

**THE URBAN POOR'S VULNERABILITY TO THE IMPACTS OF
CLIMATE CHANGE IN LATIN AMERICA AND THE CARIBBEAN.
A POLICY AGENDA.**

Lucy Winchester and Raquel Szalachman
Economic Commission for Latin American and
the Caribbean, United Nations (ECLAC/UN)
lucy.winchester@eclac.org
raquel.szalachman@eclac.org

Summary:

Cities in Latin America and the Caribbean (LAC) currently face many environmental and sustainable development challenges, with significant impacts on human health, resource productivity/incomes, ecological “public goods”, poverty, and inequity. In this context, climate change impacts in the region will exacerbate and create additional complexity, particularly in urban areas. For hundreds of millions of urban dwellers in LAC, most of the risks from the impacts of climate change are a result of development failures. For the urban poor, this fact is disproportionately true. This paper seeks to contribute to the limited body of knowledge regarding climate change, cities and the urban poor in the region, and to inform how institutions, governance and urban planning are keys to understanding the opportunities and limitations to possible policy and program advances in the area of adaptation.

Key Words: urban poverty, adaptation, climate change, Latin America and the Caribbean

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I. INTRODUCTION

Latin America and the Caribbean (LAC) contribute a relatively small proportion to overall greenhouse gas emissions on a global scale. The region's vulnerability however, to global warming is significant. LAC is a highly urbanized region, with urbanization levels rivaling that of many industrialized nations¹. What is done within urban areas has a very large influence on whether the risks arising from the direct and indirect effects of climate change can be reduced. Well-planned and well-governed urban areas can greatly reduce these risks – while unplanned and poorly governed cities can greatly increase them–. Cities² in LAC currently face many environmental and sustainable development challenges, with significant impacts on human health, resource productivity/incomes, ecological “public goods”, poverty, and inequity. In this context, climate change impacts in the region will exacerbate and create additional complexity, particularly in urban areas.

This is a developmental issue. Much of the urban population and most urban governments have a very low adaptive capacity to all environmental hazards, including low adaptive capacity for climate variability and climate change, making large sections of the urban population very vulnerable to any increase in the frequency or intensity of storms, or to increased risks of disease or constraints on water supplies or food price rises, which in wealthier, better governed cities are usually easily adapted to. Particularly vulnerable to these impacts are the urban poor in Latin America and the Caribbean.

The objective of the proposed paper is to deepen our understanding of the policy implications of the urban poor's vulnerability to the impacts of climate change in Latin America and the Caribbean. Our methodological approach will seek to: first, characterize the urban poor, their habitat and their relationship with the habitat³ in LAC cities; second, hypothesize climate change

¹ The Latin American region's urbanization level rose from 73.2 percent in 1995, to 75.8 percent in 2000 and to 77.8 percent in 2005, at which time its urban population amounted to 459 million, as against 131 million rural inhabitants (ECLAC, 2006). According to United Nations population projections, 80 percent of Latin America will be urban by the year 2015. The urban population of Brazil and Mexico constitutes just over 60 percent of the total urban population in Latin America.

² By 2015, 16 percent of the total population will live in 9 large metropolitan areas. Twenty eight percent will live in 122 large cities between 500,000 inhabitants and five million. Thirty six percent will live in small and medium urban settlements, including tens of thousands of small towns with less than 20,000 inhabitants (United Nations population projections).

³ We understand habitat to incorporate not only the physical living conditions immediate to households, and neighborhoods, but also the spatial and social significance of inhabiting the city as a whole.

impacts on the urban poor and their habitat⁴; thirdly, analyze LAC experiences in sustainable pro poor habitat programs/policies for lessons learned to inform adaptation policies for vulnerable urban groups; and lastly, develop policy lessons and challenges for adaptation to climate change impacts for the urban poor based on analytical findings. Our paper will build on research results on urban poverty and precariousness in the region; on environmental and sustainable development issues in LAC cities; and ECLAC advance on overall climate change issues in the region. As such the paper will be based on analysis of secondary data (quantitative and qualitative) available within the United Nation's Economic Commission for Latin America and the Caribbean (ECLAC).

While the paper clearly contributes to the limited body of knowledge regarding climate change, cities and the urban poor, the work also seeks to inform how institutions, governance and urban planning are keys to understanding the opportunities and limitations to possible policy and program advances in the area of adaptation. Recent research shows limited explicit urban and local scale adaptation experiences for climate change impacts in the region. Potential climate change impacts have not been found to be incorporated into regional and urban projects and initiatives as a conditioning agent. Our paper seeks to extract lessons learned from existing programs in order to inform a possible agenda for policy development in this area.

II. THE URBAN POOR IN LATIN AMERICA AND THE CARIBBEAN

Two out of every three poor people in the region are city dwellers. Urban poverty takes the form of low earnings related to precarious employment, a shortage of educational capital and patrimonial assets, and shows inequities based on gender. In urban areas, precariousness living conditions⁵ characterize not only poor households, but also, albeit to a lesser degree, households whose income places them above the poverty line. Social and spatial segregation of the poor is a specific characteristic of LAC cities. Slums, comprising a wide-range of low-income settlements, from deteriorated inner city dwellings to informal settlements, in risk areas and with a variety of tenure arrangements, are in many cities, the only option available for the urban poor. Common to the majority of slums are precarious living conditions often consisting in acute environmental hazards: poor or inexistent basic sanitation, limited access to drinking water, accumulation of waste and local dumps, indoor air pollution due to increased use of biomass for cooking and heating, and quite often locations near to urban environmental conflicts (for example, final disposal sites for solid waste).

Urban poverty is a multidimensional condition, subject to cultural, social and local influences, understood and experienced differently by the poor according to gender, age, ethnicity and capacities. Poor urban households share many characteristics with their rural counterparts. The World Bank (in 2004, cited Wodon et al, 2001) reports that many explanatory factors of poverty are the same across urban and rural areas (household size, female or young household head, low

⁴ Knowledge regarding climate change impacts in cities in the region is limited. Our work is based on existing advances regarding these themes within the United Nations Economic Commission for Latin America and the Caribbean, as well as external expert opinions.

⁵ Among poor households, the most widespread problem observed is lack of access to sanitation, followed by lack of access to secure tenure and to drinking water networks. Next in importance is the problem of poorly constructed housing. Lastly, overcrowding continues to be a predominant feature of poor urban households.

levels of education, and unemployment of the household head and/or their partner). There are however, specific nuances associated with the urban poor. Returns to education are higher in urban areas than rural ones. And, while rural areas are characterized by self-employment, underemployment is prevalent in cities.

Key specific attributes of poverty that can only be found in cities include: socio-economic vulnerability due to the urban poor's integration into the market economy (cash economy); socio-economic heterogeneity within urban areas and in interaction with economic activities and processes; environmental and health risks specific to urban areas; socio-spatial segregation; social fragmentation, instability of networks, and violence; and an insecure and deficient (in terms of quality) access to goods and services.

1. Income

While welfare (and consumption) measures focus on flows of income rather than the distribution of assets and opportunities, they provide an important basis for comparison of poverty incidence over time, and between places. In 2007, 34.1 percent of Latin America's population was living in poverty (28.9 percent in urban areas), and 12.6 percent of these people were extremely poor, or indigent (8.1 percent in urban areas) (See Table 1). Although poverty is proportionally lower in cities than in rural areas, the region's high level of urbanization has concentrated most of the population in urban centers.

While 2002 is the year in which the absolute numbers of persons living in poverty and indigence were at their peak in the region, today, there are still 184 million poor people in the region and almost 68 million who are extremely poor. The percentage of Latin Americans living in poverty conditions has fallen by 14 percentage points since the beginning of the 1990s, but it continues to be significant. Much of the progress made in alleviating poverty and indigence in Latin America between 2002 and 2007 is attributable to growth effects⁶. During this period, labour income accounted for most of the variation observed in the increase of average household income of lower-income groups (ECLAC, 2008)⁷.

Employment creation and increased labour productivity, especially among the poor, are the principal transmitter mechanisms between economic growth and poverty reduction, and permit that economic growth is translated into increased incomes for the poor (Islam, 2004 and Osmani, 2002, cited in Cecchini and Uthoff, 2008).

⁶ This is especially true in the countries that have achieved the highest percentage-point reductions in poverty. Nevertheless, the parts played by growth and distribution effects in the various countries of the region have differed, and improvements in income distribution have been the main cause of the reductions in poverty and indigence achieved in a number of countries (Bolivia, Brazil, Chile, Costa Rica, El Salvador and Panama) (ECLAC 2008).

⁷ In some countries of the region, higher wage income effects in income growth improved relative income distribution. See footnote 8.

