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(Article begins on next page)

Editorial

Environmental Planning and Urban Health*

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Environmental exposures to the adverse effects from climate change are expected to increase for many urban populations in the United States during the next 50 years, potentially due to increased summertime heat stress, increased ambient ozone concentrations, and other pathways such as increased vector- and water-borne disease. Vulnerable elderly and low-income populations will be most affected by these effects, and we need research that focuses on the disparities in climate and health outcomes for urban populations.

Urbanisation and the creation of the built environment are major driving forces of environmental and climate change. Here, we discuss the role of urban environmental planning and of two related social movements – sustainable development and environmental justice – in providing the normative basis for interdisciplinary research that considers the role of the built environment in creating environmental liabilities and health inequities, and that focuses on disparities in climate and health outcomes.

Environmental Change and Cities

Although the warming effects of increasing carbon dioxide concentrations in the atmosphere were first projected over 100 years ago by Swedish scientist Svante Arrhenius, only in the last two decades has an international scientific consensus emerged about the impacts of human activities on the climate and natural systems. Environmental change, in conjunction with the trends of urbanisation of poverty in growing cities, raises concerns about the current and anticipated effects on human health. 2005, the hottest year on record, provided ample evidence of the potential ability of the consequences of climate change to disrupt the lives of millions of residents in wealthy or poor societies.

Health effects of climate change may include increases in urban heat-related and air pollution morbidity and mortality; increased transmission of vector-borne and infectious diseases; injuries from extreme weather events; and effects resulting from disruption of water supplies and agricultural systems, social disturbances, and effects on healthcare services. These effects may stem from the increases in summertime temperatures, and changes in precipitation and synoptic weather patterns produced by climate change.

While cities have long adapted to change of all sorts, the current pace of environmental change may swamp the resilience and ability of some urban populations to adapt. Wealthier societies have greater adaptive capacity. But municipalities whose budgets are already stretched thin and depleted in addressing challenges for housing, healthcare and provision of infrastructure to growing cities will need to deal with greater stressors from the interactions of widespread ecological change with the urbanisation of poverty. In many nations, health disparities and the HIV/AIDS epidemic already present urgent challenges for use of public sector resources. The additional effects of climate change on economic activities, food and water supplies could create greater levels of social disruption, as seen in the regional droughts that have contributed to the risk of famine in southern Africa.[1]

Global and strategic policy problems such as climate change have local causes, and research and policies to solve these problems and attend to their consequences will need to focus on urban populations and the creation of the built environment of neighborhoods, communities and cities. Sustainable urban development requires dealing with the potential conflicts and synergies inherent in efforts to achieve the goals of economic development, social equity, and ecological preservation. We believe that the pursuit of greater social equity can be positive for the environment, and that renewed collaboration between health scientists, planners, and scholars in the social and biophysical sciences can help to inform understanding of the synergies between these goals – what works and what does not work in the creation and use of sustainable development strategies and healthy communities.

Given the social justice dimension of environmental change, the concepts of sustainable development and environmental justice provide a normative framework needed to attend to inequities in climate and health outcomes

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and useful for the development of urban policies to adapt to and mitigate environmental change. Below, we discuss the conceptual basis of urban environmental planning in the United States, as it is relevant to the concerns of environmental health and sustainable development. A widely used definition of *sustainable development*, discussed below, suggests two forms of distributive equity, both within and between generations. The concept of *environmental justice* emphasises distributive and procedural equity, the inclusion of all groups in deliberative democratic decision-making and the equitable distribution of benefits and risks among urban residents.

The Ecological Contradiction

In providing for economic growth or addressing market failures and externalities, urban planning has a long tradition of spurring both the inadvertent creation of social and environmental problems, and innovative efforts to enact comprehensive solutions for the public health problems arising from the production of the built environment.[2]

The work of social theorists Foglesong and Campbell suggest that an "ecological contradiction" is fundamental to the conflicts faced by cities adapting to climate change.

