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Institutional responses of cities to global environmental change

Michail Fragkias‡

Abstract

This paper reviews interdisciplinary work on institutions and contemporary political economy that has considerable implications for the understanding of bidirectional interactions and feedback loops between urban systems and global environmental change. Five topics of particular importance for the study of urban institutional responses to global environmental change are explored: i) The choice of institutions and institutional change – elaborating on the differences of concepts such as the normative Rawlsian and the positive non-Rawlsian veils of ignorance; ii) The maintenance of institutions and institutional robustness; iii) effective urban governance and government failures (what are the lessons from urban political economy); iv) effects and cross-scale effects of national political institutions; and v) institutions and belief systems as a research frontier.

I. Introduction

This article explores the institutional interface of two major global changes of at least the last half of the 20th century (or even, since the middle of the 19th century) brought about by humans and characterized by their accelerating and eventually rapid pace. On the one side, a global shift from rural to urban living has been a defining trend of the last 100 years (Lowry 1991). Cities and urban areas have become more important in the world's social, economic, cultural, political, and environmental spheres (Sánchez-Rodríguez et al. 2005). Half of the world's population now lives in cities compared to 30% fifty years ago and 10% one hundred years ago (Leitmann 2003). Following the industrial revolution Europe, North America and then Japan gradually became predominantly urban. Most industrial countries urban/rural balance is stabilizing at around 80%. Most of the future population growth of the world is projected to occur in the rapidly growing cities of poor African and Asian nations as well as in Latin America (which has already gone through its urban transition and is today approximately 77% urban) (UN 2004). Between

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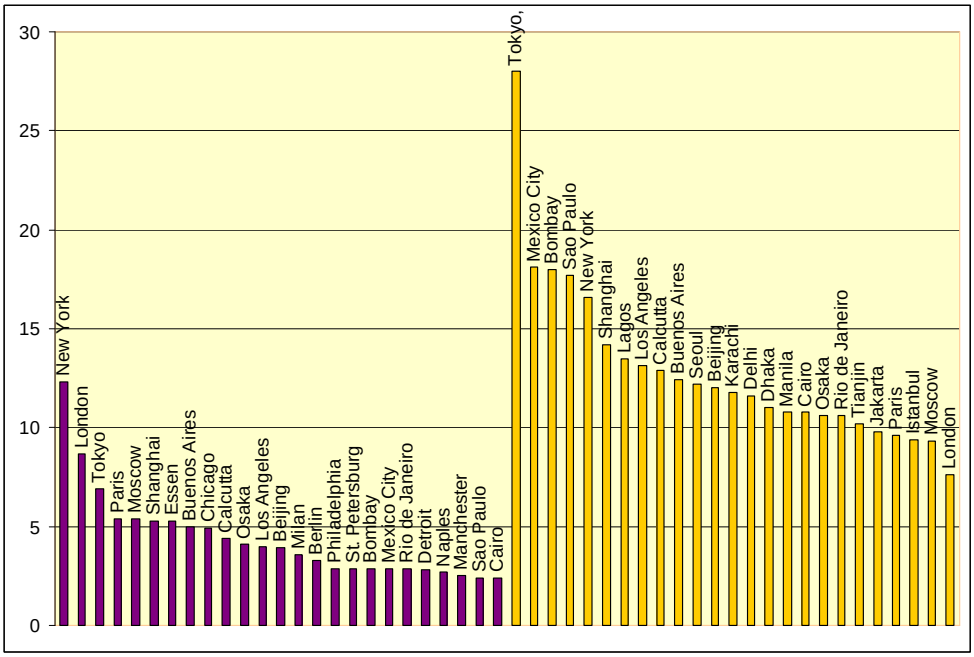
1980 and 2030, urbanization levels in Africa are expected to increase from 20% to more than 50% (Leitmann 2003). Africa and Asia today are urbanizing more quickly and at a larger volume respectively than the rest of the world's regions. While we expect an increasing number of megacities, cities with population of over 10 million people, they are expected to contain approximately the same proportion of the world's urban population – around 15% (Kahn 2006; UNCHS 2002); the majority of urbanites live in medium-sized or small cities. Furthermore the highest growth rates are observed in medium sized cities developing world cities – subject to many present-day urban pathologies.

Figure 1. Distribution of world's 25 largest cities - 1950 and 2000, in purple and yellow respectively (Source: UNCHS, 2002)



In parallel, and intricately interwoven with the process of urbanization[1], anthropogenic global environmental change has been extensively documented is acknowledged now as reality from an overwhelming majority of scientists. Global environmental change (GEC) is defined as the set of biophysical transformations of land, oceans and atmosphere, driven by an interwoven system of human and natural processes. More formally, GECs are global changes that (i) alter the well mixed fluid envelopes of the Earth system (the atmosphere and the oceans) and hence are experienced globally and those that (ii) occur in discrete sites but are so widespread such as to constitute a global change (Vitousek 1992). Examples of the former include change in the composition of the atmosphere, climate change, decreased stratospheric ozone concentrations and increased ultraviolet input while of

the latter, land use change, loss of biological diversity, biological invasions and changes in atmospheric chemistry.

At the forefront of GEC realities lie the global warming trends connected with progressive sea level rise, increased intensity (and maybe frequency) of climatic extreme episodes leading to (natural) disasters (Simon 2007). Today we know that "warming in the climate system is unequivocal" and that "most of the observed increase in globally averaged temperatures since the mid-20th century" is *very likely* (90-99% chance) due to human activity (IPCC 2007). Expected temperature increases range from 1.1 - 6.4 °C with a best estimate of 1.8 °C (3.2 °F). Due to thermal expansion and loss of mass from glaciers and polar ice caps, sea-level rise is expected between 18-59 cm in the 21st century (ibid.). Frequency of natural catastrophes since 1960 shows a threefold increase in the 1990s and a nine-fold increase in economic losses in real terms (ibid). Other predictions brought forward by the IPCC AR4 SPM suggest that it is v*ery likely* that hot extremes, warm spells and heat waves will continue to become more frequent over most land areas; that heavy precipitation events will become more frequent - frequency (or proportion of total rainfall from heavy falls) will increase over most areas. Also, it is *likely* that the area affected by droughts will increase, that future tropical cyclones will become more intense, with larger peak wind speeds and heavier precipitation (but we have *less confidence in the estimates of change of total number).* Clearly, these predictions have significance for human security, safety, and health in the next 100 years, and in particular for urban areas.

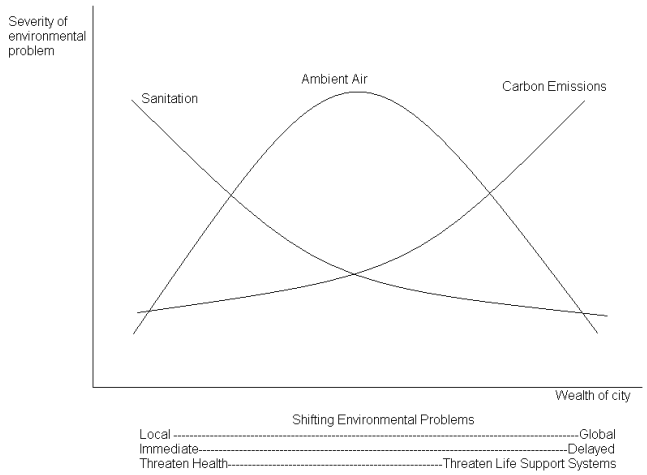
Many of the most important changes associated with the impact of economic globalization and global environmental change are taking place in urban areas. This increasingly dominant interconnection of urbanization processes and GEC poses significant scientific and policymaking challenges in the future[2]. An explicit goal of this paper is to enrich the study of human-environment interactions in urban settings with lessons from the field of modern political economy and recent scholarship in institutional change. In what follows, the article reviews the ways issues of urbanization and environmental change have been analyzed in the past, the methods and frameworks presently utilized and finally connects the modern/new literature from the fields of political economy and the new institutionalism focusing on five topics of particular importance: the process of choice of institutions and institutional change, the maintenance of institutions and institutional robustness, effective urban governance and government failures, effects and cross-scale effects of national political institutions and the role of belief systems for institutional responses to global environmental change.

