, and partners and as mobilizers of community resources.<sup>5</sup> Each urban combination of elements is unique, as is its mode of insertion within local and regional ecosystems. From this specificity comes place-based knowledge that can be scaled-up and contribute to the understanding of global conditions. The case of ozone holes illustrates this scale-up. The damage is produced at the micro level of cars, households, factories, and buildings, but its full impact becomes visible and measurable only over the poles, where there are no cars and buildings.

A debate that gathered heat, beginning in the 1990s and remaining unresolved, pits the global against the local as the most strategic scale for action. Redcliff (1996) argued that we cannot manage the environment at the global level. Global problems are caused by the aggregation of production and consumption, much of which is concentrated within the world's urban centers. For Redcliff, we first 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 relationship to the processes through which the environment is being transformed. Not everyone agrees. Thus Satterthwaite has long argued that we need global responsibilities, but cannot have such without international agreements (Satterthwaite 1999). Low (2000) adds that we have a global system of corporate relationships in 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, a question that, if asked, would have been heard at the national level in the early industrial era.

I 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. Each locally produced set of damages will require much clean-up and the establishment of preventive

measures. However, the global organizational structure of the corporation involved also needs to be engaged. Along these same lines, the focus on individual cities promoted by notions of inter-city competition in a global corporate economy has kept analysts and political leaders from understanding the extent to which the global economy needs networks of cities, rather than just one perfect global city. Hence, specific networks of cities are natural platforms for cross-border city-alliances that can confront the demands of global firms. One key benefit for cities of international agreements is in preventing 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 it is likely to enhance their competitiveness in the long term. Cities that succeed in instituting such policies should not bear the expense incurred by the lack of such policies in other cities, whether at the national or international level. This will, at times, require policies that restrain the transfer of environmental costs to other locations.<sup>6</sup>

The second observation is that an enormous share of the attention devoted to urban sustainability in the literature has been on how people as consumers and household-level actors damage the environment. When measuring cities, inevitably individuals and households are by far the most numerous units of analysis. Yet, there clearly are shortcomings in this focus. In matters 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 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. However, these emissions will also have to be addressed at the broader macro levels of our economic systems. Further, some recent innovations suggest the possibility of planetary interventions at the local level. One matter that I have researched is what it would mean to use the newly developed "paint" that is mixed with bacteria that can live in concrete and seal the surfaces of buildings. The result is an effective sealing of walls, which diminishes green gas emissions and purifies the air around the building.<sup>7</sup> This simple technology may be used for all concrete buildings, whether they are located in modest neighborhoods or the business districts of global cities. It is just one example of how a global scale is constituted through a vast number of local sites, all of which are using the same technology.

4 Some kinds of international agreements are crucial. Examples include agreements that set enforceable limits on each national society's consumption of scarce resources and their use of the rest of the world as a global sink for their wastes. Other agreements I find to be problematic, notably that concerning the market for carbon trades. The latter contains negative incentives. Firms need not change their practices insofar as they can pay others to take on their pollution. Overall, there is no absolute reduction in pollution.

5 For instance, instituting a sustainable consumption logic can be aided by zoning and subdivision; regulations; building codes; planning for transport, water and waste, recreation and urban expansion; local revenue raising (environmental taxes, charges, levies) and by introducing environmental considerations when preparing budgets, purchasing, contracting and bidding [see Satterthwaite's and other researchers' work on the IIED website for one of the most detailed and global data sets on these issues].

6 For instance, the vast fires to clear large 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 often at high taxation expense to its inhabitants and firms.

7 Bacteria residing within concrete structures seal cracks and reduce the permeability of concrete surfaces by depositing dense layers of calcium carbonate and other minerals. Our buildings would thus more closely model the self-sustaining homeostatic physical structures found in nature (Jonkers 2007). This is particularly significant in the current period because a) buildings are the largest single source of green gas emissions and b) it would create employment, mobilize citizens in their neighborhoods, and allow local governments to get involved by initial small subsidies, especially in modest neighborhoods. An experimental technology with a similar capacity to be deployed "globally at the local level" is the so-called carbon negative cement [see [http://www.novacem.com/docs/novacem\\_press\\_release\\_6\\_aug\\_2009.pdf](http://www.novacem.com/docs/novacem_press_release_6_aug_2009.pdf)]. There are many other such uses of nature's capacity to address the environmental challenge in cities, although none as globally present as the challenge of greening buildings. Some of these have been developed a decade ago. For instance, using bioreactors (essentially controlled ponds) that combine bacteria and algae can clean nitrate-contaminated water and gaseous Nitrogen (N<sub>2</sub>) can be recycled into the atmosphere (Garcia and Hernandez 2000).

