Summary: Current knowledge of adaptation to climate change in developing cities is reviewed, utilizing Bangkok and Ho Chi Minh City as “test beds” – capitals of the two Southeast Asian countries most vulnerable to climate change. Findings indicate that the intensity and type of adaptive responses at urban scales strongly reflect previous national governance frames, e.g., degree of decentralization and role of civil society. Accepting such constraints, there is need for significant changes in approach that would (i) integrate knowledge and value capture from “mainstream” urban disciplines such as economics and urban planning; (ii) achieve synergistic benefits by appropriately combining “hard” and “soft” adaptation measures; (iii) systematize and disseminate knowledge, as no organized menu of potential adaptation mechanisms and related “best practice” is available, leading to limited awareness of climate change adaptation instruments and constraining action at the urban level.

Key Words: Comparative Responses to Climate Change; Bangkok; Ho Chi Minh City
URBAN ADAPTATION TO CLIMATE CHANGE: BANGKOK AND HO CHI MINH CITY AS TEST BEDS

I. INTRODUCTION

This paper assesses the state of knowledge on urban adaptation to climate change, by a wide variety of institutional actors, through the prism of two Southeast Asian metropolitan regions, Bangkok and Ho Chi Minh City. Such adaptation has become a necessary urgent response to future threats, given current global forecasts and trends (Adger et. al 2007). Our focus on adaptation in urban settings extends beyond the obvious fact that 65% of the world’s population will live in urban areas by 2050. Urban areas are essentially human built and dominated environments that are unique and thus present specific adaptation challenges. To date, however, academic research into vulnerability and adaptation has often been biased in favor of bio-physical systems, such as ecological systems, coastlines and watersheds, and rural areas (c.f. Amadore et al., 1996; Huq et al., 1999; Cruz et al 2007). Yet there are many reasons to increase our attention to the problems of urban adaptation, and to Southeast Asian urban environments in particular. Although urban areas are often assumed to be less vulnerable to impacts due to higher rates of development (c.f. Yusuf and Francisco 2009) there are many specific vulnerabilities found in urban settings: i.e., diseases may spread more quickly in dense environments; poor, often migrant or unregistered populations have little social capital or adaptive capacity; land is often scarce and expensive in urban settings, limiting relocation options; etc (Satterthwaite et al, 2007).

Our field work in Bangkok and Ho Chi Minh City focuses on: (i) likely initial impacts from climate change in the two cities; (ii) vulnerability of populations; (iii) current adaptation actions being undertaken; and (iv) barriers and challenges to local urban adaptation, whether institutional, economic, or social. We conclude with lessons learned from the two cities on how adaptation practices and adaptive capacity can be improved, both locally and for other metropolitan centers in the developing world.

II. HO CHI MINH CITY: FIDDLING WHILE ROME BURNS?

1. The Case of Ho Chi Minh City

Ho Chi Minh City (HCMC) faces serious challenges from climactic changes (CC) to its biophysical and built environment, which will have concomitant impacts on social and urban development. HCMC is listed among the 10 port cities in the world most exposed to flooding and storm surges and this vulnerability is expected to continue throughout the 21st century (Nicholls, 2008). In a recent World Bank report, the authors noted that Vietnam will likely be one of the top 5 countries affected by sea level rise, with “potentially catastrophic” consequences (Dasgupta et al., 2007).

The population of HCMC was officially 6.6 million in 2007 (Statistical Office of HCMC), living in an area of 2095 km², a rapid expansion from the 1975 (post-war) population of 2.5 million (Gubry and Huong, 2002). Growth in the past decade has been around 3% per year; population projections indicate that more than 10 million people will live in HCMC by 2020. Population density ranges from as high as 30,000 people/km² in
the city center to 600/km² in the outer districts (Le, 2007). This rapid urban population growth has contributed to processes of unplanned development on the peri-urban fringe, due to haphazard conversion of formerly agricultural lands; a number of service-provision problems, particularly related to drinking water and sewer/drainage access; and a shortage of adequate housing (Wust et al., 2002; Eckert and Waibel, 2009).

2. Climate Change Impacts and Scenarios for HCMC

HCMC is likely to face four major impacts from climate change in the next century: increased precipitation during the wet season and decreases in the dry; sea level rise; rising urban temperatures; and increased incidences of storms.

