

BUILDING CLIMATE AND DISASTER RESILIENCE INTO CITY PLANNING AND MANAGEMENT PROCESSES

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Summary: This paper presents an integrated analytic framework for tackling climate change through mainstreaming disaster risk management into overall development planning in urban areas. It discusses the ongoing application of the “Climate Resilient Cities” framework in East Asia, the Middle East, and Africa. This initial empirical experience points to the importance of having the following aspects in place for sustainable programs of resilience: information and sensitization; leadership and institutional coordination; stakeholder consultation and ownership; and incentive structures for political agents to absorb costs now for benefits that will be realized later.

Key Words: climate change, cities, disaster risk management, adaptation, mitigation, resilience, urban development, risk reduction, Vietnam, Senegal, Middle East

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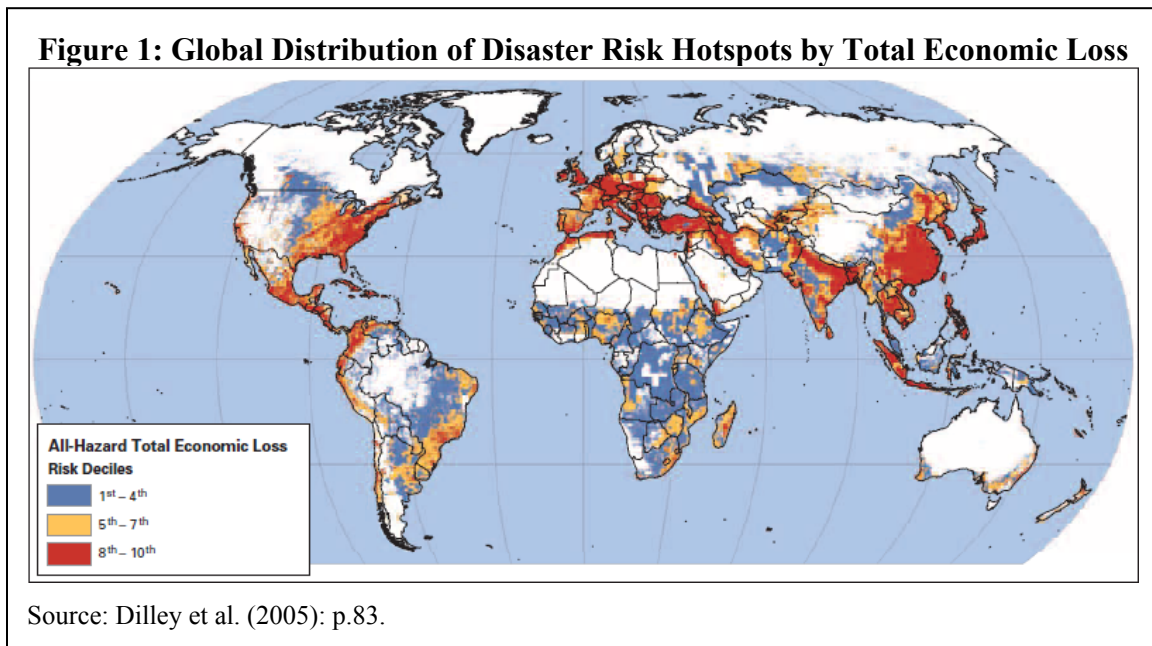
I. INTRODUCTION

1. Background

Cities around the world, from New Orleans to Ho Chi Minh, are facing an increase in the frequency and severity of climatic and other natural disasters. These factors will, in turn, put people and assets at greater risk of impacts of these events. For example, a recent OECD study (Nicholls et al., 2007) reveals that 90% of the total estimated asset exposure in large port cities (with populations exceeding one million) is concentrated in only eight nations (China, US, India, Japan, Netherlands, Thailand, Vietnam and Bangladesh).

In addition to the threat of climate change, the impacts of natural disasters, in the form of typhoons, floods, earthquakes, landslides and tsunamis, are rising worldwide. In 2007, more than 201 million people were affected by 405 natural disasters, marking a forty percent increase in the number of people affected over the previous year. In line with prior patterns, the greatest number of the 23,167 fatalities recorded was from poor communities in developing countries (IFRC, 2008). In 2008, although a decrease in the number of disaster events (321) was noted, the devastation caused by these events increased, impacting over 211 million people and killing 235,000, and with property damage estimated at US\$181 billion (UN-ISDR, 2009).

