

# Strategy for Cities



**National Adaptation Plan  
to Climate Change**

## 3 Strategy for Cities

### 3.1 Introduction

Formulation of public policies for cities based on integrated approaches is a recent development, in response to the challenges of applying coordination and synergic approaches to an array of sectoral actions and programmes and their impacts on the dynamics of use and transformation of urban space. The Ministry of Cities (MCid), focal point for the current Strategy for Cities under the National Adaptation Plan, was created with the mission of improving the drafting, implementation and management of public policies targeted at urban territorial planning. In practice, MCid aims, through its programs and actions, to make cities more humane, socially and economically just, and environmentally sustainable, by means of democratic management and integration of public policies for urban planning, housing, sanitation, urban mobility and accessibility, and traffic through coordinated efforts with federal, state and municipal bodies and civil-society organizations.

Urban development policies are, potentially, among the more effective means for bringing about adaptation to climate change in cities, especially by means of systemic approaches that address current issues while, at the same time, anticipating future problems. Such integrated approaches become more viable as scientific knowledge advances

and uncertainties with respect to climate change decline.

There is a general consensus that cities that offer participative urban planning processes which ensure democratic management, decent housing, basic sanitation (safe drinking-water supply, sewerage, street cleaning, solid waste management, stormwater management), high-quality roadway systems and public safety and civil defence, are inherently more resilient to most of the impacts of climate changes (OLIVEIRA AND MOREIRA, 2006).

Nonetheless, urban-planning flaws, such as inadequate housing, infrastructure and services, especially when exacerbated by informal settlement in unsuitable areas, contribute toward increased climate-change risk in urban areas. In many Brazilian municipalities, such deficiencies are associated with uncoordinated urban growth, which undermines the capacity of local administrations to cope with the impacts of climate events, owing to the difficulty of providing suitable and affordable urban infrastructure and public services to a majority of the population (UN-HABITAT, 2009).

Most Brazilian cities already face socio-environmental problems associated with accelerated growth and transformations of urban space. Climate change tends to exacerbate the effects of existing hazards,



such as flooding, landslides, heat waves and water shortages.

Historically, issues relating to changes in climate patterns and extreme weather events have generally been overlooked by government at the three levels and, consequently, themes such as urban development, risk management and adaptation to climate change have usually been treated separately. In recent years, Brazil has advanced in the implementation of public policies for urban development that combine urban planning and risk management within a prevention perspective. Recently, it has been incorporating considerations on climate change.

Among the effects of climate change discussed in Volume I of this NAP that are of greatest relevance to cities are the increase in Earth's average surface temperatures. Depending on the climatic scenario considered, these may rise by between 2 and 4°C in some regions of Brazil by the end of the 21st century. Such increases in temperature may modify moisture flows and create atmospheric conditions that are more susceptible to extreme events. There is thus increased risk of a rise in the frequency and intensity of extreme rainfall events in the more urbanized and populated regions of Brazil, especially the South, Southeast and along the Brazilian coast.

This, combined with other evidence from studies on a global scale, indicate that climate variability already poses a significant challenge and that future climate change seems inevitable. This

makes it imperative to develop strategies for adaptation, in view of the issues of ethical and social justice these entail.

Although everyone will, in some way be affected, the impacts of climate change are inordinately heavier for the poor. Some precarious communities and settlements, because they are concentrated in high-risk areas with limited access to services and resources, are already under climatic-variability stress (Marengo, 2009) and particularly vulnerable to extreme events. Under such conditions, problems are exacerbated owing to a lack of resources that is reflected in lower capacity to respond to crises, thereby increasing their vulnerability to severe weather conditions expected under more intense climate-change scenarios. Addressing such challenges requires inter-institutional and joint collaboration, social-policy formulation strategies, and effective long-range integrated nationwide adaptation programmes. Thus, the NAP acquires importance not merely as a tool for directing guidelines and actions, but also as the nexus for inter-sectoral and intergovernmental coordination.

A crucial aspect for implementation of national urban development policy relates to consonance of the actions of federal authorities with those of the states and municipalities, other Branches of government (legislatures and judiciary), and participation of civil-society in coordination and integration of investments and actions for Brazilian cities, targeted at reducing social inequality and strengthening environmental sustainability.

**This Chapter thus aims: to apply a climate lens to the framework of public policies for urban planning and development and to identify no-regrets actions that contribute directly to reducing vulnerability to climate change and to development of resilient cities.**

This sectoral strategy will examine the main characteristics of Brazilian cities, as well as current federal-government actions and policies targeted at addressing the latest climate-change assumptions, with a view to setting basic guidelines for adaptation to climate change in the context of urban development and related themes.

