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Informal settlements in urban coastal zones and adaptation to climatic variation

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Rosa Fernandez and Jean D’Aragon’s article on slums and disaster risks, makes a strong argument that the form or morphology of these settlements has an important influence on their level of vulnerability. While the configuration of these settlements is indeed a key factor, the choice of location for housing of poor families or new migrants to the city is usually based on a complex set of economic and social choices (or possibly lack of choices). Slums are not always spontaneous and are often not the results of invasions or occupations. Many slum dwellers have purchased the land that they have built their houses on and have documents to prove it. However, rarely do these documents have the weight of legal title. Therefore slums are usually considered as illegal by government officials and town planners while the occupiers of housing in these areas may feel that they have acquired their home through legitimate market means. In most African cities the large majority of residents live in areas without legal tenure because they have no other choices. Urban planners have often not provided affordable options for the poor to acquire environmentally secure, minimally serviced and low-risk sites for housing construction.

Many new urban migrants in developing countries and other poor families have settled in some of the most environmentally risky parts of cities. Due to rapidly raising property values the poor have, sometimes voluntarily, sometimes forcibly but often out of economic necessity relocated into areas considered to have high environmental burdens. These areas tend to be

low coastal zones, river basins susceptible to flooding or steep ravines with high erosion risks. These settlement areas are almost always unserviced meaning that the lack of sanitation and piped water supply means that ground water is either polluted or brackish. Informal water markets predominate with very high prices and consequently very low water consumption per person per day. Diarrheal disease are often endemic and some other coastal cities suffer periodic outbreaks of cholera. The floods that often devastate these may be attributable to a combination of factors including the increasing climatic variability and environmental changes induced by settlement in vulnerable zones and the removal of natural vegetation in adjoining river basins.

Many major cities in developing countries are located on or near the coast. Historically, populations have preferred to live within 100 kilometres of coasts and near major rivers (Small 2003). Cities often located in low-lying areas near the mouths of major rivers, which served as conduits for commerce between interior agricultural and industrial regions and the rest of the world. As it happens, these locations place these cities at greater risk from current and projected climate hazards such as cyclones, high winds, flooding, coastal erosion and deposition, and sea-level rise.(De Sherbinin et al 2007 p39). Populations settling in low elevation coastal areas are at risk from sea-level rise, stronger storms and other seaward hazards induced by

climate change. These coastal settlements are changing, especially due to urban development and the direction of population movements adapting to increasing risk. Mitigation may be the best means of avoiding risks related to climate change, but it is too late to rely solely on mitigation. Modification of the prevailing forms of coastal settlement will be needed, so as to protect local residents (McGranahan et al 2007 p17).

Coastal populations can be a burden on coastal ecosystems, many of which are already under stress. The coastal systems are more densely populated – in both urban and rural areas – than any other zones (McGranahan et al 2007 p18). Both urban disasters and environmental hot spots are already located disproportionately in low-lying coastal areas (Pelling 2003). Climate change will increase the risk of both. In particular, rising sea levels will increase the risk of floods, and stronger tropical storms may further increase the flood risk. Low-income groups living on flood plains are especially vulnerable (McGranahan et al 2007 p18).

Coastal ecosystems, both onshore and offshore, are among the most ecologically diverse in the world, and also among the most threatened by human settlement (Agardy et al 2005). The concentration of populations and economic activities on and near the coast has had serious environmental consequences. Urban systems have radically altered the flows of water, energy and materials, transforming the pre-existing ecosystem. (Rakodi et al 1997). Some features of urban development increase the risk of flooding. Water drains more rapidly from built-over land, increasing peak flows and flood risks, particularly if the built drainage system is not adapted accordingly. In many parts of the world, developers have drained wetlands, sometimes reducing malaria prevalence or opening up valuable land for urban development, but also removing a buffer against tidal floods. Particularly in delta regions, land compaction, subsidence due to groundwater withdrawal and reductions in the rate of sediment deposition (due to water regulation) can lead, in effect, to sea-level rise, increasing flood risk (Ericson et al 2006).

While economic activity and urban development often increase the environmental pressures that lead to flooding, low-income settlements, and poor groups within all settlements, tend to be the most vulnerable. Affluent groups are in a better position to take protective measures and to adapt or escape when flooding does occur (McGranahan et al 2007 p19, 20). The poorest residents of the cities of low-income countries are often forced (implicitly or explicitly) to settle in flood plains or other hazard-prone locations, as they cannot afford more suitable alternatives (Hardoy et al 2001).

