Enhancing Capacities for Building Climate and Disaster Resilient Cities in Asia

Dickella Gamaralalage Jagath Premakumara
Institute for Global Environmental Strategies (IGES)

1. Introduction

The rapid urban growth, climate change and natural disasters pose a huge risk to quality of life, economic and social stability of the cities, especially in developing countries where one out of seven people is living in informal settlements and urban slums (IPCC, 2012; Mitlin and Satterthwaite, 2013). Evidence also suggests that investing in resilience programming that reduces exposure to risk is significantly more cost effective than post-disaster responses in local governments (WMO, 2008). These realities have led to significant international commitment to enhance capacity for building resilient cities than ever before in achieving sustainable development. The Sendai Framework for Disaster Risk Reduction (2015-2030), a successor of the Hyogo Framework for Action (2005-2015) called for urgent actions on achieving disaster risk reduction and resilient cities (UNISDR, 2015). In addition, some other global initiatives, such as the Making Cities Resilient Campaign of the United Nations International Strategy for Disaster Reduction (UNISDR), the Asia Pacific Adaptation Network (APAN), the Annual Global Forum on Urban Resilience & Adaptation of ICLEI-Local Government for Sustainability and the 100 Resilient Cities of the Rockefeller Foundation (100RC) are also advocated widespread commitment by local governments to build resilience cities and increasing support for strengthening local capacities.

Reflecting these trends, drafting a local resilience action plans by integrating disaster risk reduction and climate change adaptation is getting more importance in order to reduce current threats of disasters and the emerging impact from climate change (Pelling 2003, Prabhakar et al., 2009). Despite this growing recognition, developing cities in Asia are not yet receiving adequate attention for introducing effective measures for planning resilient cities. Drawing on the experience of four Asian Cities, including Cebu (Philippines), Nonthaburi (Thailand), Ho Chi Minh (Vietnam) and Shanghai (China), this paper aims to examine how developing cities can effectively plan and take specific measures to enhance climate and disaster resilient cities. The paper begins with an overview of the recent evolution of theoretical and conceptual issues related to resilience in development practice. Then, the key factors influencing risks and enhancing resilience capacities of cities will be discussed based on the case study analysis, especially focusing on local context, risks (shocks and stresses) and the capacity to deal with climate and disaster impacts. Finally, paper concludes by discussing key challenges and identifying some policy

recommendations to enhance resilient cities in Asia.

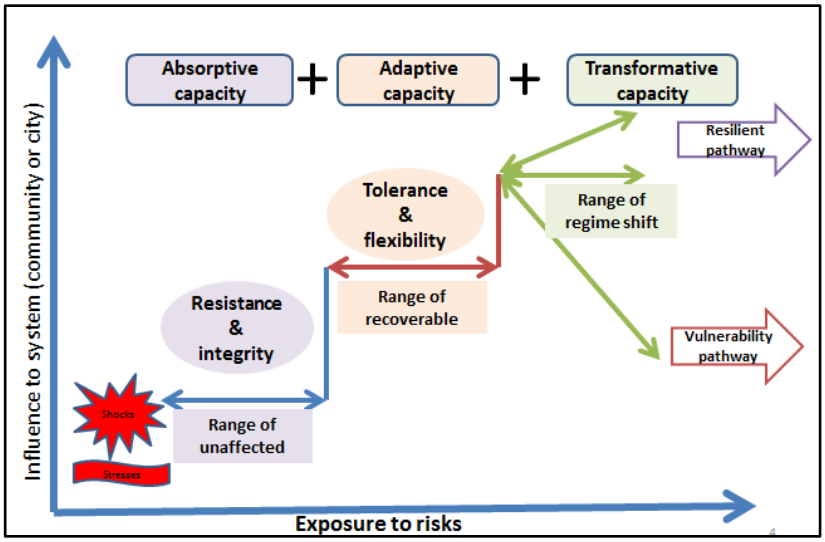
2. Theoretical framework and methodology

