



City Profile

Climate and Disaster Resilience

Banda Aceh Bangkok Colombo Danang Dhaka
 Hanoi Ho Chi Minh Hue Iloilo Makati Mumbai
 San Fernando Sukabumi Suwon Yokohama



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About the Initiative

Climate and Disaster Resilience Initiative (CDRI) is an umbrella initiative of Kyoto University, funded by the Global COE Program "Human Security Engineering for Asian Megacities", which has research, education, training and implementation components. Under this initiative, the city profile work is jointly done by Kyoto University, CITYNET, UNISDR Hyogo Office and UNU. This is regarded as the joint initiative of the Asia Regional Task Force on Urban Risk Reduction (RTF-URR).

City data were collected through questionnaire survey. Cooperation and inputs from all the cities listed here are highly acknowledged.

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About the Organizations

Kyoto University

IEDM Laboratory of Kyoto University Graduate School of Global Environmental Studies targets to reduce the gap between knowledge and practice through pro-active field level, community based project implementation in the field of environment and disaster risk management. Key research areas are: climate change adaptation, urban risk reduction, environment and disaster education. GCDE program of Kyoto University targets education and research excellence on Human Security Engineering in Asian Megacities, with focus to city governance, infrastructure management, health risk management and disaster risk management.

CITYNET

For over 20 years, CITYNET (The Regional Network for Local Authorities for the Management of Human Settlements) has committed itself in helping local governments in the Asia Pacific Region in achieving sustainable urban development through institutional and capacity building in the form of capacity enhancement initiatives and city-to-city cooperation. It is a unique network on its own with a wide range of urban stakeholders, including but not limited to local governments, development authorities, non-governmental organizations (NGOs), community-based organizations (CBOs), associations of local authorities, research and training institutes and private companies. To date, CITYNET caters to around 116 members from 24 countries/regions in the Asia Pacific and Europe.

UNISDR

The United Nations International Strategy for Disaster Reduction Secretariat (UNISDR) is the focal point within the UN system on disaster risk reduction, and promotes and advocates for commitment and resources to disaster risk reduction. UNISDR has opened its new office "UNISDR Hyogo Office" in October 2007, in Kobe, Japan. One of its objectives is to work more closely with various institutions based in Japan which have accumulated experience and expertise in disaster risk reduction. UNISDR Hyogo Office aims at stimulating collaborative activities on DRR to further implement the Hyogo Framework for Action, with and among Governments and institutions working on disaster risk reduction, in particular North East Asia, including Japan.

RTF-URR

Asia Regional Task Force on Urban Risk Reduction was established in 2008 to facilitate interactions and collaboration among different stakeholders in the region. The goal of the task force is to enhance decisive actions to reduce risk and increase community resilience in the urban areas in the Asian region. The task force, coordinated by UNISDR Hyogo Office, conducts policy advocacy, knowledge management, and promotes synergy and cooperation of related initiatives.

United Nations University - Institute for Sustainability and Peace (UNU-ISP)

UNU-ISP aspires to further boost the UNU's contribution to international society by seeking a greater understanding of the broad, intersecting themes that extend across three of the most pressing issues on the UN agenda: (i) global change and sustainability, (ii) international cooperation and development, and (iii) peace-building and security. UNU-ISP will bridge these cross-cutting issues through a comprehensive and integrated approach, and will actively roll out a series of research, educational and social-collaborative initiatives aimed at solving current problems and anticipating future challenges.

Background and Targeted Issues

Urban areas, where 65 to 90 percent of economic activities of most Asian countries are concentrated, are experiencing ever increasing risk due to changing climate. On one hand cities are expected to continue acting as backbone of the nation's economy and on the other they also need to prepare to accommodate larger population because it is estimated that two out of three people on earth will live in urban areas by 2030. According to the United Nations Human Settlements Programme 2007, 'there is a constant pressure to keep pace with, if not lead, change in regional and global economic development. This, in turn, can be a force contributing to uncontrollable urban expansion and the generation of more vulnerability to disasters'. Moreover, since Asia is the most disaster-prone region, the incidences of climate-induced disasters are also high compared to other regions. Past disaster trends suggests that high density population in Asian cities increases the mortality and the number of affected people in a typical disaster event, which in turn also result in increasing economic losses in the region. There is a serious concern that the targets of Millennium Development Goals may not be effectively achieved if disaster risk reduction is not prioritized in development planning in general and urban development in particular.

With growing confidence of scientific community, climate change and induced impact on human life have become a burning issue not only for the environmentalists but also for the policy makers and world communities. Climate change is occurring, accompanied by significant changes in precipitation, temperature, and changes in the frequency and intensity of some extreme events. These changes will affect natural and human systems independently or in combination with other determinants to alter the productivity, diversity and functions of many ecosystems and livelihoods around the world. Yet these impacts will not be distributed or felt uniformly, as those "with the least resources have the least capacity to adapt and are the most vulnerable".

Settlement on marginal or unstable land such as coastal areas, mountainous areas, river basin and urban slums heightens their exposure to the impacts of climate hazards. With limited capacities and resources at their disposal to respond to stresses such as droughts, floods, typhoons and rainfall-induced landslides, their ability to meet basic needs and improve their lives is constrained. Climate change impacts and variability, therefore, threaten to exacerbate existing vulnerabilities and further entrench development disparities. Therefore, there is a need to build a resilient community that would be efficiently capable to face climate change and associated disaster risk. For that, city governments need to be aware of current and future potential risk and take more initiative in order to enhance the resilience of the urban systems and communities. Despite growing recognition of 'building resilient communities and enhancing adaptation to climate change', Asian urban communities are not yet receiving adequate attention. Most of the explosive growth is going on in developing countries of Asia where already about half of the urban population live in slum areas. These large proportions of the people are also at higher risk from the effects of climate change. Many urban dwellers have already started to face life-threatening risks from the increased intensity of storms, flooding and landslides that climate change is bringing. These and other impacts will also bring the threat of damage to their livelihoods, property, environmental quality and future prosperity.

[References: United Nations Human Settlements Programme, 2007; IPCC, 2001; IISD, SEI, IUCN, Intercooperation, 2003; ID21, 2008; DFID, 2007; IDS, 2007; UNHSP, 2003]



This study recognizes that the scale of developmental concerns Asian cities are expected to address in a very near future will be behemoth. Moreover, even the best possible and technologically advanced resource provisions can not ensure elimination of threats which is already demonstrated through experience of hurricane Katrina. Therefore, more attention needs to be paid to raise the resilience of both urban local organizations and communities to climate change and associated disasters.

This study looks at different dimensions of resilience from the lens of urban communities. Understanding urban problems and recognizing potentials within communities is of utmost importance to enhance resilient to climate change risk and disasters. It attempts to measure the existing level of climate disaster resilience of urban communities. The scope of this study is limited to climate-induced disasters (hydro-meteorological disasters), such as cyclone, flood, heat wave, drought and heavy rainfall induced landslide and building resilience against them. In the attempt of building a resilient community, key questions that need to be answered are:

- How to enhance resilience of the community?
- What are the indicators that need to be addressed to be able to characterize and measure Climate Disaster Resilience?
- How can we create an effective index to assess the level of climate disaster resilience of a vulnerable urban community?

This research is an attempt to seek answers to these queries by focusing on the urban communities of Asian cities. It aims to enhance community resilience after evaluating the existing level of climate disaster resilience of a community using a Climate Disaster Resilience Index (CDRI).

In this initiative, community resilience can be understood as:

- Capacity to absorb stress or destructive forces through resistance or adaptation
- Capacity to manage or maintain certain basic functions and structures during disastrous events
- Capacity to recover or 'bounce back' after an event.

This concept comprises the capacity of a community to absorb stress (hydro-meteorological disasters), to manage it and to recover from it. It is assumed that if a community can raise its climate resilience, it would enhance its disaster resilience and finally these two resiliencies would combinedly enhance community's resilience to climate disaster risk.

The community's climate disaster resilience would be assessed considering the following dimensions:

- Natural: topography, disasters, natural environment degradation, hydro- meteorological situation
- Physical: history, location, accessibility, infrastructure and utilities, housing condition, land tenure, environmental degradation,
- Social: population, health, education, knowledge and awareness, social capital, conflict, crime,
- Economic: income, employment, expenditures, assets, access to financial services, financial coping mechanism
- Institutional: internal and external institutions, institutional collaboration, coordination and cohesion

Based on these dimensions, a methodological approach is developed to determine a Climate Disaster Resilience Index (CDRI).



Briefly, outcomes of this study are:

- Methodology of CDRI development;
- CDRI to measure community's climate disaster resilience;
- Climate Disaster Resilience Map for the Identified communities;
- Strength and weakness of different sectors of each dimension of CDRI (physical/social/economic/institutional/natural) of a community so that local authorities and development organizations can prioritize the sectors for policy implication.
- Inputs for policy formulation process of development organizations for urban communities risk reduction.

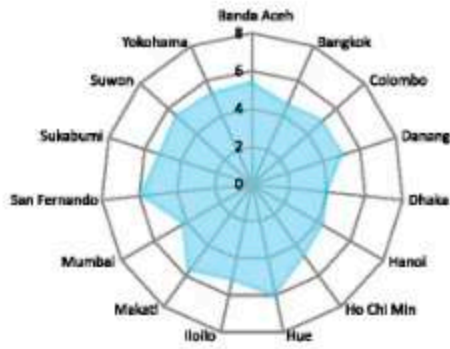
Cities that are focused on in this initiative are in alphabetical order: Banda Aceh (Indonesia), Bangkok (Thailand), Colombo (Sri Lanka), Danang (Vietnam), Dhaka (Bangladesh), Hanoi (Vietnam), Ho Chi Minh (Vietnam), Hue (Vietnam), Iloilo (Philippines), Makati (Philippines), Mumbai (India), City of San Fernando, La Union (Philippines), Sukabumi (Indonesia), Suwon (South Korea) and Yokohama (Japan).

Climate and Disaster resilience Index (CDRI) and the analysis are based on the questionnaire survey, filled up by the city officials. The quality of results is very much dependent on the data quality, and proper understanding of the questionnaires. Needless to say, these results are not absolute values, but broad policy guidance and scope of improvements in selected sectors of the climate and disaster related problems in the respective cities.

On the overall analysis, there are six graphs showing comparative nature of cities. This comparison is made to highlight the positive side of city's preparedness. One graph shows overall city's resilience, and five other graphs demonstrate city's resilience in terms of natural, physical, social, economic and institutional.

For each city, five graphs are presented: overall resilience (combination of all five factors), and physical, social, economic and Institutional resilience. Overall resilience factor varies between 0 and 12. Physical, social and institutional all have a range between 0 to 4, and economic resilience between 0 and 6. Higher the value of the resilience means higher preparedness to cope with climate and disasters. Policy points are based on the results, and provide encouragement of city government's engagements in specific city services and institution and capacity building.