Looking ahead, the risks will continue to increase if actions are not taken. Figure 1 below shows the global distribution of risk of economic loss from six types of natural hazards – floods, drought, landslides, volcanoes, earthquakes and cyclones – based on a series of historical data sets delineated by hazard type. Regions most at-risk of (in terms of



magnitude of loss) include East Asia and the Pacific (EAP), South Asia, and the Middle East and North Africa (MENA). The northern and coastal areas in Latin America, all of the Caribbean, and the Eastern United States also could potentially sustain heavy losses. The projected impact on individual countries varies, with some having a substantial proportion of their economies at risk. For example, in EAP, the Philippines has 78.7% of its GDP in areas at risk of three or more natural hazards, and Indonesia has 32.4% at risk; China, Thailand and Vietnam have over 50% of GDP at risk of two or more hazards (Dilley et al., 2005).

Relative to other regions, over the past 50 years, EAP has faced the brunt of climate change impacts as well as other natural disasters, especially in the form of earthquakes, floods, storm surges and cyclones. Damage and losses incurred by countries in the region reached more than US\$600 billion from 2000-2008 alone (EM-DAT, 2009). Summers in EAP are already becoming hotter with average seasonal temperatures having increased by 0.1°C to 0.3°C per decade. And the worst is yet to come – according to the IPCC's middle-range scenario (IPCC, 2007), the region will experience a rise of about 2.5°C in temperature by the end of the century. These potential climatic variations could lead to sea level rise, increased precipitation levels, and more frequent, intense storms.

Cities are at the forefront in facing losses from disasters, especially in East Asia where cities not only account for a disproportionate share of economic assets and a concentration of population, but many are also located in coastal regions and along the aptly named *Ring of Fire* – making them inherently more vulnerable to sea level rise and seismic activity. East Asian cities are also facing pressures from very rapid increases in urbanization, swelling by two million new residents every month – primarily rural migrants in search of better opportunities (Gill and Kharas, 2007). Many of these cities are already unable to provide basic services to existing residents, evidenced by the proliferation of slums. In East Asia, there were 194 million slum dwellers in 2001, and this number is projected to increase to over 300 million by 2020 (UNHSP, 2003). Increasing pressures of urbanization combined with climate change impacts will only exacerbate the situation. The most vulnerable end up being the poor and marginalized groups that oftentimes are located on land unfit for development, rely on vulnerable sectors (such as handicrafts, tourism, agro-goods) for their livelihoods, and do not have any insurance or savings to fall back on in the event of a catastrophe.

To address these issues, the World Bank, with support from the Global Facility for Disaster Reduction and Recovery (GFDRR) and the UN International Strategy for Disaster Reduction (ISDR), developed a Primer (Prasad et al., 2009) for city mayors on how to proactively reduce vulnerabilities to the impacts of climate change and natural hazards. This practitioner's guide focuses at the city level and recognizes that while cities are most exposed to natural hazards, they are also at the forefront in responding and that they can play a proactive role in being better prepared and resilient.

2. Scope and Organization of the Paper

This paper presents an integrated approach for tackling climate change alongside disaster risk management (DRM) through overall development planning at the local level, based on the Climate Resilient Cities (CRC) methodology developed as part of a recent World Bank publication (Prasad et al., 2009). It then discusses the initial application of this CRC framework in cities in East Asia, Sub-Saharan Africa, and the Middle East and North Africa. Based on these ongoing applications, evidence suggests that the CRC framework is useful for identifying vulnerabilities across a range of city “types” – with varying sizes, geographies, from different regions, hazard risks, capacities, economic bases, etc. The framework identifies the broad parameters that can influence levels of vulnerability, and is a useful way of raising awareness and engaging governments to undertake deeper analysis for mainstreaming climate and disaster risk management.

Based on these ongoing empirical applications, a few key issues are emerging in terms of the political economy of implementation as well as the analytic framework and tools needed to help local policymakers along the process of becoming more climate- and disaster-resilient. The city-level experiences showcase the importance of the following aspects for sustainable resilience programs: (a) information and sensitization; (b) leadership and institutional coordination (including vertical and horizontal coordination across government); (c) stakeholder consultation and ownership; and (d) incentive structures for political agents to absorb costs now for benefits that will be realized later, possibly through financial incentives and/or “peer pressure” (e.g. the creation of a vulnerability index to measure and track results achieved vis-à-vis other cities could serve to instigate reform). As the empirical work progresses, further assessment in these areas will merit additional research before any concrete recommendations can be made.