2.1.Resilient city

Resilience is gaining increasing prominence within the literature on cities and climate change. The term of resilient was first introduced to the field of ecology nearly four decades ago by Holling (1973): *"…resilience is the persistence of relationships within a system and the ability of these systems to absorb changes"* (Holling, 1973). Currently, the concept has also been applied to human social systems (Leichenko, 2011). Resilience means the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2010). The United Kingdom Department for International Development's (DFID) definition also links resilience with long term development: *"…disaster Resilience is the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses - such as earthquakes, drought or violent conflict – without compromising their long-term prospects"* (DFID, 2011).

This shows that there are many definitions of a resilient, though no single definition has yet to be adopted by all development and humanitarian actors. However, there appears to be general agreement that resilience is more than just the ability of a system (such as a household, community or city) to bounce back to its pre-disaster state. Rather, it is an ability to adapt the dynamic conditions and put in place mechanisms that enable long-term, systemic responses to the underlying causes of vulnerability (Barrett and Constas 2013).

Figure 1: Three capacities in building resilient cities



Source: Adopted from Baba and Tanaka, 2014; Frankenberger, et al. 2012

2.2.Planning resilient cities

Baba et al. reveals that when risk exposure exceeds a certain level, effects on urban systems will begin to appear in a discontinuous manner (See Figure 1). The measures that can be taken to this point include precautionary measures and adaptive measures to draw out the adaptability of the systems. Furthermore, when risk exposure surpasses a certain threshold, a regime shift (or revolutionary phenomenon) takes place, breaking down the existing framework of urban systems and demonstrating the transformative ability to create fundamentally new systems (Baba et al., 2014). DFID in its resilient city programmes identifies that the cities those who collapse or recover, but are worse than before are likely to fall deeper into a vulnerability pathway. However, those who bounce back or bounce back better can be said to be on a resilience pathway (DFID, 2011).

In this regards, we identified that a resilient city is one that is able to cope with disaster and climate impacts now and in the future, thereby limiting the magnitude and severity of those impacts. Thus, building resilient cities requires understanding the constantly changing relationship between context (city overview) and risks (disaster and climate change) on the one hand and three critical capacities (absorptive, adaptive, and transformative) on another. *Context* particularly understands how the city works and examining its current status and future trends, such as environmental, political, social, economic, and demographic conditions that affect, and are affected by the adaptive capacity of the city to cope with disaster and climate impacts (Frankenberger, et al., 2012). *Absorptive capacity* is the ability to minimise exposure to shocks and stresses where possible and to recover quickly when exposed (Frankenberger et al., 2012). *Adaptive capacity* involves making proactive and informed choices about alternative strategies based on changing conditions (Frankenberger et al., 2012). *Transformative capacity* relates to governance mechanisms, policies/regulations, infrastructure, community networks, and formal safety nets that are part of the wider system in which households and communities are embedded. These capacities enable more lasting resilience and often challenge the status quo in a substantial way (Béné et al., 2012).

2.3.Methodology

We selected four Asian cities for case study analysis based on their population size, urbanisation and economic growth, exposure to climate hazards, and a track record of disaster management efforts. Further, it was also taken into consider about the political interest of local governments about the subject and the accessibility and availability of relevant information in selecting these case study cities. As Figure 2 describes a participatory method was utilised throughout the process of data collection and field facilitators were selected in each country to conduct the workshop with the help of city officials in the respective cities. A series of focus group discussions were conducted during the period of 2013-2014 with citizens, city officials and city councillors to ensure that all the key groups are represented as much as possible to gain a better understanding regarding

the risk context in the city. The timeline method and risk matrix were elaborated with community members to identify the main hazards and prioritise them concerning their intensities and frequencies. Second, a detailed analysis of existing capacities was carried out and prioritised. After the risks and capacity assessments, two city consultation workshops were organised (2014-2015) inviting different stakeholders (local leaders, non-government organisations (NGOs), government agencies, the private sector, academic, and department heads) to make a resiliency plan identifying key barriers preventing the impact being reduced and priority measures (both short-term and long-term) to reduce the impact of these risks. Some of these workshops were chaired by the Mayors of the respective cities (Cebu and Nonthaburi) ensuring political leadership for the implementation of the plans. In the following section, the case studies will be introduced and the main findings are summarised.