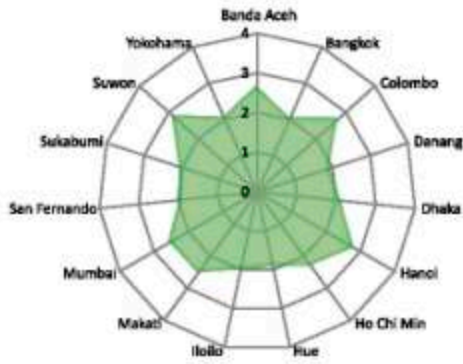




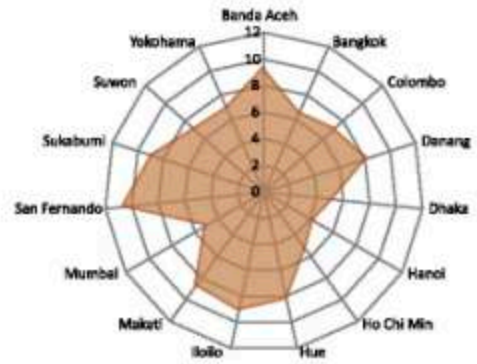
City's Resilience Mapping based on CDRI



Physical Dimension



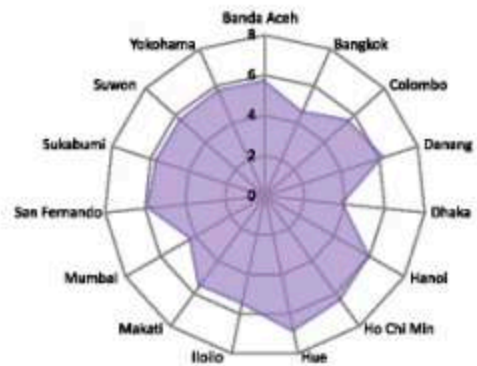
Natural Dimension



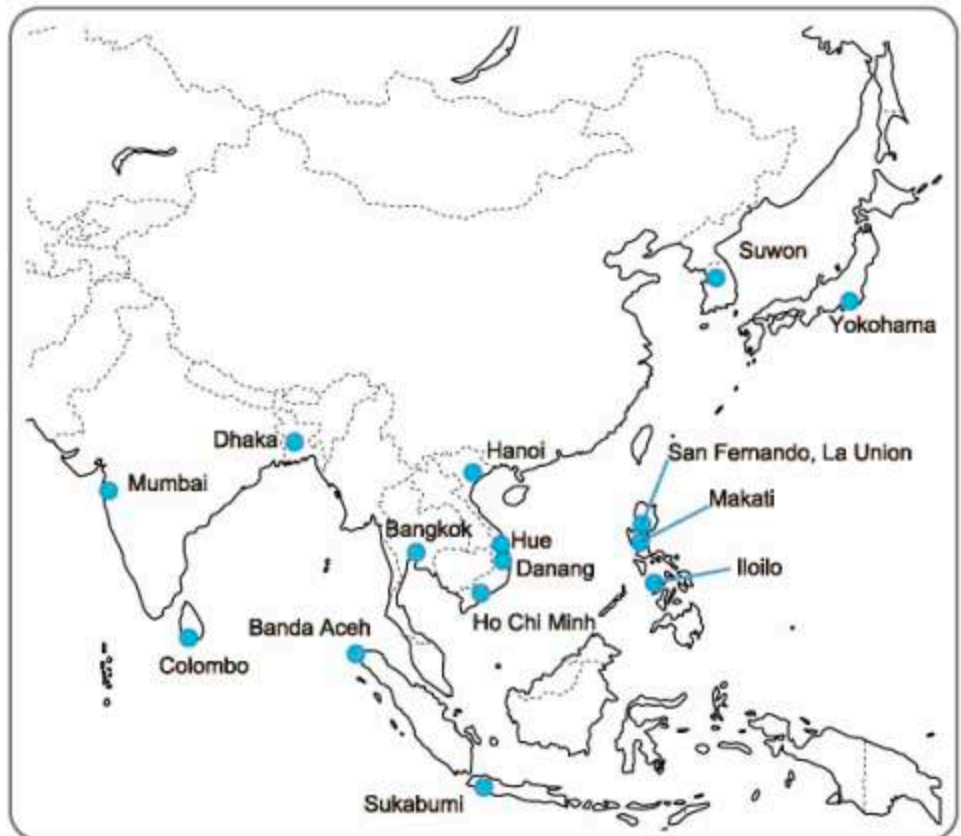
Social Dimension



Institutional Dimension



Economic Dimension



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City Outlook

Banda Aceh city's first name was Kutaraja. Later on, the name was changed into Banda Aceh. Banda comes from the Persia, "Bandar" and it means port or heaven. Today, as an 804 year old city with 219,659 inhabitants, Banda Aceh became one of the older Islamic Kingdom City in South East Asia. Banda Aceh as the capital city of Nanggroe Aceh Darussalam Province is also known as Mecca veranda.

The Master Plan for the rehabilitation and reconstruction of Aceh was set in law, through Presidential Regulation No. 30/2005. It advocates that all facets of the reconstruction of Aceh be consistent with long-term environmental health and sustainable development. Together with the city's Microzonation program, the Master Plan can be effectively used for information management for Disaster Management.

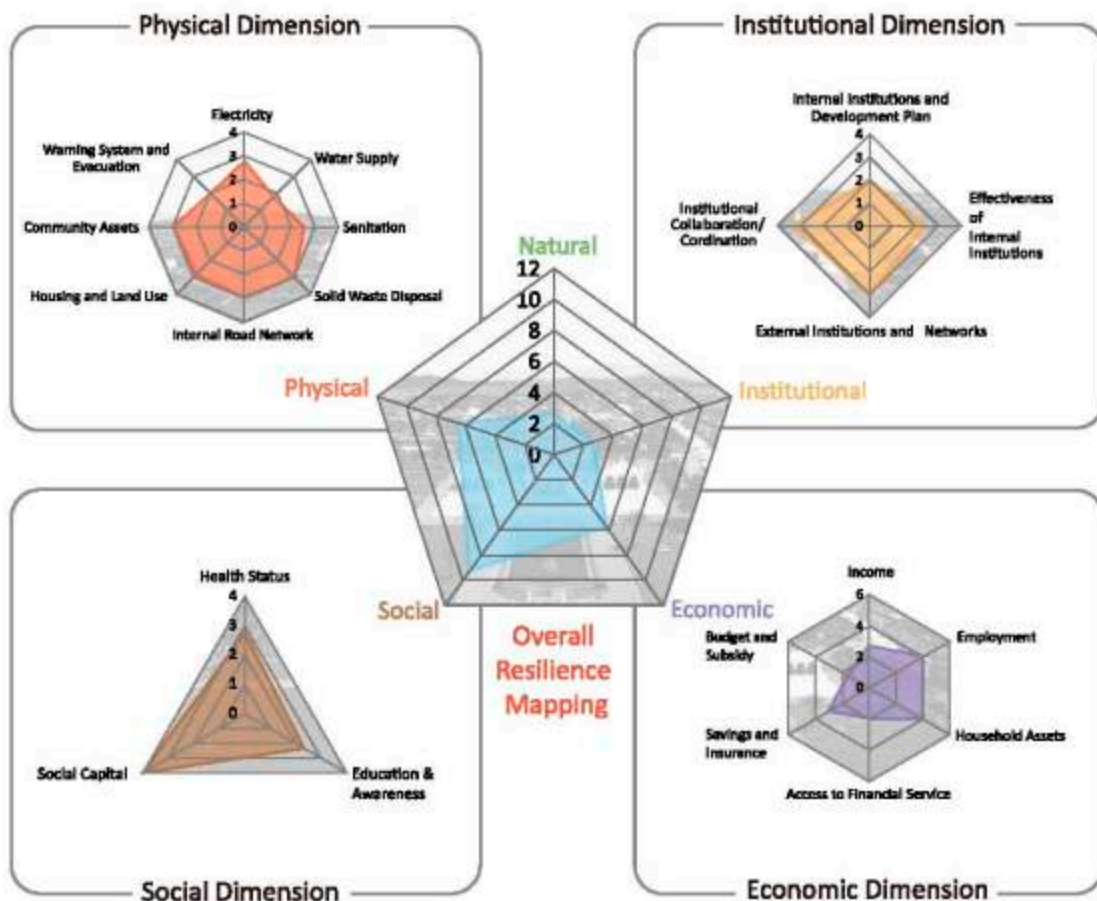
The city's population density is 3.58 persons per square kilometer. Working age population (from 17 to 64 years-old) accounts for 75% of total population. About 80.76% of people depend on tertiary occupation (service sector base) while 13.04% and 6.20% depend on secondary (manufacturing, industry base) and primary occupation (agriculture base) respectively. In 2000, Banda Aceh experienced catastrophic flood disaster that led to a loss of about 100 billion rupiah (approximately USD 9 million). In 2004, Banda Aceh

was again affected by the heavy tsunami and earthquake disasters (leading to a total estimate of damage and losses of USD 4.45 billion for Aceh and North Sumatra combined), totally damaging one third of the area, partially damaging another one third of the area. It is reported that more than 70,000 of casualties as well as more than 12,000 destroyed houses resulted from the tsunami disaster.

[Source: Banda Aceh City Questionnaire Survey ; JICA, 2005 ; IFAD, 2005 ; <http://www.e-aceh-nias.org>]



Analysis Result



Policy Point

Banda Aceh experienced tsunami and recovery process and has contributed significantly to the disaster risk reduction aspects. However, Banda Aceh's institutional and physical resilience have scope for further improvement along with more investment in risk reduction initiatives. There is a need to have additional focus on early warning and water supply system which would collectively improve the city's overall resilience.

Tsunami recovery programs have helped in building stronger social capital; enhanced community and household assets and better employment opportunities. However, dedicated budget and subsidies may also be offered to boost investment in risk reduction activities and increase present level of household income.

Education and awareness, as well as health status in general are dwindling the social dimension of resilience. The city needs to address root causes of the problem to reduce vulnerability and enhance awareness and health.

Effective mainstreaming of risk reduction in governance and institutions is required which will lead to enhance economic resilience as well.



City Outlook

The town of Bangkok began as a small trading center and port community on the west bank of the Chao Phraya River serving the Ayutthaya Kingdom, the precursor of modern Thailand which existed from 1350 to 1767.

Bangkok special administrative area covers 1,568.7 km². Much of the area is considered the city of Bangkok, therefore making it one of the largest cities in the world, populated by 8 to 10 million (night / day time) inhabitants. The Chao Phraya River, which stretches 372 km, is Bangkok's main geographical feature. The Chao Phraya River basin, the area surrounding Bangkok, and the nearby provinces comprise a series of plains and river deltas that lead into the Bay of Bangkok about 30 km south of the city center. This gave rise to Bangkok's appellation as the "Venice of the East" due to the number of canals and passages that divide the area into separate patches of land. The city once used these canals, which were plentiful within Bangkok itself, as divisions for city districts. However, as the city grew in the second half of the 20th century, the plan was abandoned and a different system of division was adopted.

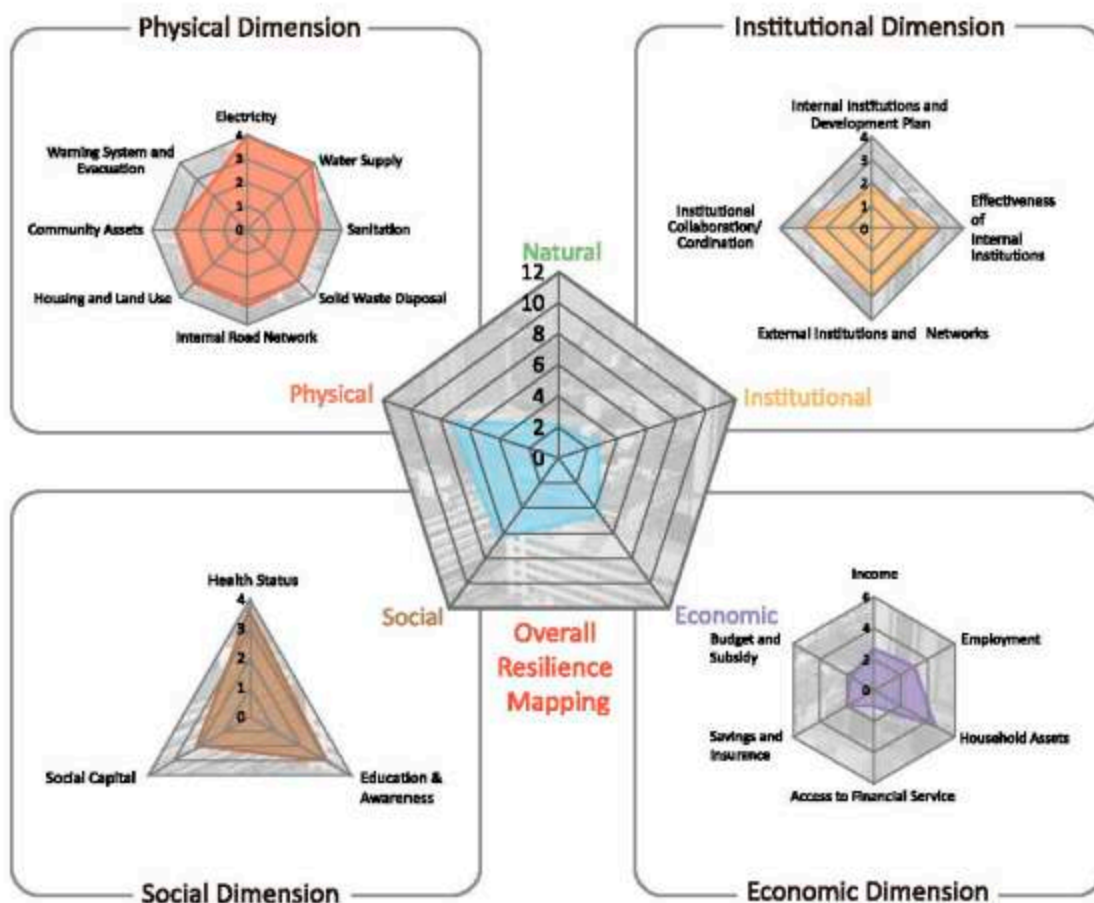
Bangkok lies about two meters above sea level, which causes problems for the protection of the city against floods during the monsoon season. Often after a

downpour, water in canals and the river overflows the banks, resulting in massive floods. Flooding in Bangkok and vicinity has been a very critical issue of urban management since an inception of the modern metropolitan administration. Therefore, several flood events claiming heavy damages occur in Bangkok city, such as the one in 1983 that caused 6,600 million Baht (approx. USD 190 million) in damage according to the National Statistical Office (NSO).