TABLE 1: URBAN POVERTY AND INDIGENCE, BY URBAN AND RURAL AREAS, IN LATIN AMERICA/a (%)

Year	Population living below poverty line			Population living below indigence line		
	National	Urban	Rural	National	Urban	Rural
1980	40.5	29.8	59.9	18.6	10.6	32.7
1990	48.3	41.1	65.4	22.5	15.3	40.4
1997	43.5	36.5	63.0	19.0	12.3	37.6
1999	43.8	37.1	63.7	18.5	11.9	38.3
2002	44.0	38.4	61.8	19.4	13.5	37.9
2005	39.8	34.1	58.8	15.4	10.3	32.5
2006	36.3	31.0	54.0	13.3	8.5	29.2
2007	34.1	28.9	52.1	12.6	8.1	28.1

Source: ECLAC (2008). *Panorama social de América Latina 2008*. Economic Commission for Latin America and the Caribbean, United Nations, December 2008. Based on special tabulations of country household surveys.

a/ Estimates for 18 countries of the region plus Haiti.

Regarding relative poverty incidence as a proportion of total urban population, four country groups exist in the region: (i) a first group, where less than 25% of the urban population is poor (Argentina, Costa Rica, Chile, Panama and Uruguay); (ii) the second, where between 25% and 40% of total urban population is poor (Brazil, Ecuador, Mexico, and Peru); (iii) the third, (Bolivia, Colombia, Dominican Republic, Guatemala, and El Salvador) where urban poverty fluctuates between 40% and 50% of the total; and (iv) the last group, with more than 50% of total urban residents being poor (Honduras, Nicaragua, and Paraguay) (Table 1.1, Appendix 1). In all countries where statistics are available, urban poverty levels are greater in secondary and smaller cities, as compared to larger metropolitan areas (ECLAC, 2008).

Income distribution is more unequal in Latin America than anywhere else in the world⁸. The LAC region exhibits significant income inequalities in urban areas as well as at the city level, as compared to other regions in the world⁹. Although conceptually related, poverty and inequality are two distinct phenomena and do not necessarily evolve together¹⁰, and in the long run, persistent inequalities may undermine efforts to reduce poverty. The average Gini coefficients for the region show levels up to 0.56 at the city level and up to 0.50 for urban areas¹¹, although there are some differences among countries¹². Lesser unequal per capita income distributions

⁸ Between 2002 and 2007, nine countries of the region significantly narrowed the gap between the groups at the extreme ends of the spectrum, both by increasing the poorer groups' share of total income and by lowering that of the highest income households (Argentina, Bolivarian Republic of Venezuela, Bolivia, Brazil, Chile, El Salvador, Nicaragua, Panama and Paraguay). In other countries income structure remained relatively unchanged (Colombia, Costa Rica, Ecuador, Mexico, Peru and Uruguay). In Dominican Republic, Guatemala and Honduras the income gap widened (ECLAC, 2008).

⁹ According to UN Habitat (2008), average Gini coefficients for selected cities regionally show the following pattern: Africa (26 city average), 0.54; Asia (38 city average), 0.40; Latin America and the Caribbean (19 city average), 0.55; and Eastern Europe CIS (18 city average), 0.31.

¹⁰ In LAC although GDP per capita has grown in most of the countries, Gini coefficients showed an improvement only in some of them (Table 1.2, Appendix 1).

¹¹ See Tables 1.3 and 1.4 in Appendix 1.

¹² Brazil, Colombia and Guatemala exhibit extremely high levels of inequality at the urban level. At a city level all 19 cities examined exhibit Gini coefficients above the International Alert Line, with Bogota and all the Brazilian cities analyzed showing the highest levels (UN Habitat, 2008).

between households, however, do permit increased reductions in poverty levels, given increases in average incomes per worker or increased State transfers.

2. Public services

In most of the LAC region, access to improved water and sanitation is quasi-universal. The increased growth of the urban population in the region, however, has created a huge pressure on the capacity of water and sanitation infrastructure and systems to continue to deliver adequate services. In 2004, 96 percent of the region's urban households had access to safe drinking water and 86 percent to basic sanitation. In rural areas, access levels are 73 percent and 49 percent respectively. Wastewater treatment is far less widespread: less than 15 percent of the region's municipal wastewater is treated. While regional figures paint a positive image of the region, they mask the diversity of situations across countries, cities and parts of cities, as well as serious deficiencies in the quality and level of supply¹³. Even in the countries where there is drinking water, supply services may be intermittent, and it is estimated that this corresponds to 60 percent of the population served through household drinking water supply connections (Winchester, 2008).

The majority of the persons without access to drinking water supply and sanitation services belong to low-income groups. Many of them are concentrated in periurban areas, principally in poverty belts on the periphery of many of the cities in the region. It has proven to be very difficult to provide these marginal areas with services of acceptable quality. The main problems encountered in efforts to expand services to marginal populations have been due, on the one hand, to the high poverty levels and the low level of payment capacity and culture, and on the other hand, to high construction and operating costs. These urban areas have very often experienced explosive growth and have developed in an unplanned manner, in areas far from existing infrastructure networks and with more difficult topographical conditions. This situation has meant that low-income groups, in many cases, must purchase water from private vendors at prices that far exceed (up to 100 times in some cases) those of official companies. These groups also incur a high health risk, as there is no guarantee of the quality of the water provided (Jouravlev, 2004) or of the alternative solution adopted (collective sources, individual wells, illegal connections to networks, rainwater collection or extraction from nearby water sources)¹⁴.

The Johannesburg Plan of Implementation explicitly recognized that water and sanitation are fundamental to poverty eradication and sustainable development overall. Increasing access to domestic water and sanitation services and improving water resources management are catalytic entry points for efforts to help developing countries fight poverty and hunger, safeguard human health, reduce child mortality, promote gender equality, and manage and protect natural

¹³ According to World Health Organization statistics, in 2004, nine countries show coverage levels greater than regional averages (Argentina, Brazil, Colombia, Dominica, Mexico, Surinam, Uruguay, and Venezuela). Twenty-four countries show average coverage levels less than the regional average; in Haiti in 2004, just over 9 percent of the total population living in urban areas had domiciliary connections to drinking water. Central American countries show a subregional average of 47 percent coverage (with household connections), while the Caribbean shows a subregional average of 49 percent. South America shows better performance levels (73 percent).

¹⁴ Increasing levels of water pollution are affecting many bodies of water in the region.

resources¹⁵. In addition, sufficient water for washing and safe, private sanitation facilities are central to the basic right of every human being for personal dignity and self-respect.

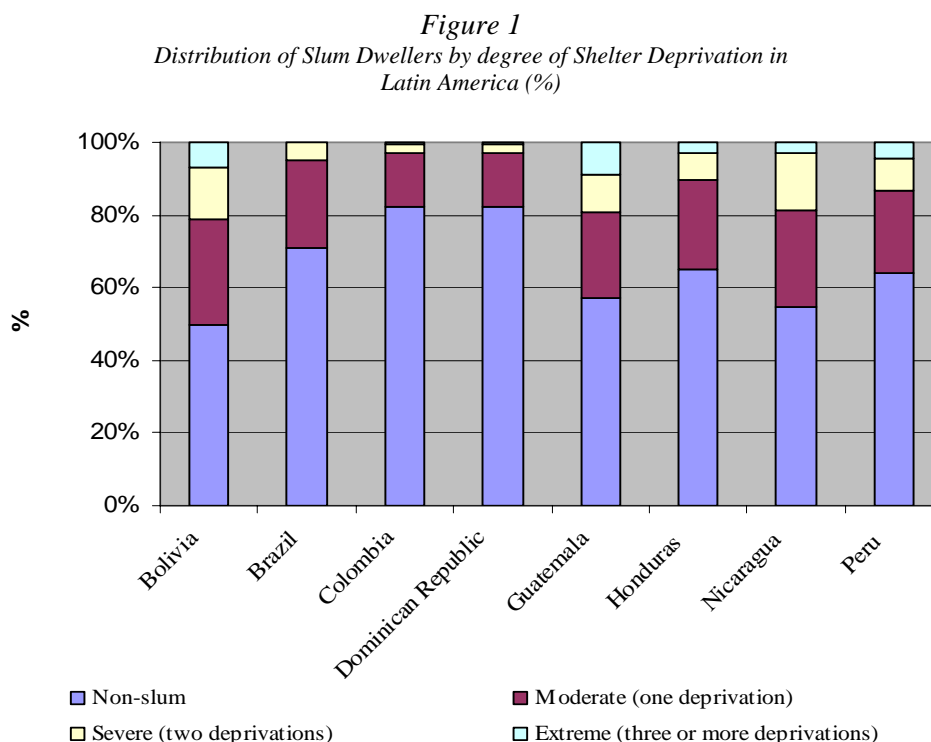
3. Land tenure, poor quality of houses and slum formation

Studies by ECLAC showed that low-income households are willing to save mainly to acquire assets which are very valuable for them; among those, land is the most valuable asset held by the poor (Szalachman, 2003). High land prices due to the scarcity of urban land -- originated by the expansion of human settlements and the absence or weakness of mechanisms for rational land distribution among competing uses, and patterns of land ownership and use --, along with the lack of financial resources for low income groups, have given rise to irregular settlements as often the only available option for urban poor. As a consequence, irregular tenancy and property insecurity are common to many cities in LAC. While the numbers vary from country to country, a more or less significant amount of Latin America's urban populations (nearly 50% in some cases) lives in informal housing situations, meaning that they illegally occupy public and, to a lesser extent, private land. The significant increase in land prices in large cities has frequently had the collateral effect of relegating the poor to low income peripheral areas due to the lower cost of land, thus contributing to the socio-spatial segregation of the poor.