II. Interactions between environmental change and urbanization and a new conceptual framework

Urbanization is not only a demographic trend but also a profound environmental phenomenon (Boone and Modarres 2006; Low et al. 2000; Platt 2004, 2006). Although some don't think of cities as inherently natural (viewing them as concrete jungles consisting of buildings, streets and sidewalks that have replaced the "natural" environment), cities and their suburbs are now the main human habitat.

Current thinking about the relationship of urban areas and their surrounding "natural" environments has identified several shaping factors (or dimensions) acting independently, or more often, in parallel (Leitmann 2003). These are: (i) the level of economic development of a city, (ii) rapid demographic change, (iii) ecosystem factors, (iv) urban form (spatial structure) and function, and (v) the wider institutional setting.
Economic development (or growth) of cities, according to the urban environmental transition (UET) hypothesis, implies distinct environmental challenges (McGranahan et al. 2001). As cities develop economically they face an increase in waste, and CO_2 per capita, a reduction in particulate matter concentration and SO_2 emissions and an increase in the percentage of people with access to drinking water and adequate sanitation (Leitmann 2003).

Figure 2. Urban Environmental Transitions (UET) hypothesis (McGranahan et al. 2001)



While population growth may well cease sometime this century, the growth of cities and their environmental pressures are certain to expand globally (UN 2004). Rapid population growth impacts communities, industry, commerce, transportation in the form of energy consumption, water use, waste generation and other environmental stresses. Population growth places a huge burden on different capacities of local governments and nature itself - local government capacity on, for example, the management of municipal sewage, solid wastes, the control of emissions and nature's capacity to withstand further depletion of natural resources (Leitmann 2003). Note that rapid demographic change together with economic development act simultaneously to provide sustainability advantages larger cities: economies of scale for green public infrastructure investment (as the marginal cost of provision to new migrants low) and the diversity in labor markets (that allows taking advantage of urbanization rather than localization economies) (Kahn 2006). But they do bring about sustainability disadvantages: public health risks (the proverbial "eggs in one basket" is close to megacity urbanization phenomenon), urban citizens may not be able to "vote with their feet" (Kahn 2006).

Ecosystem factors are important whether one looks at the relationship from the perspective of a city within an ecosystem or a city as an ecosystem. The built environment also constitutes an ecosystem that affects air quality, wind speed and the water cycle. Features of ecosystem(s) (geography, topography, vegetation and climate) surrounding cities or urban ecosystems affect the degree and nature of environmental problems faced in the urban area. Recently the Millennium Ecosystem Assessment (MA) showed that the coastal system is disproportionately more urban than other systems assessed (McGranahan, Balk, and Anderson 2007). Cultivated agricultural systems and inland water zones also have more urban land area than the average across ecosystems assessed. Coastal, cultivated and inland water zones tend to support the world's largest cities elevating the global importance of those zones substantially.

Looking further than the ecosystem view, we find that the nature of urban systems is affected by the evolving sheer extent of new urban land, density and spatial patterns of urban land use. Urban land use decisions regarding change severely affect urban livelihoods. Function-wise, an urban spatial structure with poorly functioning land markets and ineffective land management policies leads to degradation of environmentally sensitive lands (wetlands and coastal resources), occupation of hazard prone areas (steep slopes, flood plains, vacant land next to polluting industries or waste disposal sites), air pollution, and loss of cultural resources, historical sites, open space as well as prime agricultural land (Leitmann 2003). Form-wise, the importance of a **spatial view** of urban spatial structure (population growth, migration, distribution, settlement patterns and urban morphology - not to mention broader views of city network linkages into megalopolises) cannot be overem-

phasized (Anas, Arnott, and Small 1998). For example, cross city contrasts of population densities across the world show significant variation in their spatial distribution when looked at in the same scale. Thus although in many cities the populations may be similar, the distribution of population is very diverse. This has considerable implications with respect to land consumption (often with a loss of prime agricultural lands) and CO2 production per capita.

The institutional setting is the fabric connecting a variety of public and private actors interacting under divergent interests and power - in formal and informal sectors and in voluntary exchange (market) and political settings. Actors in an urban system often operate within overlapping or neighboring political administrative boundaries that create spillover effects that can be potentially addressed more effectively at larger scales but politicians often face a mismatch of incentives regarding their responsibilities and capacities in addressing problems with distinct spatial/temporal scales. Every local government faces problems of intersectoral coordination when dealing with atmospheric, geospheric or hydrospheric environmental problems; issues that can theoretically be addressed by an integrated urban-environmental planning approach[3].

Along with the ongoing patterns of human agglomeration and the growth of human settlements, we observe an increase in complexity of interactions between environmental change and urbanization (Simon 2007). This complexity provides an argument for the need for a focus on urbanization in the study of global environmental change and vice versa as well as a new conceptual framework of complex interactions (Sánchez-Rodríguez et al. 2005). Up to date, emphasis in the literature regarding those interactions has been placed on impacts originating in urban areas that have a negative effect on GEC.

Cities cause atmospheric and microclimatic changes: urban lifestyles reduce atmospheric quality with the introduction of a wealth of air pollutants – side products of urban lifestyle consumption patterns; they give rise to the urban heat island effect (Oke 1982); and city size is statistically associated with changes in rainfall patterns (Kaufmann et al. 2007). Urban land use change can affect biogeochemical cycles through altered disturbance regimes, landscape management practices, urban spatial structure, and changes in the local environment; these changes have created novel ecosystems, which have the potential to significantly affect biogeochemical cycles at local, regional, and global scales (Pouyat et al. 2007). Urban form affects natural ecosystem function through the displacement or removal of flora and fauna (or loss of biodiversity), net primary productivity, nutrient and material cycling and disturbance regimes (Alberti 2005). It is important to emphasize though that while worldwide urbanization processes have been studied on a case-by-case basis, we do not have a

good understanding of the aggregate impact.

Other complex interactions between urbanization and global environmental change are understudied. Less attention has been paid to GECs that have a negative effect on urban areas (e.g impacts on the socioeconomic situation and health of the people who live in cities), the resulting interactions and responses within urban systems due to those GECs and the feedback of those responses to GEC[4]. Four themes that emerge from a conceptual framework of interactions between the urban and the global environment components of the Earth system have been identified (Sánchez-Rodríguez et al. 2005) conceptually distinguishing the earth system into an urban sub-system and a global environment sub-system. *First,* the conceptual framework starts with processes within the urban system that contribute to global environment change. Second, it focuses on the pathways through which specific global environmental changes affect the urban system. Third, once these pathways and points of intersection are identified, the framework addresses the interactions and responses within the urban system which result. Finally, it centers on the consequences of the interactions within the urban system on global environmental change, or feedback processes (Sánchez-Rodríguez et al. 2005)[5].