Precipitation: There has been a small but noticeable increase in total precipitation of about 0.8mm a year over the past 20 years, and rain events with a large volume in a shorter period of time are becoming more common (Ho, 2008). This has resulted in a steady up-tick of flooding events, from 356 in the city in 2003 to 478 in 2006. A likely major factor in increased urban flooding is land conversion resulting in the loss of agricultural polders and increase in impervious surfaces (often cement) leading to increased runoff after storms. The city’s canal system is also outdated and incapable of handling current water volume: the canals are not regularly dredged, and many thousands of households have built illegal settlements that slow down drainage (Vu, 2006). The loss of much of the wetlands on the southern and eastern edges of the city to development (Saigon South and Thu Thiem) has decreased overall natural water absorption functions and increased vulnerability of other surrounding areas to flooding as well.

Sea level rise (SLR): The National Meteorology and Hydrology Centre predicts SLR for Vietnam of 35 cm by 2050, 50 cm by 2070, and 100 cm by 2100. For HCMC, this will likely mean an increase in already dangerous flood-tide levels that overtop the existing dyke system. In 2007, high tides inundated 556 ha of the city, causing several hundreds of thousands of dollars in damages. A SLR of just 50 cm added to a flood tide of about 1.5 m would lead to flooding of 300 km² of the city. Estimates indicate that 6% of the city land area, 15% of its infrastructure, and 500 major business enterprises would be inundated with a 1m SLR (Carew-Reid, 2008). SLR will likely also increase salinity of shallow coastal aquifers, from which much urban drinking water is drawn.

Urban temperatures: Local temperatures have increased 0.78°C in HCMC from 1977-2006 (Ho, 2008); an urban heat island effect, when combined with the predicted 2-3°C temperature rise forecast for Vietnam, may result in unusually high temperatures within the city by century’s end. As a result, populations like the elderly may be especially vulnerable to health ailments and increased mortality, given relatively low rates of use of air conditioning in HCMC, especially among lower-income classes. The lack of green space and planted trees for shade and cooling in the central city also exacerbates the problem.

Storms: HCMC has not traditionally been a site of major typhoon/storm activity. However, models indicate that typhoons may track further south under global warming conditions, meaning HCMC may increasingly be hit by major storm systems. HCMC does benefit considerably from 20,000 ha of replanted mangrove in Can Gio District at
the mouth of the Saigon river, but this area is under pressure from economic development.

3. Vulnerable Communities

The metropolitan authorities have not yet undertaken vulnerability assessments to determine where the greatest impacts of CC will occur, thus only the most general conclusions can be made. Vulnerable populations are likely to be: those communities in the most low-lying areas of the city or those areas already plagued by flood events due to poor drainage (physical vulnerability) and the households with the least ability to adapt to climate changes (social vulnerability), including large numbers of migrant households.

Physically vulnerable: Lowest-lying areas of the city include the downstream area of the Saigon and Dong Nai Rivers, which are strongly affected by tidal movements. District 2, where the new planned city of Thu Thiem is to be built on swampy lands, is one major area in which much of the land is 1m asl or lower. Other areas at 2m-5m asl include much of the city centre and business district (Districts 1 & 3). Districts in which drainage is already a major problem and where flooding is frequent include District 12.

Socially vulnerable: HCMC is home to a very large number of unofficial and illegal migrants; it has been estimated that they constitute as much as 30% of the population. Vietnam, like China, has long maintained a household registration system to restrict migration, and many households who are not granted official permission to live in HCMC do not have the proper paperwork to buy land, register children in school, or access public services (Pincus and Sender, 2008). Migrants tend to live at higher densities in some particular districts (Go Vap, Tan Binh, Binh Thanh and District 12) where they account for as much as 70% of the population (Le, 2002), making these districts sites of particular social vulnerability. The number of poor people in HCMC estimated to be affected by 1m SLR is 48,000, mostly people living in low-lying wards (Carew-Reid, 2008). While the poor are not necessarily the only people who will be impacted in these areas, they tend to have less access to insurance, and less capability to rebuild or move away from affected areas without financial help. They are also more likely to live in shoddy housing that is vulnerable to climate events.