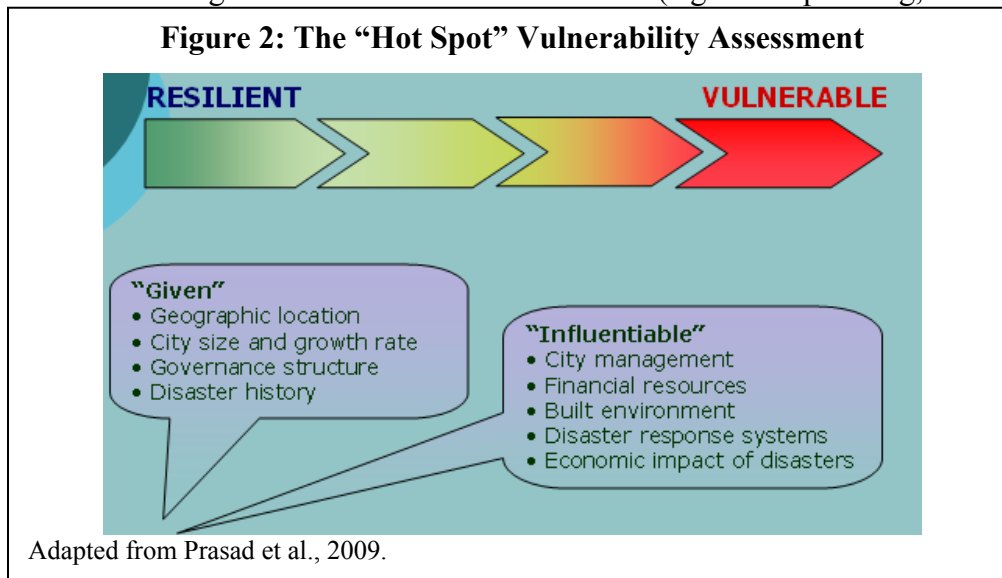
This paper is organized as follows: first, it explains the analytic framework on which the CRC program is based and points to the gaps discovered. The paper then discusses the initial experience from three regions where different depths of analysis were applied. – in five cities in MENA, a rapid qualitative vulnerability assessment was carried out; Dakar, Senegal in sub-Saharan Africa went one step further with the analysis by including geospatial data to produce localized vulnerability maps; and three cities in Vietnam in EAP are in the process of developing full-fledged local resilience action plans. The concluding section of the paper draws out the issues that are emerging as key areas of focus and discusses the implications for further work.

II. CLIMATE RESILIENT CITIES

1. What factors affect a city’s vulnerability?

There are several factors that affect a city’s vulnerability to climate impacts and natural disasters (see Figure 2). Some of these factors are static or cannot be easily affected – such as geography (e.g. coastal, on a fault line, delta, etc.); disaster history; city size; population growth rate/ density; appointed or elected governance structure etc. There are several other factors that are within the city’s influence. For instance, city management

(especially as pertains to departments related to climate change and DRM); capacity to generate financial resources from a local base (e.g. property tax versus national transfers); investments in and regulations on the built environment (e.g. urban planning, land use,



building codes, infrastructure provision); the level of economic diversification that would reduce the impact of disasters on any predominant sector; and the existence and effectiveness of an early warning and disaster response system. In order to reduce existing vulnerabilities, a city must focus on these factors which can be influenced through policies and regulations, infrastructure and investments, or training and capacity building.

2. What is a Climate-Resilient City?

A disaster- and climate-resilient city is one that exhibits capacities to adapt when exposed to natural hazards in order to minimize damage and losses. The first step toward enhancing resilience is raising awareness of contributing factors that exacerbate vulnerabilities, as described above. This must be undertaken with multi-stakeholder information-gathering and priority-setting through the formation of a city climate change team (if it does not already exist) that draws on a variety of stakeholders from government (including departments of infrastructure, planning, finance, environment, construction, etc.), civil society, academia/ scientific institutes, and the private sector/ business community. This team is responsible for developing a *local resilience action plan* (LRAP) that includes details of the identified priorities, including a time-bound matrix of activities that need to be completed in order to increase resilience. The package and sequence of activities would be appropriate to the context of the city’s financial/ technical capacities, planning/ budgeting cycles, and political/ cultural environments and would outline details of implementation. In addition, it would reflect the city and stakeholder priorities and be consistent with local and national policies/ institutions that would be involved in implementation of identified actions based on priorities.