[Source: Bangkok City Questionnaire Survey ; <http://www.apru.org>; Lekuthai and Vongvisessomjai, 2001]



Analysis Result



Policy Point

Inputs for strengthening institutional capital and increasing budgetary incentives for disaster risk reduction is important to enhance resilience of Bangkok.

Significant efforts are underway to improve health status and education levels. However, additional focus through proactive community participation programs might help building city's social resilience.

Disaster risk reduction mainstreaming with existing developmental activities and planning will be a major incentive that Bangkok needs to offer quickly. Similarly internal institutions may be further developed to take lead in this aspect.

Widening insurance base for risk coverage and improvement of warning and evacuation system will play complimentary role in building physical and economic resilience of the city as a whole.

Enhanced access to financial services could be linked with built-in risk reduction mechanism to complement resilience in different spheres.



City Outlook

As the largest city in Sri Lanka formerly known as Ceylon, Colombo is the country's financial and commercial capital with a population of 647,100. It has been ruled by the Portuguese, Dutch and British. Centuries of colonial rule saw a decline of indigenous administration and the Ordinance in 1865 which created Municipal Councils to Colombo and Kandy was conceived as a means of training the Ceylonese in the art and science of self-government. The Legislative Council of Ceylon, by a Bill constituted the Colombo Municipal Council in 1865 and the Council met for the first time on 16th January 1866.

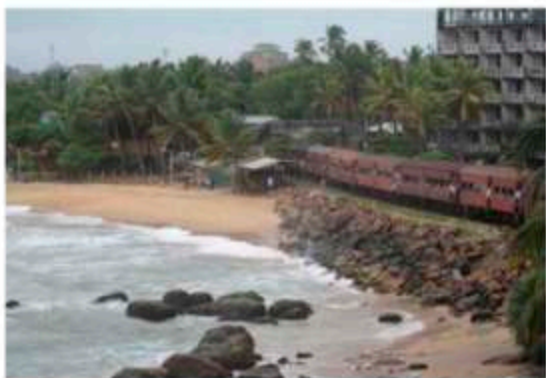
Population density is 17,353 persons per square kilometer and the population growth rate is 0.4% per year. Working age population (17 to 64 years-old) accounts for 54.10% of total population. The city population is in majority composed of 53.53% male against 46.47% female. About 60% of people depend on tertiary occupation (service sector base) while 35% and 5% depend on secondary (manufacturing, industry base) and primary occupation (agriculture base) respectively.

Reports from the tsunami that occurred in 2004 showed that 10,150 families were affected, 38,020

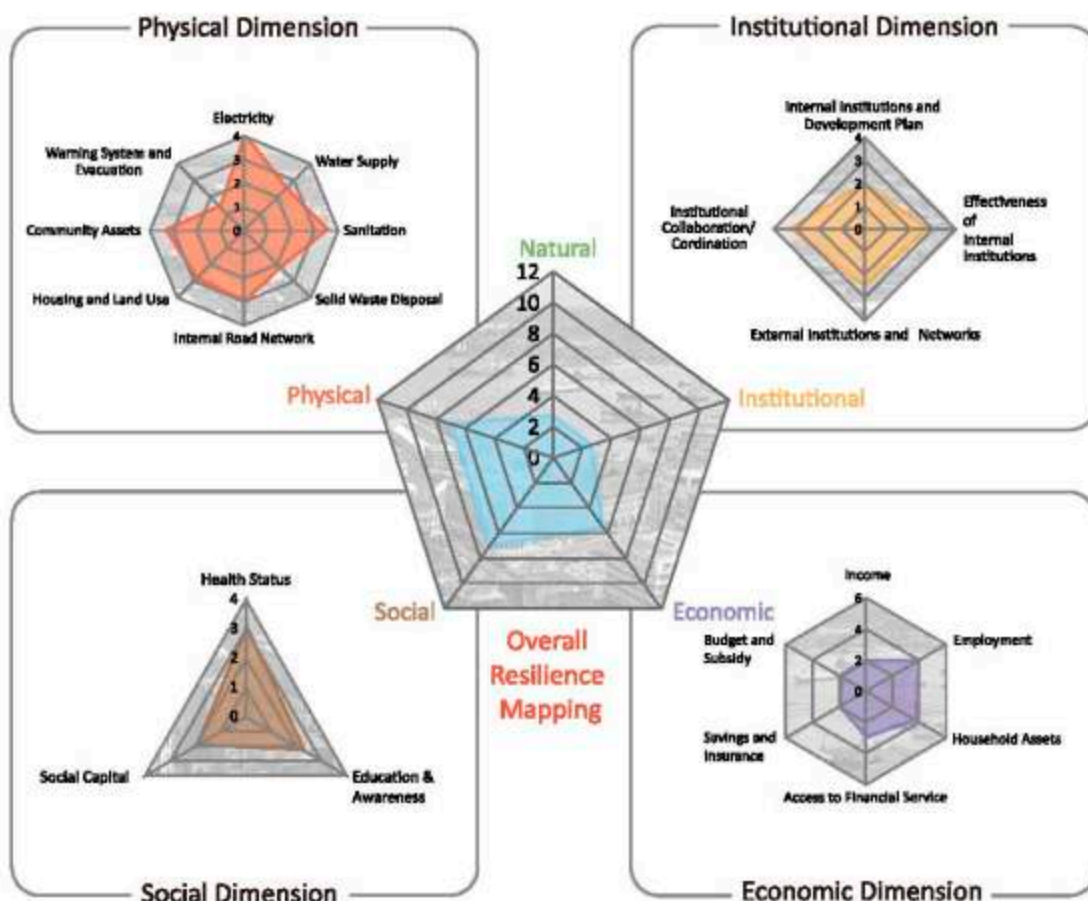
persons displaced, 138 dead, 64 injured, 12 missing, 3,100 houses fully damaged and 2,627 houses partially damaged (Colombo District data).

In 2007, Colombo experienced catastrophic flood disaster that led to a loss of two human lives.

[Source: Colombo City Questionnaire Survey ; <http://www.adb.org>]



Analysis Result



Policy Point

Overall, Colombo's climate disaster resilience requires synergetic yet parallel attention to physical, social, economic and institutional dimensions.

Institutional resilience needs considerable attention along with support from economic front i.e. diversified sources to raise incomes, budget and subsidy to risk reduction activities, and widening savings and insurance base.

Municipal services especially water supply and solid waste management needs upheaval to ease stress in daily lives of the communities and enhance physical resilience

Warning and evacuation system needs an overhaul with corrective measures to built social capital through massive awareness across sectors and scales.

Resilience based development planning and effective involvement of multiple stakeholders will be an asset to strengthen the institutional resilience of Colombo.



City Outlook

Danang's name originated from the Cham word Da Nak, meaning "opening of big river" since the 15th century. In August 1858, French troops landed under the orders of Napoleon III, beginning colonial occupation in the area. As a concession, it was renamed as Tourane in French. It came to be considered as one of French Indochina's major cities. Before 1997, the city was part of Quang Nam - Danang province. In January 1997, Danang was separated from Quang Nam province to become the fourth municipality of Vietnam.

Currently, Danang city's population is 792,895 (based on 2006 statistics), composed of 48.5% male and 51.5% female. Population growth per year is 11.37%. Working age population (17 to 64 years old) accounts for 65% of total population.

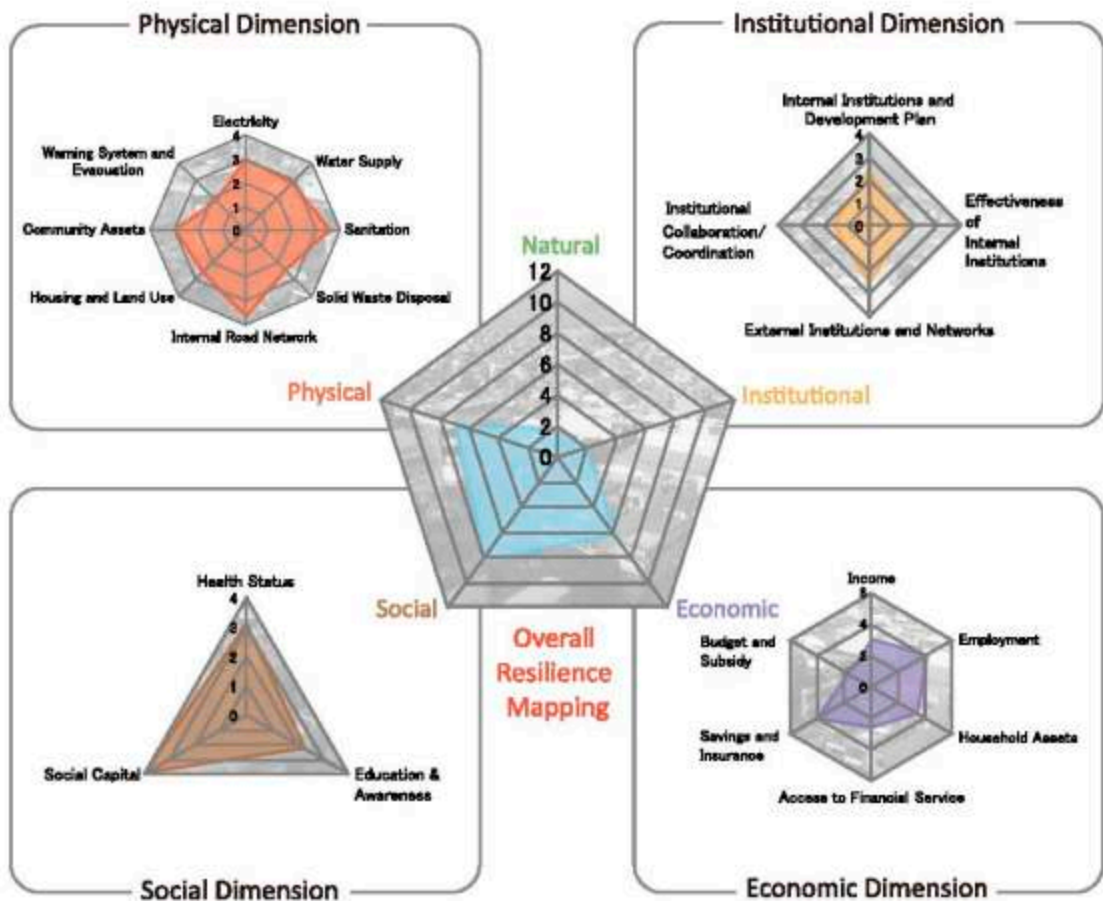
The city is often facing severe disasters, such as the case of catastrophic storm and flood occurring in 1996, 1998 and 2006, all resulting in heavy losses. In 2006, typhoon Xangsane struck Vietnam and Danang city suffered the worst damage. At least 22 locals report-

edly died in the storm, and 61 were seriously injured. Property damage in Danang city alone is estimated at over 5.29 trillion dong (USD 330 million). Over 83,000 houses were destroyed or had their roofs blown off, 320 fishing vessels were damaged, and over 20,000 trees were uprooted.

[Source: Danang City Questionnaire Survey ; <http://www.intellasia.com>]



Analysis Result



Policy Point

Physical dimension of Danang’s resilience calls for immediate improvement specifically in improving warning systems and solid waste management.

Strong social capital need to be strategically complemented to enhance education and awareness and health status among masses.

Budgetary provisions for risk reduction are skewed and would require the city to devote incremental share of developmental budget towards this.

Savings and insurance are promising however, the city need to facilitate access to financial resources.

Risk reduction is a development agenda for most organizations in Danang but better coordination is also needed for making resiliency concerns more effective.