Yet income measures alone do not provide the sole measure of vulnerability. Several other social factors may come into play. About 45% of HCMC’s labor force works in the informal sector, e.g., motorbike driving, mobile food vendors, etc. (Bolay et al., 1997). These occupations can have low security of employment and low incomes, and provide no access to social safety nets (pensions and health care) like formal sector jobs. At the same time, however, the small scale of these activities and the fact that they are mobile could be an advantage in adapting to uncertain environments, e.g., flooding.

A similar conundrum exists with regard to housing; there are both challenges and opportunities in current vulnerabilities. On one hand, the majority of HCMC residents do not possess legal land tenure documents for their homes (Kim, 2004). A major challenge for HCMC will be to regularize the approval of resident permits/land certificates so residents feel legally protected and will be qualified for funding if resettlement is an adaptation option pursued; without these assurances it will be very hard to move people
from vulnerable areas voluntarily. On the other hand, there are inherent incentives for people to resettle due to the very low quality of housing in the city: more than 10% of the city’s population is living in extremely substandard illegal housing (Wust et al., 2002) and in a recent survey, only one-fifth of residents reported satisfaction with their housing, as most residents live in semi-permanent, self-built houses, or else subdivisions of existing buildings into low-quality apartments (Vu, 2004). In this case the vulnerability of residents in poor quality housing to increased climate events creates an incentive for an adaptation option like resettlement that might be more difficult to implement in another city.


While the Government of Vietnam (GoV) is increasingly recognizing the threats facing the country from climate change, there have been only a few government projects focused on identifying social vulnerability and addressing adaptation. For example, Vietnam’s first national communication to the UN Framework Convention on Climate Change (UNFCCC) in 2003 only listed technical possibilities for adaptation, such as building sea dykes higher (GoV, 2003). Vietnam has more recently developed a National Target Program for Climate Change (NTP in December 2008, but the document has little to say about how adaptation will take place and who constitutes the most vulnerable populations (MONRE, 2008). Currently, the NTP tends to be focused on sector-wide and quantitative vulnerability assessment, and on hard adaptation solutions that the government can implement through policy or financial planning.

Like nearly all localities in Vietnam to date, HCMC has no localized official climate change adaptation plan. In fact, the “HCMC Master Plan for Urban Development to 2050” adopted in 2008, which is to guide all investment and planning activities in the city, does not mention climate change at all. The primary HCMC government office for dealing with climate and disaster is the Committee for Prevention of Floods and Storms. The committee has the responsibility to research and formulate strategies to prevent floods, tidal surges, sewage, drainage and water supply, and forecast floods and inundation. Local income taxes include mandatory payments for a City Flood and Storm Fund that was capitalized in 2008 at 1.18 million USD, primarily to engage in short-term responses to flooding. In 2008, a new Steering Center for Urban Flood Control Programs of Ho Chi Minh City was founded, although it is not entirely clear what CC-related activities it can or will take on. The center reports directly to the People’s Committee and is modestly funded (half a million USD) by the national government.

NGOs have so far not been particularly active within HCMC in CC activities. However, universities and other research institutes increasingly are paying attention to CC adaptation in terms of ongoing or planned research. For example, there is a University Working Group on Climate Change, chaired by the Technological University, to design a research strategy needed to support CC response and adaptation, operating at the request of the People’s Committee Chairman.
5. Primary Barriers and Challenges to Local Urban Adaptation

Institutionally, Vietnam is not equipped with a strong lead ministry to guide climate adaptation. The CCFSCS, while experienced in inter-ministerial coordination and local action, is set up to respond to disasters when/if they happen, not to coordinate ministry actions to reduce vulnerabilities over the long term. The problem is compounded by a general lack of horizontal integration, leading to overlap and competition among agencies, such as between the Ministry for Agriculture and Rural Development (MARD) and Ministry of Natural Resources and Environment (MONRE). There is also little active involvement of strong ministries like the Ministry of Construction, Ministry of Finance, and Ministry of Planning and Investment in CC adaptation plans, as CC is still seen as an ‘environmental’ issue out of their purview.

The scale for adaptation actions is also unclear. The NTP states that a goal should be to mainstream climate change considerations into development planning of all localities, but that national guidelines on how to do this will have to be formulated first (MONRE, 2008). This means many localities will wait until they get instructions from Hanoi. Uncoordinated and overambitious urban planning is another issue. In March 2008 the People’s Committee approved a revised 2025 master plan outlining massive new development areas, a number of metro rail systems, and extensive highway expansion, with little attention to the impact of CC on these plans, which pay more attention to the financial benefits of public-private partnerships than to the environmental problems they may cause or be vulnerable to (Douglass and Huang, 2007).