In *Planning the Capitalist City*, Foglesong presents American urban planning as a method of policy formation born from conflict over the production, management and use of the built environment. As capitalism both stimulates demand for state intervention and then restricts it, two fundamental contradictions operate in the dynamics of planning in capitalist societies.

The "property contradiction" is based in the inherent social character of land, despite its privatisation in capitalist societies. Free market democracies in turn attempt to regulate private land use to meet public needs, although the institution of private property resists this intrusion. This regulation is fundamental to the "capitalist-democracy" contradiction, in which a strongly inclusive and participatory democracy represents a continual threat to property capitalists, as "the more populous body of non-owners will gain too much control over landed property"[3] – that is, governmental control over urban land. His analysis illustrates the conflicts inherent in 19th century urban growth and its regulation of land use that continue today.

While Foglesong's property contradiction characterises the tensions over the simultaneous public and private nature of land, an ecological contradiction characterises the public and private uses of ecosystem services to support life and modern economies.

In *Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development*, Scott Campbell describes the effort by city planners towards achieving sustainable development as one of reconciling conflicts between three types of conflicting priorities: equity issues (social justice, economic opportunity and income equality), environmental protection (creation and enforcement of rules to protect human health, e.g., air and water quality); and overall economic growth and market efficiency.[4] Campbell's typology of the "planner's triangle" is useful for representing the conflicts and trade-offs between projects that prioritise one substantive goal over others, and locates sustainable development in the efforts to resolve these inherent conflicts and harness the potential synergies between divergent priorities.[4]

A "resource conflict" is seen between environmental protection and economic development, based in businesses exploitation of natural resources for their "economic utility in industrial society and their ecological utility in the natural environment."[4] Expanding on Campbell's idea of the resource conflict, we propose that an ecological contradiction characterises the use of natural systems in urban development. The contradiction between the need for natural systems to form the basis of the social and economic reproduction in free-market democracies (e.g., water and air supplies) and the tendency of those economies/societies to exploit natural systems to the point of severe perturbations (e.g., climate change), necessitates social regulation and adaptive strategies, which themselves are either resisted or embraced by capitalists and political actors. The "ecological contradiction" allows this dialectical relationship between development and ecology to include the global scale of emerging environmental change, such as the rise of atmospheric trace gases and the loss of biodiversity.

Sustainable Development Paradigm

The sustainable development paradigm evolved from the reflexive recognition that modernity has, through ecological change, imposed new global and widespread threats to human health and well-being. New social movements have been organised in the past 30 years as a result. Leaving aside questions of their effectiveness, in the past 15 years governments have made new international agreements to address environmental change, including the landmark 1992 United Nations Conference on Environment and Development (UNCED) agreements and the Kyoto Protocol. Some from the private sector have embraced industrial ecology policies and practices.[5] There has been much activity by a range of social actors, internationally, to define and operationalise the rubric of sustainable development.

An early and influential definition of sustainable development was put forth by the United Nation's World Commission on Environment and Development (the Brundtland Commission) in 1987. In their report, *Our*

Common Future, the commission proposed that sustainable development comprised two distinct normative facets that qualify an overarching goal of continued economic development: intergenerational justice, and intra-generational justice, or the fair distribution of resources in the present among different nations and classes of people, particularly between developing and developed countries. Intergenerational justice was defined as "meeting the needs of present generations without endangering the capacity of future generations to meet their own needs."

Thus, while economic growth was central to sustainable development, it was initially conceptualised as an idealised goal for a desired state of society based on ethics and distributive justice, with no directly implied concrete steps on how to attain the goal. The Brundtland Commission proposed that this concept form the basis for future economic and environmental government policies, and over the past decade the goal of sustainable development has been popularly adopted by the European Union, many nations, multilateral agencies, and locally-based government agencies as the basis for planning efforts. *Our Common Future* brought the new terminology of sustainable development into the policy arena for multilateral institutions, placing economic activities into a normative relationship with social and environmental needs and limitations.