Dhaka

Bangladesh

City Outlook

The existence of urbanized settlements in Dhaka dates back from the 7th century. The development of Dhaka as the township and a significant growth of population came into existence when the city was proclaimed as the capital of Bengal under Mughal rule in 1608. After independence, rapid and massive growth of the city population took place attracting migrants, workers from the rural areas. A real estate boom has followed the expansion of the city and development of new settlements.

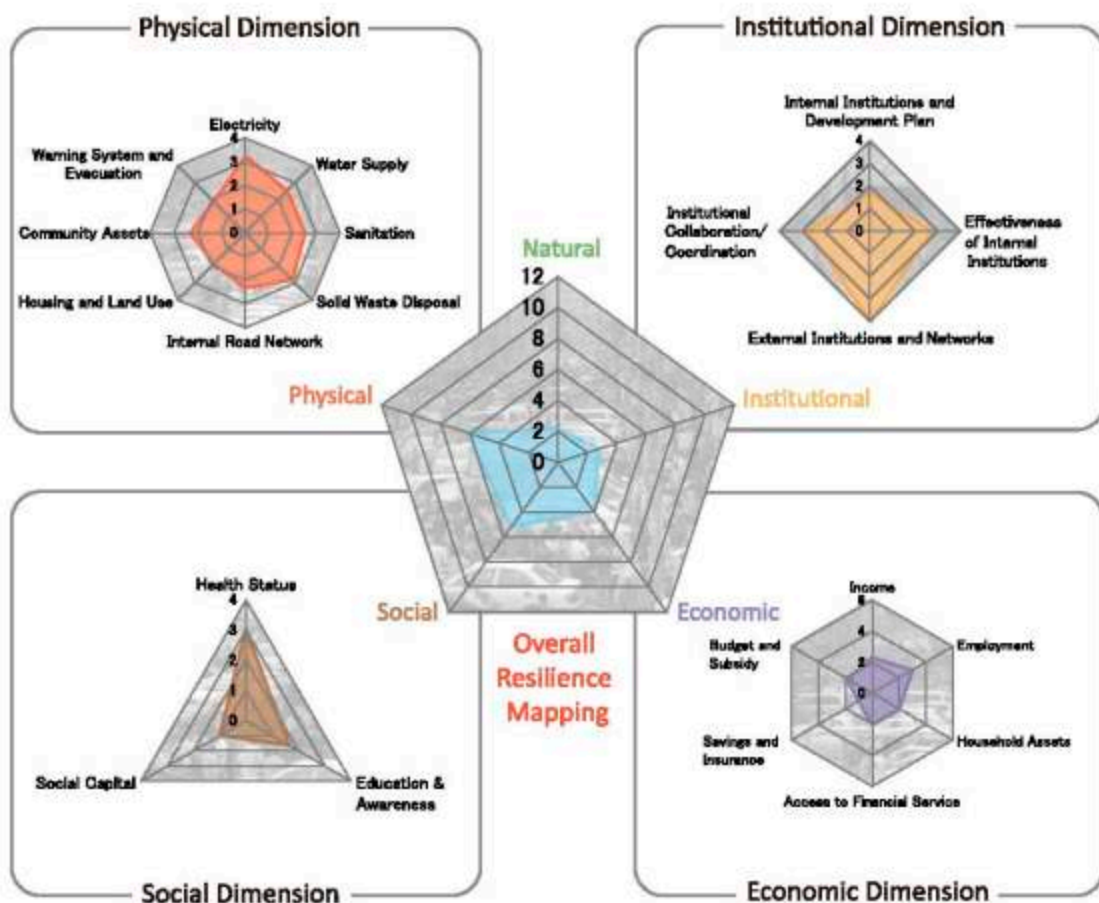
Due to rapid unplanned and unregulated urban expansion, Dhaka City, being 400 years old with 12 million inhabitants, now suffers from problems of drainage and stagnation of rain water, leading to flooding during the monsoon season. This situation has turned very bad in recent years both in the old city areas and new parts. Unwise closure of natural and old artificial drainage and navigational canals has aggravated the situation. Main streets now go under a meter of water after every heavy monsoon shower. Most parts of the city are vulnerable to annual flooding during the monsoon months, because of the topographic condition of the Dhaka. At times of abnormal floods nearly 75 percent of Dhaka goes under water. Such situations were experienced in 1954, 1987, 1988, 1998, and 2004, with the latter ones being the most severe (with 4,000, 2311 and 1700 million BDT (approx. USD 58 million, 34 million and 25

million) in 1988, 1998 and 2004 respectively). During such periods the settlements of the poor are affected the worst although other areas also were not spared. The floods cause colossal economic loss to the city and also affect the health of the people. The severity of the floods has been intensified partly due to unplanned urban development, but is also a direct result from poor physical planning. Efforts are now being made for the opening up of the closed canals for the purpose of improving drainage. Dhaka city experienced heavy damages due to catastrophic floods mainly.

[Source: Dhaka City Questionnaire Survey ; http://www.emi.pdc.org/cities/CP_Dhaka-July2006.pdf]



Analysis Result



Policy Point

Dhaka, being the capital of Bangladesh and home to over 12 million people, need to adopt a balanced approach to systematically yet swiftly address physical, social, economic, institutional dimensions of climate-disaster resilience.

Disaster communication in the form of improving early warning systems and evacuation planning and accessibility by better internal access roads will be a good help in building physical resilience if also complemented by improvements in existing housing construction practices.

A city-wide social capital enhancement initiative may be launched to engage more partnership and buy-in towards climate disaster resilience.

Recognizing the fact that almost 50% of Dhaka's populace is categorized as 'urban poor', savings linked insurance programs can be boosted while offering overall financial service improvement for risk reduction.

Leveraging on existing strength in terms of external institutional networks, internal networks may also be strengthened while making climate-disaster resilience a development planning agenda.



City Outlook

The origin of Hanoi dates back to more than 2,000 years when the capital of the Au Lac dynasty, which lasted for only 50 years, was Co Loa. The ensuing thousand years witnessed the rise and fall of various dynasties (Dinh, Ly, Tran, Ho, Le, Mac, Nguyen) that brought with them changes in the location of the capital as well. In 1883, France's colonization of Vietnam began and the French Indochina Union was born. Hanoi became the capital of French Indochina (consisting of Viet Nam, Lao and Cambodia). Up to the end of the 19th century, France exercised a lake-centered planning and expanded the city area from the Hanoi citadel and the Ancient Quarter toward the southeast.

In 1946, the Vietnamese Democratic Republic was formed and Hanoi was declared as its capital. Since 1976 Hanoi has served as the capital of the Socialist Republic of Vietnam.

Hanoi city population is 3,118,200 with a population density of 3,385 persons per square kilometer.

Working age population comprised between 17 to 64 years-old accounts for 67%.

Hanoi experienced various flood disasters. In 1945 and 1971, it was facing catastrophic floods which resulted in heavy losses (USD 51.5 million and USD 79.9 million respectively). In 1996, another flood disaster led to

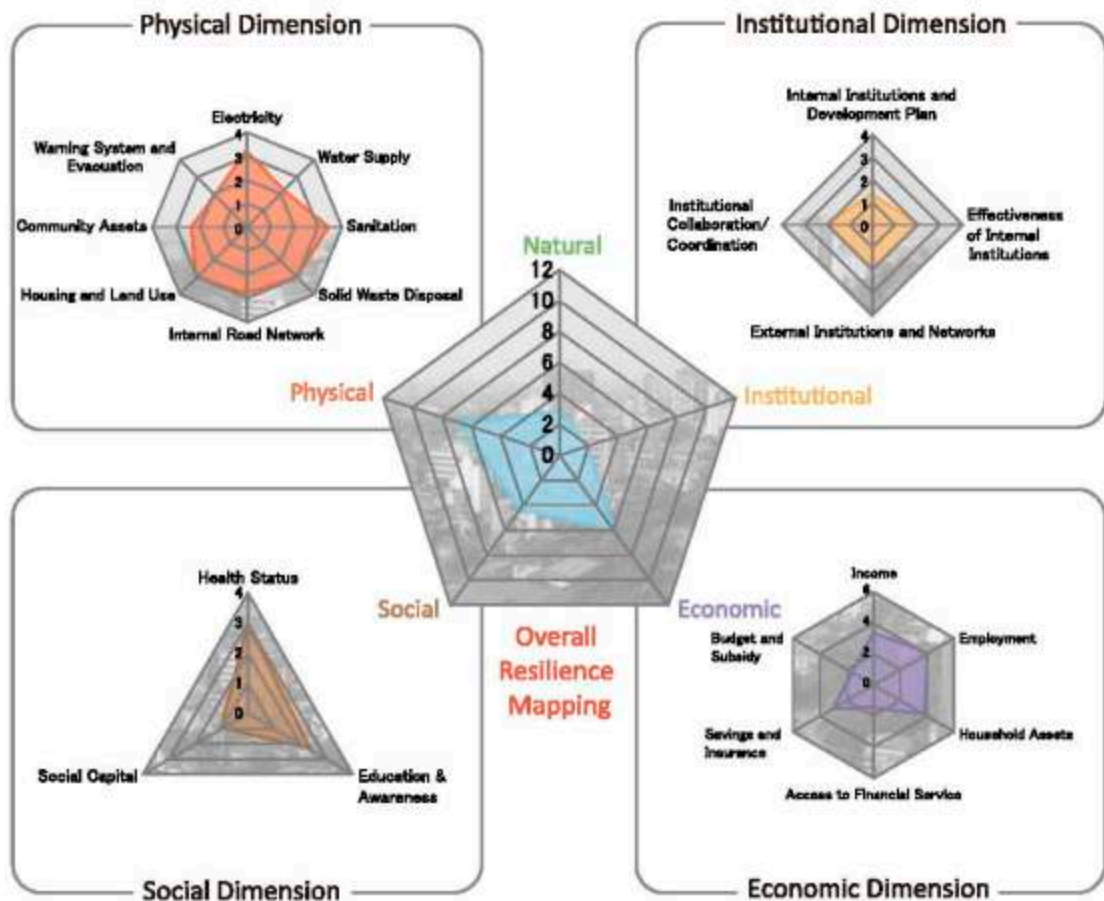
USD 5 million losses for the city.

In 2008, Vietnam experienced its worst rain in 35 years in storms that sparked flooding across large part of the country, hitting Hanoi severely during which 22 people reportedly died.

[Source: Hanoi City Questionnaire Survey ; <http://www.tinquehuong.wordpress.com>]



Analysis Result



Policy Point

Strong focus on flood management and dyke control suggests that disaster concerns always remained priority in Hanoi. However, added attention should be given to improve social and Institutional dimensions of resilience.

Outreach of early warning system to city's relevant institutions as well as communities needs serious attention. Similarly, establishment of evacuation centers should also be considered an equally top priority.

Awareness about 'hazards Hanoi is prone to' can be spread by targeted community based education programs in such a way that it also builds social capital.

Economic resilience can be augmented by two pronged approach. Firstly by improving access to financial services with built-in safety component and secondly by increasing budget and subsidy based incentives to disaster risk reduction.

As a capital city with presence of multiple institutions, external and internal institutional coordination remains a challenge. However, 'Climate disaster Resilience' if given priority, can provide a common link to enhance institutional networking.



City Outlook

In 1998, Saigon-Ho Chi Minh City celebrated its 300th anniversary, but the period of the 75 years between 1623 and 1698 may be regarded as the time in which Saigon was founded. In 1976, after the reunification, the National Assembly unanimously decided to rename Saigon-Cholon-Gia Dinh as Ho Chi Minh City. Bearing the name of Uncle Ho is a big honor for the city and at the same time requires high responsibility for building and protecting the country.

Since liberation, Ho Chi Minh City has contributed a great deal to socialist and national construction and defense. Politburo's Resolution 01 (1982) stipulates that Ho Chi Minh City has a political position just behind Hanoi, the capital. It is endowed with favorable conditions that cannot be found elsewhere. It has great potential for developing industry, exports, tourism and services. In coordination with other localities, Ho Chi Minh City is forming an agro-industrial economic structure for the country's socio-economic development.