6. Findings

Some key findings from the HCMC case study are that despite the looming threat of serious impacts from climate change, Vietnam is not yet taking adaptation seriously. Adaptation faces many challenges, including:

(i) Uneven distribution of vulnerability, and no overall assessments to help identify the most vulnerable communities;

(ii) Low levels of stakeholder consultation and public information accessibility, due both to government recalcitrance and low demands from citizens;

(iii) A focus on hard adaptation options that can attract donor funding, rather than smaller soft options;

(iv) Dispersed authority structures and lack of clear power to take action between vertical national and metropolitan levels and between agencies at horizontal levels;

(v) Low capacity and incentives for government institutions to undertake impact assessments without outside funding or technical assistance;

(vi) Low motivation to undertake action when faced with other problems such as development and poverty that seem more pressing than climate change;
(vii) No mechanisms for evaluation of costs and benefits of adaptation actions versus non-actions or for climate proofing of existing urban policies.

III. BANGKOK: HIGH RISK, EVOLVING RESPONSE

1. The Case of Bangkok

Metropolitan Bangkok (the Bangkok Metropolitan Administration area) is home to approximately 10 million residents, the Bangkok Extended Urban Region (BEUR) to approximately 17 million. Bangkok is a middle-income metropolis with mean per capita GRP of approximately $9,000 (NESDB, 2008). Unlike Ho Chi Minh City, the population of metropolitan Bangkok is growing slowly – approximately 1% per annum.

Bangkok’s underlying function, as capital of Siam, dates back many centuries; however, Bangkok, at its present site, was founded less than 250 years, in 1768, when the capital was moved from Ayutthaya (founded in 1350), after its sacking by the Burmese. Before that, the capital was located at Sukothai. Obviously, Bangkok’s function as the primate city of Thailand (formerly Siam) can be decoupled from the physical settlement. In fact, in climate change impact discussions, some Thai and IDO stakeholders argue that the capital, or parts of it, can be moved again in response to danger, if necessary.

2. Climate Change Impacts and Scenarios for Bangkok

Potential impacts of CC have been assessed in more detail for Bangkok than for many other East Asian metropolitan areas. This is a product of Bangkok’s relatively advanced economic development, mature bureaucracy, and high physical vulnerability - a considerable portion of the Bangkok Metropolitan Administration (BMA) area is below sea level, exacerbated by high rates of subsidence.

A variety of technical studies have been undertaken that outline likely impact scenarios, (ONEP, 2008; World Bank, 2008; World Bank, 2007; World Bank, 2008b; World Bank, 2006; Institute of Development Studies, 2007; Greenpeace, 2006; BMA, 2007). The main potential impacts identified in these studies are:

(i) Thirty year flood levels in 2050 will inundate an additional 180 square kilometers of BMA and Samut Prakarn Province compared with the 2008 equivalent scenario – equivalent to a 30% increase in flooded area (World Bank, 2009).  

(ii) Much of the increase in flood prone area will be in the western areas of the metropolis where protection structures, e.g., dykes, pumps, are less developed (World Bank, 2009).

(iii) Flood volume will increase by the same percentage as precipitation, but flood peak discharge will increase more (World Bank, 2009).

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1 “Real” population, including migrants, of BMA in 2007 was 10,100,694.

2 At present, the rate of subsidence is 3-5 cm/year in the BMR. See Buapeng (2007).

3 Samut Prakarn is an adjoining industrial Province immediately to the south of BMA, part of the contiguous built up urban area and a component of the BEUR.
Mean temperature will increase 3-3.5% by 2100 (Greenpeace, 2006)

3. **Vulnerable Areas and Communities**

   (i) About one million people will be affected by a 30 year flood in 2050. Of these, one-third (330,000) will be affected by half meter flooding for at least a week.

   (ii) Buildings will be the most affected structures. More than one million buildings might be damaged by such a flood, causing over $3 billion USD damage (2008 prices). However, *half of these buildings are yet to be built in potentially impacted peripheral areas, particularly to the west.*

   (iii) Water supply, sanitation, public health, energy, and transportation infrastructure will be minimally affected. This is both because much key infrastructure is in protected areas (the core city), and many systems, particularly those built since the 1995 flood, are designed to withstand significant flooding. For example, MRTA subway stations are raised and the new Suvarnabhumi International Airport international airport, despite being on land that was below sea level twenty years ago, was constructed on land fill raising its elevation several meters.