This LRAP requires four core inputs – the first is the Hot Spot qualitative vulnerability self-assessment (Figure 2). The second step is to investigate specific vulnerabilities further by gathering additional data and technical information at the local level; through a mapping exercise (with filters such as land use and infrastructure; socioeconomic aspects; hazard profile; and future growth trends), a visual representation of the specific hotspots is generated. The third step is inventorying government capital improvement plans and policy/ regulatory reforms to assess whether vulnerabilities are being adequately addressed. In view of the remaining gaps, the fourth step is setting priorities among competing demands and limited funds available to implement programs and abilities to raise external financing;¹ these prioritized actions are the basis for a comprehensive action plan to build resilience. The plan identifies areas of focus – assets, infrastructure, sectors, geographic areas, communities in the city – and the expected timeframe (short, medium and long-term), as well as the responsible implementing institutions.

The CRC framework advocates for mainstreaming climate and disaster resilience into urban planning and management processes to reduce potential losses and protect lives, property, and the local economy.

III. COUNTRY/ REGIONAL APPLICATIONS

The CRC methodology is applicable to all types of cities worldwide. Here we present three case studies in which it is being implemented: MENA, Senegal (sub-Saharan Africa), and Vietnam (EAP). In the MENA region, the Hot Spot exercise was carried out as a part of a rapid diagnostic across five cities in the region – this provided an indication of initial vulnerabilities in each city, but also points to emerging regional trends as well as benchmarks across cities. In Senegal, the Hot Spot exercise was complemented with the second stage of analysis – a geospatial mapping exercise. In Vietnam, the full process of developing a local resilience action plan is underway, going beyond the Hot Spots vulnerability assessment and mapping exercises, and into the an identification of priorities for action.

1. Middle East and North Africa: Value in Benchmarking

Many of the countries in the MENA region are urbanizing at very rapid rates. By 2030, the population is projected reach 430 million, of which 280 million will be urban (UNPF, 2007). In addition, the region is also experiencing an increase in the occurrence of natural disasters and climate impacts. The situation is likely to worsen, particularly for coastal cities – with a projected 0.5 meter sea level rise, for instance, about 3.8 million people would be affected in the Nile Delta alone (Alexandria, Rosetta, Damietta and Port Said). Vulnerabilities are increasing with the concentration of people in cities, development in hazard-prone areas, and lack of proper building codes and resilient infrastructure.

The first part of the CRC methodology – the vulnerability assessment – was applied in

¹ Detailed guidance on undertaking these four steps is now being developed by the World Bank: *Climate Resilient Cities: How to Develop a Local Resilience Action Plan* (Forthcoming).

five cities in the region: Alexandria, Egypt; Amman, Jordan; Damascus, Syria; Tripoli, Lebanon; and Sana'a, Yemen. These cities represent a mix of political and business capitals, coastal and inland geographies and income ranges. Alexandria is a large coastal city at risk of the impacts of sea level rise, coastal erosion, sandstorms, and flooding. Sea level rise is particularly worrisome as the city has been built in an alluvial plain that is only about 2.5 meters (8 feet) above sea level (Mayton, 2008). Amman and its surrounding areas account for more than 50 percent of the country's population, 80 percent of the nation's industrial sector, and 55 percent of country's employment (Ibid.). The city is vulnerable to earthquakes, flash floods, and drought. Damascus is located on the Dead Sea fault line, which is a seismically active area. Other hazards facing the city are flooding and droughts. Tripoli is vulnerable to landslides, earthquakes, coastal erosion, and potentially, tsunamis; Sana'a is prone to flash flooding, drought, and landslides – in October, 2008, heavy rain and flooding caused an estimated YR 327,551 million (US\$1,638 million) in damage and losses, which is equal to about 6% of the country's annual GDP (GFDRR, 2009).

Emerging issues and challenges

The emerging lessons and issues from this exercise are presented below (World Bank, draft report, Middle East and North Africa Region 2009):