Environmental Justice Initiatives

The goal of sustainable development asserts equity criteria that form an important basis for interdisciplinary collaboration on global environmental change research. The concept of environmental justice adds a mandate for procedural equity to address power imbalances between disadvantaged communities and the public and private sector.

At the height of industrial development in the United States, reports emerged that minority groups were disproportionately exposed to environmental hazards, while reaping fewer amenities such as parks. In large cities, an Environmental Justice (EJ) movement coalesced through the work of community-based organisations and grew rapidly over the last 20 years, seeking through organising, research and legal activism to promote an environmental "right to health." The EJ movement seeks an end to environmental racism – the disproportionate exposure of minority and lower income people to toxic pollution, whether from the siting of hazardous facilities and dumpsites in black and Hispanic neighbourhoods, or from disproportionate allocation of resources and amenities.[6]

During the 1970s, efforts by urban environmentalists to include race and class issues in the mainstream movement led to coalitions between labour, environmental and minority

organisations and the creation of a series of conferences on the urban environment.[8] These conferences expanded these coalitions, as African American groups increased focus on urban health issues. During the 1980s, protests by black activists over the racially-biased siting of waste facilities led to increased recognition of environmental racism. A seminal study by the United Church of Christ in 1987 analysed national data and demonstrated that "race was the best predictor of hazardous waste location" – even above income.[7]

A number of studies following have repeated this key finding: that "there is a rough but identifiable association between wealth and race on the one side and exposure to dangerous chemicals on the other... The poorer, and/or less white a person is, the higher the risk of environmentally induced illness."[8-10] As well, in a 1992 report, "Environmental Equity: Reducing Risk for All Communities", the US Environmental Protection Agency (EPA) found that minority and low-income communities experience higher than average exposure to toxic pollutants than the general population.

During the 1990s, national leadership summits articulated EJ principles, and the Clinton administration provided important institutional support through his *Executive Order on Environmental Equity* of 1994, which requires federal agencies to analyse and address disproportionate effect on communities of colour. The EPA defines environmental justice as "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[11]

As noted earlier, impoverished communities are at higher risk due to the effects of poverty-related climate change effects on already stressed populations. Justice concerns are rooted in the fundamental difference in the balance of power and distribution of effects between developed and developing countries. The disparity between the responsibility for and the efforts of adaptation to burdens imposed by global warming effects is a focal point for poorer countries.

Climate change can be seen as a pervasive social justice issue at every scale and location; the poor are most vulnerable to the adverse health outcomes, potential effects on livelihoods, the creation of refugees, and property damage from increased climate variability. Poverty-related climate effects include reduction of food security, employment, incomes and economic growth; greater exposures to health risks, increased frequency and severity of extreme climate events. These dynamics can result in wider income gaps between wealthy and poor societies.

Some scholars argue that agreements and collective

actions between nation states are more likely to gain the cooperation of the largest number of states when the agreements are perceived as fair and equitable in costs and burdens.[13] Programmes for climate adaptation, greenhouse gas mitigation and compensation for damages from effects will need to be assessed in terms of distributive and procedural equity criteria. The atmosphere and climate system is a global public good, and so vulnerable to policy failures typically seen in provisions of non-excludable public goods. Some nations may seek to benefit from the public good without participating in and paying for its protection, waiting for others to take initiative, or participate in a limited way (for example, the free rider and the prisoner's dilemma).[12]

In the light of uncertainty about the effects and magnitude of environmental pollutants on vulnerable populations, many organisations involved in environmental justice have advocated the use of adaptive strategies that incorporate safety factors, similar to the goals of the Precautionary Principle. These principles form a strong basis for environmental governance related to climate change as well. Basic elements of the precautionary principle embraced by environmental justice organisations, relevant for public health practitioners are, (1) taking preventive action in the face of uncertainty; (2) shifting the burden of proof to the proponents of an activity; (3) exploring a range of safer alternatives to possibly harmful actions; and (4) increasing public participation in decision-making.[13]