   (iv) Direct economic losses related to direct business disruption (not including damage to structures) from a 2050 flood would be close to $1 billion USD (2008 prices). However, a wider measure indicates that land generating 23% of Thailand’s GDP would be flooded, and thus one-quarter of the economy would be at risk. This is because the EBEUR dominates the national urban system more than any other primate metropolis in East Asia, accounting for over half the country’s economic output. Thailand would have a greater percentage of GDP at risk from sea level rise than any other major country in East Asia except Vietnam (World Bank, 2006)

   (v) There would likely be significant increases in diseases and accidents associated with flooding and temperature rise, of special concern is dengue fever, but other risks include salmonellosis, electrocution, drownings, etc.

Understanding vulnerability in the Bangkok case is complicated by a lack of understanding of the geography of the urban region’s highly dynamic production, housing, employment, and household-based livelihood systems. The most dramatic impacts associated with sea level rise will impact the western BMA and the BEUR Upper Gulf Provinces of Samut Sakarn and Samut Songkran. Long-standing slums (which have been largely “regularized” in middle income Bangkok) in areas such as Klong Toey (Bangkok’s largest substandard housing area), and along rail lines extending northward from Hua Lampong station, will not be significantly affected by most major potential CC induced flood events because they are interwoven into the relatively well-protected inner city area. (However, the core city’s already differentially high temperatures, will be further raised, increasing emissions from air conditioners, etc.) The areas most at risk from sea level rise (the major threat to the BEUR) are Bang Kui Thien District of BMA (which fronts on the Gulf of Thailand), and the key industrial provinces of Samut Prakarn, and Samut Sakorn Province (BMA, 2007). The latter two provinces account for large numbers of industrial jobs, thus major flooding events would disrupt employment in
factories; in addition, most workers (blue collar lower middle class) that work in these areas, live nearby. In sum, vulnerability in the BEUR is likely to be associated as much with employment disruption as residential life per se, and the socio-economic groups most impacted would not be the poorest, but industrial workers (including domestic and international migrants), and middle class suburbanites in Bang Ku Thien (see below). This contrasts with the HCMC case, largely explained by Bangkok’s differential position on the economic development trajectory.

Bang Ku Thien District, with a population of 127,000 (2007), officially described as “medium income” has attracted the most attention because its coastline and canal system is already being affected by sea level rise, affecting locally important orchard, aquaculture, and agri-business industries, impacted by changes in salinity. A peri-urban and suburban area, its middle class housing could be at risk (including in Thonburi to the immediate north). Despite the vulnerability of the western BMA, much additional middle class housing is proposed for the western BMA area.


To date, the highest level of CC awareness has been displayed by the national government, particularly the Office of Natural Resources and Environment Policy and Planning (ONEP), which will officially represent the Royal Thai Government in about-to-commence post Kyoto international CC discussions, negotiations, and optimistically, treaty ratification and enforcement. The ONEP has produced a National Strategy on Climate Change Management (ONEP, 2008) that is technically strong, addressing vulnerability and risk issues, and measures to be taken organized around a series of action areas. Each of these action areas (termed approaches) identifies (i) measures, (ii) institutional responsibilities (agencies), and indicators. The national strategy is a mix of mitigation and adaptation measures. Skillfully, the strategy relates vulnerability to the structure of the nation’s economy, stressing potential damage to economic pillars such as agriculture, agri-processing and tourism. One section of the strategy focuses specifically on potential damage to urban settlements.

At the metropolitan level, the BMA, in conjunction with the World Bank (World Bank 2009) is undertaking a Climate Change and Adaptation Study for Bangkok Metropolitan Region. The motivation for this action stems from increased awareness of the threat of CC impacts in the BEUR, largely associated with NGO and CBO efforts (see below) and acknowledgment that more action is needed, much of which will require large tranches of capital. This study advocates “mainstreaming” of climate change adaptation in all local and national agency operations in the BEUR, “climate proofing” city building. Unsurprisingly, the report advocates less harvesting of ground water (the main cause of subsidence), protection of shorelines, city planning (land use zoning) guided by flood risk maps, creation of more green retention areas (“monkey cheeks”), etc.

