Governing Climate Change at the City Level: Tales from Two Global Cities in Brazil

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ABSTRACT

Purpose - This paper analyzes the factors shaping climate policies in two global cities in Brazil through a multilevel perspective: São Paulo and Rio de Janeiro. It explores how climate change is being framed and how local governments are responding to it in terms of policy strategies.

Design/methodology/approach - Through an empirical research based on two case studies, we discuss the governing of climate change action and analyze the factors that can constrain or undermine these actions based on information collected from reports, institutional websites and academic and newspaper articles.

Findings - The participation in transnational municipal networks has been central for promoting and supporting climate change actions in both cities following the international experience. The organization and implementation of climate change measures rely on a landscape formed by multiple actors often spanning several sectors and levels of governance.

Originality/value - Most of the literature on climate change policy at the local level focuses on the context of developed countries. Analyses of advanced developing countries like Brazil are sparse as well as comparison in light of the international experience. The paper also draws attention for the lack of awareness for adaptation at

the local level in these countries building upon recent scientific finding on global climate change.

Introduction

For more than a decade climate change has been considered one of the most significant political challenges facing the international community (Giddens, 2009). In 2007, the Intergovernmental Panel on Climate Change (IPCC) stated with high confidence on its Fourth Assessment Report (AR4) that climate change is now unequivocal and its impacts are underway with consequences for both urban and rural areas (Solomon et al., 2007; Parry et al., 2007). Climate change poses not only a local place-based problem, but also cross-scale challenge. Addressing this unprecedented challenge requires actions at different levels (multilevel) of governance and interventions ranging from conventions and treaties at the global level to climate protection measures at the city level (Bulkeley and Betsill, 2003; 2005; Adger, 2005; Bulkeley and Kern, 2006; Gupta, 2007).

The relationship between cities and climate change is usually based on a complex interaction between vulnerability and responsibility (Wilbanks and Kates, 1999; Robinson and Gore, 2005; Sanchez-Rodriguez et al., 2005; Lankao, 2009). Urban centers are home to a large proportion of the world's population, economic activity, and

physical infrastructure that are at risk from floods, storms, landslides, heat waves, droughts and other climate-related phenomena. Climate change is expected to exacerbate these impacts on cities around the world (Wilbanks et al., 2007; Satterthwaite et al., 2007; Hunt and Watkiss, 2007). Cities are also source of most of the world's pollution and high consumers of non-renewable raw materials (Evans et al, 2005). In addition, urban centers possess substantial ecological footprints and require vast areas to provide the food, energy, water and natural resources that keep them functioning as engines of the global economy (Sanchez-Rodriguez et al., 2005; Evans et al., 2005). At the same time, local governments and their legal responsibility and jurisdiction provide opportunities to influence many of the activities that contribute to climate change and respond to it in terms of both mitigation and adaptation policies (Bulkeley and Betsill, 2003; Robinson and Gore, 2005; Satterthwaite, 2008; Puppim de Oliveira, 2009; Bulkeley et al., 2009).

By mitigation cities can substantially reduce their environmental impact and consequently transform their infrastructure and consumption patterns improving the global environment. By adaptation cities become resilient to climatic impacts and reduce risks from climate change and variability (Dawson, 2007; Satterthwaite et al., 2007). Although these urban transformations will take decades and are probably reliant on significant developments in how cities are governed and planned, cities have a very direct interest in both mitigating and adapting to environmental and climatic change (Satterthwaite et al., 2007; Bicknell et al., 2009).

Besides the important role in formulating and implementing climate policies, local governments also participate in the international arena through transnational networks

of local (and subnational) governments. These transnational actors have been attracting increasing attention since the early 1990s and are seen as a concrete result of the Rio Summit in 1992. Bulkeley and Betsill (2003) have argued that such transnational local authorities gathered together do not fall easily into existing conceptual frameworks for climate action as it is difficult to analyze if these networks are government or non-governmental organizations.