An additional condition characterizing the urban poor's habitat situation, is overcrowding: a high percentage of its population live in overcrowded dwellings. More than 30 percent of the urban poor population in 9 out of 14 countries lives in overcrowded conditions: that is three or more people to a room (ECLAC, 2006).

According to UN-Habitat, one out of every three people living in cities of the developing world lives in a slum. There are approximately 117 million slum-dwellers in the LAC region. Average slum prevalence in the cities of the region is 27 percent (UN Habitat, 2008), although in Bolivia, Guatemala, Haiti and Nicaragua the concentration of slum households is very high (50.4, 42.9, 45.5, and 36.1 percent of total urban population, respectively). In Brazil, almost 30 percent of urban population lives in slum conditions (accounting for over 45,000,000 persons). These slums cover a wide range of low-income settlements, from precarious dwellings in central districts, to the informal settlements with inadequate infrastructure and facilities and overcrowding, located in risk areas and with different forms of tenure. Within these areas income levels are heterogeneous: for example, in Brazil, the non-poor comprise a significant proportion of residents of *favelas*, to over 50% in some cities. The formation of slums in major cities has strengthened the processes of urban and social exclusion, has exacerbated land use conflicts in urban development plans and has impeded the process of improvement poverty conditions. The exclusion that slum dwellers live is often not just limited to access to the benefits the city offers, but also to participation in the decisions affecting the city. Common to the majority of slums are also poor or inexistent basic sanitation, limited access to drinking water, and accumulation of waste and local dumps. Figure 1 shows the degree of shelter deprivation in slums for some countries, and as can be seen, Bolivia, Guatemala and Peru show the highest proportion of extreme deprivation (meaning three or more deprivations).

¹⁵ As regards to food security, by the start of the current decade, about 10 percent of the Latin American and Caribbean population (52.9 million people) suffered from undernourishment (ECLAC, 2006).



Source: UN Habitat (2008), *State of the World's Cities 2008/2009. Harmonious Cities*. Earthscan: London. Figure 2.4.8A, p. 103, based on data from the Global Urban Observatory.

4. Health care, education and social security benefits

These are three important sectors where social inequalities are particularly acute in Latin America. These inequities are characterized not only by specific population groups access to health, education and other social services, but also by the deficient quality of these services. Studies reveal that 70 percent of poor adults in urban areas have low levels of skills, as compared to 50 percent for the urban work force in its entirety. This is due to lower levels of education, but also to the poor quality of education and training to which the urban poor generally have access¹⁶.

The region shows important deficits in health (an infant mortality level of 25.6 per 1,000 live births), education (around 25 percent of Latin Americans aged 15 and over have not completed their primary education), and in most countries where social security systems have been implemented, the systems are very regressive with the higher strata benefiting from better systems than lower income groups¹⁷. This later group generally lacks access to social security due to limited public programs, unemployment, or labour informality¹⁸ (poor job quality, a lack

¹⁶ Similarly, evidence suggests that differences in wages between different groups of people may be ascribed to levels and quality of education (Arias, Yamada and Tejerina, 2003).

¹⁷ Around 2006, 16.3 percent of first quintile workers were covered as compared to 51.3 percent of fifth quintile workers.

¹⁸ Also around 2006, 19 percent of urban informal workers show social security coverage, as compared to 68.4 percent in urban formal workers.

of job security, low wages and a lack of access to social security). Women, again, overall show even more precarious access to social security¹⁹.

ECLAC (2006 cited in Cecchine and Uthoff, 2008) studies have detailed the links between the scarcity of human capital of active members of poor households, to their limited access to educational opportunities and the decisions of these families regarding their children's insertion in the educational system. Members of poor household have deficient educational levels, accessing precarious employment opportunities. Children and youth from these homes have few "quality" opportunities to educate or train themselves, this situation, combined with their lack social capital, limits them to accessing low productivity jobs in labour markets (ibid: 46).

5. Vulnerability

The Latin American and Caribbean region is subject to extreme climatic events and natural phenomena that take place in frequently recurring cycles; these events and phenomena (earthquakes, tropical storms, hurricanes, floods, droughts, volcanic eruptions) are not duly taken into account in urban planning and management. The region is highly vulnerable to these increasingly intense and frequent natural phenomena, which affect its ever more fragile ecological and social systems. The region's cities are extremely vulnerable to disasters of both natural and technological origin (the risks inherent in hazardous activities), with negative microeconomic and macroeconomic consequences at the local, regional and national levels. Moreover, urbanization patterns, especially among poor sectors (occupation of high-risk land, use of unsound materials), further heighten urban vulnerability.

Vulnerability, in fact, is a critical dimension of poverty. Poor people are particularly at risk from environmental shocks and crises, these groups are more exposed -- socially, economically and physically -- to the impacts of extreme events and, to the impacts of adverse environmental tendencies, although regarding the later, there is less empirical information regarding long term behavior trends. Increasingly frequent and severe natural disasters as well as changes in rainfall patterns, shifting agricultural zones, and rising sea levels impact developing countries and the poor who live there disproportionately. As low income groups are not usually covered by social security systems, they experience much more losses when natural disasters occur. The poor are usually the most affected by environment-based conflicts, which are also becoming more frequent in the region. The poor tend to settle in high risk areas in cities (geographically unstable environments) building their communities and homes with precarious materials.

In developing countries the consequences of disasters are more severe than in developed countries; the degree of vulnerability to disasters, although a function a various factors, is essentially a development issue. For example, due to cost restrictions, infrastructure in developing countries is generally not built according to specialized codes minimizing possible impacts from extreme climatic or natural phenomena. Institutional and cultural organization patterns show very limited capacity to respond to disasters, to mitigate impacts, and to recuperate from catastrophic events (Simioni, 2003). The urban poor are especially subject to higher levels

¹⁹ As shown by the following data from ECLAC (2008), workers with social security coverage as a percentage of the working age population: men, 25.5 percent and women, 15.4 percent.

of urban vulnerability (for economic, societal and cultural factors). These sectors are also more severely effected when disasters hit, suffering losses of major assets (housing).

6. Employment

Low growth rates have had negative effects on employment and the creation of new jobs, particularly in urban areas. Due to the insufficiency of the formal sector to accommodate an expanding urban population, nearly 40 percent of the urban population in Latin America is employed in low productivity sectors²⁰ of the labour markets; this is a relatively constant characteristic of urban labour markets during the last 15 years in the region²¹. Hence there is a high presence of large informal sectors and the persistence of underemployment among the poorest households. In 2006, informal workers in urban areas of Latin America accounted for 44.9 percent of all workers. Women are disproportionately represented within this sector: in 2005, about 60 percent of total low productivity workers were women. ECLAC studies show that in all regional countries, women receive lower wage incomes as compared to men, given equal educational levels and experience (Cecchine and Uthoff, 2008).

Joblessness in Latin America remains high, and as of 2006, the rate was still 2.4 percentage points higher than in 1990. Although some improvements were seen since 2002, sharp inequities still exist, with higher rates among the poor, women and youth.

Not all countries report the same level of wage employment, and such differences attest to the diversity of urban labour market conditions in the region. Three in every four urban employed people are wage earners in Argentina, Chile, Costa Rica and Mexico, closely followed by Brazil, Panama and Uruguay. In the Boliviaran Republic of Venezuela, Bolivia, Colombia, Guatemala, Honduras and Peru, however, only three or fewer out of every five employed people work for someone else. These countries also have a higher proportion of people employed in low-productivity sectors.

The current functioning of labour markets in the region prevents a large proportion of employed persons to live above, or beyond, the poverty line. ECLAC studies (for 2005) show that in urban areas in the region, between 10 percent (Chile) and 54 percent (Nicaragua and Honduras) of employed persons live in poverty conditions (Cecchine and Uthoff, 2008)²².

According to the World Bank (2004) wage income represents 80 percent of total monetary income of the urban poor in Latin America. Integration into the market economy means that the urban poor are much more vulnerable to economic shocks than their rural counterparts, a

²⁰ Monthly labour income of urban workers in these sectors fell from US\$345 to US\$283 at 2000 prices between 1990 and 2006, widening the gap with formal-sector workers, whose income averaged US\$ 493 in 2006 (ECLAC, 2008).

²¹ In 2006, Bolivia, Paraguay, Honduras, Guatemala and Nicaragua, show levels of employment in low productivity sectors of more than 60% (ECLAC, 2006).