International NGOs are the third group of actors involved in climate change issues in Bangkok. Greenpeace (Greenpeace, 2006) has identified key climate change related issues facing Bangkok in a study (reflecting an ecosystem methodological perspective) that describes global CC dynamics, pairing them with potentially vulnerable eco-systems.
in Thailand, e.g., mangrove ecosystems. The Rockefeller Foundation funded a cursory assessment of Bangkok’s vulnerability to CC impacts (IDS, 2007), considering Bangkok for inclusion in its $70 million USD, *Asian Urban Climate Change Resilience Building program*, but eventually opted for second-level cities in Thailand and the three other participating countries (the regional office of the project remains in Bangkok).

Unlike the HCMC case, local NGOs, Community Based Organizations (CBOs), plus universities, are significantly involved at the local level. This is particularly the case in Bang Ku Thien District. There, local NGOs such as the Chumchon Thai Foundation, Green Peace (local chapter) are working with CBOs and Bangkok-based universities (e.g., Rangsit University, Asian Institute of Technology) to devise strategies to slow coastal erosion, salinization, etc. The BMA has introduced sand-bagging approaches, but the local NGO – CBO – University alliance is proposing alternative adaptive measures. BMA has conducted a study on sea level rise, *Prevention and Solution for Coastal Erosion in Upper Gulf of Thailand Coastal Area* (BMA, 2007); associated public hearings were well attended and have stimulated greater NGO-CBO-University involvement. Significantly, communities in the most physically vulnerable areas (Bang Ku Thien, Samut Sakarn, Samut Prakarn) have developed a “network of wetland communities” that shares learning, lobbies senior governments, etc.

5. **Assessment: Barriers and Challenges to Local Adaptation**

Although the BMA originally focused on mitigation (energy efficient lighting, etc.), it is recognizing the key role that metropolitan governments need to play in adaptation. Increasingly, a division of labor seems to be emerging with BMA and other at risk local governments in the BEUR focusing increasingly on adaptation, and the national government focusing on mitigation, given the latter’s international global governance interface.

As might be expected in a nation and metropolitan region where NGOs are free to operate, NGOs, CBOs, and universities are playing an increasingly important role in awareness building, and locally driven (customized) intermediate technology and “soft” adaptation efforts. (Thai NGOs have enjoyed enormous success in many developmental areas, e.g., population planning, control of HIV infection, stopping dam construction.) However, there is also an awareness by the BMA and the national government that large amounts of capital and complex globally dispersed knowledge need to be applied to the problem, hence the recent involvement of IDOs, such as the World Bank. Local NGO involvement is however largely centered on geographical areas that are obviously at risk, where physical impacts are already appearing. Outside these areas, NGO and CBO involvement is much more difficult to motivate.

Actual adaptation measures to date have a “hard” (large scale dyke systems, large scale landfill projects to raise elevation of critical infrastructure, sand bags along the Gulf of Thailand, climate proofing of specific facilities such as subway stations) bias in the

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4 No assessment of the actual Thai situation is undertaken. The ecological perspective biases the report to rural systems.
Bangkok case. Although metropolitan (or national) scale laws supportive of adaptation may be in effect, e.g., BMA’s Ban on Nine Types of Buildings in Flood Affected Areas law, they are likely to be enforced only if lower-level governments are committed to their enforcement, supported by CBOs and NGOs.

In the EBUR, massive capital investments protecting large areas of the city, have not been leveraged as they should be, particularly in eastern BMA. In such areas, development should be densified, utilizing mechanisms such as upgrading of FARs and enhancing rapid transit access. Green retention areas in Bangkok often attract high-end adjacent development, creating land value capture opportunities, that can provide capital for further flood-proofing activities.

6. Possible Cost-Effective Adaptive Measures

Priority areas for action include:

(i) Dramatically reduce ground water harvesting immediately, which exacerbates physical risk through subsidence – the national government needs to play a key role.

(ii) Deliver awareness programming /education to make communities, local NGOs and relevant private sector actors (such as insurance companies) aware of vulnerabilities and possible responses.

(iii) Public land and housing authorities should begin planning relocation areas.

(iv) Protected areas should be more densely developed through land use, taxation, and enhanced transportation access; a proportion of enhanced land value should be captured.