Climate change will increase the risk of flooding, as well as causing other environmental damage in coastal areas. The estimates of global-mean-sea-level rise in the range from 22 centimetres to 34 centimetres, between 1990 and the 2080s.. It has been estimated that a sea-level rise of 38 centimetres would increase five-fold the number of people flooded by storm surges. (Nicholls 2004)

Globally the Low Elevation Coastal Settlements (LECZ) contains some 2 per cent of the world's land and 10 per cent of its population, based on estimates for 2000. Of the somewhat more than 600 million people living in the zone, 360 million are urban. The LECZ contains a greater share of the world's urban population than of its rural population, it also contains a greater share of large urban settlements (and their inhabitants) than of small urban settlements. This translates into an urbanization level of 60 per cent, compared to a world urbanization level of slightly less than 50 per cent (McGranahan 2006 p 23-26).

Africa, although it contributes a small number of the world's largest cities, has higher shares of its population in cities of 100,000 to 5 million people living in the LECZ than does Asia, Europe or the Americas. This is noteworthy because Africa's medium-to-large cities are growing at much higher rates than cities in these other continents. Given that the African cities tend to be much poorer than cities elsewhere, this raises the question of their potential vulnerability to climate change (McGranahan et al 2007 p30).

The emphasis of climate change policy has largely been on mitigation. As necessary as these efforts are, it is clear that more attention needs to be given to adaptation to the climatic changes that are already underway (Rayner, & Malone 1997). To date, there has been little motivation but in the future coastal development must be encouraged to adapt to the risks of climate change and the associated weather-related hazards that can be anticipated. It will be important to overlap the adaptation to climate change, with other forms of disaster preparedness and introduce measures to address local environmental health issues (e.g. improved water, sanitation, waste disposal and drainage systems). Particularly for the urban poor, an equitable resolution of the land issues that drive people to settle on land already susceptible to flooding could make a large difference (McGranahan et al 2007 p20, 21). Disaster preparedness and management plans are vital components of an adaptation strategy. A better understanding is needed of which people and systems are vulnerable to what kind of climate hazards; also what makes them vulnerable and where they are located (De Sherbinin et al 2007 p40).

The risks to human settlements could be reduced if people and enterprises could be encouraged to move away from the coast, or at least from the most risk-prone coastal locations (this would also reduce the pressures human settlements place on coastal ecosystems). Even relatively small shifts in settlement location, out of a coastal plain onto more elevated ground, can make a major difference. However current population movements, often resulting in the growth of slums, are in the opposite direction. Most urban infrastructure is immobile and long lasting, making rapid shifts in urban location very costly. Moreover, existing urban settlements tend to be nodes of growth, attracting even more enterprises and people. As a result, urban coastal settlement is likely to attract more investment and expansion in the future.

Land use planning can substantially reduce the vulnerability of communities to water-based natural disasters if supported by reliable flood data that can be provided by water managers.

Resilience to floods can be achieved by building infrastructure such as floodwalls; alternatively, communities can be designed to be resilient by planning approaches that do not allow settlements to be located in vulnerable areas; often, a mix is most appropriate (Muller 2007 p102). However the capacity to plan and manage urban growth is chronically weak in many developing countries.

Urban management should increasingly be focused on dealing with climatic and weather variability, but there is, as yet, only limited scientific evidence for increased variability beyond historic norms. It has been noted that most human societies are inherently adaptive; however, it is anticipated that climate change will test these coping capacities, which will need to be strengthened (Muller 2007 p102). Many poorer countries in sub-Saharan Africa are not able to manage the current variability. The challenge of maintaining reliable urban water supplies, both industrial and domestic consumption are growing and more water will be needed. (Jansen & Schulz 2006).

If actions to make urban settlements more resilient are not taken, flood disasters, water and electricity supply interruptions, with the resulting economic public health and economic implications, will occur. The costs of such disasters will almost certainly be greater than the costs of prevention through appropriate adaptation measures. At the extreme, if disasters place unsustainable financial burdens on urban societies, this could lead to the collapse of public services, and climate change will have created “failed cities”. (Muller 2007 p108)

It is evident in urban areas, where a failure to address the impacts of climate change on water resources will leave their inhabitants vulnerable to a range of immediate acute and slow-onset disasters (Muller 2007 p111). Adaptation measures will, in many cases, be integral to the process of achieving the social goals established in the Millennium Declaration. UN (2000). The sooner a start is made, the easier it will be to accommodate adaptation into “normal” development.

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Development Workshop is currently working with the support of the International Development Research Centre on a project on Climate Change, Flooding and Water Supply in Angola's Coastal Cities and works on human settlement vulnerability issues in a number of African and Asian countries.