Urban Ecosystem Management Approaches

In the 1980s, researchers from several disciplines explored the concept of the "city as an ecosystem" to develop and apply new methods for analysing effects of human-dominated natural systems in urban centres. Methodological frameworks for urban ecosystems studies were first developed by urban designers, landscape architects and urban planners, such as Ian McHarg (*Design with Nature*, 1971), Ian Douglas (*The City as an Ecosystem*, 1981) and Annie Spirin (*The Granite Garden: Urban Nature and Human Design*, 1984). The frameworks build a foundation for later researchers, who developed and applied these concepts in urban ecosystem studies.[14,15]

One approach embraced by scholars and practitioners to provide substance to the rhetoric and goals of sustainable development is to use urban forms and design strategies providing and maintaining ecosystem services. Natural systems produce resources such as timber, fisheries, and the pollination of plants essential to human survival.[16] Ecosystem services are those services used by human society that natural systems provide by virtue of their existence, such as air and water purification, biological diversity, moderation of climate extremes, and waste decomposition.

This approach was supported by a shift in environmental planning during the 1980s to 1990s from an incrementalist perspective to a more preventative approach, based on central principles, similar to the evolution in formal American environmental policy. "Pollution control," the dominant and incremental paradigm during the 1960s and 70s, missed or ignored the biological tendency of persistent toxic chemicals to concentrate in living things. Similarly, incremental planning practiced in municipal governments resulted in creation of environmental liabilities and effects on public health.

The adoption of "pollution prevention" as the operative policy by the federal government during the 1980s represented a fundamental shift in environmental policy not enabled or predicted by the strategy of pollution control. From this pollution prevention framework, which seeks to eliminate potential problems during the design phase of a plan or production process, emerged the newer techniques and emphasis on "design for the environment" and industrial ecology – a process by which products, manufacturing production, and even new communities, are guided by and structured initially during the design phase to correspond with ecological and social criteria.[5]

For planners and the planning process, a design for the environment approach has led to a range of initiatives and public proposals during the past 15 years, including the new urbanist "transit oriented development" planning of new towns for compact urban form; car-free city centres; a national rating system for high performance green buildings; conservation zoning and subdivision design techniques; and community charettes.

Similarly, "industrial ecology" represents a body of recent engineering, technical, economic and policy research that seeks to create closed-loop material flows within commerce and economic production for non-biodegradable materials, the design of manufacturing processes based on biodegradable materials (biomimicry), and the return of biodegradable wastes to natural systems, thus avoiding public sector responsibility for disposal of growing amounts of waste.[17]

This shift from an end-of-pipe pollution control paradigm to ecological orientation during the design stage of production, whether in production of the built environment or manufacturing, mirrors the evolution of pollution problems themselves, from point sources to spatially diffuse pollution. While air and water pollution stemmed from the end of a pipe in the old industrial city, with point-source stack emissions and point-source effluent, the spreading out of suburban land use after the 1950s led to the "spatially diffuse pollution" of the decentralised modern metropolitan region: transboundary urban smog, non-point source water pollution, and climate change.[18] The limitations of pollution

control related to this decentralised urban form have led to the development of ecological priorities for urban design and the planning process, and to the "ecosystem management" approach for sustainable development.

An Ecological Infrastructure Approach to Sustainable Development

Ecological infrastructure is an urban form or typology designed to address the newer concerns of global environmental change within and through urban development. Adapting a definition by the University of Washington's School of Architecture, ecological infrastructure is applying ecological sciences "and conservation biology to the strategic design of urban infrastructure" and urban form. Ecological infrastructure looks for ways to structure and guide the flows of organisms, materials, and energy that pass through a city in ways that support the characteristic climate and biodiversity of a region, to preserve the integrity of natural and physical systems, and to protect public health.[19]

It is basically the application of industrial ecology, the science of sustainability, to urban planning initiatives to provide for regenerative urban forms, for example, through the active network of cities with greenhouse gas (GHG) reduction plans, the creation of networks of living roofs for urban heat island mitigation, reconstructed wetlands for waste water processing, and other restorative urban design approaches.