Figure 2: Methodology of case study analysis

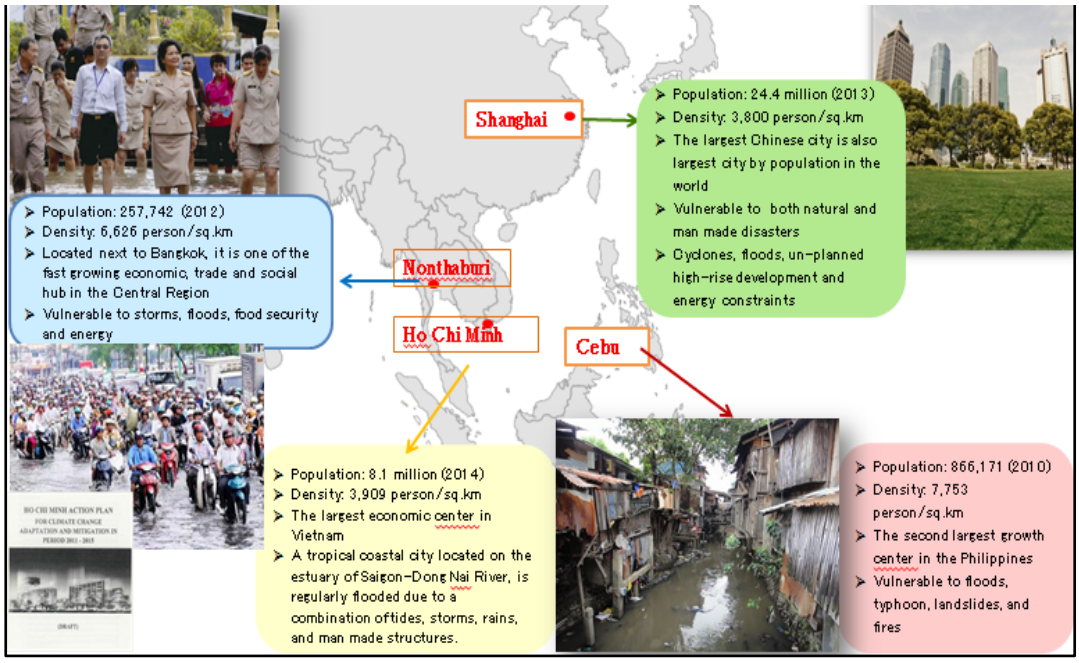
Source: By Author, 2015

3. Discussions: building climate and disaster resilient cities

In this section, we discuss the results of the case study review in four Asian cities and look at in-details how these cities are managing risks to build long-term resilience involving three objectives, such as characterise the city context, risks associated with natural disaster and climate change at the city-level, and the city's ability to adapt to anticipated change in climate.

3.1. Understanding Context and City overview

Figure 3: Overview of the case study cities



Source: by Author, 2015

Understanding how the city works and examining its current status and future trends, such as population and economic growth is important because these are affected by the adaptive capacity of the city to cope with disaster and climate impacts. The case study analysis revealed that all selected cities are rapidly growing cities have a higher vulnerability to disaster risks and climate change impacts. For example, Cebu City is the second largest growth centre in the Philippines after Manila and the total population of the city has been increased from 718,821 in 2000 to 866,171 in 2010 with 1.9% annual population growth (Cabrera, 2015). Nonthaburi Municipality is also the most urbanised centre of the Nonthaburi Province of Thailand and functions as a city centre of administrative, business and residential purposes (Pornsri, 2015). Ho Chi Minh City has a population of 10 million people in 2014 and contributes about 30% to total national income of the country (Viet, 2015). Shanghai is the largest Chinese city and the economic centre with a major administrative, shipping, and trading. It is one of the four direct-controlled municipalities of the People's Republic of China, with a population of about 25 million as of 2014 (Hu, 2015).