This discussion is particularly relevant for developing countries, which have no binding commitments for reducing greenhouse gases (GHG) emissions under the Kyoto Protocol and are more vulnerable to climate change impacts due to their geographical location and low adaptive capacity resulting from development deficits (Wilbanks et al., 2007; Bicknell et al., 2009). It is also mostly important to focus on global cities that are engines of the world's economy, centers of innovation and important areas of population growth and concentration as it has been argued elsewhere (Sanchez-Rodriguez et al., 2005; De Sherbinin et al., 2007).

Building on that, this paper analyzes the factors shaping climate policies in two global cities in Brazil through a multilevel perspective: São Paulo and Rio de Janeiro. It explores how climate change is being framed and how local governments are responding to it in terms of policy strategies and instruments. By doing so, it is expected to deepen the understanding on how these cities in Brazil are responding to these challenges and uncover the strategies that are being deployed by these local governments. The authors argue that the participation in transnational municipal networks has been central for initiating and supporting climate change actions in both cities following the international experience with considerable attention being devoted

to mitigation of GHG. On the other hand, there is critical lack of attention to adaptation measures on a comprehensive manner. Although there are not consolidated researches[1] in Brazil at the moment that acknowledge the effect of human-induced climate change (global warming) in both cities, they have been already suffering the impacts of current climatic conditions and variability on a regular basis due to its social vulnerability resulting from development deficits and poor institutions and infrastructures[2].

The organization, steering and implementation of current and future climate change measures rely heavily on a landscape formed by multiple actors with a variety of interests, capacities, and challenges often spanning several sectors as the two case studies will illustrate. This fragmented landscape of actors, interests and sectors combined with structural governance problems in both cities and in Brazil pose significant challenges for the advancement of these efforts in the two cities as they seem to have limited capacity to address the climate change challenge alone. Through an empirical research, the authors discuss the governing of climate change at the city level and analyze the factors that can constrain or undermine these actions.

Local Governments and Climate Change

Local governments have taken the lead in responding to climate change in diverse contexts, including developing, developed and countries that have been reluctant in supporting international action towards the mitigation of GHG emissions (e.g. USA). In

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[1] A recent report for São Paulo has highlighted its vulnerability and sensitivity to some of the projected impacts of climate change and suggested some adaptation measures. A similar report for Rio de Janeiro is expected to come out soon. Although these are timely and promising initiatives, it is still in its early stages.

[2] In January/February 2010, intense rainfalls have flooded different areas in the city of São Paulo causing deaths and losses. In April 2010, massive rainfalls in Rio de Janeiro caused landslides that killed more than 50 people in risk-prone areas, with hundreds losing their homes and thousands being affected by disruptions in different parts of the city.

this direction, there is a growing body of literature that provides robust arguments for the engagement of local governments in climate policy making (Kousky and Schneider, 2003; Bulkeley and Betsill, 2003; 2005; Puppim de Oliveira, 2009; Bulkeley et al., 2009), although these non-state actors, as referred by constructivist approaches in international relations (Bulkeley and Betsill, 2003), do not have direct nor binding commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (Bulkeley and Betsill, 2003; Betsill and Bulkeley, 2007). These arguments are usually based on the recognition that cities and its local governments have the legal jurisdiction and control over areas and sectors that can influence many activities that are not only critical sources of GHG emissions such as transportation and energy use, but also key instruments for managing and reducing urban climate risks such as land use regulation, zoning, civil defense and disaster response (Wilbanks and Kates, 1999; Robinson and Gore, 2005; Dawson, 2007; Satterthwaite et al., 2007; Bulkeley et al., 2009).

There are also many reasons for acknowledging local governments as one of the critical actors in climate policy, and urban centers as the fundamental arena where climate governance is taking place (Bulkeley and Betsill, 2003; Lankao, 2007; 2009). In the same direction, the city is also the level of governance closest to the people (Kates and Wilbanks, 2003; Evans et al., 2005; Adger, 2005; Satterthwaite, 2008; Puppim de Oliveira, 2009). This recognition builds on the assumption that local governments are more flexible and more accountable to its citizens than other levels of governance. In theory, they tend to be smaller and decisions can be taken faster than those at the national level. This flexibility and readiness in response and action can shape governmental structures to be more adaptive to new situations and agendas so that these

governments become less bureaucratic to implement policies as local governments are closer to their constituencies and local officials suffer the pressure from interest groups such as civil society, community organizations and environmentalist groups on a daily basis (Puppim de Oliveira, 2009).