- **Information and sensitization** – Even a basic qualitative self-assessment provides a great way of raising awareness on the links between climate change and disaster risks, and the imperative for action. Without this, there is a tendency for “business as usual” to continue – including poorly planned and regulated developments, which end up further increasing vulnerabilities. In the MENA cities, the idea of having a regional workshop to disseminate and discuss project findings was raised, as it would not only increase awareness among participating city governments but also attract other cities' participation in the program.
- **Leadership and institutional coordination** – Most of the cities consulted did not have disaster risk management departments at the city level, with the exception of Damascus. Greater focus was given to the environment, sustainable development and climate change issues. To address this issue, in Amman Municipality, it was suggested that a joint climate change and disaster risk management department should be created. As all of the cities reviewed are vulnerable to multiple natural hazards and climate change impacts, such as sea level rise and water scarcity, it is essential that the government take an integrated approach to disaster risk management and climate change through corresponding political and institutional arrangements at the national and local levels.
- **Incentive structures** – Since local governments have fixed resources available to address development issues ranging from health and education to infrastructure, often disaster and climate change risks do not emerge as clear priorities. Technical and financial assistance, at least in the early stages, is important to support capacities to better assess and respond to natural disasters. In addition,

cities want to learn from the experience of their neighbors, and in some cases, see how they compare. Cities in the MENA region were interested in benchmarking progress of becoming more resilient to disasters and climate change, but some data and information was seen as being politically sensitive, not to be shared with others. To rectify this problem, cities suggested they should maintain a certain level of flexibility to safeguard sensitive data and information for their internal use only. While regional benchmarking may be more culturally sensitive in certain regions, disclosure has proven to be a useful change agent in the past. A *vulnerability index* that quantifies and aggregates the information from the CRC vulnerability assessment (including the publicly available information) would allow benchmarking across cities as well as across time – on progress toward increasing resilience (see Box 1 below).

Box 1: Vulnerability Index

Indices provide a rapid and standardized methodology for comparison and benchmarking. There are several indices, such as Transparency International (which measures corruption) or the DoingBusiness index (which measures the complexity of business regulations), that have shown that “naming and shaming” can actually lead to positive results. In the case of DoingBusiness, an “award” is given to the most successful “reformer” and this has prompted action from several governments.

In the case of climate change and DRM, a standardized and quantifiable way of assessing factors affecting vulnerabilities, and then appropriately weighting them into an overall index will be important for instigating action and benchmarking progress. Based on the qualitative vulnerability assessment discussed in this paper (detailed matrices available in Prasad et al, 2009), any city can determine its general vulnerabilities. Designed to give an overview of all important issues and activities that could affect the city, the assessment is based on 11 categories of attributes in 4 main areas: i) City description, i.e. city location, resident population, population growth and density; ii) Political and economic impacts, i.e. governance structure, city management on climate change and disaster risk management and financial resources; iii) Natural hazards, i.e. threats of natural hazards, disaster response systems in use, political and economic impacts of disasters and iv) Climate change impacts, i.e. description of impacts and additional testing to rate the level of vulnerability in each sector, such as built environment, industry, energy generation and distribution, health care facilities, cultural and religious heritage, etc. The next step now is to turn this qualitative assessment into a matrix.

2. Senegal: Lessons on the Importance of Data

The city of Dakar, Senegal stretches across 550 square kilometers (0.3% of the national territory) and is home to about half of Senegal’s urban population, with a population of 2,167,893, which is rapidly growing at a 4.5% rate (Wang, draft report, 2009). The

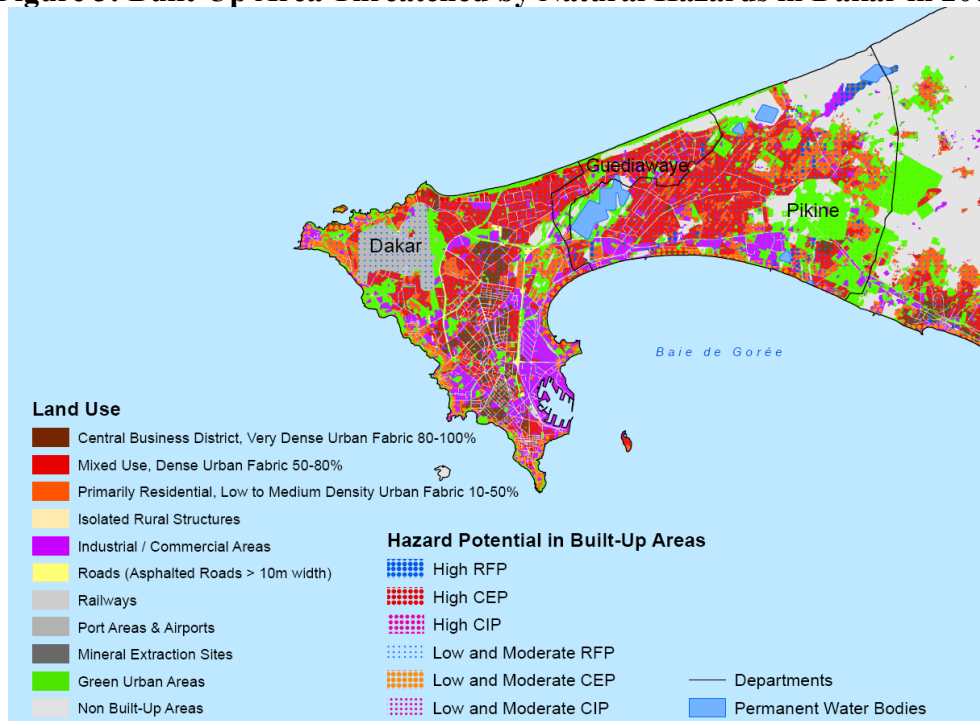
population growth is largely driven by rural migration due to droughts, low agricultural yields, and land degradation (Mbow et al, 2009). Due to problems with housing access, many of the migrants end up occupying abandoned low-lying, marginal lands unsuitable for development. This is also revealed in the trend of contiguous expansion of urban built-up areas, with large proportions of growth in the peri-urban areas and outer suburbs.