(v) Green space planning and water retention planning should be better integrated through multiple-use approaches (e.g., floodway parks), with a proportion of adjacent land value captured where appropriate.

(vi) Bangkok should share its successful track record in “flood proofing” key public infrastructure, and encouraging early involvement of NGOs and CBOs in CC adaptation with other cities, especially within East Asia.

IV. CONCLUSIONS

Several major lessons can be summarized from our case studies of the current state of play in HCMC and Bangkok. Our studies indicates that the manner in which nations and cities are addressing climate change adaptation closely echoes pre-existing institutional structures and

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5 This law was enacted in 1999, but only recently seriously enforced. It bans nine types of buildings in flood prone areas, e.g. high rise buildings, warehouses, hotels, shopping centers, and industrial factories.
priorities, especially urban and development policy frameworks, policies in regard to
decentralization (or centralization), NGO activities, etc. Not surprisingly, jurisdictions are not re-inventing institutional structures and processes in the face of climate change. For example, Bangkok’s response to climate change vulnerabilities is more decentralized, involving urban
governments, CBOs and NGOs, more than Vietnam’s more centralized, state-directed approach. 
A similar situation exists in regard to developmental priorities, e.g., Vietnam places a premium 
on economic growth, Thailand on local self-sufficiency.

1. **Vulnerability identification is complex:** Establishing vulnerability in metropolitan areas is not easy. Although the poor are usually more vulnerable in terms of socio-economic adaptation capabilities, they may not necessarily live in the most physically vulnerable areas, as the Bangkok case indicates. However, especially early in the economic development trajectory, there is often an association between settlement in flood-prone areas, lack of air conditioning and poverty, etc., as indicated by the HCMC case. As cities become wealthier, the relationship between physical vulnerability and household income may become blurred. Yet socio-economic and psychological dimensions of vulnerability are not being researched to nearly the same extent as bio-physical parameters. For example, we know more about what areas of Bangkok will be flooded in a 30 year flood in 2050 than we do about the socio-economic makeup of communities at risk and likely psychological and social responses from their households to a major CC induced event. One problem facing vulnerability assessment to date has been the emphasis on housing, infrastructure, and physical communities. However, vulnerability of employment / livelihood systems to CC events can be equally serious, especially in the case of Bangkok.

2. **Too little attention is paid to future urban fabric:** If as little as a 35 year time perspective is taken in a fast-growing city, such as Ho Chi Minh, over half the urban fabric that will exist at that time has not yet been built. This is an enormous opportunity to adapt and avoid future problems. However, under most present urban expansion scenarios for large cities in Southeast Asia, city building patterns will actually increase vulnerability, as in the case of the flood-prone south-western area of Bangkok metropolis, where population is expected to more than double. Often climate change adaptation focuses on cities as if they were static entities, paying relatively too much attention to the present form as compared with the future. Adaptation should have a strong preventive orientation as well as curative. Cities need to integrate climate forecasting into ongoing urban planning, particularly in housing and transportation. Increments to built urban form, ranging from informal settlements to highly planned new towns, should be strictly limited to areas safe from flooding and other climate impacts, yet these is no indication that this is yet happening.

The foregoing means that there is a need to mainstream climate proofing and adaptation efforts, building on existing national and local priorities and programming. Value can be added to existing programs by climate proofing them. For example, if new urban towns are a priority, as in Vietnam, such programs can be leveraged to produce urban form that is more climate change resilient. The good news is that most developing cities are growing fast demographically, meaning that new urban form is being created all the time. Thus new industrial zones, communities, infrastructure, etc., can readily be located on higher ground, built to LEED standards, etc., with concomitant lessened incremental cost for climate change vulnerability reduction benefits. Creating new neighborhoods for relocation and absorption of migrants (e.g.,
in HCMC for migrants from the Mekong Delta, the latter being at high risk) may just be a matter of providing appropriate sites with basic infrastructure and good access for affordable, reduced vulnerability housing. Poverty reduction programming is another excellent lever. For example, slum prevention site and services schemes can be located on high ground or in places with cooler micro climates; slum upgrading schemes can introduce new building types, wider access to cell phones by the poor can reduce their dependence on specific geographic locations, training programs can be aligned with new employment opportunities (such as public health, construction) associated with CC, etc.