²² Four groups of countries exist in the region. The first group is comprised of five countries (Chile, Costa Rica, Argentina, Uruguay and Panama), where between 10 and 19 percent of the urban employed are poor. The second group of countries (Mexico, Brasil and Venezuela) shows levels of between 20 and 29 percent of total urban workers as income poor. The third group of countries is El Salvador, Guatemala, Ecuador, Colombia and Paraguay (between 30 and 39 percent of total urban workers are working poor). And finally in Bolivia, Nicaragua and Honduras where more than 40 percent of the urban employed are poor.

situation that underscores the importance of the mechanisms of survival and adaptation of households, and understanding of the development of intervention strategies. Macroeconomic shocks are transmitted to poor urban households through the labour market²³. Own account workers and those lacking in job security are the hardest hit when there are negative movements in the business cycle. This situation, combined with the heterogeneity of the urban area and its processes and business activities, make it complex and difficult to anticipate the effects of external shocks in the different social sectors. Although in 2005 about one third of total regional population lived in poverty (income measurement), the proportion of income vulnerable households is even much higher. In not one Latin American country²⁴, is the per capita average income of the fifth income quintile equal to or larger than 2 times the poverty line (Cecchine and Uthoff, 2008). Fifty percent of the population of Latin America is income vulnerable. In Argentina, Bolivia, Paraguay, Uruguay and Venezuela, 70 percent of the population is income vulnerable.

In many cities of the region, the urban poor inhabit formally (tenure) and work informally. Thus poverty is prevalent in formal neighbourhoods created by public programs or through old invasions that were consolidated through combined public and community efforts. Those urban poor who work in the formal sector and inhabit formally are particularly vulnerable to economic cycles, both for the increased cost of living in conventional housing (with services "bought" in the market) and a relative increased rigidity in their asset mix.

This situation, combined with the heterogeneity of the urban territory and its processes and economic activities, makes it difficult and complex to anticipate the effects of external shocks to different social groups.

7. Social exclusion, social risk, violence

Maybe the worst consequences of the economic process of urbanization are the problems of social exclusion, social risk and violence. The social exclusion process closes the access of vulnerable people to the basic social structure that is needed for their human development. High levels of inequality usually menace social cohesion as they may lead to increases in crime and other forms of social and political conflict. These, in turn, create insecurity and lack of confidence among the economic agents which poses a further risk to economic growth and social development. Some studies have found a strong linkage between high levels of violence and lack of work and vice versa. These studies also found that in general, high rates of violence make mobility within the community dangerous, resulting in reduced access to education and lack of investment in communities (World Bank, 1997).

Particularly acute in urban areas in the region, is violence committed upon and by young people. Young people are over-represented in terms of incidence and gravity of violence, as both victims and perpetrators. Studies show that the incidence of violence among the causes of young people's deaths in Latin America is rising and has a strong gender bias: the rates for young men are more than double those for young women in deaths by homicide, traffic accidents and

²³ Consumption price effects can also be significant for the poor. For example, escalating food and oil prices triggered an upswing in indigence in mid-2008.

²⁴ Sixteen countries (Argentina, Bolivia, Brasil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Uruguay, Venezuela) for the year 2005.

suicides (ECLAC, 2008). Underlying this phenomenon, is a marked material and symbolic social exclusion, reflected in inequality of opportunities, a lack of access to employment, alienation among young people who are not studying nor working, and the gaps between symbolic consumption and reduced material consumption. Other considerations include territorial segregation, and the lack of public spaces for social and political participation.

The persistence of inequalities due to social exclusion and difficulties in accessing social services and socio-political institutions has undermined efforts to decrease income inequality, and at the same time has increased group and individual vulnerability and has created poverty traps caused by the impossibility of social and physical mobility (Poverty Research Unit at Sussex, 2003).

In Latin America, how the very poor perceive social inclusion reflects their aspirations for economic autonomy and material well-being, and their desire to possess the essential skills needed to get ahead in a knowledge- and information-based society. Perceptions and sensations of exclusion are stronger among the poor than among the non-poor. Feelings of loneliness, impotence and disorientation are most common among Latin Americans who live in lower-income households and have lower levels of education²⁵.

8. Urban environmental degradation

Urban environmental degradation is a serious problem facing the region. Generally speaking, the causes of the increase in air, soil and water pollution in the region are associated with unplanned urbanization processes, agriculture (use of unsustainable techniques and agrochemicals) and poor environmental management. The uncontrolled growth of cities has exposed a large proportion of the population to deteriorating air and water quality, solid and hazardous waste contamination and coastal degradation. Overcrowding, lack of infrastructure and urban sprawl heighten exposure to pollutants, with the result that the poorest sectors are usually the primary victims of pollution. Usually poor neighbourhoods and slums are located near polluting industries or near rivers with polluted water due to industries residuals.

Urban inhabitants in Latin American mega cities and large metropolitan areas, as well as increasingly in medium sized and smaller cities, are exposed to air pollutants that surpass recommended limits²⁶. In Mexico alone, approximately 25 million people are affected by air pollution. The evidence on airborne particulate matter and public health is consistent in showing adverse health effects at exposures experienced by urban populations in cities throughout the world, in both developed and developing countries. The range of effects is broad, affecting the respiratory and cardiovascular systems and extending to children and adults and to a number of large, susceptible groups within the general population.

²⁵ Based on analyses by ECLAC (2008) of special tabulations of Latinobarometro survey.

²⁶ Cifuentes (2005) surveys available air quality data for 46 cities in LAC. At the time of this study, twenty six of these cities, containing 85 million people (of which 28 million were children less than 18 years of age) out of the almost 100 million population of the cities considered in the study's universe, were exposed to particulate concentrations above internationally accepted levels. For many of them (18 million, 6 of them children), the excess was notably large (more than twice the US standard at that time).

Much of the population in LAC faces a double environmental burden. Malnutrition, lack of access to health services and other ills related to poverty may render the population more susceptible to developing adverse health effects from air pollution. How far socioeconomic status modifies the effects of air pollution on health still warrants attention²⁷.

The direct and indirect environmental and social costs that represent the production, handling and inadequate disposal of waste to the urban community are growing in the region and are significant²⁸. At a regional scale, 45 percent of all waste is disposed of in open-air dumps or waterways. In small cities in the region, this proportion reaches over 60 percent. In the region's slums and urban marginal neighbourhoods, environmental and health conditions can be dramatically poor. The economic and social impoverishment in these settlements force many families to use waste as a survival strategy, via street collecting or scavenging in dumps, with the associated health risks.

III. CLIMATE CHANGE IMPACTS AND THE URBAN POOR IN LAC

The earth's surface temperature has increased between 0.74 and 1.8 degrees Centigrade since 1906 (Un Habitat, 2008) but only in 2007 the Stern Report and the Fourth Intergovernmental Panel on Climate Change (IPCC) emphasized two important new elements: the human responsibility on climate change and the potential damage of climate change under different scenarios (ECLAC, 2009). While cities are not the only generators of greenhouse gas emissions, there is no doubt that built-up areas consume more energy, producing more carbon emissions and therefore a larger contribution to climate changes, than undeveloped areas.

Estimates by the United Nations Environmental Program (UNEP), indicate that in 2000, the Latin America and Caribbean region was responsible for approximately 12 percent of global carbon dioxide emissions, with 4.3 percent of emissions coming from industry and 48.3 percent from land use changes (principally deforestation). Eighty-three percent of greenhouse gas (GHG) emissions in LAC are from six countries (Brazil, Mexico, Venezuela, Argentina, Colombia, and Peru) (UNEP/ROLAC and SEMARNAT, 2006).

On a global scale, there is a strong correlation between emissions, population and GDP rankings, reflecting the importance of population and economic growth as emissions drivers. While this correlation holds true for the LAC region as well, overall drivers in the region include a rapid growth of energy consumption, substitution of other fuels for clean natural gas in both the non-

²⁷ Temporal variations in ambient PM10 concentrations have been associated with increased daily mortality. In Sao Paulo, a 1995 study shows how the death rate of adults living in more polluted zones was 13 percent higher when suspended particulate concentrations were relatively high. In Lima, in 1998, more than 90 percent of medical admissions of children under 5 was due to respiratory infections, many of which can be attributed to air pollution and specifically to transport sector emissions.

²⁸ The environmental impacts are mainly revealed in the contamination of surface and underground waters for public supply and the obstruction of drainage canals due to the uncontrolled dumping of solid wastes in bodies of water. Other important impacts that affect human health are the emission of air contaminants due to open air burning; the incineration of waste without adequate control equipment; the transmission of pathogen microorganisms through water; by food; as well as vectors that transmit diseases. These are in addition to aesthetic and nuisance impacts due to noise and bad odors.

electricity sector and for electricity generation, low comparative advantages for alternative energy sources, serious air pollution levels in many urban centers, and continued deforestation.

While it is impossible to calculate the exact proportion of greenhouse gases generated in urban areas, worldwide they are likely to account for most human-driven emissions. This takes into account the concentration of industry and wealthier social groups with high-consumption lifestyles. It also factors in the greenhouse gas emissions from activities that serve urban areas, such as agriculture, forestry, oil and natural gas exploitation, air and road transport, and electricity generation. In Latin American cities, the combined impacts of population growth, urbanization, motorization and increased energy use act as drivers for emissions.

In this context developed economies generate and suffer the consequences of high levels of emissions. On the other hand underdeveloped areas contribute very little to its generation²⁹. The LAC region suffers its consequences in a disproportionate way (ECLAC, 2009), due to its geography, with numerous insular states located within the hurricane strip, and low coastal zones³⁰, or others depending on Andean defrosting for urban water provision, or subject to forest floods and fires.