With the increase of extreme rainfall events (especially in 1989, 1995, 2005), severe flooding is becoming a serious problem in Dakar. While such events occurred in the past, the low population density led to a relatively small flood risk. With the population increase and sprawl into vulnerable lands, the need to develop strategies for social housing to relocate population, water evacuation with improved canals network, dikes construction, and the reshaping of catchments is increasing. The problem is exacerbated by growing vulnerability to climate change risks, including coastal erosion (Mbow et al., 2009).

A study on Dakar was recently carried out which relied on two types of information – (i) the qualitative vulnerability self-assessment (used in Vietnam, as described above) and (ii) geo-spatial data analysis. Together, these two sources of information produced analysis to identify and evaluate natural hazard and climate change risks that could be used to support local government to better respond to the rapid peri-urban expansion and disaster risk management.

Figure 3 below (World Bank, draft report, 2008) represents some of the findings of the study in terms of the spatial analysis conducted to overlay hazard potentials on built-up areas of Dakar. This map shows the types of built-up land use classes that are exposed to natural hazards, and the severity of different hazard potentials.

Figure 3: Built-Up Area Threatened by Natural Hazards in Dakar in 2008



Source: World Bank draft report, 2008.

Emerging issues and challenges

The initial lessons and key issues that emerge from this analysis are the following:

- **Information and sensitization** – While qualitative self-assessments are a good way to engage with government partners in a non-technical manner and build awareness of the issues, the Dakar application shows that technical and spatial data are important in verifying qualitative information.
- **Leadership and institutional coordination** – Raising awareness among government officials on natural hazards and climate change risks brings officials together from a range of line ministries and departments. When the analysis shows that climate impacts are serious and are likely to affect multiple sectors, it may facilitate better coordination within government to take actions to reduce vulnerability. In Dakar, institutional coordination is a big issue, in particular for the ex-ante DRM efforts. The post-disaster emergency response plan, called the ORSEC plan, is well-organized and relatively efficiently implemented when a disaster strikes. However, a variety of ex-ante DRM regulations are not coordinated and not implemented as effectively. There are significant gaps between legislation by national/ regional governments, and implementation and supervision by local governments due to lack of resources and political will. The

experience from Dakar highlights the importance of raising awareness among government officials, but it also points to the challenge that information alone may not be sufficient and that the political willingness and agenda to reform existing practices must also exist. Without these aspects, the sustainability of a resilience program would be limited.

- **Stakeholder consultation and ownership** – Public consultation early on and throughout the process is key to ensure ownership and buy-in to the results of the analysis. In Dakar, the experience showed that not only does the analysis bolster with public sensitization, but community inputs help to strengthen the findings of the analysis. In addition, capacity building programs on emergency preparedness, response and risk reduction for communities as well as local government officials would likely add value and increase awareness and understanding of the importance of resilience.
- **Incentive structures** – Hard data can act as an agent for change. Producing rigorous analysis that leaves little room for debate and provides visual mapping of natural hazard and climate risks can strengthen the imperative for action. Stakeholder involvement in generating and analyzing the data, and its powerful visual representation, can help motivate and involve local people more proactively.