The city has a population of 8 million inhabitants and a population growth rate of 10%. Population density is 4,000 persons per square kilometer. Working age population (17 to 64 years old) accounts for 66.4% of

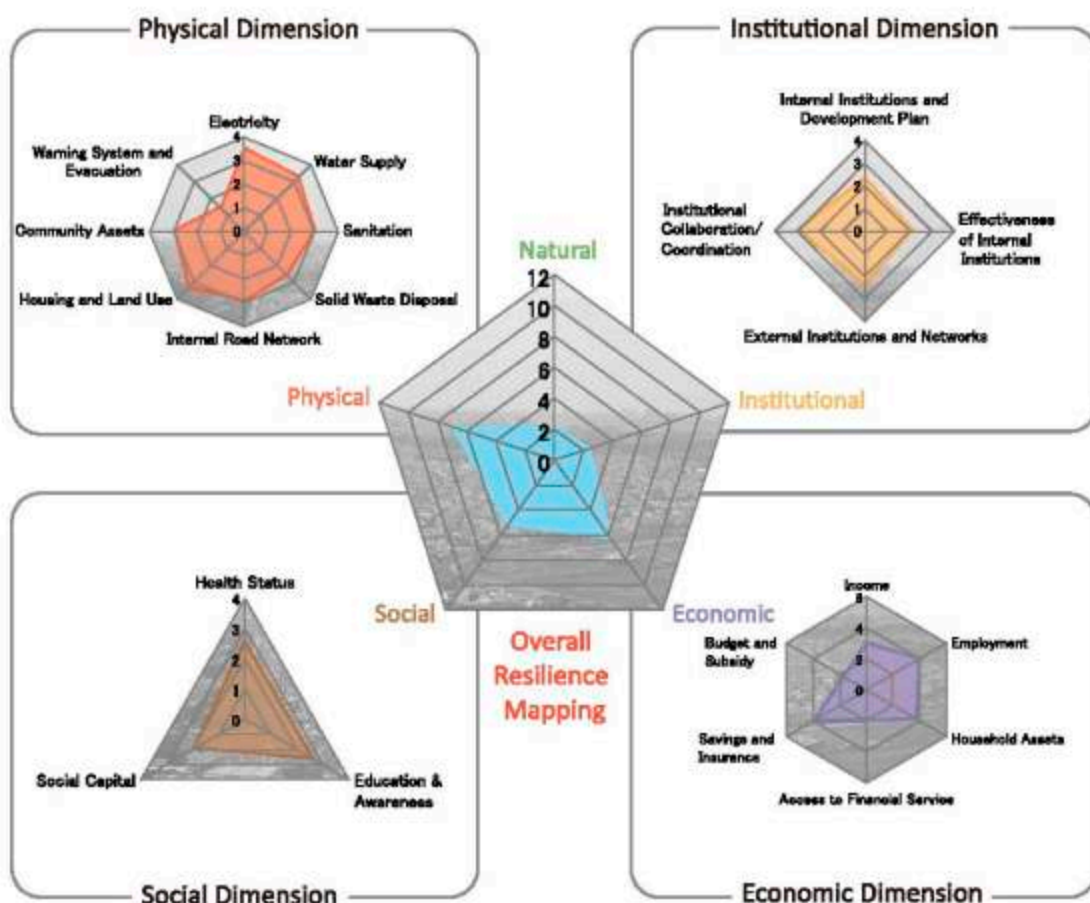
total population.

The city experienced an earthquake in 2006 with minor damages. It regularly faces so-called normal floods on an annual basis. In December 2008, many areas of Ho Chi Minh City remain submerged after the highest flood tide in 49 years swamped the city.

[Source: Ho Chi Minh City Questionnaire Survey ; <http://www.saigon-gpdaily.com.vn>]



Analysis Result



Policy Point

Being the largest city of Vietnam located in Mekong delta, citizens possess better awareness about risks and adopted 'living with flood' approach. Yet, it is crucial to develop systematic and advance levels of warning system to offset possibilities of potential loss of lives in case of unprecedented climate induced disasters.

Development of evacuation centers should also find priority and community perceptions and conveniences may be treated as key parameters while selected hazard resistant structures to be established as evacuation centers.

Solid waste management, sanitation and internal road network improvement will not only improve physical resilience but will also improve quality of everyday life of citizens.

Carefully selected community based approaches to develop social capital of urban community; especially in highly vulnerable pockets of the city will provide great impetus to develop social resilience.

In order to be effective in catalyzing resilience, local institutions of the city need to enhance both internal and external linkages and offer budgetary support and subsidies to promote disaster risk reduction.



City Outlook

Hue is the capital city of Thừa Thiên - Huế province, Vietnam. Between 1802 and 1945, it was the imperial capital of the Nguyễn Dynasty. As such, it is well known for its monuments and architecture.

The city is located in central Vietnam on the banks of the Sông Hương (Hương River), just a few miles inland from the Biển Đông. It is about 700 km (438 mi.) south of the national capital of Hanoi and about 1100 km (690 mi.) north of Hồ Chí Minh City, the country's largest city formerly known as Saigon.

Hue City has a population of 330,836 inhabitants. Population grows at a rate of 1% per year.

About 70% of people depend on primary occupation (agriculture base), 20% on secondary (manufacturing, industry base) while 10% depend on tertiary occupation (service sector base).

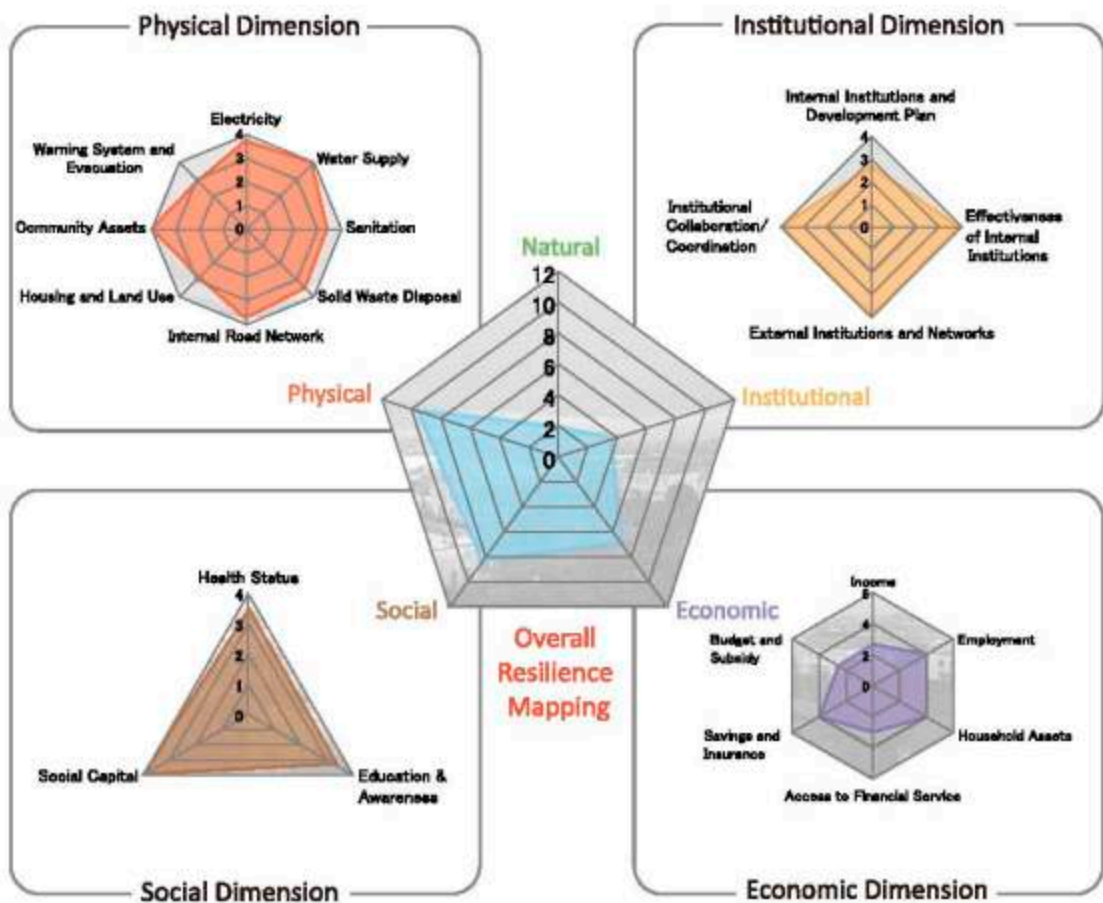
In 1999, Hue city was heavily damaged (90%) by a catastrophic flood. In Thừa Thiên Huế province, this catastrophic flood led to the death of 400 people and

damage to property worth US\$120 million, equivalent to one-half of the province's annual GDP. In 2008, it experienced a normal flood with 20% of loss. Between 1999 and 2002, the city registered an average 3791.5mm of annual rainfall and an average temperature of 24.6 degree Celsius.

[Source: Hue City Questionnaire Survey ; FAO-CIFOR, 2005]



Analysis Result



Policy Point

Risk reduction should receive high priority in education to aware people as social dimension of resilience in Hue is going to alter overall resilience efforts in the city.

Warning systems and evacuation has room for further improvement to address growing climate induced risks. Additionally, improvements in housing conditions and land use planning will certainly boost physical resilience.

Employment rate is high but low income earning opportunities are a cause of concern and can be improved by entrepreneurial development by offering better access to financial services.

Leveraging on high social capital, augmenting education opportunities, improving health status and making aware common people about impending risks can be initiated.

Local institutions in Hue can resolve to mainstream disaster risk reduction into development plans and incentivize DRR activities through dovetailing budget and subsidy.



City Outlook

Irong-irong appears in the Maragtas legend of the coming of Ten Bornean Datus (Chieftain) to Panay who bartered gold for the plains and valleys of the island from a local Ati Chieftain. One datu, Paiburong by name, was given the territory of Irong-Irong (now Iloilo). For 300 years before the coming of the Spaniards, the islanders live in comparative prosperity and peace under an organized government and such laws as the Codes of Kalantiaw. Today, Iloilo has rejoined the ranks of the progressive provinces outside of Metro Manila. Iloilo's colorful history has distilled a spirit that possesses the complex nuances of contrasting cultures. It is a culture essentially Oriental, progressively Occidental yet uniquely Ilonggo.

In December 1898, the Americans entered the Iloilo port and took over the reins of the City. Under American tutelage, many Ilonggos became luminaries in the fields of politics and government. The outbreak of the Second World War took a heavy toll on the province. Like the rest of the Country, Iloilo was left with severely shattered economy and deeply demoralized populace. Possessing the resilience and determination of their forebears, the Ilonggos slowly regained their foothold.

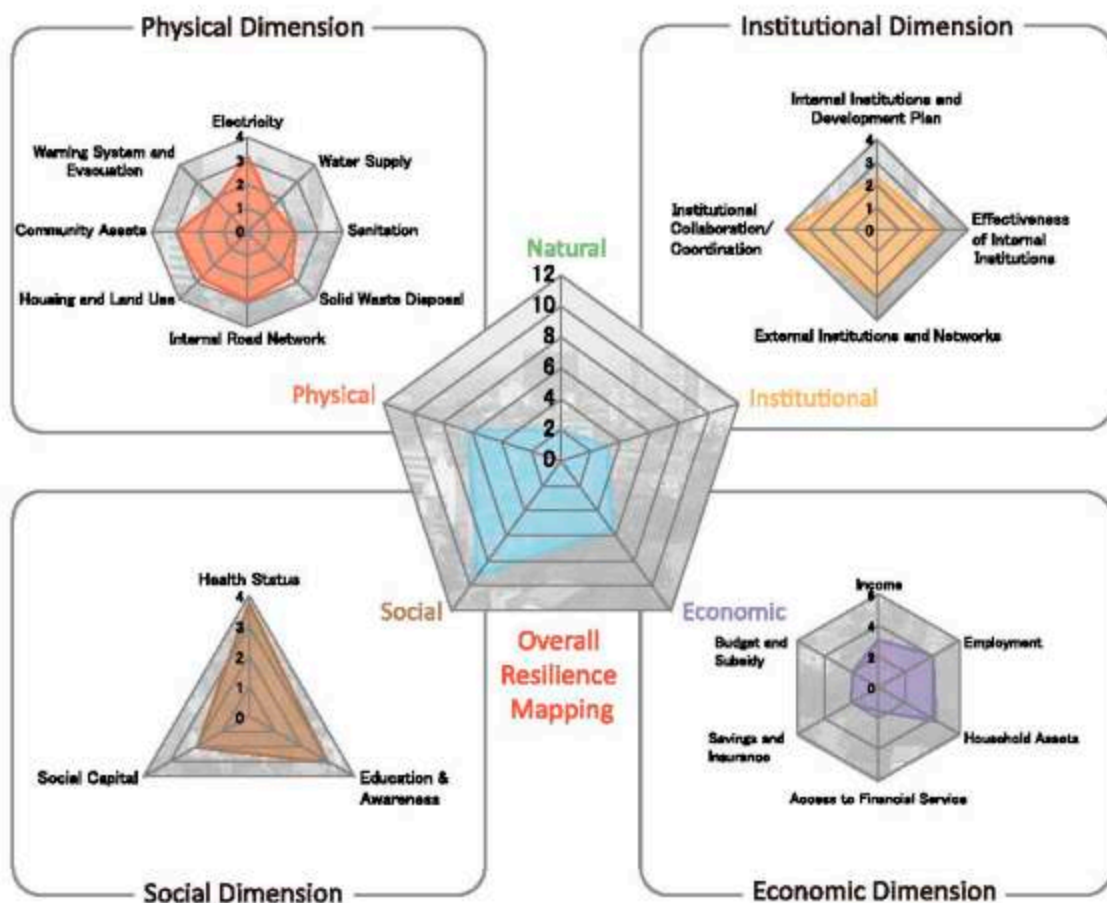
Iloilo city is populated by 403,196 inhabitants, with a population density of 5,209 persons per square kilometer and a population growth rate of 1.93% per year.