The structure of these thematic areas nod towards the integrated approach of vulnerability, adaptation and resilience (VAR) – one of four crosscutting themes of IHDP programme[6]. Adaptation is the process of structural change in response to external circumstances[7]. As properties of social-ecological systems (SESs), the concepts of *resilience*, *robustness*, and *vulnerability* are heavily interlinked (Young et al. 2006). Robustness is a set of system properties that favor the endurance of the system to disturbances without changes in system structure; robustness depends crucially on past adaptation activity. Resilience is *"the capacity of a system to absorb and utilize or even benefit from perturbations and changes that attain it, and so to persist without a qualitative change in the system's structure"* (Young et al. 2006). Robustness and resilience differ in that the concept of resilience allows for temporary changes in functioning and dynamics, as long as the system remains within the same stability domain but the concept of robustness does not. Vulnerability is a state where neither robustness or resilience help the system survive without structural change (Young et al. 2006). Disturbances affecting a vulnerable state will lead to a structural system adaptation or collapse. All three terms express a temporary condition of the interaction between a system and its context (Young et al. 2006). The above definitions will be useful for the literature discussed in the following section since the contrasts and implications will become obvious.

III. Urban institutions, institutional change and responses to GEC

Today, across every society on the planet, established sets of formal and informal institutions (such as rules, regulations and traditional forms of interaction) shape interactions among members and collective decision-making at the different political levels (from small settlements, to cities and states). These institutions are important drivers of the observed short-run and long-run societal, economic and political outcomes, as well as environmental change. Political institutions are central to the existing collection of institutions. It is increasingly understood that in a globalized world of important economic aspects of human-environment interactions, political aspects of these interactions are at least equally important (and in particular, ones at the local level). The following sections attempt the exploration of connections in works of political institutions and political economy to the research agendas surrounding the topics of urbanization and global environmental change (through a look at urban human-environment interactions or urban social-ecological systems).

In what follows I expand on aspects of the interdisciplinary work on institutions and contemporary political economy with a high degree of relevance for the interactions between cities and global environmental change. A synthesis of this literature could provide stronger foundations for the urban GEC agenda. I identify five topics of particular importance for the study of urban institutional responses to global environmental change: i) The choice of institutions and institutional change – elaborating on the differences of concepts such as the normative Rawlsian and the positive non-Rawlsian veils of ignorance; ii) The maintenance of institutions and institutional robustness; iii) effective urban governance and government failures (urban political economy); iv) effects and cross-scale effects of national political institutions; and v) institutions and belief systems as a research frontier.

III.1 The choice of institutions and institutional change in cities

Over the time period perceived relevant to global environmental change (and climate change processes), responses to the phenomenon can come about through three primary means: technology, institutional development and change as well as behavioral and belief changes (Wilbanks et al. 2007)[8]. It is the main tenet of this paper that institutional change within metropolitan areas deserves increased attention – as it is identified as a dominant option for an urban response to GEC and that institutional change is very strongly interrelated with changes in beliefs.

Formal and informal institutions (formal rules and informal constraints) affect strongly or weakly, directly and indirectly our everyday behavior and choices in market and non-market settings (North 1990). Basic examples of formal institutions include the laws and organizations of a country (federal, state or municipal), governmental decrees or the Constitution of a country; examples of informal institutions include behavioral norms at the level of society (such as traditions and conventions), or bureaucratic norms at the level of politics (or even, corruption). Institutions have deservedly won the name "the rules of the game" as they are also the mechanisms of application and enforcement of the rules as well as the punishment mechanisms of those who do not follow the "rules" (North 1990)[9]. Institutions present themselves in different flavors across the world and not all societies pick a set of institutions favorable to economic wellbeing (North 2005; Aoki 2007).

A very useful framework for thinking about social institutions and their interactions with the environment is provided by the analytical proposed by Young and the IDGEC project. The framework revolves around three distinct concepts: **fit**, **scale** and **interplay** - interlinkages among distinct institutional arrangements at the same and across levels of social organization (Young 2005). The idea of fit regards the quality of the match of characteristics of interacting institutions and biogeophysical systems as the measure of the effectiveness of the social institutions (Young 2005, p. 57). The idea of interplay revolves around the fact that although "*no institution operates in a vacuum*" and although institutions (like other phenomena) can be analyzed in isolation "*[t]he effectiveness of specific institutions often depends not only on their own features but also on their interactions with other institutions*". (Young 2005, p. 60-61). Thus, although the study of institutions on a case-by-case basis makes the task analytically feasible, a considerable amount of information is hidden in interactions between institutions. The idea of scale is widespread in natural sciences and is increasingly gaining importance in social sciences. Scaling up or down findings on the role of institutions is not a trivial process. Scaling up spatially is very similar to the exception fallacy problem: results derived from a micro-scale system focus may not be directly applicable to larger meso- or macro-scale systems. Scaling down spatially is very similar to the problem of ecological fallacy – knowledge of the large scale system processes may not be representative or explain well processes at the meso- or micro-scale systems (Young 2005, p.64-65). The problem of scale is, for example, of particular importance when trying to identify "*whether and to what extent the causal mechanisms through which institutions affect behavior at one level of social organization, such as small scale or micro-level societies, also play key roles at other levels of social organization, including national (meso-level) societies and international (macro-level) society and vice versa."* (Young 2005, p.66).

As a requirement for exploring possibilities for institutional responses to global environmental change, we need to understand better the bidirectional relationship of local urban institutional structures and global environmental change[10]. We make the case that not only do local socio-political institutions indirectly affect and alter the effects of GEC but GEC can lead to the adoption of new policies and institutions at the local level[11]. Local socio-political institutions may have primarily indirect (but very important) effects on GEC - as compared for example to the direct effects of natural resource management institutions or international environmental agreements (IEAs) – but GEC has direct effects on local socio-political institutions[12][13]. Our understanding of the literature identifies this as a topic that requires substantial research efforts in comparative institutional analysis since there exist important implications of fit, interplay and scale, in the choice of local/urban social institutions – differing substantially across the world's urban areas – for global environmental change processes.

Institutional changes as an adaptation option involves among other things, assuring effective governance, providing financial mechanisms to increase resiliency, improving structures for coordinating among multiple jurisdictions, targeting assistance programs for the impacted, and adopting sustainable community development practices (Wilbanks et al. 2007)[14]. Changes in formal institutions range from deeper "structural" changes in governance structure to micro adjustments in policy tools. Understanding the effects of structural changes one has to ask what is the relative performance of local political governance structure such as different forms of executive and legislative branches of local government that affect urban growth and GEC. For example, what are the effects of an executive branch that employs a mayor vs. a city manager or both simultaneously; what is the effect of a type of legislative branch, such as a city council.

At the level of micro interventions, several policy instruments have been suggested in relation to adaptation to climate change such as zoning, building and design codes, terms of financing and early warning systems (Kirshen, Ruth, and Anderson 2006) but possible institutional responses to GEC from municipal and metropolitan governments extend further to transportation planning, creation of green infrastructure. Zoning is a widely utilized tool for city governments (with the primary goal of protecting public health, safety and welfare) but not the only tool available to local governments targeting the regulation of land use addressing issues of pollution, GHG emissions and energy consumption among other problems[15]. Sub-national (local, county and state) governments control land use through land subdivision; building codes; regulation of wetlands and floodplains, land use and growth controls such as moratoria on development, designation of historical districts; state enabling acts and home rule authority, buying or aquiring

through eminent domain land and property; tax incentives and other devices (Platt 2004).

The increased awareness and understanding of the underlying causes of GEC (as well as experiencing its dire effects) will provide societies with opportunities for institutional change (institutional change moments); it is thus worthwhile to consider what shape this institutional change may take. How will societies choose between different flavors of institutions and mechanisms for their enforcement in response to global environmental change? Modern political economy suggests that if urban societies are sufficiently risk averse and manifestations of GEC are sufficiently random within each society, those societies will arrive at institutions that account for uncertainty over the future state of the environment (under a non-Rawlsian veil of ignorance) rather than uncertainty about personal endowments (the Rawlsian veil of ignorance concept). We elaborate on these concepts below.