### **3.2 Main vulnerabilities of Brazilian cities to climate change**

The vastness of Brazil's territory underscores the great variety of geographic, environmental and climatic characteristics which, in turn, affect and correlate to an array of economic, social and urban-development issues among Brazilian municipalities. The history of Brazil's development also reflects the diversity of its urban settlements, especially between micro and macro-regions of great social and economic heterogeneity.

Such heterogeneity has repercussions on the resilience of municipalities and their ability to adapt to climate change, which also relates closely to aspects of governance and democratic management (OLIVEIRA and MOREIRA, 2006). From an urban standpoint, local administrations are better able to deal efficiently with

issues of infrastructure and essential public services for public well-being, and more capable of regulating and exercising control over the local-level actions of individuals and companies (SATTERTHWAITE *et al.*, 2007).

Prospective impacts from climatic hazards also vary throughout Brazil, making the analysis of risks even more complex, especially when considering current and likely future effects of climate change.

As a means for guiding discussion of the next items, Table 5 presents a summary of the main relevant characteristics of Brazilian municipalities for the drafting of adaptation guidelines, based upon an assessment of current urban risks in the context of climate change. An array of approaches is required to promote adaptation in different Brazilian cities, bearing in mind that the risks inherent to climate events vary in a number of respects, and that specific knowledge of major determining factors is needed when defining municipal-level adaptation measures. However, the broad outline of this adaptation strategy will focus on a national approach, leaving local-level planning and decision-making to municipal managers and private-sector players.

As stated earlier, municipal characteristics are of crucial importance when assessing how climate change may affect a given urban system. Indeed, when defining guidelines for adaptation it is relevant to note that, according to the 2010 census (IBGE, 2011) municipalities with populations of over 100,000 account for

a mere 5%, or 283, of the total of number of Brazilian municipalities (5.565) but, nevertheless, are home to more than half of the Brazilian population (54.7%, or 104.4 million).

In the light of this concentration, investment of public resources in such municipalities, which include major cities, can enhance expansion of access to improvements in urban infrastructure, including basic sanitation services and housing which, in principle, would greatly help reduce risk exposure of the most vulnerable groups. This observation notwithstanding, the need for public investments in medium and small municipalities must also be addressed in order to overcome infrastructure deficiencies, especially when the micro and macro-regions in which they are located is considered, in view of the duty of the State to reduce inter and intra-regional inequalities.

In the larger cities, social inequality and the impetus to maximize property gains during recent decades have greatly exacerbated exposure of a major portion of the population which, lacking resources and other alternatives, has been forced to settle in high-risk areas. When faced with the array of threats posed by climate change, the risks of living in such

improvised urban settlements become even worst.

All too often, these same cities also have high population densities which, it is generally acknowledged, significantly increases the potential for damage, especially in informal settlements (UN-HABITAT, 2003; UTZINGER and KEISER, 2006). As a matter of location, such settlements are often exposed to hydro-meteorological disaster risks, such as landslides and flooding (NATHAN, 2008; BERTONI, 2006; COLTEN; ZAHRAN *et al.*, 2008)

Vulnerability, in such cases is specifically related to questions of health, food insecurity, insufficient access to livelihoods, lack of basic services and poor capacity on the part of managers to foster progress and initiatives for adaptation in an extensive, preventative and inclusive manner (IPCC, 2012).

The following table presents a categorization of Brazilian cities, based on size, and on major components of exposure to climate change and vulnerability. Though not exhaustive, its objective is to illustrate and guide the drafting of guidelines for adaptation and future studies to complement this still incipient knowledge.

Table 5. Characterization of Brazilian municipalities, demographic aspects (Census, 2010) and urban risks, in climate-change context