3. Vietnam: Lessons for Institutional Set-Up

Vietnam's long coastline, climate and topography make the country extremely prone to natural disasters, particularly those associated with severe tropical storms and river flooding in low-lying delta areas. Climate change is also a very real threat to Vietnam's continued socio-economic development. In 1996, more than 2,000 km² of the country's coastal zones were estimated to be at risk from annual flooding, with the Mekong River Delta accounting for 75% of this total and the Red River Delta a further 10% (MHC, 1996). Devastating floods hit the Mekong Delta in 2000 and 2001, killing nearly 900 people (the majority of which were children) and destroying or damaging 1.2 million houses. In some areas, such as the central provinces and the Mekong River Delta, floods appear to be increasing in intensity as compared with those in the first half of the 20th century (Oxfam Vietnam, 2008), although this may be a reflection of increasing human settlement, cultivation and infrastructure development in hazard-prone areas.

For Vietnam, climate simulations under a range of scenarios suggest that mean annual temperatures might increase by between 1.5-2.5⁰C (MONRE, 2008). There is evidence that Vietnam is already experiencing increased ambient temperatures, particularly during the summer months.² Changes in precipitation are less certain but most studies suggest

² Annual average temperature in the period from 1991 to 2000 in Hanoi, Da Nang and Ho Chi Minh City were 0.8°C; 0.4°C and 0.6°C, respectively, higher than average value in the decade of 1931 and 1940. In 2007, annual average temperature at these three stations were all higher than the average in the 1931 - 1940 decade by 0.8 - 1.3°C and similarly higher than average in the 1991 - 2000 decade by 0.4 - 0.5°C.

increases are more likely (IPCC, 2007). Vietnam stands to be the country most seriously impacted by sea level rise (SLR): up to 16% of its area would be impacted by a 5m SLR (Dasgupta et al., 2007). Most of this impact is expected in the Mekong and Red River Deltas and in the area southwest of Ho Chi Minh City.

The Government of Vietnam is engaging more and more in climate change adaptation and disaster risk management. The December 2008 *National Target Program (NTP) to respond to Climate Change*, lead by the Ministry for Environment and Natural Resources (MONRE), establishes priorities and actions on mitigation and adaptation; the *National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020*, approved in November 2007, led by Ministry of Agriculture and Rural Development (MARD), outlines Vietnam's strategy for disaster mitigation and management and focuses on floods, storms and drought. These national frameworks, together with several Ordinances and Laws, set the stage for other activities on climate change, even at the city level.

Three pilot cities in Vietnam – Hanoi, Can Tho, and Dong Hoi - were chosen to undertake self-assessments using the City Typology and Risk Characterization matrix (previously outlined in section II); the results of these assessments revealed that the cities are “Hot-Spots” for climate change impacts and disaster risks. In Hanoi the main risks are floods, inundation, drought, storm surges and extreme temperatures; Can Tho is vulnerable to drought, floods and extreme precipitation, landslides, and wind storms; in Dong Hoi, the main risks are wind storms, river flooding, flash rainwater floods, tsunamis, drought, landslides, storm surges and extreme temperatures.

Emerging issues and challenges

The initial lessons and key issues that emerge from this analysis are the following:

- **Information and sensitization** – the threat of climate change is beginning to be acknowledged in the three cities, and there is greater awareness about the threat of natural hazards and disasters among government officials, but tangible information and data, as well as levels of public awareness, remain low. The process of collecting information in the three cities presented several similarities in terms of incidence of recent natural disasters, such as floods and inundation. While these types of data are readily available and quite detailed (both physical and economic data), data on projected climate change impacts are not.³ All of the cities are in the process of revising their Master Plans, and city base maps are available. Hazard maps were available in Can Tho and Hanoi, but these were not inclusive of all disaster types; in Hanoi for example, the hazard map focuses only on floods and inundations, with socio-economic activities listed, but the plans for future growth are not provided in visual or graphic representation. The CRC framework is supporting local efforts on data management and interpretation,

³ One exception is Can Tho, where a local university developed and applied several exercises to downscale forecasting models.

while the mapping exercise is intended to develop greater collaboration among the city departments to consolidate data and information.