It was also revealed that if not properly accounted for in disaster preparation and response plans, the rapid population growth in these cities with large numbers of migrants cannot be fully integrated into the formal systems, increases in informal settlements and pressure on the city's infrastructures is likely, consequently making the cities even more

vulnerable to the impacts of climate change and natural hazards. In Cebu City, about 30% of its households are occupied in informal settlements in the risky areas with lack of basic infrastructure, services and the livelihoods (Cebu City, IGES and A2D, 2014).

Moreover the larger the area a city occupies and the denser a city is also impacting the resources required to adequately protect the population against climatic events and natural hazards. It was identified that Shanghai has 36,055 building blocks over 8 stores within its total land area of 6,787 sq.km (Hu, 2015). Since 2010, the energy demand in Cebu City is expected to grow at 4.5% annually and the existing transport, water supply, drainage and solid waste management systems are also poor maintained and not adequately (Cebu City, IGES and A2D, 2014).

Further, the case study analysis revealed that climate change impacts and disaster risk management are linked to city locations and geography. According to Nonthaburi, most of its development areas are located on the flat, low-lying floodplain of Chao Pharya Basin with a height varying from 1 meter to 3 meters. When the water level in Chao Phraya River and major canals are already high, this usually results in a stagnant flood situation, especially when there is a heavy rain (Nonthaburi Municipality and IGES, 2015). Located at the downstream of the Dong Nai river basin, 60% of Ho Chi Minh City's land area are less than 2 metres in elevation and was influenced by tides and sea level rise. Like most cities situated on deltas, Ho Chi Minh City faces serious challenges due to climatic change with increasing natural disasters such as typhoon, floods, droughts that occur regularly. Shanghai City is also located in the Yangtze River Delta in East China and its old city and modern downtown are formed by the Yangtze's natural deposition and by modern land reclamation projects (Viet, 2015).

3.2. Understanding Climate and Disaster Risks in the Cities

A comprehensive climate and disaster risk assessment are necessary to understand the hazards faced, manage growth while systematically addressing disaster risks, and adapt to the local impacts of climate change. The case study analysis recognised that there are some differences of the data available in these cities. The scientific data and information on climate change projections and disaster risks are readily available in Shanghai and Ho Chi Minh cities. Unfortunately, a data on climate risks and hazards did not exist in Cebu and Nonthaburi cities. Carrying out a comprehensive risk analysis and data gathering was also identified as costly and local government staffs in these two cities lack scientific background and expertise. Thus, the community-based, participatory risk analysis adapted to understating the risks better and reduces both costs and time required for data collection.

The participatory consultative method engaged city experts and stakeholders in each city in the risk and capacity assessment process also help to develop local adaptive capacity. The qualitative data gathered from participatory methods later integrated with scientific data of national and global disaster and climate models, providing a deeper understanding

of the risks and the scientific foundation for planning efforts by city-decision makers and other stakeholder groups.

The most common climate risk across all case study cities are extreme events resulting from weather related hazards and the most common threat is flooding. According to the Geo-hazard maps prepared by the Mines and Geosciences Bureau (MGB 7) of Cebu, 26 (out of 80) barangays in the city at high risks of flooding. Flood is also the most existing disaster risks in Nonthaburi Municipality. The Great Flood in Thailand in 2011 was a severe flooding in last 70 years and has caused an enormous damage to life and property of the Nonthaburi Municipality.