This section presents an overview of the impacts of climate change for the region, principally based on IPCC findings, of particular relevance for urbanization issues, and the urban poor. While the IPCC global models are currently our principal source of understanding the global implications of climate change, these global models are not particularly useful for subregional and local analyses, due to regional diversities in topography and geography, as well as in relative sizes and characteristics of the countries of the region. Global perspectives on regional impacts, however, do provide key elements for understanding the broad and profound implications of climate change for the urban poor.

Regional climate change impacts are expected to be wide ranging and include coastal sea level increases, increased sea surface temperatures in the Caribbean Basin, increased intensity of weather disturbances, tropical glaciers and snowcap melting, significant warming of moorlands and other high altitude ecosystems in the Andes, higher frequency and extension of forest fires, the appearance of tropical disease vectors in the Andes piedmont, changes in agricultural productivity, and impacts on coastal and watershed ecosystems. Under certain scenarios, food insecurity could be significant.

Most of the region's largest cities are coastal cities and so are vulnerable to sea level rise; many are very vulnerable to extreme weather events; and many Pacific Coast cities rely on glacial melt for their water supplies during dry summers – a source that will be severely depleted within 20 years at current rates of glacial melt.

In Latin America for instance, the coastal plain of north-east South America is very low-lying, generating risks for major settlements from north-east Brazil to Venezuela. The coastal zone of

²⁹ Three and a half percent of CO2 emissions associated to the energy sector in 2005. LAC is also under the average level of CO2 per capita emissions on a global scale (Acquatella, 2008).

³⁰ In most Caribbean island states, 50 percent of the population resides within 2 km of the coast (Vergara, 2005).

Guyana holds 90 percent of national population and 75 per cent of the national economy; its highest point is 1.5 meters above sea level with much residential land, including the capital Georgetown, below high water sea level. In many Caribbean states, between 20 and 50 per cent of population resides within the low-elevation coastal zone (Satterthwaite, 2007).

Vulnerability profiles in the region generally incorporate the multiple dimensions of development in the context of climate change and extreme events / disasters. Lacking in these profiles is the explicit recognition of the urban poor's heightened economic vulnerability due to their dependency on cash incomes through an insertion in precarious labour markets. This reality is further complicated by price effects, in that access to urban services (water and sanitation, energy, transportation, health, and even education and childcare) depends on both the availability of quality services, and cash outlays by the poor. Access to housing (location, tenure and quality) also depends on cash income.

In the face environmental change and extreme events, how the poor manage risks stemming from exposure to these hazards is uncertain, and specific to social, cultural and territorial contexts. Research shows us that the poor manage their asset portfolios in order to try to limit the impact of external shocks. They may combine these strategies with seeking new livelihood opportunities. Climate change complicates this situation. The poor, besides being impacted disproportionately, are highly vulnerable to possible price effects which may exacerbate poverty conditions. It is important that vulnerability profiles incorporate an understanding of the factors which are transmitting poverty to vulnerable populations in urban areas in LAC (precarious labour markets, the poor's insertion in the cash economy, education and health issues, urban economics and land use, property rights and tenure) and how climate change may shift and change these factors in relation to the urban poor. Mitigation measures may also affect these factors, as well, in positive and negative ways (for example, price effects for energy).

Water resources

The LAC region, although basically humid, with large fresh water resources, presents difficulties in water availability and quality due to the irregular temporal and spatial distribution of resources. Stress on water availability and quality has been documented where lower precipitation and/or higher temperatures occur (IPCC, 2007:586). During the last decades, important changes in precipitation and increases in temperature have been observed in the region. As a consequence of increased temperatures, the trend in glacier retreat is accelerating, and is a critical issue for Bolivia, Peru, Colombia and Ecuador, where water availability has already been compromised either for consumption or hydropower generation. The IPCC states that these problems with supply are expected to increase in the future, becoming chronic if no appropriate adaptation measures are planned and implemented. La Paz, Quito, and Lima will be particularly impacted.

The IPCC reports that by the 2020s, the net increase in the number of people experiencing water stress due to climate change is likely to be between 7 and 77 million. For the second half of the century, the potential water availability reduction and increased demographic pressures would increase these figures to 60 and 150 million (2007:583). Access to safe drinking water will become a concern for a greater proportion of LAC inhabitants.

Additionally, with respect to mountainous areas, among other expected changes, are a loss of many of the environmental goods and services provided by these mountains, especially water supply to urban areas, basin regulation, and associated hydropower potential.

The demand for water for irrigation is also projected to rise in a warmer climate, bringing increased competition between agricultural and domestic use in addition to industrial uses.

Extreme events and disasters

Many countries in the LAC region are at increased risk from natural disasters as a consequence of climate change. The region is subject to extreme climatic events and natural phenomena that take place in frequently recurring cycles --earthquakes, tropical storms, hurricanes, floods, droughts, volcanic eruptions – and the region is highly vulnerable to these increasingly frequent natural phenomena, which affect its ever more fragile ecological and social systems. According to UNEP studies (2003) in 70 percent of the area represented by Latin American countries, current vulnerability to flooding events is high.

Within the region the Caribbean is the sub region most affected by natural disasters. The entire region's cities are extremely vulnerable to disasters of both natural and technological origin (the risks inherent in hazardous activities), with negative microeconomic and macroeconomic consequences at the local, regional and national levels. ECLAC estimates that in the 2004 hurricane season, total economic impact of natural disasters in the region amounted to 7,559 million USD: and in 2005 season, to 5,409 million USD.

Estimations of future impacts and vulnerability to climate change show an important increase in the number of people at risk of hunger³¹ and in the number of victims as a result of coastal floods, landslides and mudflows. For example, in 100 years the Rio de la Plata in Buenos Aires is expected to have average water levels of 60-100cm higher than today and stronger winds and storms surges. Within the metropolitan area, the zones most at risk are the low lying lands of the lower basins of the rivers, which have high concentrations of informal settlements (Satterthwaite, 2007).

Experts on climate change sustain that the risk of extreme events such as floods, droughts and severe storms increases as global climate change escalates. For developing countries the risks come not only from direct exposure to natural hazards, but also from the vulnerability of social and economic systems to the effects of these hazards. This situation is much worse for low income inhabitants, usually living in high risk areas or in areas with lack of clean water³², and a higher exposure to many diseases.

Urbanization patterns, especially among poor sectors further heighten urban vulnerability. Urban population are very exposed to natural disasters basically because urbanization worsens flooding because it restricts where floodwaters can go, as large parts of the ground are covered by roofs, roads and pavements, and it obstructs natural channels (IDS, 2008). And as more people crowd into cities, even moderate storms produce dramatic flows. These worsen due to the high

³¹ According to studies summarized in the IPCC 2007, if the mean temperature rises a few degrees, output growth will lag behind growth in global food demand, sending food prices upward (IPCC, 2007).

³² According to ECLAC the cost of clean water has increased 10 times en the last century, and available reserves are diminishing dramatically.

proportion of urban settlements that lie less than 10 meters above sea level, and the inexistent or scarcity of collective mechanisms for reducing or managing these kinds of risks.

A large proportion of low income urban families live in informal settlements (including many on land occupied illegally) and work within the informal economy, and thus do not sustain themselves within official rules and regulations. Given their habitat location, on the coast or by rivers, where drainage systems usually do not exist or are inadequate, as well as the poor quality of their homes, the poor are least able to avoid the direct or indirect impacts of climate change and are likely to be most affected. Due to low or unstable income level, these people can only afford to live in very risky zones and are usually unable to move or change jobs when a natural disaster is imminent. They are also least able to cope with illness, injury, and premature death, which may explain the rapid growth in the number of deaths and injuries from natural disaster, especially in Central America³³.

Women often have particular vulnerabilities as a result of gender related inequalities that exist in most of LAC and that is expressed as discrimination in access to jobs and in lower or less stable incomes, resources and services. These inequalities prior to a disaster manifest themselves afterwards in many ways: differentials in impacts and in the availability of resources and services to support recovery and reconstruction (Satterthwaite, 2007).

In Latin America for instance, the coastal plain of north-east South America is very low-lying, generating risks for major settlements from north-east Brazil to Venezuela. The coastal zone of Guyana holds 90 percent of national population and 75 per cent of the national economy; its highest point is 1.5 meters above sea level with much residential land, including the capital Georgetown, below high water sea level. In many Caribbean states, between 20 and 50 per cent of population resides within the low-elevation coastal zone (Satterthwaite, 2008).

Human Health

A warmer climate will generally increase exposure to tropical diseases, health impacts from weather disturbances in the Caribbean Basin, and respiratory irritants. In Latin America, a large portion of the population lives in mountain ranges, including large urban areas situated above 2,000 m, normally not exposed to tropical diseases (dengue and malaria). Increased temperatures will most probably affect the prevalence of these vector borne diseases in higher altitudes. Diarrhoeal diseases also may increase as a result of more frequent and severe floods and drought. An increase in the frequency and severity of extreme weather events will result in more frequent humanitarian emergencies, particularly affecting populations in high-risk areas such as coastal zones, river valleys and cities. Climate change is also expected to lead to an increase of rodent-borne diseases: due to a warmer climate and changing habitats, allowing rodents to move into new areas.