The city has experienced several catastrophic floods, such as those in 1994, 2003 and 2006 followed by heavy damage and loss. In 2006, Iloilo City was heavily affected by the catastrophic flood triggered by Typhoon Xangsane that left tremendous damages both human and material to the country (260 dead, 250,000 people displaced, USD 668 million of total damage in the whole country)

[Source: Iloilo City Questionnaire Survey ; <http://www.dartmouth.edu/~floods/Archives/2006sum.htm>]



Analysis Result



Policy Point

Social capital of Iloilo needs specific impetus as it has great potential to influence the other dimensions of resilience.

In general, basic services of the city (especially water supply, sanitation, solid waste management, internal access roads) calls for significant improvement by following participatory community based urban improvement techniques which would also benefit in building social cohesiveness.

Low-income employment prevails in the city and climate-disaster resilient livelihood options can be generated by improving access to financial services and built-in insurance to safeguard development gains.

Institutional collaboration can be more effective if networked well with external institutions by dovetailing risk reduction measures in development planning and implementation.

Updated early warning systems availability with responsible institutions and ensuring effective penetration of warning in vulnerable locations during disasters may be treated as priority.



City Outlook

The City Government of Makati has been in existence for 338 years. It was converted from a municipality into a highly-urbanized city on January 2, 1995 through Republic Act 7854 with the overwhelming approval of the residents in a plebiscite held on February 4, 1995.

The city's total land area is 27.36 square kilometers. Based on land area, excluding roads, the three major land uses in Makati are residential (38%); commercial/mixed use (15%); and institutional (14%). The city has a very compact urban environment with very limited area for expansion. Thus, most of the developments are vertical.

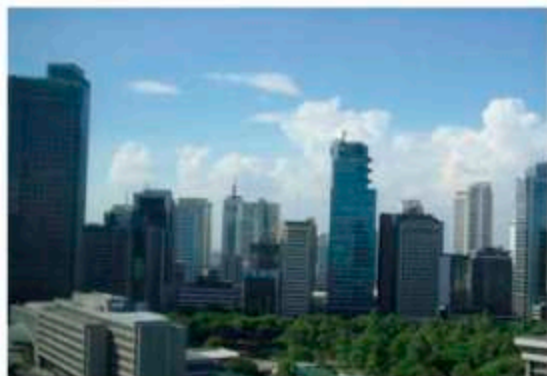
The night time population for 2008 is projected at 550,392 while during daytime is estimated to reach at 3.7 million because of the constant influx of workers, businessmen, tourists, and other transient travelers to the City.

In its effort to develop and maintain a reliable emergency communications, the City Government of Makati set up its Command, Control & Communications Emergency Alert Response System (Makati C3 EARS). The C3 EARS is the city's nerve center for dealing with emergency and disaster situations. For the continuous operation and disaster management, the Makati City allots 5% of its total budget. Following the intensified dredging operations conducted by the city government of Makati since January 2007 through its Department of Engineering and Public Works (DEPW) and Department of Environmental Services (DES), the city's barangays (villages), particularly the low-lying and flood-prone areas, are now experiencing faster flood receding time.

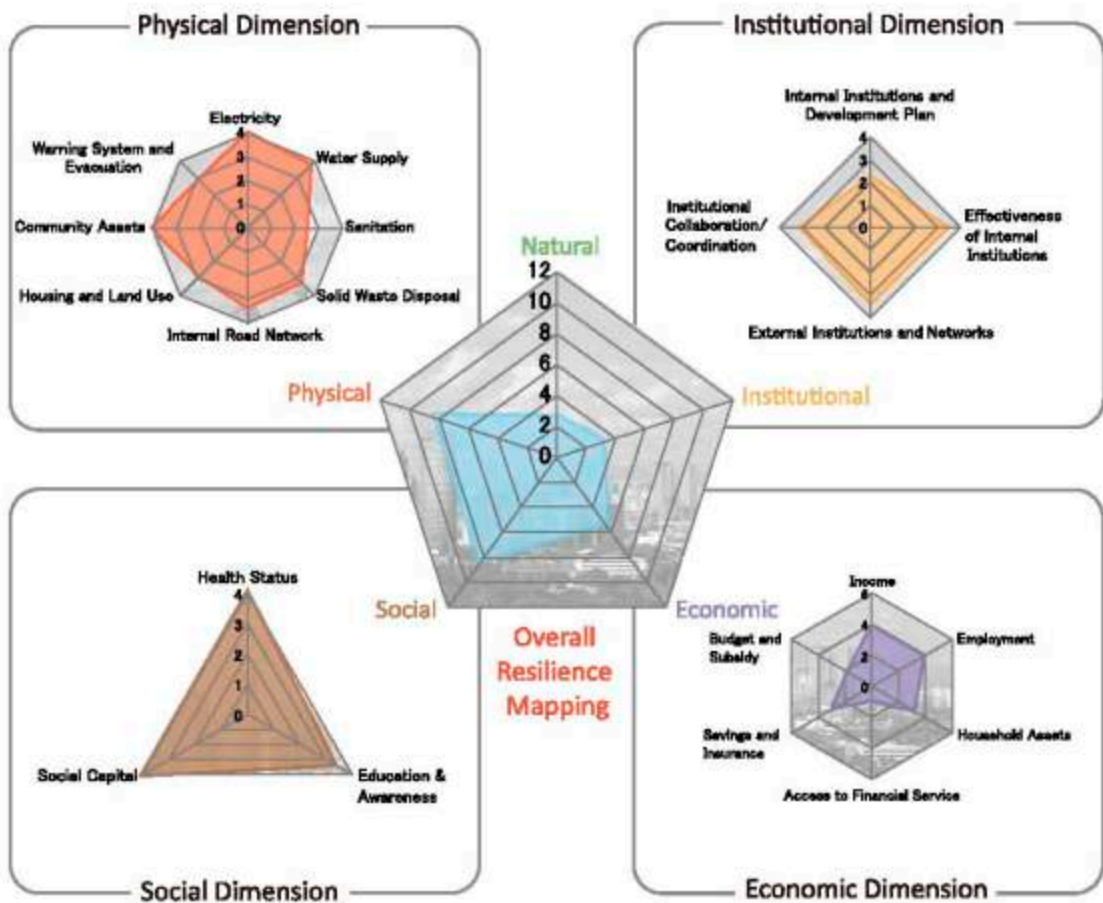
There are two physical characteristics of Makati that could pose danger to its present and future developments. First, a part of the Valley Fault System, a potential generator of a large magnitude earthquake in Metro Manila, is located at the eastern part of Makati City. Second, the western portion of the city is composed of former tidal flats. There are seven low-lying barangays at this portion of the city that are flood-prone. However, maximum receding time of flood water in these areas is only 30 minutes.

In August 2007, Typhoon Egay (Sepat) struck the Philippines, 33 families/165 persons were evacuated in Makati City.

[Source: Makati City Questionnaire Survey ; WHO, 2007 ; <http://www.makati.gov.ph>]



Analysis Result



Policy Point

At the city level, economic and institutional resilience need to keep pace with physical and social dimensions to elevate the overall resilience of the city to climate related disasters.

A number of civic services like sanitation, solid waste management, housing and land use and road network requires considerable improvement to attain better physical resilience.

Climate disaster resilience calls for major overhaul of disaster management systems with particular attention to upgrading warning systems and managing evacuation centers.

In general, employment and income levels are high in Makati. However, budgets and subsidy for disaster risk reduction and better access to financial services for encouraging local citizens to invest in disaster risk reduction need promotion.

Local institutions have high external network which can benefit best if institution-wide coordination is improved.



City Outlook

Mumbai is the commercial, financial and entertainment capital of India. Along with its neighboring suburbs, it forms the world's 6th most populated metropolitan area with home to about 19 million people making it most congested urban conglomerate in the world with an average population density exceeding 21,000 persons per square kilometer. Originated by way of interconnection of group of seven islands, today Mumbai has 24 municipal wards representing contrasting living environments with ultra-modern high-tech skyscrapers for elites' to dilapidated squatters and slums – home to over 50% of its populace.

According to the City Development Plan, behemoth infrastructure shortfall is experienced by the city – 2-6 hours of water supply (with poor condition of transmission and distribution system); 35% households without sanitation, old storm water network that cannot take a rain intensity of more than 25 ml/hour, average travel speed (proxy for road efficiency) of 6-8 km/hour, drainage capacity limited to carrying 50% of the potential sewage – all leading to substantial decline in the quality of life.

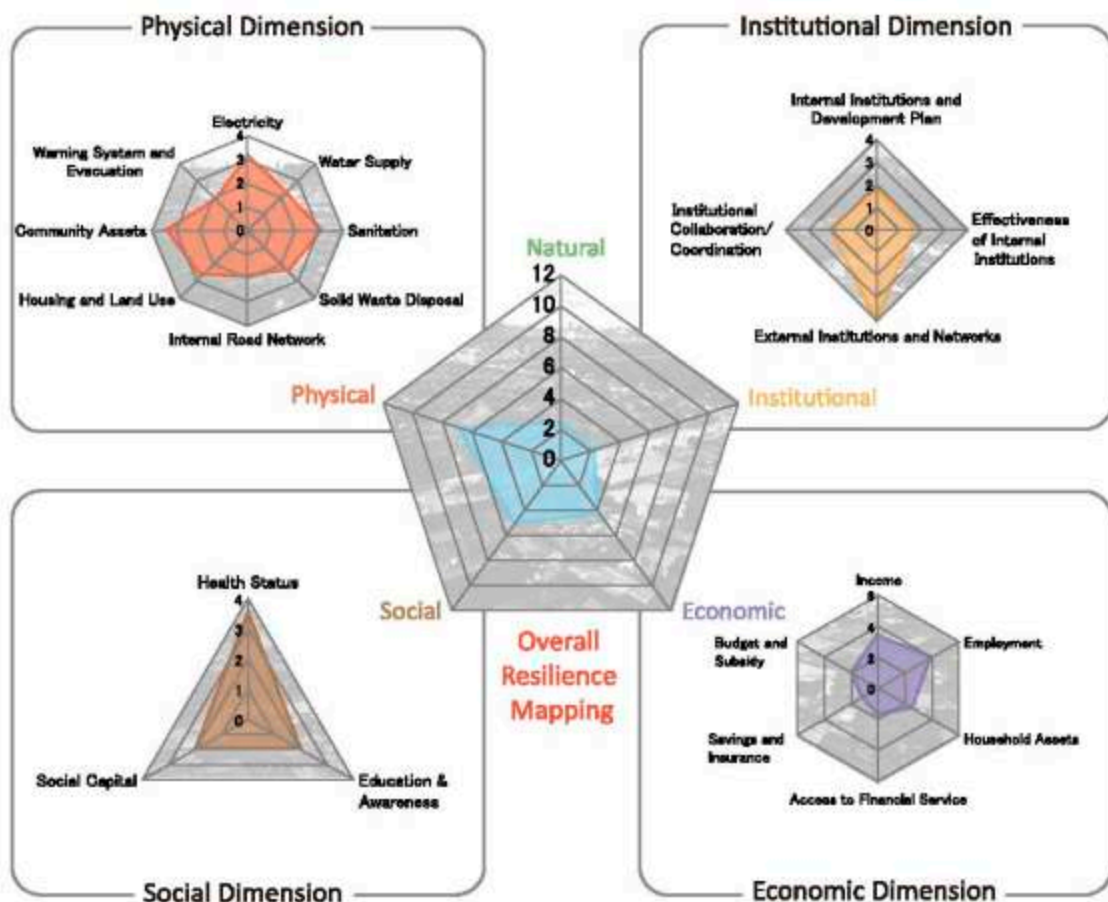
Mumbai is moderately or highly exposed to a plethora of natural and human-made hazards: earthquakes (both on and offshore), landslides, cyclonic storms and possibly storm surge, sea-level rise, rainstorms and local and regional flooding, drought, chemical, industrial and nuclear accidents and civil strife. Flooding is the most frequent and disruptive hazard in

Mumbai. The city has experienced catastrophic flood in July-2005, which was never recorded for over a century or so. In that year, torrential rain disrupted life in the metropolis, caused large number of deaths and according to early estimates (as reported in the media), resulted in the loss of more than Rs 10,000 crores (approx. USD 2 billion). To address those issues, Mumbai's Emergency Response Plan appears to be an efficient tool in enhancing early warning system in the area.