On the other hand, local governments also face many barriers in developing climate policy at the city level. Some barriers are well described and analyzed by the policy and public administration literature such as the presence of short mandates for local authorities, the lack of financial and human resources available at the local and the lack of autonomy to regulate specific sectors and economic agents (Ligeti et al., 2007; Parzen, 2008; Puppim de Oliveira, 2009). Table 1 below provides a summary of key factor that can support or inhibit local governments to engage in climate policy making.

Table 1 - Key factors that support or constraint climate change action at the city level

Key Factors	Enabling Environment	Obstacles and Constraints
Resource and Capacity	Institutional and financial capacity to undertake climate change actions	Lack of financial, human and technological resources
	Presence of a local champion	Lack of commitment from political leaders
	Allocation of financial and human resources	Lack of attention to environmental issues
	Long-term urban planning	Short-term view
Knowledge and Information	Strong communication and outreach	Business as usual approach
	Vulnerability perception and strong risk management approach	Lack of vulnerability assessment and poor understanding in terms of impacts and extend of climate change
	Strong science-policy interface	Mismatch between policy makers and scientific community
Institutions and Governance	Authority to coordinate and regulate climate change actions	Lack of authority and jurisdiction

	National programs to support local initiatives	Lack of national and international support
	Participation in transnational city networks	Poor vertical and horizontal coordination across levels and policies
	Good governance stakeholder involvement and participation strategy	Poor governance structures and difficulties in getting key sectors involved

Source: Ligeti et al. (2007); Satterthwaite et al. (2007); Parzen (2008); Bulkeley et al. (2009); Puppim de Oliveira (2009).

One of the major barriers, however, is poorly approached and understood by most climate change governance research. It draws upon the fact that climate change is considered a 'wicked problem' in policy circles (Brown, 2009). Climate change illustrates the dynamic complexity of many modern public problems as it is unstructured making the causes and effects of a changing climate extremely difficult to be identified and addressed by local authorities (Brown, 2009; Giddens, 2009). Furthermore, 'wicked problems', as coined and defined by Rittel and Webber (1973), involve multiple and intertwined sets of public and private actors and challenges that cut across interconnecting policy domains and levels of government (Brown, 2009).

This fundamental barrier may hide the chain and scale of causes and consequences of climate change in all levels and thus make climate change action at the local level ineffective or only palliative (Puppim de Oliveira, 2009). According to Brown (2009), a network approach has been argued to best tackle a wicked problem where diverse actors from government and differing sectors and stakeholders get together to share resources and knowledge. In this direction, the analysis of the modes of governing these actions is crucial for understanding how local governments from two global cities in Brazil are

addressing climate change, engaging with other local governments and collaborating in other levels of governance.

Facing the challenge: tales from two global cities in Brazil

In order to understand how local governments from the largest Brazilian cities are responding to the challenge posed by climate change, climate action was analyzed in São Paulo and Rio de Janeiro (see map 1). Brazil has ratified the Kyoto Protocol and was one of its stronger supporters. Today, it is also one of the five major emerging economies in the world and presents comparative advantages in dealing with climate change when compared to other advanced developing economies. As a non-annex 1 country, Brazil does not have emission targets under the protocol and relies on energy for electric power generated by hydroelectric plants that contributes significantly with mitigation efforts (Setzer, 2009) providing several comparative advantages in terms of sustainable development. It is also home of one of the greatest ecosystems and forests of the planet (MEA, 2005). On the other hand, deforestation by burning trees, particularly in the Amazon rainforest, constitutes a major source of GHG emissions in Brazil. Puppim de Oliveira (2009) highlights that Brazil is also one of the leading countries in the number of projects within the Clean Development Mechanism (CDM) and one of the largest receiver of resources from the Global Environment Facility (GEF), a program led by the main funding organizations for the implementation of the UNFCCC and other international conventions.