Changing weather patterns and extreme events result in damage to housing and roads networks, which in turn creates another indirect problems, such as a lack of access to goods and services, or an inability to travel to work. All of these cities include informal settlements or slums, and the ability of poorer communities to cope is limited by their lack of access to basic infrastructure such as potable water, drainage, sanitation and health services, education, and employment opportunities. According to Ho Chi Minh City, about 62% of the citizens may be affected by extreme weather events if there is not enough appropriate flood control projects in place by 2050 (this figure at the present is 26%). Rural communities and poor households in urban area are the most vulnerable groups because their livelihood will be damaged and more difficult to be recovered when facing climate change impacts, simultaneously, the low incomes also restrict them from covering losses and paying the bills for recovery. Urban flooding also affects industrial manufacture, especially reducing transport capacity and production efficiency of the industrial zones. If taking the labour forces affected by flooding as a criterion for the vulnerability assessment of the city's economy and industry, then there is about 41% of the labour forces is encountering the impacts of extreme floods. This number may be increased up to 60% by 2050 (Viet, 2015).

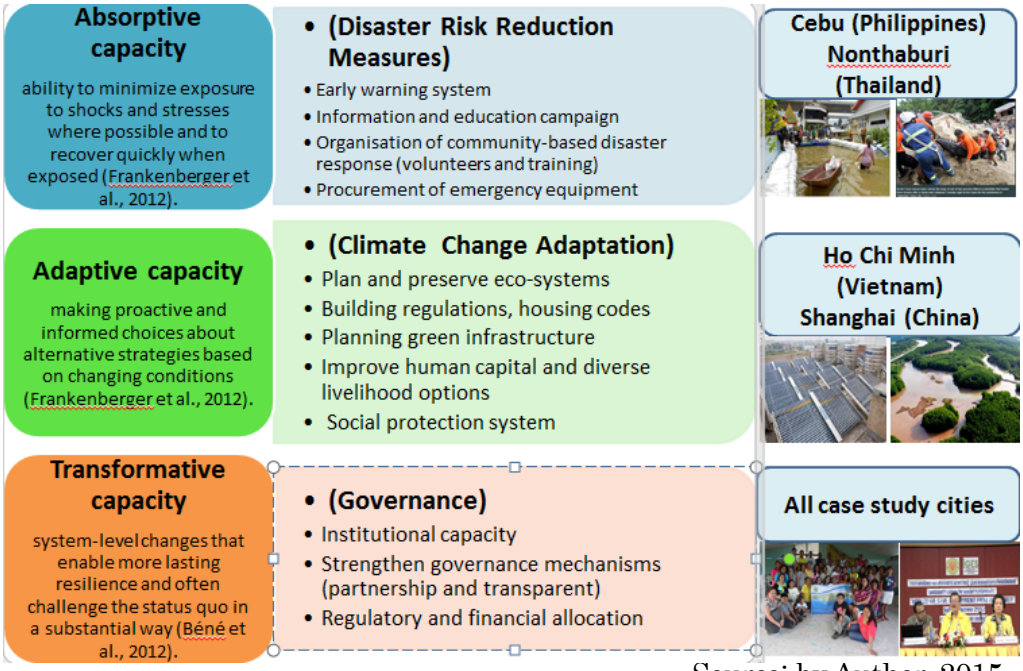
Shanghai City is also threatened by floods, storms, earthquakes and other climate and natural hazards. According to the Mind the risk : A global ranking of cities under threat from natural disasters in 2013, Shanghai is ranked as the eight most vulnerable cities in the world for its potential disasters such as typhoon, storms and flood (Hu, 2015).