[Sources: Surjan, 2008; City Development Plan, 2006; GoM, 1999; Bohra et al., 2006]



Analysis Result



Policy Point

Overall climate-disaster resilience of Mumbai is relatively low and calls for an urgent attention of stakeholders from and beyond the city. Sustained efforts are specifically needed to strengthen physical, social and institutional dimensions of resilience.

Dismal picture of city-wide basic services is a major stumbling block on the road to physical resilience and solid waste management, water supply, internal roads, sanitation and warning mechanism requires immediate interventions for improvement.

Recurring floods have already helped create awareness among common people. By capitalizing on this, civic societies and local government should focus on building social resilience.

The city needs to leverage on existing reasonable level of income and employment opportunities for crafting savings and insurance mechanism for the urban poor to augment their economic resilience.

Local Institutions responsible for city development have good external network, but need to effectively address climate-disaster issues by wider and broader cooperation with other institutions and also by mainstreaming disaster risk reduction in the development agenda.



City Outlook

San Fernando was originally named "Pindangan" –the place where fish was dried, considerably abundant and the mode of living during this era. Its earliest settlement was believed to have existed before the Ming Dynasty as archeological finding revealed that the early settlers were engaged in trade and commerce with Mainland China and the Middle East having these products of primitive art (i.e. porcelain, beads, spearheads, etc) as the object of trade and commerce, the same form of artifacts unearthed at Barangay Cadaclan. The formal creation of the then municipality coincided with the creation of the Ministerio de San Fernando on May 6, 1786, during the Spanish regime. The name San Fernando was given in honor of King Ferdinand.

On March 20, 1998, the residents of San Fernando declared their resounding approval on a Plebiscite which ratified Republic Act 8509 converting the municipality into a component city.

The City of San Fernando, La Union has a population of 114,813 inhabitants and a population density of 1,091 persons per square kilometer.

Climatological data from two stations (Station: 325-Dagupan City, Pangasinan and Station: 222- Vigan

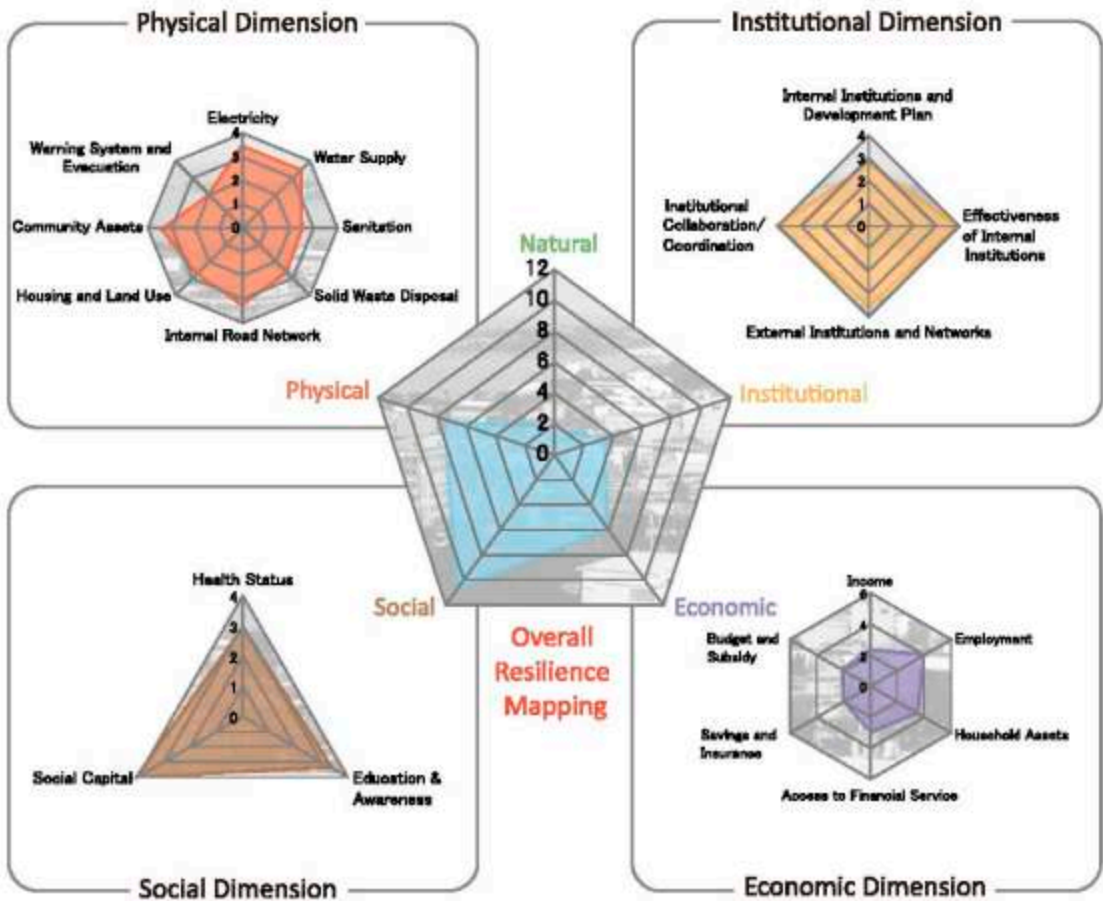
City, Ilocos Sur) show a mean annual rainfall of 2346.3 mm per year and a mean annual temperature of 27.6 degree Celsius between 1971 and 2000.

Supertyphoon "Paeng" (Cimaron) hit the city, leaving 14 dead and a trail of destruction. In 2001, the City of San Fernando and its nearby suburbs experienced heavy flooding as a result of the overflowing of rivers surrounding these areas.

[Sources: City Comprehensive Land Use Plan (CLUP); City of San Fernando, La Union Questionnaire survey; <http://www.reliefweb.int>; PIA, 2006. <http://www.pia.gov.ph>]



Analysis Result



Policy Point

Overall, San Fernando should benefit from its high social capital and institutional capacities to improve physical and economic dimensions of resilience.

Early warning systems, evacuation procedures, sanitation, solid waste management and housing calls for sustained investment for fortifying physical resilience.

Budget and subsidy on risk reduction, income levels of people and savings and insurance patterns - all affects economic resilience and requires improvement.

Leveraging on existing high social capital, education and health status of the populace can be upgraded further.

In order to get most out of present institutional strengths, 'climate-disaster resilience' should be accorded a development planning priority.



City Outlook

The word Sukabumi comes from Sundanese language - suka which means "to like" and bumen which refers to "house or environment". Therefore, the word sukabumi refers to a fresh and comfortable condition, where people like to live in, to take a rest.

From the colonization period, since many people from Netherlands investing in plantations surrounding the city lived in Sukabumi, the government of Netherlands decided to make Sukabumi a Municipality (then called as "Burgerlijk Bestuur" with the status "Gemeenteraad Van Sukabumi").

Sukabumi City has 282,944 inhabitants with a population density of 5,895 persons per square kilometer. The city's population growth rate is 2.39% per year. Working age population (comprised between 17 and 64 years-old) covers 52.94% of total population. Those below 17 years-old represent 41.60%.

Sukabumi city belongs to areas especially at risk for landslides and flooding due to rampant deforestation and West Java's unstable ground that make for a deadly mixture during the rainy season.

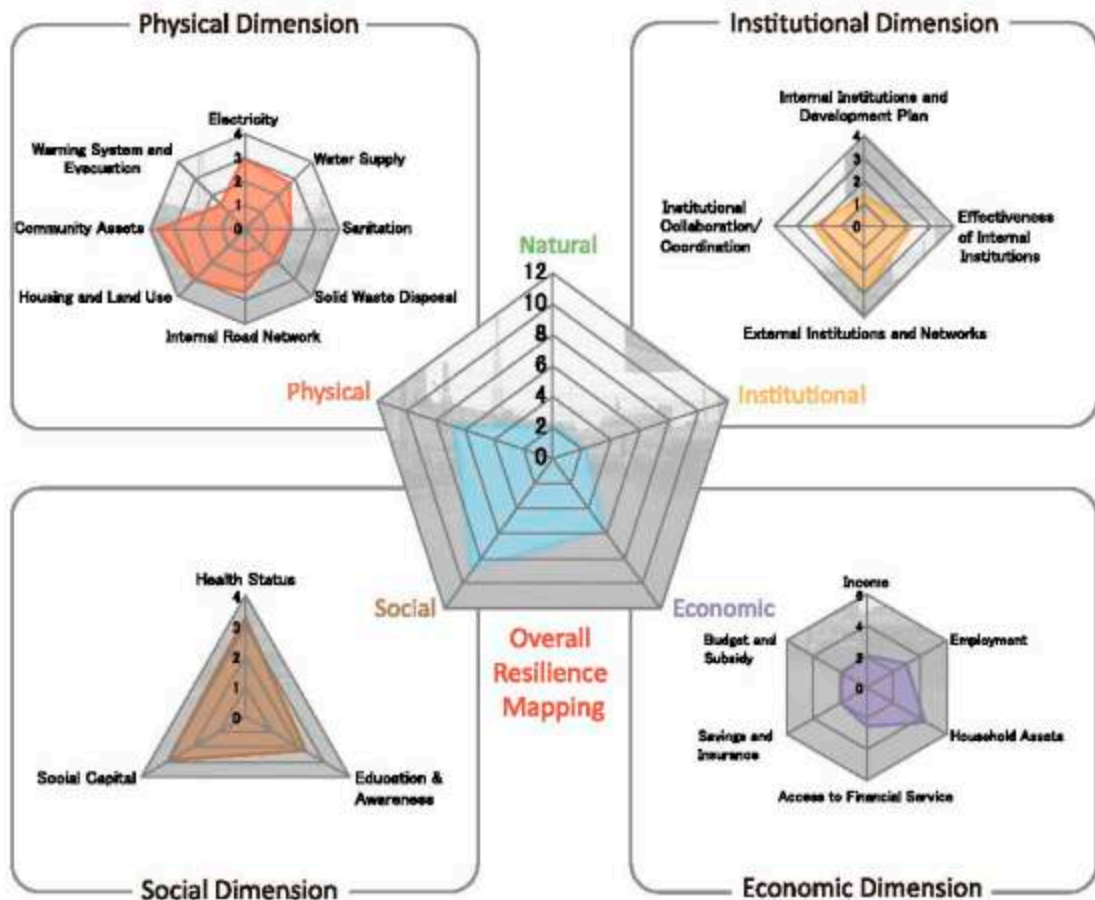
The city experienced flood in 2007 leading to a loss of

Rp. 200 million (approx. USD 17,500). A year later, it was again facing a twister that led to Rp. 300 million (approx. USD 26,000) losses. In April 2008, Heavy torrential rain downpoured West Java areas and caused flash floods in Sukabumi district. The floods has caused one bridge broken and killed 7 people.

[Source: Sukabumi City Questionnaire Survey ; WHO, 2008 ; The Jakarta Post.com; <http://www.kabar-irian.com>]



Analysis Result



Policy Point

Sukabumi's path to attaining climate-disaster resilience calls for adopting an all encompassing approach by strengthening physical, social, economic and institutional dimensions.

Basic infrastructure of the city (especially sanitation, solid waste management and internal road network) and disaster infrastructure of the city (early warning and evacuation), both have room for improvement.

Exploiting existing high social capital, both health status and education and awareness can be reinforced towards better social resilience.

For boosting the economic dimension of the Sukabumi's resilience, initiatives such as economic policy reforms and incentive driven investment may be promoted which will bring more employment opportunities and increase income levels to safeguard against natural threats.