Map 1 – Indication of the two Brazilian global cities, São Paulo and Rio de Janeiro

In recent years, there are a number of ongoing climate change initiatives at the local, subnational and national levels. However, Brazil has not been able to design and implement a comprehensive climate change strategy even though a national plan[3] has been approved by the Congress and by the President in December 2009, and some local and subnational regulations are taking place in different parts of the country particularly at the subnational level. The analysis of two of these efforts, namely in São Paulo and Rio de Janeiro, provides interesting insights on the way these actions are being framed and how these local governments are acting in different policy domains and contexts.

Case studies are frequently applied in social science research and provide an in-depth investigation and a systematic way of looking at different policies and actions (Yin,

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[3] The National Plan on Climate Change has been approved in December 2009 (National Law 12.187).

2009). For the purpose of this paper, information was collected from reports, institutional websites and academic and newspaper articles (Puppim de Oliveira, 2009). The main findings of the case studies are presented below followed by a discussion of the key factors shaping climate change policy making.

São Paulo

The city of São Paulo is the largest urban agglomeration in South America and is among the top-10 cities in the world with a population of over 11 million people (City Mayors Statistics, 2010). The city is an important financial and commercial hub for the region and responds to up 10% of Brazil's total GHG emissions[4]. Over the last decade, the city has developed a series of local initiatives to address climate change, environmental degradation and air pollution due to high industrial and automotive emissions. It included increasing regulatory standards, law enforcement for industrial plants and the restriction of 20% of the city's automobiles during peak hours in the central area (Puppim de Oliveira, 2009).

In 2003, São Paulo joined the Cities for Climate Protection (CCP), a campaign of the International Council for Local Environmental Initiatives (ICLEI). ICLEI is one of the major transnational municipal networks worldwide and it has been supporting climate action at the municipal level for almost two decades focusing, in the beginning, only on mitigation and more recently also on adaptation. Local governments join the CCP by passing a resolution pledging to reduce GHG emissions through five milestones, basically elaborating a baseline emissions inventory, adopting emission targets,

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[4] When excluding the deforestation in the Amazon.

developing local action plan and implementing specific policies and measures (ICLEI, 1993).

São Paulo elaborated an emission inventory in partnership with research centers[5] to set priorities for climate action (Puppim de Oliveira, 2009). The city has also joined the Energy Efficiency Program of the State of São Paulo, a subnational champion for environmental and climate change policies in Brazil (Cunha et al., 2009). In parallel with the state initiatives, the city of São Paulo has also developed a specific policy to address climate change as a result of the partnership between a research center[6], ICLEI, the municipal secretary for the environment and committed individuals and policy entrepreneurs. This policy was approved by the City Council and became a municipal law in June 2009[7]. Although general in its lines as it still waits for specific regulations, the law established a concrete target of 30% reduction in GHG emissions by 2012 through initiatives to improve public transport, energy efficiency, green building, land use and solid waste management. This was an important milestone due to the importance of the city of São Paulo for Brazil and South America and to the fact that São Paulo was a pioneer municipal government in approving such law in the country.

In this direction, the city has also implemented a CDM project in the Bandeirantes landfill, one of the largest in the country, where the CH_4 (methane) released by the landfill is being used for power generation and the revenues invested for the benefit of poor communities located in the surrounding area. Puppim de Oliveira (2009) shows that this action alone was estimated to have reduced GHG emissions by 11% in the city.

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[5] *Centro de Estudos Integrados sobre Meio Ambiente e Mudanças Climáticas* (Centro Clima), *Coordenação dos Programas de Pós-graduação de Engenharia* (COPPE), *Universidade Federal do Rio de Janeiro* (UFRJ).
[6] *Centro de Estudos em Sustentabilidade* (Ces), *Escola de Administração de Empresas de São Paulo* (EAESP), *Fundação Getulio Vargas* (FGV).
[7] Municipal Law N. 14.933, 5th June 2009.

Since 2007, another law has been approved obligating buildings with more than three bathrooms to use solar water heating systems (Bulkeley et al., 2009).

Climate change policy making in the city of São Paulo shows synergies and interaction with other policies and actors (such as ICLEI, The World Bank, research centers and the State of São Paulo government) trying to combine climate security with economic benefits arising from air pollution (avoiding health effects), better urban planning and land use and revenues from carbon credits. Climate action in São Paulo, however, still pays very little attention to adaptation measures although the city often suffers from several climate-related events such as floods, landslides and water scarcity (Puppim de Oliveira, 2009).