- **Leadership and institutional coordination** - Results of the program show that rather than lack of information, the lack of coordination among government departments that is the key challenge. Many agencies collect data and produce corresponding indicators, maps and reports; however, those data and representations are not shared or agreed upon with other line agencies. The CRC exercises found that the departments generally have a sound understanding of CC issues, but they tend to focus only on how climate change could impact their respective activities and need assistance to transform this knowledge into action at a broader level. In addition, channels for vertical coordination need to further developed – while national policy frameworks exist (and, in some cases, with mandates for local governments), the details in terms of financial transfers from national to local government and technical assistance support have not been worked out. Horizontal and vertical coordination should be enhanced so that climate change can be addressed in an integrated way with disaster risk management as part of longer-term socio-economic efforts. In addition, the pilot application in the three cities demonstrates that a champion is needed to push for the program: specific agencies at the local and national levels have been identified.
- **Stakeholder consultation and ownership** – Local stakeholders have been a critical part of the process in Vietnam. The CRC team met with and interviewed a range of stakeholders in each city and collected their evaluations and suggestions in terms of main vulnerabilities, priorities, effectiveness of actions taken, and proposed measures to enhance resilience. This feedback was added into the matrixes and the maps to be included in the local action plans. The political will to address climate change systematically has been demonstrated through the leadership of the cities' People's Committees and their departments. Climate change teams, and a focal point for the action planning process, have been established to lead the process: their job is to encourage officials and technical staff to think of vulnerabilities, disaster risk management, and climate change issues in a more holistic manner, as a part of a comprehensive sustainable development process. The three cities' vice Chairmen all clearly expressed the willingness to own the process and to shape the CRC framework to meet their needs and individual goals.
- **Incentive structures** – the three cities need financial incentives to scale up their local resilience programs. Ideally, these programs should be linked to existing activities with adequate financing to enhance sustainability and ensure follow through on the action plans. This can be achieved by using the cities' own resources, or by tapping funds from ongoing development projects being supported by donors, the central government, and/or financial institutions.

Box 2: Financing for Adaptation

Estimates of the costs of adaptation in developing countries range from US\$10 to \$171 billion annually (various studies: World Bank, 2006; Oxfam International, 2007; UNDP, 2007; UNFCCC Secretariat, 2007; Stern 2007).

These numbers, while representing a wide spread, are very large in magnitude. A number of specialized climate funds are emerging that can be useful sources of funding. Climate-related funds include: the United Nations Adaptation Fund, managed by the Global Environment Facility (GEF), is forecast to be capitalized at US\$80–300 million per year between 2008–2012; other GEF adaptation programs; as of May 2009, the Global Facility for Disaster Reduction and Recovery has provided US\$15 million for adaptation programs worldwide.

Climate Investment Funds (CIFs) are being established by the World Bank jointly with regional development banks. The CIFs consist of the Clean Technology Fund and the Strategic Climate Fund. Under the Strategic Climate Fund, there is a Pilot Program for Climate Resilience (PPCR) with the objective of piloting and demonstrating ways to integrate climate risk and resilience into core development planning, while complementing other ongoing activities. The PPCR may provide funding for technical assistance to enable developing countries to build upon existing national work to integrate climate resilience into national, local or sectoral development plans, strategies and financing and may also provide additional financial resources to help fund public and private sector investments identified in national, local or sectoral development plans or strategies addressing climate resilience.

IV. EMERGING LESSONS AND NEXT STEPS

Based on the ongoing implementation of the CRC framework, several factors are emerging as being important for mainstreaming resilience into local development planning and management. First, policymakers do not always see the links between climate change impacts and urban development, but changes in mindset can occur through the use of targeted data and information to raise awareness, from a basic vulnerability assessment to the use of more technical mapping exercises.

Second, rapid qualitative vulnerability self-assessments and scientific geo-spatial analysis complement each other, and strengthen the robustness of the analysis in a more persuasive way – hard data itself can act as an agent for change.

Third, climate change responsibilities often reside in the departments of environment while disaster risk management responsibilities reside with emergency response departments, and the two groups often do not communicate, which exacerbates coordination issues. Inter-departmental institutional set-ups or common programs with

shared funding may bridge this divide.

Fourth, the vertical coordination across government structures (national-provincial-local) poses at least as many intricacies as the horizontal coordination; national plans and policies are often not supported by budgets and authorities at the local level, which clearly has implications for action and ownership.

Finally – and this is perhaps the easiest issue to tackle since it is technical in nature rather than a political economy question – the nexus between climate change, DRM, and urban development is in its nascent stage and requires further research. Practical applications, such as the methodology described in this paper, can bring greater cohesion in how governments frame the issues and incentives for action, but further study is clearly merited. It is anticipated that, through additional technical assistance and partnerships with local government networks and organizations like the UNISDR and GFDRR, new lessons and opportunities to build resilience into local development planning will continue to emerge.

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