3.3. Understanding Climate and disaster risk management capacities in the cities

Resilience building relies on integrated programming—a cross-sectoral approach with a long-term commitment to improving the three critical capacities, such as absorptive capacity (disaster risk management), adaptive capacity (longer-term climate change adaptation), and transformative capacity (improved governance and enabling conditions). The case study analysis identified that Cebu and Nonthaburi Cities are more focused on actions for building absorptive capacity with adopting disaster risk reduction measures, including risk assessment and preparedness planning, disaster response, relief and recovery programmes. Both cities have established disaster management committees,

Figure 4: Climate and disaster management capacities in the cities

early warning system and command centres, information and education campaign for its citizens to well prepare and responding to disasters. Also, they have well established organisational mechanisms at community-level of sudden response (volunteers and training) and emergency equipment.



Source: by Author, 2015

However, Ho Chi Minh and Shanghai Cites have begun to recognise the importance of strengthening the adaptive capacity under the resilience capacity–building initiatives to address the current threats and those emerging from climate change. The built and ecological environment of these cities significantly makes climate change impacts and Green House Gas Emissions. Both cities identified that the presence of lack of street trees and parks, coverage of flood retention areas, extent of wastewater and drainage system, waste disposal, and encroachment and illegal construction can intensify flooding in the cities. For responding to these issues, local governments identified both structural and non-structural initiatives that can be pursued through legal and political system, zoning regulations, infrastructure and urban services, specifying change building codes and restrict land use in areas subject to climate change impacts such as flooding, increase urban tree coverage and vegetation, plan and manage the river-basin and upper land's vegetation, cleaning of the channels and construction of new drainage system if necessary.

Further, this study found that all city governments face many challenges in planning resilient cities due to fiscal and policy making limitations. In order to effectively address the challenges faced by the cities in integrating resilient plans into daily decision making

and long term development plans of the cities, emphasise was given on enhancing the transformative capacities, which would be needed in order to facilitate systemic changes in the structural constraints (such as those of ecological, political, economic, or social structures). To bring typical changes in local policies, institutions and administrative process and planning systems where the changes are often most needed, four key factors are identified, such as effective political leadership, efficient financing, jurisdictional coordination and citizen participation.

4. Conclusion and recommendations

This study identified that local governments have great potential to lead in building resilient cities, despite the political, technical and financial constraints that they are facing in day-to-day operation. In order to effectively address the challenges of natural and climate change disasters, cities need to incorporate risk assessment and resilient measures into daily decision making and long term development plans and investments. Following are some recommendations for building resilience capacity in developing cities:

Resilient planning requires an understanding of both disaster risks and climate hazards:
Case study cities are growing quickly, where built-up areas are projected to increase more rapidly in the coming years. The locations and built environment of these cities often place their citizens and assets at greater risk for natural disasters, including those expected to worsen with climate change impacts. Considering this close link between disaster risks and climate risks, efforts are required to build resilience in cities by integrating climate change adaptation with existing efforts in disaster risk management. More accurate risk information is required to prioritise different risk reduction strategies. For the risk identification and analysis, a participatory, community-based method can utilise with the scientific, quantitative data gathered from other sources at national or global-scale. The analytical tools and more innovative donor funding mechanisms are needed in order to support local governments in building capacity to conduct comprehensive risk analysis and design appropriate interventions to address underlying causes of vulnerability and risk.

Integrating climate change adaptation with existing efforts in disaster risk reduction:
Local governments need to develop both short-term and long-term resilience measures, but many more need to bring them into their everyday operations. However, many local governments are reluctant or unaware of how to mainstream disaster and climate concerns in their political and development agenda, and how to address them in their investment plans and their citywide strategic thinking. Developing a local resilience action plan, as described in this paper is an important proactive measure in this regard. To reduce risks and enhance resiliency, the local resilience plans should balance a combination of risk reduction measures (early warning system) and climate adaptation measures (land use planning, building regulations, and eco-system management). The balance of these

measures will differ from each city, but they should be cost effective and appropriate to local conditions.