Uncertainty is one basic parameter of institutional origins (Rawls 1973). The Rawlsian normative analysis of such origins suggests that institutional choice is made under a "veil of ignorance" - a descriptive concept denoting choice under uncertainty over personal endowments of the deliberators (ibid, 1973). As the positive political economy analysis of institutional choice shows though, once everyone realizes their unique position ex post, issues of implementation, enforcement, defection, punishment and renegotiation come into play. Actual formal institutions are in reality the result of such interactions. We know that individuals act in a self-interested manner and strategic manner in their everyday lives and can expect that they will pursue the changes in formal institutions that leave them better off (Shepsle 2006). The new political economy thus supports the argument that even if institutional choices are made under a Rawlsian veil of ignorance, we cannot trust that powerful economic and political actors will not act strategically ex post in order to alter the institutional choice to their advantage. In the end, the normative concept of a Rawlsian veil of ignorance is not as useful for the description of the evolution of formal institutions.

So is the role of uncertainty in institutional choice effectively diminished if it is not uncertainty about endowments that effectively leads to the choice of institutions? It is understood that uncertainty is still important as it can affect opportunities rather than endowments. Thus, under a non-Rawlsian veil of ignorance, uncertainty that affects institutional choice may be primarily that of uncertainty regarding the future rather than that of personal endowments. From this positive view of institutional choice, being aware of the present distribution of endowments allows the weight of the choice to be placed on uncertainty regarding the future.

Under the assumption of a non-Rawlsian veil of ignorance two powerful forces

have to be considered (Shepsle, 2006). First, the so called *status quo bias* suggests that efforts for reforms can be simply defeated due to ignorance regarding who gains or looses – even if the sum of gains is larger than the sum of losses (Fernandez and Rodrik 1991). This bias can possibly be defeated by better processes of identification of gainers and losers from a choice of an institution - which, note, is something that is a main focus of the vulnerability literature (Adger, 2006). Thus, the more positive non-Rawlsian veil of ignorance approach although compatible with the notion of an emphasis on discovering vulnerabilities/risks to populations from GEC poses a challenge to the framework in the need for an understanding of a diametrically opposite state; that of potential for gains. Utilizing vulnerability analysis, a better balance of (short-term) losers and gainers of global environmental change can be achieved.

Second, the *preference drift* is founded on the understanding that the present value of a decision is discounted for both risk and time (Messner and Polborn 2004). Although an institutional deliberator may be aware today of the sets of institutions that are inline with his or her interests, it is difficult to know which will be the relevant ones in the future due to random shocks. Thus, today's institutional decision is discounted across time for the effects of the set of institutions on interests acknowledging alternative future scenarios and probabilities of those scenarios coming about. A political economy view of a choice of institutions today given future uncertainties requires an increased attention to future projections of vulnerability (contrasted with existing/current vulnerabilities and the identication of adaptation mechanisms – fundamental topics of discussion in the VAR literature (van der Leeuw 2001). The non-Rawlsian veil of ignorance view of institutional choice also supports the notion of reducing uncertainty about impacts of GEC.

Knowing that GEC affects in fundamentally different ways rich and poor populations (within and across countries), with differing capacities of access to political decision-makers, we need to better understand the role of different types of uncertainty in institutional choice. Using a climate change related example and assuming that populations that do not show willingness to respond to change are not plainly blissfully ignorant regarding the presence or potential effects of climate change but are smart calculating individuals, a process of institutional choice will have to be sensitive to the problems of status quo bias and preference drift.

III.2 Maintenance of institutions and institutional robustness

The question of maintenance of institutions in light of shocks or even gradual changes in an urban system also falls partly on the domain of political economy.

"Institutions are robust if they still support the same equilibrating behavior despite the changed circumstances" (Shepsle 2006). Non-robust institutions are those that within a changed environment may not only cause a change in strategic behavior but the institution itself (a change in the rules of the game). Note that this political economy definition is connected to the concept of fit, springing from the coupled human-environment interactions approach (Young 2005): the level of fit of an institution defines its robustness.

Of particular importance is the fact that institutions can (and sometimes do) "possess self-referential mechanisms of adaptation and reformation" (Shepsle 2006). Those mechanisms address surprises – as clarified by the concept of self-confirming equilibrium: "*If an equilibrium is founded on incomplete awareness about inconsistent beliefs by the parties concerned, but is made transparent by unfolding events, then it will very probably fall apart*" (ibid., 2006). Since this must be the case in many instances, how are institutions maintained in the presence of surprises? The answer lies to the reversion features of institutions.

Understanding the capacity for response originating from cities to GEC, requires the identification of examples of robust and non-robust urban institutions and the role they play in shaping outcomes that lead to GEC. For example, are land use policies, zoning regulations, and building codes, adaptive and if not, can they be modified to be part of an adaptive management toolbox? The issue of maintenance of institutions (as well as the previous topic of choice of institutions) provides a good framework for establishing connections between the 'vulnerability, adaptation and resilience' framework with modern political economy.

III.3. Good urban governance and the attention to government failures

With globalization "changing the roles and responsibilities of governments at all levels through decentralization" and a parallel democratization there has been a greater emphasis on the role and abilities of cities to self-govern which at least theoretically allows for better informed social choices and more effective use of local resources (Linares 2003; Redman and Jones 2005). Effective governance has been identified as key to urban-environmental sustainability; given the complex interactions between urbanization and the local, regional and global environment, effective governance is a primary issue upon which a comprehensive urban sustainability research agenda should focus (Redman and Jones 2005). In particular, they argue that "[f]or benefits to outweigh the risks of continuing rapid urbanization and at the same time, for those benefits to be widely shared and to maintain valued aspects of the environment requires governmental institutions and policies

that are adaptive, participatory, and effective." (*ibid.*, 2005). Several policy suggestions that could promote good urban governance have been suggested (sometimes with strong debates following). These include factors such as the protection of key ecosystem services, the reduction of private transport, the minimization air pollution, protection of fragile lands from market forces, densification and verticalization, acceptance of continued migration and internal growth, and covering the land and infrastructure needs of the poor.

The authors (*ibid.*, 2005) provide examples of three views/visions of urban governance (from three distinct entities, the US NAS Panel on Population and Environment, the World Bank and the Resilience Alliance) that is needed to attain sustainability related objectives in the future: (i) The U.S. National Academies' Panel on Population and Environment pinpoints five dimensions of the urban-governance challenge: a local government's ability to provide adequate public services to their citizens (capacity), to raise and manage sufficient revenue (financial), to cope with the variation, fragmentation and inequity within cities (diversity), to deal with rising urban violence and crime (security) and to deal with increasing complexity in managing the jurisdictional mosaic as cities grow in population and extent (authority); (ii) The World Bank's World Development Report focuses on three issues regarding good urban governance: responsibility sharing and coordination for the empowerment and linking of actors in different levels of government, (responsibility sharing and coordination), wide participation in strategizing for understanding and consensus building, motivating action and efforts for progress assessment (participatory governance) and networks for communications and capacity-building among practitioners and stakeholders (network building); (iii) the Resilience Alliance group promotes the idea of participatory urban governance using adaptive and resilience-building management approaches; in particular, the group favors flexible –open to learning- management that can build resilience (avoiding rigidities that could result in the breakdown of socioeconomic systems); learning can occur through structured scenarios and active adaptive management. This can lead to institutional structures that match ecological and social processes operating at different scales and that are responsive to the interlinkages between the scales[16].