Rio de Janeiro

The city of Rio de Janeiro is the largest and most complex urban center in the Brazilian coastline with over 10 million people and presents itself as the second most populous city in the country with great economic, political, cultural and historical importance (Egler, 2007; De Sherbinin et al., 2007). Although very known for its beaches and beautiful landscapes, the city of Rio de Janeiro faces many socio problems and environmental challenges such as urban violence, informal and illegal settlements in hazardous areas (e.g. *favelas*), sewage disposal and industrial waste among many others. De Sherbinin et al. (2007) analyzed climate scenarios and the vulnerability of Rio de Janeiro highlighting that these problems will be exacerbated by climate change in the near future.

Climate policy making in Rio began back in 1998 when the city government joined CCP. As in the case of São Paulo, the city of Rio elaborated an inventory of GHG emissions in partnership with the local university[8]. After some years of silence and no political action, climate change was brought back in the municipal agenda in early 2007 when the Mayor signed a protocol of action, namely the Rio Protocol[9]. This protocol encompasses both mitigation and adaptation measures and tries to integrate key sectors within the municipal administration towards an action plan to address both causes and risks associated with climate change. For instance, it demands the inclusion of a climate change dimension into the city's masterplan as well as improvements in local regulations and urban planning combined with the development of CDM projects. In order to raise public and internal awareness to the climate change issue, the local government commissioned scientific assessments in key specific sector such as ecosystems vulnerability, climate change projections and health impacts, coastal zone management and possible effects on urban infrastructure and dwellers. This was followed by the organization a series of events bringing together civil servants, government officials, scholars and community organizations to discuss the results of these assessments in light with the city's current and future reality. These seminars named 'Rio in the next 100 years' (or Rio+100) have also called attention to the city's high vulnerability to climate change in terms of its physical exposure, sensitivity and low adaptive capacity (De Sherbinin et al., 2007; Nacaratti, 2008). These seminars and a number of field visits to learn from best practices in different contexts including Canada and the USA had the support of C40 - Cities Climate Leadership Group, a group of

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[8] *Centro de Estudos Integrados sobre Meio Ambiente e Mudanças Climáticas* (Centro Clima), *Coordenação dos Programas de Pós-graduação de Engenharia* (COPPE), *Universidade Federal do Rio de Janeiro* (UFRJ).
[9] Municipal Decree 27.595, 14th February 2007.

large cities committed to tackling climate change that work in partnership with the

Clinton Climate Initiative (CCI) from The William J. Clinton Foundation[10].

Governing Climate Change in Brazil: Key messages

The cities of São Paulo and Rio de Janeiro provide examples of two global cities, urban

areas that are important centers of population concentration and economic growth not

only for Brazil but also for South America through their long-standing relationships

with the rest of the world as important hubs for commerce, financial activities and

industrial innovations (De Sherbinin et al., 2007). The cases showed that the new

governance arrangements such as the participation in transnational municipal networks

has been crucial for initiating and supporting climate change action in both cities not

only in Brazil, but also worldwide (Bulkeley et al., 2009). Building on the experience

from developed countries, Schreurs (2008) argues that these networks, particularly

ICLEI CCP, may be most important in the earliest stages of climate policy making as

local actors seek ideas from cities with similar politics or characteristics.

The cases of both cities bring evidences on the factors that are shaping climate policy at

the local level at these early stages in Brazil. These findings highlight factors that have

been raised elsewhere (Bulkeley and Betsill, 2003) when analyzing climate change

action in the UK, USA and Australia. These factors include the presence of committed

individuals and political will to address climate change within the local government

agenda, the availability of funding for assessments and GHG inventories, local power

and jurisdiction over key sectors, and the existence of informal networks to support

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[10] For further information, see http://www.c40cities.org and http://www.clintonfoundation.org/what-we-do/clinton-climate-initiative (access on 1st July 2010).

policy design and implementation engaging with a range of different actors, such as research institutions, governmental bodies, political champions and community organizations.