These various questions can be analytically envisioned 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 by ecologists to conceptualize the city in this context to be very illuminating. 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 relationships among scales. 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 provide solutions.

Research has raised a set of specific issues concerning ecological systems that point to possibly fruitful analytic strategies to understand cities and urbanization processes with regard to environmental conditions and policy. One of the reasons why 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 understanding of what needs to be done. However, understanding the city as a broader system poses enormous difficulties precisely because of the multiple scales that comprise 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, firm or government office can recycle waste, but cannot address effectively the broader issue of excess consumption of scarce resources. An international agreement can call for global level measures to reduce greenhouse emissions, but depends on individual countries, individual cities, individual households and firms to implement many of the necessary steps. A national government can mandate environmental standards, but 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 to 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 constructed environment and the economy, and the life of infrastructures and certain types of investment instruments. The combination of these two steps helps to deconstruct a given situation and 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 useful analytically to approach some of these questions in the case of cities. What may be negative in a small spatial scale or a short-time frame may be positive in 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 may come and go, but the forest cover of a region can remain relatively constant overall.

This raises a question as to whether a city needs a larger system in place to neutralize the impact on the overall city system of major disturbances within the city. One research finding of ecologists in this domain is that movement across scales brings about change, which is the dominant process. It is not only a question of larger 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, and competition becomes less important. This also tends to suggest thinking of 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 formation 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 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 instigating a broad range of environmental damage that may involve very different scales and origins, yet be constituted in urban terms. CO<sub>2</sub> emissions produced by the micro-scale of vehicles and coal burning by individual households become massive air pollution covering the entire city with effects that transcend CO<sub>2</sub> emission *per se*. Air- and water-borne microbes materialize as diseases at the scale of the household and the individual body. They become epidemics that thrive on the multiplier effects of urban density and are capable of destabilizing the 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 the damage is atmospheric and some of it is internal to the constructed environment of the city. This might be the case with sewage or disease, whereas some of it, like deforestation, is in distant locations around the globe.

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, although it does so in the form of a collection of confined individual sites, albeit distributed worldwide. This worldwide geography of extraction materializes in particular and specific forms (e.g., furniture, jewelry, machinery, and fuel) inside the city. The city is one moment—the strategic moment—in this global geography of extraction, and it



differs from that geography itself. A fourth way in which the city is multiscalar is that it instigates 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 differ from the actual policies as they are designed and implemented at other levels of government.

Also important 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 must operate in very short time frames and confined levels of operation, pursuing clean ups and remedial measures for a particular locality. The remedial measures 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 from a particular site over a specific period of time.

## 6. CONCLUSION

Cities are complex systems in their geographies of consumption and waste-production. This complexity makes them essential for the creation of solutions. Some of the geographies for sound environmental action in cities can operate worldwide. The network of global cities is a space on a 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 also potentially the sites at which to demand accountability of these actors. The scale of the network differs from the scale of the individual cities that comprise this network.

A crucial analytic operation involved here is the provision of spatio-temporal scaling to the object of the study. This also entails distinguishing the object of study from contextual variables. In the case of cities, this might be population, economic base, etc. Executing such analytic operations would help us to 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 of, and possibilities for changing, specific systems of power, economic systems, transportation systems and so on, that entail modes of resource use that are environmentally unsound. The fact that these various systems combine in urban formations is a condition that is analytically distinct from the systems involved.

The distinction between specific systems and background or contextual variables also helps us to 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 multiple highly specialized cross-border economic circuits circulate. This idea can be applied to cities and the environmental dynamic. In this case, the city is a multiscalar system through which multiple specific socio-ecological circuits traverse. It is not a closed system. Cities are amalgamations of multiple “damage” circuits, “restoration” circuits and policy circuits.

The foregoing brings out the multiple ways in which the city scale is present. The city is a multi-scalar system by virtue of what instantiates there and of the different policy frameworks that operate in cities—national, supranational, sub-national. The circular logic that 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 on different scales. Some will be internal to households, others will be city wide and yet others will reach beyond the city and extend through locations around the globe.