Modern political economy makes an important additional contribution to the above ideas regarding good urban governance. Recent progress in the study of politics and political institutions through the field of economics (coined as the new political economy) can illuminate issues regarding the bi-directional feedbacks between local institutions and GEC. After applying their toolboxes in the understanding of how alternative ways of market organization lead to different economic outcomes (business cycles, unemployment, inflation, etc.), economists started applying them on the question of how institutions, and in particular political institu-

tions, affect economic and societal outcomes (Persson and Tabellini 2000). Political (primarily) institutions is the subject matter of political economy, a field that crosscuts the disciplines of political science and economics, defined as the methodology of economics applied to the analysis of political behavior and institutions (Weingast and Wittman 2006)[17].

A primary mandate originating in modern political economy is the breaking of the "taboo" of viewing government as purely benevolent and identifying the so-called government failures. This is true also at the level of cities (not only at the level of the State) as will be seen below. Different schools of though historically have held distinct views (sometimes extreme) regarding the motives of governments and politicians: the public interest view (welfare economics view of the state), the private interest view, (public choice view of the state) and the Plubius view that promotes the balanced view of private and public interests (Besley 2006). On the one extreme, the public sector economics school assumes purely benevolent governments operating with the goal of the maximization of a social welfare function. On the other extreme, the public finance school essentially considers all actors involved in political and policy making processes as self interested rational actors: voters, politicians and bureaucrats. Political environments do not entail voluntary exchange; while markets can be a good set up for a welfare maximizing consumer/producer operating under voluntary exchange, the top-down imposition of choices regarding national and urban policies such as changes in taxation and land use regulations is not something that can be circumvented or avoided as in the majority of cases in the marketplace. Voting is the formal institution that citizens utilize to express agreement or disagreement with sets of or particular policies and politicians are constraint by the possibility of no reelection for additional terms. In this paper we draw mostly upon the modern political economy literature that utilizes elements of economic thinking to analyze problems of political nature without assuming an explicit stance regarding the view of the state, but acknowledging that the third view more reasonably approximates reality[18].

For more than 100 years now, economists suggest that markets have been proven to be a good way of organization in the production of private goods (while responsible economists emphasize that this is true when adequate institutions exist to support them as their base.) Nonetheless, problems still exist in the provision of collective goods such as environmental quality, city infrastructure, public health, policing, fire protection etc. – giving rise to "market failures". Modern political economy suggests that the idea of good governance requires a balanced view of government – a government that operates under the market failure correction framework but that also addresses government failures (Besley 2006). "The basic and highly intuitive idea is that there are systematic reasons why government fails to deliver the kind of service to its citizens that would be ideal" and thus is used as

in arguments that "doubt the "usefulness of the standard welfare-economic recommendations for government intervention" [19].

For cities in particular, the concept of a "market failure" is the main factor that gives rise to the need of land use planning. The understanding that markets can fail to allocate optimally (to their highest valued use) scarce environmental resources has lead to significant regulation in land development[20]. The containment of urban sprawl is a prime example of a regulation that is often employed when facing a failure of internalization of negative externalities (assuming of course that urban sprawl is a product of market forces – an idea that has lately been vigorously contested). Recently though, several studies pinpoint the need to take into account government failures in the land-use planning process (Levine 2005). Land use planners and policymakers in the field not only have to pay attention to the lessons of urban economics but to the lessons of modern political economy relative to cities (through the subfields of urban political economics and public choice).

Interdisciplinary modern political economy suggests, thus, that good urban governance has the prerequisite of a thorough awareness of the nexus of relationships and opportunities for strategic interaction between all actors and stakeholders existing in the sphere of urban and environmental policy. Especially of interest is the relationship between non-elected bureaucrats (e.g. land use planners) and elected city politicians - two aspects of local governments that should not be aggregated into a single category. Thus, while designing urban sustainable futures and bridging the gap between urban planning and urban economics there is a need to connect urban planning with the lessons of urban political economics (Helsley 2004; Henderson and Becker 2000) and urban public finance.

In summary, political economy is critical for the understanding or issues related to urbanization and global environmental change. The intersections of a modern political economy with the environment have not yet been fleshed out. In particular, there exists a need for the study of institutions (social and economic) that potentially affect livelihoods in the socioeconomic sphere of cities providing the foundation for an analysis of economic development of cities and possible social and natural limits to their economic growth, the implications of technological and institutional change for urban ecosystems, and social (collective) choice problems at several local government levels (Gamble et al. 1996). Political economy of the environment could even provide part of the foundation of urban sustainability science[21] (Gamble et al. 1996).

III.4. Effects and cross-scale effects of national political institutions

The potential effects of national political institutional form (in their interplay with local institutions or in isolation) on the environment are still largely unknown. Across the globe we observe a variation in political systems: democratic versus autocratic regimes, weak versus strong states, and unitary/centralized versus decentralized states. This variation potentially drives in part the environmental outcomes we observe and the interplay of national formal institutions and local urban or regional formal and informal institutions has to be examined in further detail. In trying to understand the environmental consequences of different types of political systems, past research has asked whether democratic polities are more environmentally benign than autocratic/authoritarian polities and the answers are not simple; although a favorable tendency exists for democratic states, the relationships are complex in nature (Young 2005).

> *"[…]. The United States, Australia, and Canada, for example, have the highest national levels of greenhouse gas emissions per capita. But Russia also has among the highest levels, and China is on a course leading to a rapid rise in terms of this environmental criterion. Nor is there any evidence to suggest that democracies are especially sensitive to the environmental consequences (including loss of biodiversity and release of stored carbon) associated with the destruction of mature forests […]. This does not mean that there is no association between democracy and a concern for environmental protection. But it will surely require a more fine-grained analysis to determine just what relationships do hold in this realm."* (*ibid.*, p. 43)

But what about other aspects of political systems such as weak versus strong states and centralized versus decentralized governance patterns? Are there any implications for global environmental changes?

> *"Weak states, or states whose capacity to guide - much less to drive - society is limited, will have difficulty controlling human/environment relations in the interest of avoiding global environmental changes. But their weakness also means that they are unlikely to emerge as major sources of behavior leading to large-scale environmental problems.* (*ibid.*, p.43)

Similarly,centralized (unitary) and decentralized states / political systems differ in the level of power and authority given to sub-national government.

> *Unitary states have the competence to take decisive action regarding environmental concerns. But they often exhibit little sensitivity to subnational or local variations in environmental conditions, and they have little ability to benefit from experiments relating to human/environment relations initiated by lower levels of government enjoying sufficient autonomy to act on their own in this realm. Beyond this, political systems differ greatly in the extent to which they are subject to pressures from special interests such as industry, labor, or even environmental groups. In cases where the relationship between public policy makers and industrial leaders is unusually close, for example, it may prove particularly difficult to alter existing rules of the game in the interests of curtailing or regulating externalities that are harmful to the environment."* (*ibid.*, p.43)

Clearly, apart from answers to these very important questions we need to identify the effects of the interplay between urban or local institutions with national and international institutions – an interplay that can be critically affected by the national institutional forms described above. These interactions range substantially in scope: from periods of shifting the balance of power in tasks traditionally considered as the turf of local governments towards higher levels of government (Platt 2004) to underlying political motives (or a lack of good governance structure) can play a huge role as in the case of mayors who belong to opposition parties may not receive support from the central government in developing world settings (Linares 2003). The task is complex as there exists a need for global case studies revealing the relationships between a "tapestry of governments" at the local level and the national interacting institutions (Platt 2004).