Urbanization pressures have led to increased exposures of urban inhabitants to both traditional (infectious and transmissible diseases) and modern risks (chronic and degenerative diseases) in addition to those related to urban landslides and floods (IPCC, 2007:587). The urban poor are disproportionately exposed to both traditional and modern risks. Within the group of urban poor,

³³ For instance the Stan Hurricane in 2005 (more than 1,500 deaths) or the Mitch Hurricane in 1998 (around 18,000 deaths), also in Caracas Venezuela flash floods and landslides killed nearly 30,000 in 1999.

children are over represented, as poor families have higher dependency ratios than higher income families. (Without adequate infrastructure and urban planning, poor dwellers that suffer from malnutrition, poor water quality and lack of sewage/sanitary services are exposed to all kind of diseases. Most of LAC has suffered in the last three decades numerous epidemics related to floods, for instance, most recently in Santa Cruz, Bolivia, dengue³⁴. Infants and elderly people are among the most vulnerable population, who are also less able to cope with heat waves or unable to move fast when a disaster is imminent. Due to lack of hospitals and medical facilities for low income population, this implies high mortality levels among the low income population.

Human migration due to drought, environmental degradation and economic reasons may also spread disease in unexpected ways, and new breeding areas for vectors may arise due to increasing poverty in urban areas (Sims and Reid, 2006 cited in IPCC, 2007, 601).

IV. REGIONAL EXPERIENCES IN MITIGATION AND ADAPTATION

1. Adaptation

Adaptation for low income people must take into account pre-disaster adaptation to vulnerabilities, adopting measures like infrastructure improvements and reducing people's exposure by moving them to safer locations or improving their housing. Adaptation must also focus on reducing the impact of the hazard, for example, responding rapidly to flooding disasters. Finally measures should be implemented that reduce risks to likely future hazards, bearing in mind the uncertainty of their timing and magnitude.

People in LAC cities are much more vulnerable to extreme events due to climate change than those in wealthier and better governed cities, due to lack of resources or limited capacity of local or national governments to provide low income households with adequate infrastructure, and health services. Decentralization of responsibilities to urban authorities should have helped address these issues, but often it has not been accompanied by increased revenues or revenue-raising capacity. In most countries, the reform of the state during the 1990s weakened many of the mechanisms that support adaptive capacity as the state withdrew from public transport, health care and public works (Cetrángolo, 2007).

The high proportion of informal settlements constitutes an additional source of vulnerability in the face of natural disaster. These settlements generally do not have adequate infrastructure or services, situation that often causes the failure of dams and the collapse of public facilities (hospital, schools, bridges and highways) during weather caused disasters. Better and more stable incomes, as well as improvements in education, health, land use regulation, urban planning, housing quality standards, water management and infrastructure investment could increase adaptive capacity.

On the other hand, the LAC region presents huge geographic differences among countries, from many small islands to large deserts, as well as tropical and still unexplored forests. The climate

³⁴ According to the Bolivian Health Ministry, between December 2008 and February 2009 there were 50.000 cases reported only in Santa Cruz, and during that period of time there were some single days when 1.500 new people were infected.

change impacts and the associated risks people will face, are very different depending on the geographic characteristics of the country. In coastal areas global warming has caused the sea level to rise and hurricanes and storms have increased in the last decades. In Andean valleys there has been a water shortage³⁵ during periods of low rainfall, causing severe reduction in hydro-electric generation to the cities located in this region, together with huge increases in water availability and overflows, usually in spring, due to the melting of mountain snow. Whereas in tropical zones health diseases due to epidemics have increased in frequency, probably due to the increase in malnutrition and water pollution.

Geographic differences, the different sizes of the cities, and differences in income level and in income distribution also mean there is a great variation in the capacity and form in which LAC urban centers will adapt to the impacts of extreme weather events. There is evidence that some social indicators like adult literacy, life expectancy, and access to safe water have improved over the 1990s, but others contribute to limiting adaptive capacity such as high infant mortality, low secondary school enrolment, and high income inequality³⁶.

Some examples of autonomous adaptation especially in housing, such as improvement in design or quality, can be found in the related literature. Unfortunately most of the policy driven adaptation is through disaster response rather than reducing risks taking into account the factors that increase poor people's vulnerability. Probably one of the reasons is that governments and civil society have still not understood the magnitude and urgency of the problem, even though they have experienced the devastating impacts of current phenomena, with an increased number of victims from hurricanes and other extreme events.

Disaster risk reduction is an essential part of adaptation; it is the first line of defense against climate change impacts (Mitchell and Van Aaist, 2008). A shift from disaster response to disaster preparedness and disaster risk reduction has not yet occurred in most city and national level policies, and without doubt this type of change would have significant relevance for improving urban resilience to climate change.

However, there are examples of urban governments that have key roles as risk reducers, providing necessary infrastructure and services, guiding settlements development and regulating industries, transport and other hazardous activities that can produce disasters. The work of La Red (the network of social studies for the prevention of disasters in Latin America) has shown how good urban governance is central to adaptation and how much it can reduce risks and vulnerabilities to extreme weather events.

Manizales in Colombia and Ilo in Peru are good examples of city governments taking steps to reduce vulnerability. Although neither of these local authorities was driven by climate change consideration, local governments took steps in order to avoid rapidly growing low-income populations settling on dangerous sites. Manizales was facing high rates of population growth and environmental degradation and from 1990 on local authorities together with private organization worked to develop programs in order to reduce risks and improve the living

³⁵ Water shortage is also a huge problem in Mexico City, which has to import around a third of its water from neighboring river basins with very high energy costs (Satherthwaite, 2007).

³⁶ "Poverty and Climate Change", 2004.

standards or the poor and also to regenerate ecological areas. In Ilo, although the population increased fivefold during 1960-2000, no land invasion or occupation of risk areas by poor groups has taken place, because local authorities implemented programs to accommodate the growing population in their efforts to get decent housing conditions (Saitterwaite, 2007).

In Chile since 1998, CONAMA³⁷ has been working on a National Action Plan on Climate Change, which is structured around adaptation, mitigation and the creation and reinforcement of national capacities. In the National Strategy for Climate Change approved in 2006, the specific objectives for adaptation include: evaluation of the environmental, economic and social impacts of climate change, the definition of adaptation measures, and the implementation and follow up of these measures (Saitterwaite, 2007).

In Mexico, in 1996, the government established a Fund for Natural Disasters (FONDEN) for post-disaster financing for reconstruction of public infrastructure and compensation to low-income producers for crop and livestock losses arising from natural disasters. FONDEN targets the beneficiaries and has limits to amounts it disburses per beneficiary. The intention is not to compete with private insurance. The government of Mexico is currently looking into the feasibility of obtaining financial reinsurance for FONDEN to cover its exposure from weather risks affecting the agricultural sector. In addition, providing catastrophic insurance coverage has encouraged the formation of mutual insurance funds amongst farmer organizations (Barnett et al., 2007).

Training poor dwellers to develop a greater understanding of climate risks and vulnerability is an important tool to reduce the impacts of natural disasters. In El Salvador there is a new non governmental organization (NGO) called CESTA that is trying to teach people in Central America to be conscious of the dangers of climate change. This organization seeks to reduce low income people's vulnerability before flooding occurs. They teach people techniques for food conservation without refrigeration, for example, drying and salting meats, dehydrating fruits and vegetables, conserving, smoking and food burying. Indigenous farmers in some communities of the high Andes of Peru and Bolivia have been forecasting El Niño for at least 400 years, and are able to adjust their planting schedule if poor or late rains are expected. Their technique is to observe and study the changes in the Pleiades star constellation (Orlove et al., 2002).

Mitigation

The temperature increases associated with increasing concentrations of greenhouse gases will have mostly negative effects in both the LAC region, and at a global scale. The international community has reacted by agreeing to reduce the emission of greenhouse gases and stabilize concentrations at levels considered safe. Since the IPCC 2007, the seriousness of the global situation has become evident and additional commitments for reducing emissions will be negotiated in the short run. Contrary to previous rounds, developing country commitments for emissions reductions are required to cap total global emissions. Brazil and Mexico are two regional countries that have recently been included in the community of countries with official commitments to reduce emissions. International trade and investment conditions for carbon efficiency and neutrality are expected to dramatically increase in the near future, creating

³⁷ The National Commission for the Environment (Comisión Nacional del Medio Ambiente).

additional complexity for LAC countries in economic management and development. Pressures for the definition of mitigation goals and plans in the region are growing, due to both the need to contribute to the reduction of global emissions as well as the need to continue to be an economic actor in global markets. This is particularly complex for our region, given its strong dependency on primary natural resources extraction and use in national economic development paradigms. The extensive biodiversity of the region and abundance of natural resource stock facilitated these development paradigms, although industry, transportation, massive tourism and urbanization have placed tremendous pressures on the regional environment, at both regional, sub regional, national and local scales.