3. Adaption support associated with weak ministries: To date, CC mitigation and adaptation responses at the national operational level are frequently associated with weak and “narrow” national ministries, usually ministries associated with water management and drainage, such as the Royal Thai irrigation department. This in turn, limits financial support to cities and may inhibit creativity of adaptive responses. Of particular concern, is the lack of knowledge and sensitivity to climate change by national construction ministries responsible for building standards. Much closer coordination with urban planners, land taxation institutions, etc., is needed. Instead, adaptation initiatives tend to be viewed as “isolated” or free-standing interventions and they are not leveraged as they should be. To date, cities have looked on CC adaptation as something to be worked out by environment ministries, not something to be dealt with across the board and synergistically with planning, economic development, and finance departments.

Sectoral approaches dominate thinking and research to date, with specific ministries developing their own plans for agriculture, water management, energy provision, etc. This makes it difficult to deliver integrated adaptation packages (which should usually comprise hard and soft components and involve a spectrum of sectors), as well as presenting particular challenges for sub-national government entities such as metropolitan planning agencies when each sector, usually from a national level, is designing its own approach with no overarching coordination.

4. Time orientation of climate change response coordination mechanisms: Even when specific CC response mechanisms are developed, at all scales, in both the public and third sectors, they tend to focus on events such as floods, often with a natural hazards mentality. However, climate change is a continuous cumulative process that requires a different orientation. This bias is even more prevalent at the community level where limited resources are understandably targeted toward immediate threats and responding to disasters as they occur.

5. Limited access to information: Cities in Asia face the challenge of how to incorporate learning from adaptation studies and actions that are primarily based on the experience of the developed world. Most early adopters of climate change adaptation plans (London, New York, Boston, Seattle, Halifax, and Vancouver), where the ‘best practices’ literature has been developing from, do not face the same challenges or physical conditions as do the rapidly growing urban areas of Asia (UNDP, 2007). Our case study cities, as well as other developing cities, have limited systemic knowledge to draw from in regard to climate change adaptation measures. Obviously, current knowledge needs to be improved, systematized, and made easily accessible.
6. Wide variance in role of national government. National governments have played the lead role in guiding adaptation thinking in East Asia to date. However, the Bangkok and HCMC cases illustrate wide variability in the role of sub-national actors. Bangkok has a much stronger involvement of NGOs, CBOs, and local governments in climate change adaptation, mirroring pre-existing forms of governance. Practices that are normally best suited to local urban governments (i.e. application of building codes and formulation of land use planning maps of vulnerable areas) should be devolved and concentrated at the appropriate level.

7. Limited involvement of private sector: An important missing set of players in climate change adaptation in Bangkok and HCMC, and most other developing cities, is the private sector. For example, insurance companies have an important role to play by defining what areas are insurable and not, and setting rates. Sometimes authorities force them to insure vulnerable areas, creating “moral hazard”. More sophisticated insurance coverage is needed, e.g., refusing insurance to new development while guaranteeing coverage to existing residences, establishing mechanisms allowing (or requiring) insurance payouts after a severe event to be used for relocation, thereby removing risk to both the affected household and insurer. The private sector does not yet seem to be a significant voice in any of the actions looked at in the two cities.

8. Limited involvement of public. Local and cultural norms should guide built form adaptation. Access to CC information by communities and individuals can result in actions that reduce vulnerability. Without local voices directly influencing decisions, cities run the risk of inappropriate and unacceptable responses that may be counterproductive. For example, although minimizing development of ground floors of buildings may seem effective from an adaptation point of view, households in HCMC value street-level bottom-floor buildings, where shops can be opened, and would thus find this adaptation option unacceptable.

9. Limited range of adaptation options on table. Adaptation measures to date have a “hard” (pouring cement) bias. Adaptation options need to be understood as a suite of possibilities to be undertaken by a host of people and groups. Achieving an appropriate mix of hard vs. soft adaptation options should be the ultimate objective. The current bias in the two cities is toward hard adaptation options: especially those that are more expensive and more likely to attract donor funding; this is particularly true in the HCMC case. The problem is that soft options, which could work synergistically with appropriate hard instruments, often lack advocates, such as strong NGOs. Many soft adaptation policies and investments are ‘no-regret’ actions: that is, they are cost effective and provide benefits above and beyond their usefulness in adaptation to climate change. An example would be expanded use of urban trees to cool buildings, reducing both the urban heat island effect and also reducing energy costs of urban households.
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