Cities and their residents have adapted to environmental change from ancient times, and environmentally sensitive architecture and urban design are not new. Adaptive cities are historically based in the densely packed buildings and narrow streets of Europe medieval city centres, which served to conserve energy, maximise shade and maintain cool conditions during summer days; and the traditional architecture of settlements in arid climates, which used passive systems based on wind for ventilation and evaporation for cooling.[20] Before the advent of air conditioning and central cooling systems, builders looked to structural and design techniques to increase natural ventilation and air flow through buildings, and provide insulation and comfort from climate extremes.

However, modern architecture relies on mechanical climate control systems. Interest in urban ecological infrastructure as an adaptive response to climate change and variability is recent. Ecological infrastructure, also called "low effect development strategies" in some forms, represents a new conceptualisation of the use of natural systems in urban settings, although it operates without any structural challenges to the dominant market system, nor addresses distributive or procedural equity. Many advocates however maintain that it is inherently impossible to design

and maintain restorative urban form, without simultaneously addressing and resolving the major equity challenges of poverty and income inequality.[5,21] Given the long-term horizon of climate change effects, and its creation of uneven environmental justice challenges, the evaluation of the social equity effects of planning and policy change is critically important.

Need for Interdisciplinary Research

The identification of effective planning methods and governance approaches to integrate economic production, environmental protection, and social equity is a critical issue for the design and maintenance of sustainable communities and cities. To integrate equity concerns into environmental governance, public health research and decision-making will need to address inequities in climate change and health outcomes. We join other scholars seeking a reinvigoration of the historic links between planning and public health practice, training, and research.[22,23] The aim is to craft adequate responses to social disparities aggravated by ecological destruction and changes in the climate system.

Complex global problems transcend the ability of single disciplines to understand and solve. Interdisciplinary research brings together the concerns, variables and methodologies of different disciplines in a creative process that often focuses on complex and dynamic problems. Academic institutions should support interdisciplinary research, focusing on the needs for new management, administrative and funding strategies. Relevant questions include:

1) What are the effects of climate change and variability on population health in cities, and how are those exposures structured by race, socioeconomic class and the built environment?

2) How can urban design and building strategies (e.g., street trees; living and reflective roofs; design parameters such as building density) and social interventions (management and educational strategies; behavioural changes) create resilience in communities?

3) What changes in behaviour and technologies are required to ensure effective adaptive and mitigative planning for climate change?

Exploration of the uses of expert/professional and other knowledge in decision-making is a core area of inquiry. Research is needed on methods for integrating the different methods, objectives and normative frameworks of the social and biophysical sciences.

Conclusions

We conclude with an example of community-based research that represents a unique collaboration between local residents, urban planners and designers, architects,

landscape architects, and public health researchers. In the poor and grimy industrial neighborhood of Hunts Point in the South Bronx of New York City, USA, residents are experimenting with adding layers of organic substrate and vegetation to the rooftops of old industrial building. The idea is to improve air quality, teach children about the urban climate, study building energy use, and to evaluate how plants such as New England Aster, Purple Coneflower, Beach Strawberry and other species adapt to urban rooftops. The South Bronx Smart Roofs Demonstration Project is an effort to understand and ameliorate the effects of climate change and environmental pollution on local population health. It represents creative efforts by citizens to invest public and private resources to improve the environment in ways that may provide multiple social benefits. Although modest, the project has already involved diverse constituencies in its research, including at-risk teenagers, urban planners and landscape architects, and community leaders.[24] It serves as a good example of what types of questions interdisciplinary research may address in understanding the effects of the built environment on the health of urban communities.

In his new book on climate change, *An Inconvenient Truth*, Al Gore quotes Winston Churchill's warning to the British public before World War II – "The era of procrastination, of half-measures, of soothing and baffling expedients, of delays, is coming to its close. In its place we are entering a period of consequences." His words are an apt call to support the changes in research, behaviour and technologies required to ensure that healthy communities become possible for all.

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