Cities contribute to GHG emissions due to the vast quantity of energy they use as urban expansion goes on (land use substitution) and to waste management practices. Climate change is closely linked to the increasing demand for energy and transport that flows from growing urban populations. Although cities continue to be in the background of the international debate on climate change, city governments can have significant influence. The facilities that cities operate, and the land use and other decisions they make, have substantial impact on present and future energy consumption levels, fuel used, and waste generated in the communities they serve (Winchester, 2008).

There are few experiences in mitigation in LAC countries. In Chile the “Reduction of Greenhouse Gases” project began in March 1996 and its primary objective was to identify and apply energy efficient measures or renewable energy alternatives to reduce CO₂ emissions produced by the burning of fossil fuels. In Mexico, the Mexican Committee on Projects for Reducing Emissions and Capturing Greenhouse Gases was created in 2004 in order to participate in the Clean Development Mechanism, but it still lacks influence over the key actors that need to act for mitigation. In the Dominican Republic a reforestation project for the Sabana Clara has existed for 20 years, and the Dominican Government has declared some zones as protected areas. In Guyana de Climate Change Action Plan includes measures to mitigate climate change developing, applying and diffusing technologies that control, reduce or prevent anthropogenic emissions in all relevant sectors.

PROAIRE 2002–2010 is one of the overall strategies that integrate air quality and climate protection in Mexico City. It aims to cut emissions of air pollutants and greenhouse gases over an eight-year period. Activities include energy-efficiency improvements, protection of forests and green spaces, and public transportation enhancements. Many of the PROAIRE measures focus on transportation, which constitutes 37 percent of emissions within the federal district of Mexico City. In the region, ICLEI's³⁸ Cities for Climate Protection (CCP) campaign supports cities in the reduction of CO₂ emissions, other GHGs and air pollutants. At a global level, the CCP Global Cities Network reduced 60 million tones of CO₂ equivalent in 2005. In Latin America, for the 2005-2006 period, ICLEI reports energy savings of 8.5 million KWh, and 5,700 tons of CO₂ equivalent/year mitigated, for a total of 18 cities participating at a regional level. The campaign offers a framework for local governments to develop a broad agenda on climate change, and provides analytical methods to help set reduction targets and develop a climate

³⁸ The International Council for Local Environmental Initiatives.

change action plan. Two examples of city specific implementation of improved technology are Sao Paolo (Methane to energy) and Querétaro, Mexico (Street Light Retrofit) (Wyman, 2006)³⁹.

V. KEY LESSONS LEARNED FROM SUSTAINABLE PRO POOR HABITAT PROGRAMS IN LAC

Adaptation to climate change requires local knowledge, local competence and local capacity within local governments. It needs households and community organizations with the knowledge and capacity to act. It also requires a willingness among local governments to work with lower income groups. The key issue is how to build resilience to the many impacts of climate change that is strongly pro-poor, given the limited autonomous adaptive capacity of low income groups (Satterwaite and others, 2007).

Urban planning and management ensures planned adaptation. This means adjustments to building codes, land subdivision regulations and infrastructure standards combined with land use planning that restricts buildings in high risk areas and makes special provision for extreme events, including the use of insurance to spread risk. The problem is that this is more easily incorporated in new urban development areas, but there are restraints on implementation when huge parts of the cities correspond to informal settlements, and when financial resources are very limited.

In 2006, taking into account some of the thematic areas established in 1995 for the Regional Plan of Action for Human Settlements, the Regional Program for Social Housing and Human Settlements evaluated five programmatic areas as regards to successful policies for low income households: land, access to housing, and to public services, public space, and income generation.

These evaluations revealed that the programs with the best outcomes for low income dwellers were those that sought several goals simultaneously. For instance, to facilitate land access for low income groups through financial mechanisms, give them a house and at the same time help them access and achieve a better education: this scheme strengthened their capacity to access other kinds of credit funds in the future. Another finding was that creating employment not only helps with greater economic stability, but also increases disbursement capacity for future expenses and strengthens the sense of commitment and responsibility. Additionally, when people reach a new living standard they care for and pay more attention to the quality of private and public spaces.

These multipurpose programs demand important institutional agreements that may be very complex, and require an active participation not only from the national and local government but also from community, financial and business sectors, and even nongovernmental organizations. Although some countries of the region have implemented these types of programs, public policy is very deficient (insufficient regulation and active participation and social control, for example) in this area. Government policy has a key role regarding housing and urban policies and requires improvements in these areas.

³⁹ 10,000 high wattage street lights were replaced with more efficient lamps, cutting carbon dioxide (CO₂) emissions by nearly 4,000 tonnes per year.

Another important evaluation finding is the fundamental role that programs offering houses for different economic sectors within the same geographic area can have for social cohesion. These policies are very important in order to prevent and mitigate the exclusion or isolation in which many low income groups live, and allows them to get reach and participate in different urban realities (Simioni and Szalachman, 2006).

With reference to specific policies, the evaluations demonstrated two successful policies in order to prevent illegal land occupation and to improve access to land for low income groups: improvement in tenure security and increases in urban land supply for low income groups. Argentina has developed two successful projects in this area: “Programa de Mejoramiento de Barrios” (PROMEBA) and “Programa Rosario Habitat” (ibid., 2006). There are also interesting programs in Colombia, METROVIVIENDA and USME, and tenure regularization programs in Bolivia and Peru. PROMEBA and Programa Rosario Habitat in Argentina have also been successful in securing access to basic services for low income groups. In El Salvador, due to the particular geographic characteristics of the county, the FUNDASAL program has adapted a special technology for sanitation.

As regards to improvement in housing quality and new housing construction, Chile has broad experience in building new neighborhoods through financial schemes that include savings, demand subsidies and mortgage credit. Unfortunately, due to the rise in the price of the land, many of the new neighborhoods are built far away from city centers, with a high risk of exclusion for their population. Bolivia, Mexico and Paraguay have interesting programs for improving housing quality. Successful policies related to public spaces have strengthened infrastructure, like public transport in Bogota, or the Chilean community participation in roads paving. There are also some significant public patrimonial public space recovery programs in Chile and Ecuador. Argentina, Bolivia, Ecuador and Paraguay have some programs related to the development of productive activities to generate income and employment.

VI. POLICY LESSONS AND CHALLENGES FOR ADAPTATION

The Latin American and the Caribbean region shows huge geographic differences among its countries: it is therefore very difficult to have a regional vision as regards to climate change and global warming. The Third Assessment Report (TAR) from the IPCC stated that in most of Latin America there were no clear long-term tendencies in mean surface temperature, although some clear trends in warming in some areas and a few cases of cooling trends were observed (2001). These findings may explain the current low adaptive capacity of human systems in Latin America and why the region has still done very little in order to adapt or mitigate their economies to climate change. Nevertheless the same report informs that glaciers in Latin America have receded dramatically and that many diseases are weather and climate related, including malaria and dengue, and others related to sea-water intrusion in some areas.

Sustainable development in LAC is as much threatened by the uncontrolled growth of the urban areas, and the growth of urban poverty and precariousness, as by urban environmental degradation. Any serious initiative to alleviate the negative impacts of climatic change must incorporate these closely knit, key links between the economic, social, territorial and

environmental dimensions of development. It is also important to remember that this involves complex interactions of citizens, governmental and non governmental organizations, and business. The success of any policy measure will also depend on the basic conditions into which it is inserted: stable economies, with low levels of unemployment, and a positive rate of real growth are required preconditions to policy effectiveness and success. As long as a large part of the population lives under the poverty line, without access to water and sanitation, without the minimum nourish requirements, and facing health problems, it is difficult to make them conscious of the consequences of climate change and the need for adaptation.

For hundreds of millions of urban dwellers, most of the risks from the impacts of climate change are a result of development failures, like the lack of capacity of region to provide infrastructure, or adequate health services, to the poor, especially in slums. Due to these development failures, people in poorer cities are much more vulnerable to events than the ones in wealthier and better governed cities, and adaptation requires addressing people's extreme vulnerability to climate change risks.

Adaptation to climate change should be seen as a part of development goals and be included within government plans and investments, in order to effectively design and implement pro poor and effective adaptation in LAC.

Urban centers concentrate enterprises and jobs. In most nations they contain 60-95 percent of economic activities. Therefore adapting urban centers to climate change is important for protecting economies as well as people, and potential losses of no adaptation are too high to be ignored. Development and growth converge in urbanization: city dwellers generate an "urban footprint", and changes in land use and resource movements between rural and urban areas.

Adaptive capacity in LAC can be increased by better and more stable incomes for poor people. Due to its multiple dimensions, when we talk about climate change, the efforts need to go beyond the environment areas and include infrastructure, public services, and health and education areas.

National, local and urban governments have a key role as risk reducers for climate change not only by providing infrastructure and services, but also by guiding where development takes place and influencing where urban settlements should develop and what provisions should be taken in order to avoid disasters like floods, fires, etc. They should also establish adequate regulatory frameworks for land use and building standards in order to guarantee safer living conditions for poorer groups.

Governments should adopt disaster risk reduction measures concurrently. Limitations to this innovation exist, however: usually no data exists which clearly demonstrates the extent of the problem. The infrastructure needed to reduce risks is expensive, especially in informal settlements, and funds from international organizations or NGOs is usually available for post disaster relief and reconstruction, but not for risk reduction and development.