Size	Municipality			Population		Geographical location	Major vulnerabilities	Exposure
	Population	Qty.	%	Population million	%			
Small size	< 50,000	4957	89.07	64.01	33.6	North, Semiarid part of the Northeast and much of the Central-West region, northern and north-eastern of MG, south of BA, interior of PR and south of RS	Fewer resources for infrastructure and basic services. Development limitations and high socioeconomic vulnerability. Poverty. Sanitation problems	Mainly to droughts and floods. Some abrupt severe flooding. Waterborne diseases. High growth rates that can increase exposure to other dangers
Medium size	50 to 100,000	325	5.84	22.31	11.7	SP, RJ, central-south of MG, west of PR, SC and RS, north of RS, much of the coast from RS to CE, route between DF- Palmas (TO)- Belem (PA) – Manaus (AM). Scattered regions of MA, MT and RO, some capitals and metropolitan regions	Very variable. Generally, they have more resources than small municipalities. The larger the municipality, the greater the compliance with urban planning instruments. Some problems of drainage and sanitation.	Housings and economic activities in disaster-risk areas (floods and landslides) featuring different degrees of exposure, such as land use limitations. Contagion from waterborne diseases and depending on the case, of respiratory diseases
Large size	100 to 500,000	245	4.40	48.57	25.5			
	50,000 to 1 million	23	0.41	15.71	8.2	Some capitals and industrial and development hubs, especially in the Southeast, South and Northeast.	They have more resources and capacity to deal with structural and basic services problems. Strong social inequality and consequent housing problems normally linked to sanitation. Inadequate Drainage System due to intense sealing. Resulting in contamination of the water resources	High exposure to abrupt flooding, flash floods and inundation; landslides and water crises linked to urban supply. Respiratory diseases, thermal discomfort, worsening of health conditions and the spread of some waterborne diseases
Metropolis	> 1 million	15	0.27	40.16	21.1	Capitals of SP, RJ, BA, CE, MG, AM, PR, PE, RS, PA, GO, MA and DF and another two cities in São Paulo		

A broad variety of observed urban-settlement behaviours have a direct influence on risks associated with climate change. Urban development of valley floors and channelling of rivers are common features observed in Brazilian cities. In medium and large-size cities, urban expansion has often extrapolated the original river floodplains, producing neighbourhoods with high population densities and few green areas. Suppression of vegetation results in high temperatures on constructed surfaces and, at the same time, greater susceptibility to flooding, owing to sealing of the soil (PMSP, 1999a; DAEE, 2009). In such locations, the risk of disasters is exacerbated by inability of the soil to absorb water from intense rainfall events, resulting in abrupt flooding during which roadways become the main exit routes for runoff, where floodwaters are liable to drag people and even vehicles along with them, despite relatively shallow depths (DAEE, 2009).

With respect to roadway infrastructure and urban drainage, Brazilian urban planning was much influenced by the concept of river channeling. The consequence is that watercourses are often enclosed, with a view to shifting downstream surplus flows caused by sealing of soils. Such watercourses end up receiving excess surface flows and pollution loads, including those arising from shortfalls in other urban services, e.g., urban solid wastes and poorly channelled wastewater. (NASCIMENTO *et al.*, 2006; BAPTISTA and NASCIMENTO, 2002).

On the other hand, data shown in Table 5 indicates that smaller municipalities are most often located in regions with lower urbanization rates (North, Northeast and the Central-West, in this order) and that, consequently, they have different characteristics. In such municipalities, fewer public resources are available and other basic sectoral development demands (i.e., health and education) have priority. These are among the roughly 90% of municipalities that account for one third of the Brazilian population.

For these municipalities, exposure of the population relates to gradually evolving climatic processes, such as droughts and flooding, that affect more extensive areas. In such cases, risk factors do not stem from a specific urban planning problem, but rather, from land-use, settlement and migration processes taking place on a regional scale. In these areas, socioeconomic vulnerabilities tend to be more pronounced and may exacerbate already existing problems relating to poor sanitation, infrastructure and housing. The Special Report on Managing the Risks of Extreme Events and Disasters to Advance to Climate Change Adaptation (SREX) (IPCC, 2012) emphasizes that climate change is an additional factor which contributes to impacts relating to such events, and that local vulnerabilities pose the main determinant risk factors.

For smaller municipalities, adaptation needs to be promoted primarily as a means of reducing vulnerabilities, especially those of a socioeconomic nature, and providing opportunities for sustainable development in its broadest

sense. Such an approach can prepare these municipalities to advance toward a future with better planning and layout of urban spaces, and in which local resilience to climate threats that have historically afflicted them has been sufficiently assimilated so as to enable them to minimize the impacts of climate change.

In terms of growth and recent urban expansion, two processes related to adaptation are of concern to urban planners: fragmentation and verticalization. Areas for urban expansion in towns with high growth rates, especially smaller-size towns in the North, Northeast and Central-West, tend to suffer increasing fragmentation and dispersion. This causes encroachment into the countryside and onto productive farmland and areas with important environmental functions, such as buffer zones for protection of water sources, hillsides and aquifer-replenishment areas. Such pressures may contribute toward greater social inequality and environmental degradation.