III.5 Institutions and Belief Systems: a research frontier

"*[The] success or failure [of new forms of social intervention] depends upon affecting the skills, attitudes, consumption habits or production patterns of hundreds of millions of individuals, millions of business firms, and thousands of units of local government. The tasks are difficult not so much because [...] they aim ultimately at modifying the behavior of private producers and consumers*" (George Schultze quoted in (Levine 2005), emphasis added). All institutional changes that will come about in response to global environmental change will be in part determined by the culture, beliefs, attitudes and traditions of the members of each society that undergoes change. Institutional change needs to be explored at the base of belief systems that societies have developed collectively since the inter-

play of formal and informal institutions within each society is a very important parameter in any institutional change process.

Cognitive science suggests that what we call "common culture" within a society is reached upon through the diminishing of the deviations between the mental models existing in a society (North 2005). Our beliefs as individuals, groups or societies are the product of cross-generational individual or communal learning (or cognition) with the inter-generational conductive material being "tradition" or "culture". Humans, in their pursuit of goals, build mental models for a better understanding of their surroundings. These mental models evolve with each new experience gained (reinforcing or discarding older beliefs) as well as with the increased contact with ideas from other people (in a domestic or international setting.) The final product of this process is learning and knowledge and the diminishment of the deviations of mental models within a society. Common perceptions and cultural heritage are the vehicles for religions, myths and dogmas for "socially acceptable" interpretations of the unknown (North 2005).

Mental models and institutions are of course linked within societies. Our beliefs define everyday our choices in the political economic and social spheres and are "translated" through different processes into socioeconomic structures or foundations; those processes lead to the formal and informal institutions we experience. While formal institutions are external mechanisms through which we impose order on our environments, informal institutions are internal (personal) mechanisms, based on cognitive and mental systems that help us explain our environments and make decisions. Note that behavioral norms are almost by definition barriers to change. Often, societies find it especially hard to escape a particular norm, even if the norm is not the best possible under several measures of social welfare[22].

Historically the success of societies is not guaranteed. Welfare of present societies has been the outcome of evolutionary paths of mental models of populations and institutional change. But what are the mechanisms through which mental models are developed and how are they eventually incorporated within formal and informal institutions? We now know that mental models constantly interact (bi-directionally) with institutions creating a very dynamic system; new experiences and the exchange of ideas that affect mental models of a population have the capacity to change formal and informal institutions while at the same time institutions have the capacity to change mental models of a population through feedback of experiences from the newly-formed (or updated) socio-economic environment[23]. Many questions come up in the effort of understanding various feedback loops that target causal connections. Apart from basic bi-directional relationships, a fundamental issue is that the introduction of new or adjustment of old formal institutions will change mental models and the structure of informal institutions; these

informal institutions will in turn affect the success of formal institutions and the possibility for introduction of new formal institutions.

Simply put, we can not expect that an institutional change (targeting the improvement of a measure of social welfare) will be successful only through the change of the institution. The change has to be supported by complementarities (or even changes) in the belief systems of society[24]. With a good understanding of norms, beliefs, values, traditions and customs in a system, it is important to increasingly start focusing on interactions and feedback loops between informal and formal institutions. This is not an easy task (Mantzavinos 2001); up to date, we do not have an adequate general theory regarding which mixture of formal and informal rules can lead to strategic interactions that lead to social order and collective gain. A main reason for this is that such a general theory is not easily put forward since problems can be analyzed in case-studies that focus on particular societal groups within a particular context. A very basic framework assumes four logical relationships between formal and informal institutions: neutral, substitutive, complimentary and contestable. A good (welfare enhancing) combination of the two types of institutions occurs when there is a streamlining in preferences and interests of involved parties (Nee and Ingram 1998). A common example of the opposite is the one of the extreme failed former-Soviet socialist states[25].

While the problems countries or cities across the world face can be the result of complex interrelationships of the totality of elements of their socioeconomic and environmental structure, the focus on beliefs and culture is quite important; it is possible changes in beliefs of a critical mass of individuals can bring about (institutional and not) processes for a radical change in the path that an (urban) society is on. It is clear for example that that interacting aspects of our habitats (such as urban function and form on the one hand and climate change on the other) are affected by lifestyle and consumption choices (McEnvoy 2007; Sánchez-Rodríguez et al. 2005). Beliefs, values and culture are gaining popularity in discussions regarding sustainability and Western lifestyles (can individuals from higher income countries change their patterns of consumption to live more sustainably through changes in beliefs and values?) This view is parallel to the idea that "*most, if not all, of the 'environmental' problems we encounter are essentially due to the 'nature'-'culture' opposition in our minds*" (van der Leeuw 2001). Modern institutional analyses that take on a comprehensive view of how different institutions come about (beginning from mental models and belief systems and moving on to formal and informal institutions) and interact –or, interplay- with each other are critical in the study of the connections of urbanization and global environmental change. Such a comprehensive approach integrating elements of cognitive science, history, politics, economics, ecology and environmental science will help us understand processes of global change within urban environments.

IV. Bibliography

Alberti, Marina. 2005. The effects of urban patterns on ecosystem function. *International Regional Science Review* 28 (2):168-192.

Anas, A., R. Arnott, and K. A Small. 1998. Urban Spatial Structure. *Journal of Economic Literature* 36:1426 - 1465.

Aoki, Masahiko. 2007. Endogenizing institutions and institutional changes. *Journal of Institutional Economics* 3:1-31.

Besley, T. 2006. *Principled agents?: The political economy of good government, The Lindahl lectures*. Oxford: Oxford University Press.

Boone, Christopher G., and Ali Modarres. 2006. *City and environment*. Philadelphia: Temple University Press.

Fernandez, Raquel, and Dani Rodrik. 1991. Resistance to reform: status quo bias in the presence of individual-specific uncertainty. *American Economic Review* 81:1146-1155.

Gamble, Andrew, Anthony Payne, Michael Dietrich, Ankie Hoogvelt, and Michael Kenny. 1996. Editorial: New Political Economy. *New Political Economy* 1 (1).

Helsley, R. W. 2004. Urban political economics. In *Handbook of Regional Science and Urban Economics, Volume 4, Cities and Geography*, edited by V. Henderson and J. F. Thisse: North-Holland.

Henderson, V., and R. Becker. 2000. Political economy of city sizes and formation. *Journal of Urban Economics* 48:453-484.

IPCC. 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, edited by S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Kahn, M. E. 2006. *Green cities: urban growth and the environment*. Washington, D.C.: Brookings Institution Press.

Kaufmann, R. K., K. C. Seto, A. Schneider, Z. Liu, L. Zhou, and W. Wang. 2007. Climate response to rapid urban growth: evidence of a human-induced precipitation deficit. *Journal of Climate* 20 (10):2299-2306.

Kirshen, P., M. Ruth, and W. Anderson. 2006. Climate's long-term impacts on urban infrastructures and services: The case of metro Boston. In *Climate Change and Variability: Impacts and Responses*, edited by M. Ruth, K. Donaghy and P. Kirshen. Cheltenham, UK: Edward Elgar.

Leitmann, J. 2003. Urbanization and environmental change: issues and options for human security. In *AVISO - Information Bulletin on Global Environmental Change and Human Security*: IHDP.

Levine, Jonathan. 2005. *Zoned out : regulation, markets, and choices in transportation and metropolitan land-use*. Washington, DC: Resources for the Future.

Linares, Carlos A. 2003. Institutions and the Urban Environment in Developing Countries: Challenges, Trends, and Transitions. New Haven, CT: Yale School of Forestry & Environmental Studies.

Low, Nicholas, Brendan Gleeson, Ingemar Elander, and Rolf Lidskog, eds. 2000. *Consuming cities : the urban environment in the global economy after the Rio Declaration*. London ; New York: Routledge.

Lowry, I. S. 1991. World urbanization in perspective. In *Resources, environment, and population: present knowledge, future options*, edited by K. Davis and M. S. Bernstam. New York, New York and Oxford, England: Oxford University Press.