Ensure strategic collaboration to enhance transformative capacity:

The process of developing resilient plans and their implementation requires political support, efficient financing, collaborative partnership and citizen participation. A plan needs a support of top policy makers and the institutions with the necessary influence to get mainstreaming into existing development goals—recognising that without such mainstreaming, the achievement of these plans may themselves be threatened. The local stakeholders have a very important role in the resilient planning and external facilitator such as NGOs or universities based in the city can make facilitation. The outside agencies such as research institutes, donors, UN agencies, and national governments can provide technical support, science-based information and international experience which are greatly enhancing local government's transformative capacity to improve their resilience in the respective cities.

Acknowledgement

This research was supported by the Environment Research and Technology Development Fund (1-1304) of the Ministry of the Environment, Japan.

References

Barrett, C. B., and Constas, M (2013): Towards a Theory of Resilience for International Development Applications, Presentation at International Food Policy Research Institute, Washington, DC, August 2

Béné, C., Wood, R.G., Newsham, A., and Davies, M (2012): Resilience: New Utopia or New Tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes, IDS Working Paper, Vol. 2012, No. 405

Cebu City, IGES, and A2D (2014): A Report on the Consultation and Planning Workshop on Disaster Risk Reduction and Management in Cebu City, IGES, Kitakyushu

DFID (2011): Defining Disaster Resilience - A DFID Approach Paper, London

Frankenberger, T., M. Langworthy, T. Spangler, and Nelson, S (2012): Enhancing Resilience to Food Security Shocks, Unpublished draft white paper, Food and Agriculture Organization and World Food Programme, Rome, (www.fsnnetwork.org/sites/default/files/revised_resilience_paper_may_28.pdf). Accessed by 29 Jun 2015

Holling, C (1973). Resilience and stability of ecological systems, Annual review of ecology and systematics, 4, 1–23

IPCC, (2012): Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, a Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge,

UK

Baba, K, and Tanaka, m (2014): Development of a concept of resilient city and indicators for resilient assessment, 1st conference of International Alliance for Sustainable Urbanization and Regeneration, Kashiwa-no-ha, Japan, 2014

Leichenko, R. (2011): Climate change and urban resilience, Current opinion in Environmental Sustainability, 3 (3), 164-168.

Mitlin, D. and Satterthwaite, D (2013): Urban Poverty in the Global South: Scale and Nature. Routledge, Abingdon, Oxon, UK

Nida C. Cabrera (2015): Planning resilient city in Cebu, Philippines, Unpublished paper presented at the ISAP 2015 in Yokohama on 29 July

Nguyen T. Viet (2015): Planning climate and disaster resilient in Ho chi Minh city, Vietnam, Unpublished paper presented at the ISAP 2015 in Yokohama on 29 July

Nonthaburi City and IGES (2015): Report on Development of Resilient City Strategy for Flood Prevention in Nonthaburi City, IGES, Kitakyushu

Pelling, M (2003): The Vulnerability of Cities, Earthscan, London, UK

Prabhakar, S.V.R.K, Sirinivasan, A, Shaw, R (2009): Climate Change and Local Level Disaster Risk reduction Planning: Need, opportunities and challenges, Mitigation and Adaptation Strategies to Global Change, 14, 7-13

Pornsri Kictham (2015): Planning flood resilient city in Nonthaburi, Thailand, Unpublished paper presented at the ISAP 2015 in Yokohama on 29 July

Qunfang Hu (2015): Planning climate and disaster resilient in Shanghai, China, Vietnam, Unpublished paper presented at the ISAP 2015 in Yokohama on 29 July

UNISDR (2010) Making cities resilient: my city is getting ready, 2010–2011. World Disaster Reduction Campaign, UNISDR, Geneva

UNISDR (2015): Sendai Framework for Disaster Risk Reduction 2015-2030, (http://www.wcdrr.org/preparatory/post2015), Accessed by 29 Jun 2015

WMO, (2008): Future Climate Change Research and Observations: GCOS, WCRP and IGBP Learning from the IPCC Fourth Assessment Report. Workshop and Survey Report, IGBP Report No. 58 (WMO/TD No. 1418)