Mitigation measures can produce undesired impacts due to restrictions on commerce, and tax, dumping or tariff agreements. This can lead to changes in production patterns or transport

policies that could be unaffordable for many LAC countries due to their low income levels. The present credit crisis adds more spillover effects for the underdeveloped world, due to the slower economic growth and the consequent implications for international trade, financial flows and commodity prices.

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VIII. APPENDIX 1. LAC REGIONAL URBAN DATA

TABLE 1.1
URBAN POVERTY AND INDIGENCE, BY URBAN AND RURAL AREAS,
IN LATIN AMERICA
(In percentages)

Country	Period	Population below poverty line			Population below the indigence line		
		National	Urban	Rural	National	Urban	Rural
Argentina	1994		16.1			3.4	
	2006		21.0			7.2	
Bolivia	1989		52.6			23.0	
	2007	54.0	42.4	75.8	31.2	16.2	59.2
Brazil	1990	48.0	41.2	70.6	23.4	16.7	46.1
	2007	30.0	26.9	45.7	8.5	6.6	18.1
Chile	1990	38.6	38.5		13.0	12.5	15.6
	2006	13.7	13.9		3.2	3.2	3.5
Colombia	1991	56.1	52.7	60.7	26.1	20.0	34.3
	2005	46.8	45.4	50.5	20.2	18.2	25.6
Costa Rica	1990	26.3	24.9	27.3	9.9	6.4	12.5
	2007	18.6	17.8	19.6	5.3	4.2	6.8
Ecuador	1990		62.1			26.2	
	2007	42.6	38.8	50.0	16.0	12.4	23.0
El Salvador	1995	54.2	45.8	64.4	21.7	14.9	29.9
	2004	47.5	41.2	56.8	19.0	13.8	26.6
Guatemala	1989	69.4	53.6	77.7	42.0	26.4	50.2
	2006	54.8	42.0	66.5	29.1	14.8	42.2
Honduras	1990	80.8	70.4	88.1	60.9	43.6	72.9
	2007	68.9	56.9	78.8	45.6	26.2	61.7
Mexico	1989	47.7	42.1	56.7	18.7	13.1	27.9
	2006	31.7	26.8	40.1	8.7	4.4	16.1
Nicaragua	1993	73.6	66.3	82.7	48.4	36.8	62.8
	2005	61.9	54.4	71.5	31.9	20.8	46.1
Panama	1991		32.7			11.5	
	2007	29.0	24.4	46.6	12.0	5.0	24.1
Paraguay	1990						
	2007	60.5	55.2	68.0	31.6	23.8	42.5
Peru	1997	47.6	33.7	72.7	25.1	9.9	52.7
	2007 a/	39.3	25.7	64.6	13.7	3.5	32.9
Dominican Republic	2002	47.1	42.3	55.9	20.7	16.5	28.6
	2007	44.5	43.0	47.3	21.0	19.0	24.6
Uruguay	1990		17.9			3.4	
	2007		18.1	12.6		3.1	2.4
Venezuela (Bolivarian Republic of) b/	1990	39.8	38.6	14.4	14.4	13.1	21.3
	2007	28.5		8.5	8.5		
Latin America c/	1990	48.3	41.1	65.4	22.5	15.3	40.4
	2007	34.1	28.9	52.1	12.6	8.1	28.1

Source: ECLAC (2008). *Panorama social de América Latina 2008. Economic Commission for Latin America and the Caribbean, United Nations, December 2008. Based on special tabulations of country household surveys.*

a/ Figures from the Peruvian National Institute of Statistics and Informatics (INEI). Figures are not comparable with previous years owing to the change in the sample framework of the household survey. According to INEI, the new figures constitute a relative overestimation of 25% for poverty and 10% for indigence in relation to the previous methodology.

b/ The sample design used in surveys conducted since 1997 does not distinguish between urban and rural areas, and the figures therefore refer to the nationwide total.

c/ Estimate for 19 countries of the region.

TABLE 1.2
CHANGE IN URBAN INEQUALITIES (GINI COEFFICIENT) AND GDP PER CAPITA (PPP)
IN SELECTED COUNTRIES

Country	Urban Gini Coefficient				GDP per capita (PPP, current \$US, country data)			
	Year	Gini	% change per annum		Year	GDP per capita	% change per annum	
Brazil	2005	0,60	-0,07	-	2005	8402	3,15	+
Chile	2006	0,52	-0,24	-	2005	12027	6,00	+
Colombia	2005	0,59	0,87	+	2005	7304	3,99	+
Ecuador	2005	0,51	0,69	+	1999	3419	1,73	+
Guatemala	2004	0,53	-0,37	-	2004	4401	3,39	+
Mexico	2005	0,50	-0,15	-	2005	10751	3,39	+
Uruguay	2005	0,45	-0,83	-	2005	9962	3,70	+
Venezuela	1994	0,48	0,30	+	2002	5449	1,23	+
El Salvador	2000	0,503	0,18	+	2000	5497	4,41	+
Honduras	1999	0,50	-1,06	-	1999	2725	2,18	+
Nicaragua	1998	0,53	0,19	+	1998	2802	4,09	+
Peru	1997	0,45	0,76	+	1997	4589	5,86	+

Source: UN-HABITAT Global Urban Observatory, 2008.

Data from various sources, mostly national household surveys between 1983 and 2005.

Note: Urban Gini Coefficient is for income.

TABLE 1.3
AVERAGE GINI COEFFICIENT OF SELECTED CITIES BY REGION

Region	Gini coefficient
Africa (26 ciudades)	0,54
Asia (38 ciudades)	0,40
Latin America and the Caribbean (19 cities)	0,55
Eastern Europe % CIS (18 cities)	0,31

Source: UN-HABITAT, Global Urban Observatory, 2008.

Data from UN-ECLAC, UN-ESCAP, UNU and other sources.

Note: Gini data is a mix of income and consumption. Africa (income: 15 cities, consumption: 11 cities), Asia (income: 37 cities, consumption: 2 cities), LAC (all data are on income), Eastern Europe And CIS (all data are on income) Years of data are various.

TABLE 1.4
AVERAGE URBAN GINI COEFFICIENT BY REGION

Region	Gini coefficient
Africa (16 countries)	0,46
Asia (11 countries)	0,39
Latin America and the Caribbean (15 countries)	0,50
Eastern Europe & CIS (18 countries)	0,32

Source: UN-HABITAT, Global Urban Observatory, 2008.

Data from UN-ECLAC, UN-ESCAP, UNU and other sources.

Note: Gini data is a mix of income and consumption. Africa (income: 8 countries, consumption: 8 countries), Asia (income: 6 countries consumption: 5 countries), LAC (all data are on income), Eastern Europe and CIS (all data are on income) Years of data are various.

TABLE 1.5
PERCENT OF URBAN POPULATION LIVING IN SLUMS AND SLUM POPULATION TOTAL,
2005 LATIN AMERICA AND THE CARIBBEAN

Country	2005		Country	2005	
	Percent	Thousands of people		Percent	Thousands of people
Antigua & Bermuda	4.8	1	Haiti	70.1	2,316
Argentina	26.2	9,343	Honduras	34.9	1,169
Aruba /a	2	1	Jamaica	60.5	852
Bahamas /a	2	5	Martinique	6	1.6
Barbados /a	1	1	Mexico	14.4	11,686
Belize	61	47.3	Netherlands Antilles /a	1	2
Bermuda /a	1	1	Nicaragua	45.5	1,473
Bolivia	50.4	2,972	Panama	23.0	430
Brazil	29.0	45,509	Paraguay	17.6	634
British Virgin Islands /a	3	0	Peru	36.1	7,329
Cayman Islands /a	2	1	Puerto Rico /a	2	59
Chile	9.0	1,270	Saint Kitts and Nevis /a	5	1
Colombia	17.9	5,920	St. Pierre and Miquelon /a	8,7	1
Costa Rica	10.9	290	St. Lucia	6	11.9
Cuba /a	2	169	St. Vincent & Grenadines /a	5	3
Dominica /a	14	7	Suriname /a	6,9	22
Dominican Republic	17.6	1,043	Trinidad and Tobago	24.7	247
Ecuador	21.5	1,808	Turks and Caicos Islands /a	2	0
El Salvador	28.9	1,166	Uruguay /a	6,9	4
French Guiana	10.5	15	Venezuela	32.0	7,521
Grenada	6.0	2	Virgen Islands /a	2	62
Guadeloupe	5.4	24			
Guatemala	42.9	2,550			
Guyana	33.7	72	Latin America and the Caribbean	27.0	117,439

/a Based on 2001 figures.

Source: United Nations Human Settlements Program (UN-Habitat) (2008). *State of the World's Cities 2008/2009. Harmonious Cities, and United Nations Human Settlements Program (UN-HABITAT). 2003. Slums of the World: The face of urban poverty in the new millennium. Available on-line at: <http://www.unhabitat.org/publications/slumreport.pdf>. Nairobi: UN-HABITAT.*