In areas where towns are more consolidated, as is the case in many medium and large-size cities, increasing verticalization takes place in central and more affluent regions, while population densities rise on the peripheries. This leads to loss of socio-environmental quality, greater compaction and loss of soil permeability and subdivision of properties (PBMC, 2014).

In summary, many of the current risks present in urban regions will tend to

be exacerbated in a future scenario of climate change. However, impacts can be minimized or avoided through adoption of no-regrets adaptation measures targeted at reducing current risk factors and introduction of more robust urban-planning and development guidelines and policies.

### **3.3 Overview of urban-development policies and potential adaptation actions**

This section presents a summary of the main urban planning and development actions and instruments in effect or foreseen in public policies. The objective is to present aspects of government activities that contribute toward reducing some of the aforementioned vulnerabilities.

#### **3.3.1. General Aspects**

Under Brazil's federative structure, the Union, the states and the municipalities are autonomous bodies, with competencies defined in the Federal Constitution (CF). The Union (or Federal Government) has the power to set guidelines for urban development, including basic sanitation and urban transport (Art. 21, XX). The Federal Constitution states that it is the competence of the municipalities to provide services of local interest. In this respect, municipalities are responsible for implementation of urban development policies, with a view to organizing full development of a town's social functions and ensuring the well-being of the population (as defined in the caption of CF, Art. 182).



To enable implementation of these constitutional provisions, the Cities Statute (Law 10257/2001) establishes general guidelines for urban policies. One such guideline establishes a guarantee of the right to sustainable cities, meaning the right to housing, environmental sanitation, urban infrastructure and transport, among other services (Art. 2, I). These guidelines are convergent with basic premises for adaptation in urban centres and provide support for reducing risks and mitigating many of the vulnerabilities related to climate change, while contributing toward making cities more resilient.

In view of this normative framework, intergovernmental cooperation and coordination becomes indispensable. This is especially the case when the solution to large and complex urban issues depends upon shared management and administrative cooperation measures, as is the case of management of river basins, conurbations and sprawling metropolitan regions. The Metropolis Statute (Law 13089/2015) sets guidelines for planning, management and execution of public functions of common interest in metropolitan regions and conurbations within states and establishes general standards for integrated urban-development planning and other instruments for shared governance, defining criteria for federal-government support for governance actions in the field of urban development.

In consonance with the aforementioned constitutional provisions, and to ensure

alignment of the main current planning instruments, integrated urban and environmental planning and management systems need to be adopted. These include: Municipal Master Plans, River Basin Plans, Municipal Environment Plans, the Local Agenda 21, Integrated Shoreline Management Plans, Municipal Integrated Solid Waste Management Plans, Municipal Basic Sanitation Plans, Municipal Disaster Risk Reduction Plans, Mobility Plans and Local Social Housing Plans. Such integration is of utmost importance, since all sectoral plans targeted at ensuring and enhancing the quality of life in urban contexts, also serve as environmental-planning instruments of immense importance for reducing the vulnerability of municipalities to future climate-change impacts and for increasing their adaptative capacity.

### **3.3.2. Federal Government sectoral policies for cities as tools for fostering adaptative capacity**

One of challenges that the Cities Statute has posed for government is reversion of a widespread characteristic of Brazilian cities, also common in many cities throughout the world, namely: spatial segregation. Affluent neighbourhoods that have leisure areas and modern urban facilities, coexist alongside immense outlying neighbourhoods and slums, marred by precariousness or total lack of infrastructure, irregular land tenure, flooding and landslide risks, shoddy building standards and degradation of areas of environmental interest.

Creation of the Ministry of Cities, in 2003, signalled the Brazilian Government's commitment to transforming this scenario. This Ministry received the mission of supporting states and municipalities in the formulation of a new urban-development model that contemplates housing, sanitation, mobility, accessibility and urban renewal programmes.

Throughout Brazil, the Ministry of Cities concentrates efforts on four major areas that contribute directly to reducing current vulnerabilities and, more indirectly, toward mitigation of future climate-change threats.

The first of these areas is urban planning and implementation of the Cities Statute, by means of dissemination of methodologies and support for public participation in the drafting and implementation of Municipal Master Plans, through promotion of the National Campaign for Participatory Master Plans. A Municipal Master Plan (PD) instituted by a municipal law, is the main municipal planning instrument for urban expansion and development throughout the territory of the municipality (Cities Statute, Law 10257/2001). All municipalities with populations greater than 50,000 must have a Municipal Master Plan.