Mantzavinos, Chrysostomos. 2001. *Individuals, institutions, and markets*, *Political economy of institutions and decisions*. Cambridge, UK ; New York: Cambridge University Press.

McEnvoy, Darryn. 2007. Climate change and cities. *Built Environment* 33 (1):5-9.

McGranahan, G., P. Jacobi, J. Songsore, C. Surjadi, and M. Kjellén. 2001. *The citizens at risk: from urban sanitation to sustainable cities*. London: Earthscan.

McGranahan, Gordon, Deborah Balk, and Bridget Anderson. 2007. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones *Environment & Urbanization* 19 (1):17-37.

Messner, Matthias, and Mattias K. Polborn. 2004. Voting on majority rules. *Review of Economic Studies* 71:115-132.

Nee, Victor, and Paul Ingram. 1998. Embededness and beyond: Institutions, exchange, and social structure. In *The New Institutionalism in Sociology*, edited by V. Nee and M. C. Brinton. New York: Russell Sage Foundation.

North, Douglass Cecil. 1990. *Institutions, institutional change, and economic performance*, *The Political economy of institutions and decisions*. Cambridge ; New York: Cambridge University Press.

———. 2005. *Understanding the process of economic change*, *The Princeton economic history of the Western world*. Princeton, N.J.: Princeton University Press.

Oke, T. R. 1982. The energetic basis of the urban heat island. *Quarterly Journal of the Royal Meteorological Society* 108:1-24.

Persson, Torsten, and Guido Enrico Tabellini. 2000. *Political economics : explaining economic policy*, *Zeuthen lecture book series*. Cambridge, Mass.: MIT Press.

Platt, Rutherford H. 2004. *Land use and society : geography, law, and public policy*. Rev. ed. Washington, DC: Island Press.

———. 2006. *The humane metropolis : people and nature in the 21st-century city*. Amherst: University of Massachusetts Press in association with Lincoln Institute of Land Policy, Cambridge.

Pouyat, R. V. , D. E. Pataki, K. T. Belt, P. M. Groffman, J. Hom, and L. E. Band. 2007. Effects of urban land use change on biogeochemical cycles. In *Terrestrial Ecosystems in a Changing World*, edited by J. G. Canadell, D. E. Pataki and L. F. Pitelka. Berlin: Springer.

Rawls, J. 1973. *A theory of justice*. London: Oxford University Press.

Redman, C. L., and N. S. Jones. 2005. The environmental, social, and health dimensions of urban expansion. *Population and Environment* 26 (6):505-520.

Sánchez-Rodríguez, Roberto , Karen C. Seto, David Simon, William D. Solecki, Frauke Kraas, and Gregor Laumann. 2005. Science Plan: Urbanization and Global Environmental Change. In *International Human Dimensions Programme on Global Environmental Change (IHDP) Report Series*. Bonn Germany: IHDP.

Shepsle, Kenneth A. 2006. Old questions and new answers about institutions: the Riker Objection revisited. In *The Oxford handbook of political economy*, edited by B. R. Weingast and D. A. Wittman. Oxford: Oxford University Press.

Simon, D. 2007. Urbanisation and global environmental change: new intergenerational challenges. *International Journal of Green Economics* 1 (3/4):299-306.

Simon, David. 2007. Cities and global environmental change: exploring the links. *The Geographical Journal* 173 (1):75-79.

UN. 2004. World urbanization prospects: the 2003 revision. New York: UN Press.

UNCHS. 2002. The state of the world's cities report 2001. Nairobi: United Nations Centre for Human Settlements.

van der Leeuw, Sander. 2001. 'Vulnerability' and the integrated study of socio-natural phenomena. In *IHDP Update: Newsletter of the International Human Dimensions Programme on Global Environmental Change*. Bonn, Germany: IHDP.

Vitousek, P. M. 1992. Global environmental change: an introduction. *Annual Review of Ecology and Systematics* 23:1-14.

Weingast, B. R., and D. A. Wittman. 2006. *The Oxford handbook of political economy*, *The Oxford handbooks of political science*. Oxford: Oxford University Press.

Wilbanks, Thomas J., Paul Kirshen, Dale Quattrochi, Patricia Romero-Lankao, Cynthia Rosenzweig, Matthias Ruth, William D. Solecki, Joel Tarr, Peter Larsen, and Brian Stone. 2007. Effects of global change on human settlements.

Young, Oran R. 2005. Science Plan: Institutional Dimentions of Global Environmental Change. Bonn, Germany: International Human Dimensions Programme on Global Environmental Change.

Young, Oran R., Frans Berkhout, Gilberto C. Gallopin, Marco A. Janssen, Elinor Ostrom, and Sander van der Leeuw. 2006. The globalization of socio-ecological systems: An agenda for scientific research. *Global Environmental Change* 16 (3):304-316.

Endnotes

[1] Indeed, urban growth is considered as one type of land use change, a subset of global environmental change.

[2] The need for further exploration of the intersection of those topics is promoted by the IHDP Urbanization and Global Environmental Change project (www.ugec.org), an international scientific programme positioned thematically at the crossing of two major global changes (Sánchez-Rodríguez et al. 2005).

[3] The combined consideration of those five aspects of interactions between environmental change and urbanization leads us to some interesting consequences (particularly relevant to climate change). First, urban growth can potentially operate as a factor for reducing the chance of climate change; with more women in the workforce we can expect lower birthrates and a population growth slowdown which by definition could allow for a smaller global ecological footprint (Kahn 2006); the strong – and quite unrealistic - assumption for this scenario is that the new generations will not adopt Western lifestyles. Second, in the short-term greenhouse gas (GHG) emissions are expected to increase as poorer cities continue to develop economically even with the assumption that the Environmental Kuznets Curve holds for the case of GHGs; most developing nations are too far to the left of the EKC turning point (Kahn 2006). The picture can be painted in darker colors if we acknowledge that according to UET theory, the GHG severity curve is not bell shaped but is an increasing function of wealth (McGranahan et al. 2001).

Technology of course has historically assisting in solving humanity's problems. Related to the hot topic of climate change, it is possible that today we do not face enough incentives so that the right technology comes about. A "cap and trade" system has been suggested but there exist implementation/enforcement problems. Absence of incentives does not show clear steps for emission reductions. Political action - at the national level, at least- is also almost non existent possibly due to one or more of the following three factors: blissful ignorance of the citizens of Western nations, technological optimism of the citizens of Western nations and/or the awareness or perceptions of the distribution of costs and differing vulnerabilities - for example, the perception that lower elevation coastal zone (LECZ) urban residents of the developing world will bear the majority of the costs. It is still a speculation to think about who will gain and lose by climate change in a country like the US (Wilbanks et al. 2007). If one assumes slow rates of climate change, and consequent capacity for migration and modification, the costs of climate might very small.

[4] Research in these unexplored areas is promoted and supported by the IHDP Urbanization and Global Environmental Change core project. This project provides the framework for coordination of research that analyzes interactions between global environmental change

and urban processes. In short, the framework seeks an answer to the following question: What are the interactions between GEC and urban processes and the results of these interactions across spatial and temporal scales and for different social groups (social groups defined as appropriate in any particular context: in terms of age, gender, ethnicity, class, migration status, degree of empowerment etc.) It suggests a focus on the rate, intensity and scale of urban and environmental change and their mutual impacts; the examination of pathways of transformations of urban systems and a look at the challenges for sustainability of urban areas. The framework focuses on processes and people: seeing urban areas as part of wider geopolitical, socio-economic processes and environmental systems that operating at various spatial and temporal scales and both the nature of different impacts and possible adaptations and coping strategies.
It is an integrative interdisciplinary science framework: it seeks to bring closer together the social and natural sciences that can have an input on these issues; to enhance the connection between theoretical and applied approaches, seeing urban areas as part of wider geopolitical, socio-economic processes and environmental systems that operating at various spatial and temporal scales.