## REFERENCES

- Beddoe R. et al. (2009). Overcoming systemic roadblocks to sustainability: The evolutionary redesign of worldviews, institutions, and technologies. *PNAS* 106 (8): pp. 2483-2489.
- Daly H.E. (1977). *Steady-State Economics: The Economics of Biophysical Equilibrium and Moral Growth*. San Francisco: W. H. Freeman and Company.
- Daly H.E. & J. Farley (2003). *Ecological Economics: Principles and Applications*. Washington, DC: Island Press.
- Dietz T., Rosa E.A. & R. York (2009). Environmentally efficient well-being: rethinking sustainability as the relationship between human well-being and environmental impacts. *Human Ecology Review* 16(1). Pp 114-123.
- Environment and Urbanization. (2007). “Special Issue: Reducing the Risk to Cities from Disasters and Climate Change.” Vol 19, No.1.  
Retrieved from: <http://eau.sagepub.com/content/vol19/issue1/>
- Etsy D. C. & M. Ivanova (2005). Globalisation and environmental protection: a global governance perspective. In F. Wijen et al (Eds.), *A Handbook of Globalisation and Environmental Policy: National Government Interventions in a Global Arena*. Cheltenham, UK: Edward Elgar.
- Garcia J., Mujeriego R. & M. Hernández-Mariné (2000). “High rate algal pond operating strategies for urban wastewater nitrogen removal” *Journal of Applied Phycology* (12) pp. 331-339
- Girardet H. (2008). *Cities People Planet: Urban Development and Climate Change*. (2nd ed.) Amsterdam: John Wiley & Sons.



- Gund Institute for Ecological Economics, University of Vermont. (2009). <http://www.uvm.edu/gjee/>
- Gupta A. K. (2004). WIPO-UNEP Study on the Role of Intellectual Property Rights in the Sharing of Benefits Arising From the Use of Biological Resources and Associated Traditional Knowledge. Geneva: World Intellectual Property Organization and United Nations Environmental Programme.
- Jonkers H.M. (2007). "Self Healing Concrete: A Biological Approach" in *Self Healing Materials: An Alternative Approach to 20 Centuries of Materials Science* Springer pp.195-204
- Low N.P. & B. Gleeson (Eds.) (2001). *Governing for the Environment: Global Problems, Ethics and Democracy*. Basingstroke, United Kingdom: Palgrave Publishers Ltd.
- Mgbeogi I. (2006). *Biopiracy: Patents, Plants, and Indigenous Knowledge*. Vancouver: University of British Columbia Press.
- Morello-Frosch R. et al. (2009). *The Climate Gap: Inequalities in How Climate Change Hurts Americans & How to Close the Gap*. Los Angeles: USC Program for Environmental and Regional Equity. Retrieved from [http://college.usc.edu/geography/ESPE/documents/The\\_Climate\\_Gap\\_Full\\_Report\\_FINAL.pdf](http://college.usc.edu/geography/ESPE/documents/The_Climate_Gap_Full_Report_FINAL.pdf)
- Porter J. et al. (2009). The value of producing food, energy, and ecosystem services within an agro-ecosystem. *Ambio* 38(4): pp. 186–193.
- Redclift M. (2009). The environment and carbon dependence: landscapes of sustainability and materiality. *Current Sociology*, 57(3): pp. 369-387.
- Rees W.E. (1992). Ecological footprints and appropriated carrying capacity: what urban economics leaves out. *Environment and Urbanization* 4(2): pp. 121-130.
- Rees W.E. (2006). Ecological Footprints and Bio-Capacity: Essential Elements in Sustainability Assessment. In J. Dewulf and H. Van Langenhove (Eds.) *Renewables-Based Technology: Sustainability Assessment* 143-158. Chichester, UK: John Wiley and Sons.
- Reuveny R. (2008). Ecomigration and Violent Conflict: Case Studies and Public Policy Implications. *Human Ecology*, 36: pp. 1–13.
- Sassen S. (2001). *The Global City* (2nd edition). Princeton, NJ: Princeton University Press.
- Sassen S. (2005). The ecology of global economic power: changing investment practices to promote environmental sustainability. *Journal of International Affairs*, 58(2): pp.11-33.
- Sassen S. (Ed.) (2006). *Human Settlement and the Environment*. EOLSS Encyclopedia of the Environment (Vol 14). Oxford: EOLSS and UNESCO.
- Sassen S. (2008). *Territory, Authority, Rights: From Medieval to Global Assemblages*. Princeton, NJ: Princeton University Press.
- Satterthwaite D. et al. (2007). *Adapting to climate change in urban areas: the possibilities and constraints in low- and middle-income nations*. Human Settlements Discussion Paper Series, London: IIED. <http://www.iied.org/pubs/pdfs/10549IIED.pdf>
- Schulze P.C. (1994). Cost-benefit analyses and environmental policy. *Ecological Economics* 9(3): pp. 197-199.
- Van Veenhuizen R. & G. Danso (2007). *Profitability and sustainability of urban and peri-urban agriculture*. Rome: Food and Agriculture Organization of the United Nations. Retrieved from <http://www.ruaf.org/sites/default/files/2838.pdf>
- Warner K. et al. (2009). *In Search of Shelter: Mapping the Effects of Climate Change on Human Migration and Displacement*. CARE International. Retrieved from <http://www.ehs.unu.edu/file.php?id=621>