The second area of intervention of MCid is social housing. To tackle housing issues, Brazil currently has three instruments that contribute toward reducing vulnerability to climate change: 1) actions for urbanization of precarious settlements, as a strategy for redeeming

social liabilities relating to an accumulated housing deficit; 2) large-scale production of social housing, as a strategy for settling the housing deficit and assuaging future demand for housing; 3) regularization of land-tenure issues in the social interest.

The Programme for Urbanization of Precarious Settlements seeks to provide improved housing conditions for people living in high-risk areas. Actions under this programme are covered by the Growth Acceleration Programme (PAC) to which the states, the Federal District and municipalities may submit proposals for addressing urban-planning, housing, land-tenure, social and environmental issues. Projects for urbanization of precarious settlements must provide solutions for all diagnosed needs in the area, and especially those relating to mitigation of risks and adoption of measures for reducing population densities through reordering of settlement patterns. Projects submitted must encompass deployment of basic infrastructure, containment and stabilization of hillsides for elimination or mitigation of landslide risks, recovery of degraded areas, construction of public facilities, improved roadway systems, and control of subdivisions, with a view to enabling access to public utility and emergency services, land-tenure regularization and social-welfare services.

Moreover *Minha Casa Minha Vida* (PMCMV) a programme that promotes home ownership for low-income families, distributes deeds to decent housing, served by basic infrastructure and services in urban and rural areas of Brazilian

municipalities. Through integration among sectoral policies and coordination with other urban-planning and economic-development instruments, the PMCMV is an important instrument for refurbishing degraded, environmentally-fragile and headwater areas, through promotion of settlement of empty urban spaces and better planned urban expansion. The programme prioritizes families living in high-risk or unhealthy areas, or that have been left homeless owing to states of emergency or public disaster.

The third area of intervention, whereby MCid contributes toward reducing vulnerability to climate change is environmental sanitation. The main elements of the National Basic Sanitation Plan (PLANSAB) approved in December 2013, are universal provision of safe drinking water, and access to wastewater collection and treatment. According to data from the National Sanitation Information System (2013) the greatest deficiencies in sanitation relate to sewage collection, since only 56.3% of Brazil's urban population is connected to wastewater networks.

In order to promote full access to basic sanitation services (i.e., safe drinking-water supply, collection and treatment of wastewater, storm drains, street cleaning and urban solid-waste management) and to achieve universalization goals, initiatives have focused on structural measures (principally strengthening of management and planning capacities) and support for local interventions of states and municipalities. Such interventions include sustainable urban drainage

works and projects targeted at reducing flood risks, improvement of wastewater infrastructure and of environmental safety in municipalities; deployment of water-supply and wastewater systems in urban areas, and support for street cleaning and urban solid waste management.

MCid's participation in sanitation-sector activities is targeted at municipalities with populations of over 50,000 and those that comprise Metropolitan Regions and Integrated Development Regions. In smaller municipalities and rural areas, sanitation activities are carried out under the auspices of the Ministry of Health, through the National Health Foundation (FUNASA).

Urban development actions often intersect with risk-management and disaster-response activities. These are addressed by the National Plan for Risk Management and Responses to Natural Disasters, launched by the Presidency of the Republic on 8th August 2012. (For further details, see the Strategy on Disaster Risk Management). Within the framework of this Plan, MCid conducts initiatives for risk mitigation, through support for structural works for containment of hillsides, urban drainage and flood control, and measures for mitigating the effects of prolonged drought in semi-arid regions through construction of infrastructure for collection, distribution and storage of drinking water. Such initiatives and interventions, whenever possible, should focus on reinforcing capacities for adaptation to climate change, in consonance with the principles of Ecosystem-based Adaptation (EbA).

MCid maintains close ties with the Geological Survey of Brazil (CPRM) which, aside from its main attribution of conducting basic geological surveys, also promotes knowledge on risk areas and conducts zoning exercises for municipalities, through preparation of geotechnical maps showing areas suitable for urban settlement and of vulnerability to disasters, in 821 priority municipalities.

For containment of hillsides, MCid engages in three types of activities: planning (Municipal Risk Reduction Plans (PMRR); projects; and engineering works. In view of their contribution toward reducing urban risks and addressing vulnerabilities relating to the lack of infrastructure and of adequate urban-planning instruments, such actions need to be reinforced and expanded in the coming years.