[5] Theme 1, looking at the underlying human and physical urban system processes that contribute to global environmental change asks questions regarding how do urban lifestyles and consumption patterns, urban land use and land cover change contribute to GEC and what are the zones of influence of urban systems, and how do these social and biophysical 'teleconnections' affect GEC? Theme 2, seeking a better understanding of the pathways through which specific types of global environmental change affects local and regional processes and human well being asks questions like: What are the main processes by which GEC affects human behavior and interactions? E.g. economic activities, livelihoods, migration patterns, human health. How do GECs contribute to shaping the built environment and affect the resource base upon which urban systems rely?
The third and fourth themes focus at the interactions and responses within the urban system as the result of the impact of global environmental change and the consequences of interactions within Urban Systems (interactions among its socioeconomic and geopolitical processes and environmental dimensions) on Global Environmental Change. Theme 3 asks: How do these interactions between the human and the physical systems shape the impact of GEC? How do the interactions between the human and physical systems shape the responses to GEC? How do the impacts of GEC affect livelihoods in urban communities? While Theme 4 closes the loop by asking how do the results of interactions within the urban system modify the impacts on various components of GEC?

[6] IHDP's core research projects are linked by four crosscutting themes, which crystallize key aspects of human dimensions research: "*Vulnerability/Resilience/Adaptation*: What factors determine the capacity of coupled human-environment systems to endure and produce sustainable outcomes in the face of social and biophysical change? *Thresholds/Transitions*: How can we recognize long-term trends in forcing functions and ensure orderly transitions when thresholds are passed? *Governance*: How can we steer tightly coupled systems towards desired goals or away from undesired outcomes? *Social Learning/Knowledge*: How can we stimulate social learning in the interest of managing the dynamics of tightly coupled systems?" The definitions of vulnerability, resilience and adaptation that are provided are found in Young et al. (2006).

[7] A related term such as *adaptedness* refers to the effectiveness of a dynamic structure in dealing with its environment; *adaptability* refers to the capacity to adapt to future changes in the environment of the system concerned (Young et al. 2006).

[8] The institutional dimensions of Global environmental change have been analyzed extensively by the IDGEC core project of the IHDP.

[9] Obviously, the notion of a change of a formal institution includes the success of the implementation of this change. Thus, if the mechanisms for the application of change are not functional, institutional change has not essentially been achieved.

[10] An appropriate distinction between institutions of governance at different levels: the international, national, regional and sub-national/local level. Later on we focus particularly on the interactions of national and local (cities/county district/township/village) level of politi-

cal institutions. We do not focus at all on global governance mechanisms such as international environmental agreements and international governance organizations. We focus on how political structures of human settlements may affect localized political, economic and social behavior that drives global environmental outcomes.

[11] The strong interrelationship of global environmental change and political institutions cannot be underemphasized. In 2005 the city of New Orleans was partially destroyed by the passage of Hurricane Katrina. We do not know and maybe will never know if this particular event was part (or how much a part of) of anthropogenic GEC processes. But what we can observe with certainty is the potentially destructive effects of inadequate or conflicting national and local political institutions manifested themselves in the case of the worst natural catastrophe ever experienced in the USA.

[12] The topic of political institutions falls within Theme 3 and Theme 4 of the UGEC Science Plan. In particular, sections 3.2.1 and 4.1.3 deal with the responses of urban governance institutions to GEC.

[13] In other words: what are the local institutional drivers of global environmental change, if any? Are there existing local institutions that promote more sustainable levels and rates of global environmental change? Are there urban communities with identifiably friendlier sociopolitical institutions to global environmental change processes? Do, for example, local socio-political institutions adopted in US metropolitan areas have more benign effects on global environmental change processes than the ones existent in Chinese megacities? Moving in the opposite causal direction, are there local socio-political institutional changes can we identify that are a result of global environmental change? Differently put, what are the institutional responses to global environmental change? Are they successful? What are their aggregate societal costs and benefits?

[14] It is also argued that adaptation will be more pronounced if it coincides with other sustainable development goals (Wilbanks et al. 2007).

[15] Interestingly enough, in the U.S., the large scale adoption of the tool of zoning originates in the 1920s as one of the responses in an effort to address urban overcrowding (Platt 2004).

[16] Folke et al., 2002

[17] Note that definitions differ across time and disciplines, as the Smithian to the Marxian approaches to political economy reveal (Weingast and Wittman 2006). Political economy is the application of economic models / tools / thinking to political phenomena and thus is defined from its methodological approach

[18] The current version of the paper does not provide an overview of all relevant subfields or competing fields of modern political economy: on the treatment of local elections, voting, and information aggregation, or parties, candidate quality behavior or coalitions; in the context of GEC, the subfield of open economy politics deserves exposition. The goal of the paper is the initial connections between fields that are currently disconnected; all the above mentioned topic carry significant weight in their implications for the subject matter but will become the focus in future research.

[19] An important distinction exists between government and political failures (a subset of government failures): "*Government failure refers to problems that arise when one actor in the economy (the state) monopolizes the legitimate use of force. Political failure refers to the narrower idea of problems that arise when power to control this monopoly is allocated in democratic political systems.*"

[20] In the prominent sectoral aproach in city management, responsibilities for different aspects of managed city amenities are allocated to separate bureaus (such as the ones for transportation, housing, water and sewer services etc.) It is almost trivial to claim that good communication or coordination between the separate departments is important so that policies are not shortsighted and do not lead to unwanted results. Urban planners' role is one of cross sectoral coordination but unfortunatelly sometimes this does not occur, especially since historically, urban planners focus on land use issues. A main effort of educating urban planners to integrate the lessons from urban economics is currently under way (Bertaud). This means that planners are getting more educated on taking into account the power of markets - essentially the information prices signal and identifying economic fallacies that

come about from partial equilibrium argumentation. But then, it is time to consider lessons within urban political economics and public choice.

[21] Very important fields such as political ecology that in many ways thematically overlap with the present topic are not the focus of this paper

[22] Example: driving on the "wrong" side of the street once a society has picked the right side, would be a bad choice, evolutionarily speaking. In social science terminology, this is cases of strategic interactions (or games) that have more than two equilibrium solutions. Even if one equilibrium is obviously better than another, populations can remain trapped in the worst position for an indefinite amount of time if there is not exogenous or endogenous important change that will coordinate the population into the new equilibrium.

[23] At the millennia scale, globalization is a phenomenon that has begun from the first shifts of population out of Africa which has already altered mental models and has even achieved the convergence of mental models in populations across the planet. The path of human kind towards the planetary era until recently was performed at a very slow pace. Rates of change are now much faster and further convergence of mental models can be expected to become a reality also at a much faster rate.

[24] Posner recently provided examples of crucial changes of mental models of populations that came about from world history altering events (such as the destruction experience by the Germans and the Japanese at the end of WWII. Others pinpoint the impacts of recent wars and conflicts on institutions in several African countries. (Also changes in perceptions and values arising from brain drain reversals).

[25] Similarly, one can think of today's states with political and socioeconomic models that combine (a) behavioral norms that do not value productivity, innovation, a belief in the State as a primary factor of increase of the citizen's welfare only through subsidies, partisan politics and corruption with a parallel doing away from meritocracy and political clientele relationships between politicians and citizens and (b) formal institutions that forbid property rights on productive resources. Note that a good match of institutions does not necessarily make the combination successful.