Although with slightly distinctive interpretations, Setzer (2009) had already argued in the same direction when analyzing climate policies in the city and the state of São Paulo. Although we can say that São Paulo, Rio de Janeiro, and other contexts follow some common patterns of action at the local level, previous works such as Bulkeley and Kern (2006) and Bulkeley et al. (2009), identified contrasting modes of governing these initiatives through the deployment of different strategies such as networking and partnerships, exercising regulation and authority, self-governing and enabling an environment for private action.

These different approaches applied to address climate change illustrate that it is not only a place-based problem but also a cross-scale and multilevel challenge. The first generation of local government efforts is important to raise public and government awareness and mitigate partially some causes of the problem, especially in developing countries like Brazil. However, recent research on the magnitude and scale of the global changes (Füssel, 2008; Parry et al., 2008; Rockström et al., 2009) suggests that local governments alone may have limited capacity to address the causes and cope with the unavoidable impacts of climate change without strong commitment and leadership from national governments and the international community to reduce inequalities and enhance the capacities of individuals, communities and institutions.

In Brazil, as in many countries, although the national government has been acting by designing integrated plans and programs to address mitigation and adaptation in specific sectors such as agriculture, energy and industry, these measures have been patchy and tentative with most attention being given to mitigation. The need for strong adaptation interventions is constrained by social inequality, lack of institutional capacity and pathways of unsustainable development that have been permeating Brazil for many decades (Ferreira, 1998; Ribeiro, 2008). The table 2 summarizes climate change action and policy making in both cities.

[Add table 2 here]

In the light of the challenge ahead, governance emerges as a key concept to bridge different efforts and provide the pathway for the development of appropriate strategies. In the Brazilian context, where the 1988 Federal Constitution divided responsibilities for environmental and social policies and climate-related legislations among the three levels of government (federal, state and municipal), climate governance will require the organization, steering and implementation of policies and measures with the participation of multiple actors that span several sectors, not only the environmental area (Moser, 2009). This is not an easy task in a country with 27 states and more than 5500 municipalities as highlighted by Puppim de Oliveira (2009). The roles of the three levels of government combined with the specific interests of regions, economic groups and political contexts may often conflict with each other and undermine climate change efforts in the long run.

Conclusion

This paper has investigated climate change action and policy making in two global cities in Brazil, São Paulo and Rio de Janeiro, considered to be the most important in population concentration and economic and political relevance. Through a multilevel perspective, the analysis has shown that these cities have followed the international experience in terms of factors shaping these initiatives at the local level. The participation in transnational municipal networks has fostered action and policy making at the city level particularly in mitigating GHG emissions. It has also raised public and governmental awareness in terms of the challenge posed by human-induced climate change and climatic variability although there is still a huge gap in terms of the adaptations needed in urban planning and infrastructure to cope with the unavoidable effects of increasing global temperatures and its consequences for the global climate system.

Although being considered a significant step towards addressing the issue, it has been argued that recent research suggests that local government action may be not enough and that they have limited capacity to cope and adapt to climate change. Even though local governments are closer to the people, they rely on measures taken and supported by higher levels of government intervention as their responsibility and jurisdiction is constrained by legal and institutional aspects and they can not govern and regulate the multiplicity of actors and sectors needed to address the 'wicked problem'. Understanding and approaching the governance challenge is crucial for securing safe and sustainable pathways for global cities and countries worldwide.

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Table 2 – Summary of Climate Change Action and Policy Making in São Paulo and Rio de Janeiro

	Municipal Government							Partnerships
Cities	Focus	Stage	Transnational Networks	Emission Targets	CDM	Strategy	Infrastructure	Partnerships
SP	Mitigation Adaptation	Implementation (particularly in terms of mitigation)	Yes CCP ICLEI and C40	Yes 30%	Yes	Governing by authority (municipal laws and specific regulations) Raise awareness Scientific assessment and scenario modeling Environmental education	Improve public transport, cycling lanes, landfills, solid waste management, energy efficiency, green building	Research centers
RJ	Mitigation	Early	Yes CCP ICLEI and C40	No	Yes	Governing by authority (municipal decree and specific regulations) Basic scientific assessment	Public transport, cycling lanes, landfills, solid waste, green building	Research centers

						Environmental education	management, urban planning	