Finally, the fourth area in which the MCid intervenes in urban development is urban mobility. The National Urban Mobility Policy (PNMU) in conjunction with similar policies and strategies at state and municipal levels, seeks to ensure socially-inclusive and sustainable democratic access to towns and cities, prioritizing collective and non-motorized transport. From the standpoint of this NAP, however, the theme of urban mobility is examined in greater detail on the sectoral strategy for infrastructure.

### **3.4 Priority guidelines for adaptation**

In pursuit of adequate urban development, the investment plans of Brazilian cities seek to incorporate strategies for adaptation to climate change and reduction of vulnerabilities. Such planning entails careful evaluation of climate risks and requires integrated land-use and settlement guidelines for installation of the necessary infrastructure. Moreover, adoption of concepts that reinforce urban sustainability, with lower consumption of natural resources, can greatly contribute to the adaptive capacity of cities.

The main objectives of these proposed guidelines are to rank efforts for fostering the resilience and adaptation capacity of municipalities and to prioritize no-regrets measures and actions for urban development which contribute, directly or indirectly to reducing vulnerability to climate change. There follows a summary of these guidelines.



**1. Promote coordination among the three levels of government** with a view to fostering cooperation for reducing vulnerability to climate change through integrated territorial planning and management by states and municipalities, especially in areas of public interest in metropolitan regions and conurbations;

**2. Consider adaptation to climate change in processes of rehabilitation of consolidated and degraded urban areas**, with a view to fostering urban diversity and limiting urban expansion and exposure of the population to risks arising from inadequate land-use and settlement patterns;

**3. Consider adaptation to climate change during processes for promoting urbanization of precarious settlements**, with the aim of improving housing and living conditions of the population through integrated approaches such as installation of urban infrastructure, housing improvements, land-tenure regularisation, environmental restoration and social-welfare;

**4. Consider adaptation to climate change during large-scale projects for production of social housing**, ensuring conveniently-located housing for low-income families living in situations of vulnerability, through decent and resilient infrastructure, with access to urban, social and cultural goods and services and leisure opportunities;

**5. Strengthen urban planning integrated with policies and practices for prevention of disasters and risks**, through specific urban-expansion projects, setting standards for urban land-use, settlement and land subdivision procedures, with a focus on adaptation to and mitigation of risks posed by climate change;

**6. Promote engineering works for containment of hillsides and formulation of Municipal Disaster Risk-Reduction Plans (PMRR)**, increase the number of municipalities benefited, particularly those listed on the National Register of Municipalities with Areas Susceptible to Landslides, Floods or related Geological or Hydrological Processes (CadRisco) as foreseen in Law 12608, of 10th April 2012;

**7. Incorporate measures for adaptation to climate change into actions for implementation of the National Basic Sanitation Plan (PLANSAB);**

**8. Strengthen actions for Sustainable Urban Drainage** targeted at reducing flooding, through works and services including containment basins, heavy-runoff control structures, seepage-drainage systems, riverside parks, recovery of floodplains, restoration of floodplains, and other related measures. Such sustainable drainage actions, whenever possible, should comply with Ecosystem-based Adaptation (EbA) principles;

**9. Support implementation and improvement of water-supply and wastewater services**, taking into account socio-economic, public-health, ecological and infrastructural aspects of measures adopted, so as achieve health and environmental benefits directly associated with such systems seeking, in particular, decontamination of water bodies, multiple use of water, greater energy efficiency, and use of biogas from wastewater and urban solid-waste treatment, and other renewable energy sources;

**10. Support actions for improvement of street cleaning and management of solid wastes**, with the aim of expanding pre-sorting in municipalities, appropriate disposal of tailings and eradication of landfills, since more intense rainfall arising from climate change may exacerbate outflows of slurry from dumps that contaminate water bodies, exacerbating the effects of inadequate waste disposal on watercourses, in dumps and in densely populated urban areas, aggravating flooding risks;

**11. Support the management and dissemination of information related to climate changes**, as inputs for the drafting of diagnostic studies and development of strategies for adaptation, in synergy with urban planning;

**12. Support studies on the impacts of climate change in different cities**, as inputs for development of adaptation methodologies for urban infrastructure within urban development policies;

**13. Support capacity building for human resources and dissemination of information management technologies**, to assist in implementation of strategies and methodologies;

**14. Incorporate adaptation to climate change into enhanced urban planning models**, with a view to fostering management of land-use and settlement through approaches that respect environmental preservation and mitigate disaster risks;

**15. Support coordination of initiatives for review of regulations and technical standards for buildings and urban-planning**, with a view to promoting resilient buildings and urban infrastructure.