External Institutions and networks help Sukabumi in disaster situations however, the city also needs to build these capacities in its local institutions.



City Outlook

Suwon is the provincial capital of Gyeonggi-do, South Korea. Suwon lies approximately 30 kilometers south of Seoul and is one of the most populous of Seoul's satellite cities. It is traditionally known as "The City of Filial Piety".

The main industrial employer in Suwon is Samsung. Hwaseong Fortress is Suwon's most notable attraction. Built in 1796, the entire city used to be encircled by the walls, but now Suwon has expanded beyond this boundary. Hwaseong is also listed as a UNESCO World Heritage Site. Haenggung Palace is another noteworthy historical attraction. Suwon City Council prides itself on the condition of its public lavatories. It has made efforts in recent years to make new lavatories clean and to improve existing facilities, and now offers visitors guided bus tours of the municipal restrooms.

Suwon city has over a million inhabitants with a population density of 8975.2 persons per square kilometer. Children (below 17 years-old) occupy the majority of population (74%); working age population (between 17 and 64) covers 22% of total population.

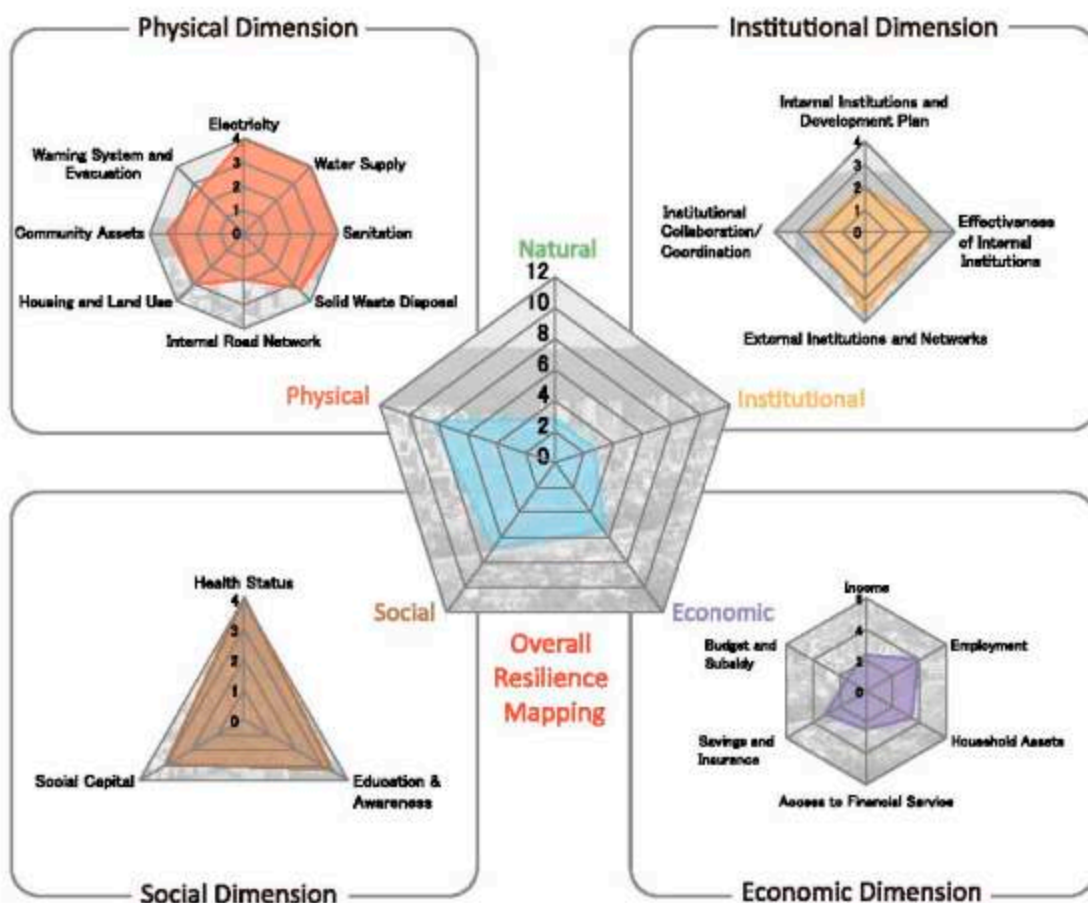
The city average rainfall amount (from 2000 to 2006) is 1307.13 mm; average temperature for the same period is about 12.3 degree Celsius.

A severe flood was occurring in Suwon city in 2000 resulting in heavy casualties (1 dead and thousands of people affected) and financial loss of 14 billion won (USD 10 million).

[Sources: Suwon City Questionnaire Survey;
<http://en.wikipedia.org/wiki/Suwon>]



Analysis Result



Policy Point

Warning and evacuation systems need attention to follow present existing higher levels of city services like electricity, water supply and sanitation to enhance physical resilience effectively. Due to undulating topography, despite good quality roads, accessibility during emergencies remains a challenge which requires more fine-tuning or decentralized planning of emergency infrastructure to ensure quick access.

Carefully carved programs need to be injected through grass-root organizations to improve social cohesion and awareness of communities to abate climate-disaster risks.

High employment rate needs to be translated into better income levels which can be boosted by offering better access to financial services and diversified income opportunities which will help elevating economic resilience.

Development planning and coordination will be an incentive to promote disaster risk reduction if prioritized at institutional level planning for urban development.



City Outlook

Located in the Kantō region of the main island of Honshu, Yokohama serves as the capital of Kanagawa Prefecture with a land area of 437.35 sq. km further subdivided into 19 wards. The city caters to around 3.64 million people making it the second largest city in Japan next to Tokyo.

Once a small village during the feudal Edo period, Yokohama is now known as the major commercial and economic hub of the country since its opening as a Port City in June 1959 wherein the Port of Yokohama serves as base of foreign trade in the country.

During the early 20th century, rapid industrial growth has been very visible within the city as manifested by factories built by entrepreneurs especially along the coastal areas. However, much of Yokohama was destroyed when the Great Kantō Earthquake happened on September 1, 1923 causing the loss of more than 30,000 lives and destruction of infrastructure facilities. As part of its rehabilitation, rubbles from the quake were used to reclaim lands for parks, the most famous of which is the Yamashita Park located in the waterfront which was opened in 1930.

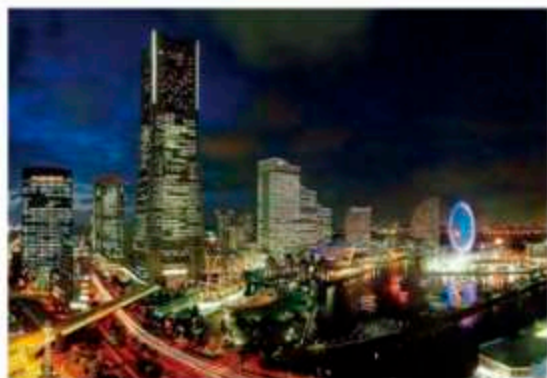
Rebuilding Yokohama after the said incident has been successful however, the city experienced yet another great damage due to thirty-odd US air raids during the second World War which killed an estimated of 8,000 people in a single morning of May 29, 1945.

With the administration being transferred to the city government from the national government on June 1, 1951, major development projects initiated by the city

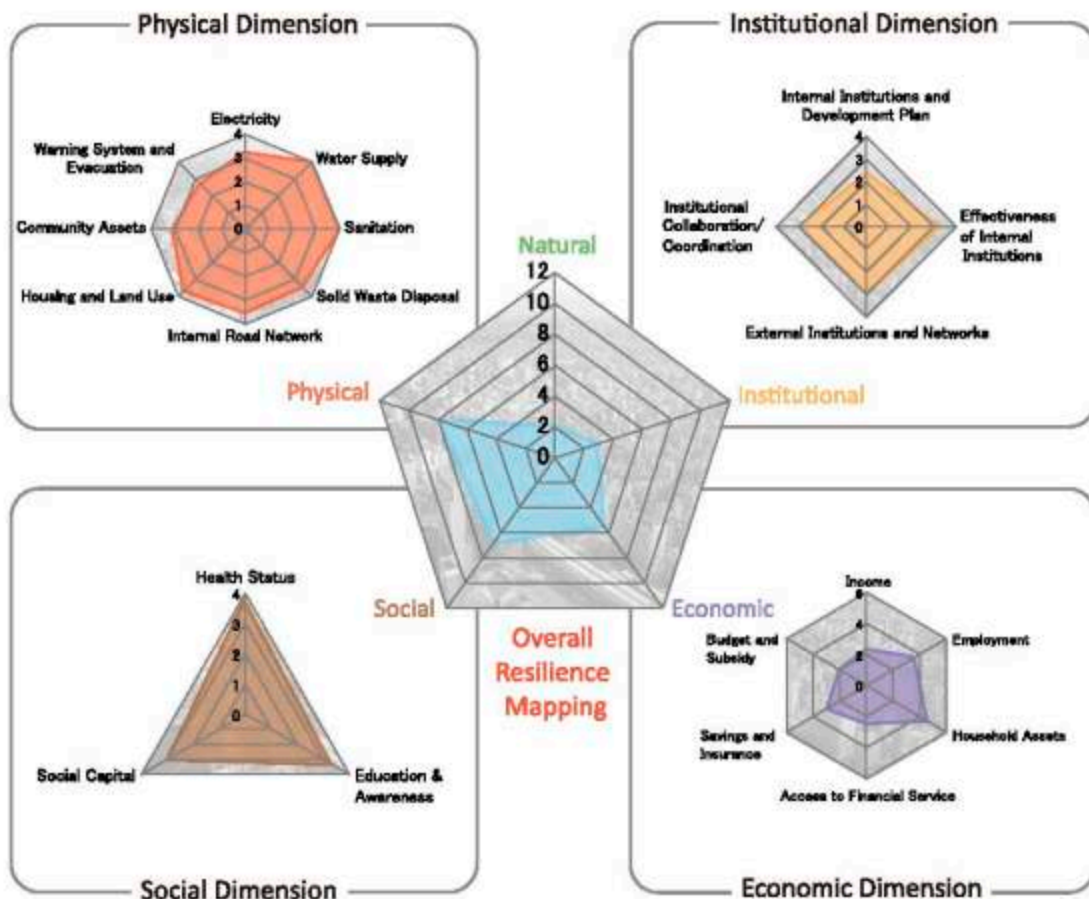
have been taking place enabling Yokohama to regain its prominence as the Port City of the region even up to the present era as manifested by significant landmarks within the city such as the construction of Minato Mirai 21, a major urban development project on reclaimed land which started in 1983.

Being situated on coast, Yokohama's susceptibility to typhoons remains high. Highly developed underground spaces and infrastructure are also prone to flooding which may result in huge economic losses and business disruption.

[Sources: <http://www.city.yokohama.jp/en/>,
<http://en.wikipedia.org/wiki/Yokohama>,
<http://www.channel4.com/history/microsites/H/history/c-d/cities05.html>]



Analysis Result



Policy Point

Being a port city from developed country, Yokohama need to increase financial incentives for insuring lives and assets to climate induced disasters.

Livelihood diversification to widen the employment base and income levels may be considered as probable options to promote economic resilience.

Warning and evacuation system strengthening and community asset building are two prominent areas requires attention to address shortcomings in physical resilience.

Developmental planning organizations of the city are although networked well, also needed better external linkages and placing disaster risk resilience at forefront.

Innovative means of education and awareness tools will help in uplifting and renewing existing social capital and interest of well informed and literate communities of Yokohama.

Way Ahead

CDRI (Climate and Disaster Resilience Initiative) is in its development stage. Through the data collection and questionnaire analysis, city resilience mapping is done, which has different components of physical, social, economic, institutional and natural aspects. Based on these findings, policy suggestions are made.

As mentioned earlier, the data is mainly based on questionnaire survey. Where the questionnaires were incomplete, secondary sources and subjective observations were made. Therefore, needless to say that there are further scopes to improve the methodology and data collection process.

User feedback on the CDRI methodology is of utmost importance. The goal of the whole process of CDRI is to make city managers and practitioners aware of the existing and future city risk for climate related disasters. The policy suggestions should be linked to specific actions at the city and community level. Danang 2009 Training and Action Workshop on "Climate and Disaster Resilience in Coastal Asian Cities" (18-20 February 2009) is the first step in

getting user feedback on the CDRI methodology. There needs to be more future training and action workshops in future to upgrade CDRI methodology.

We see the development of CDRI in two specific ways:

- City based in-depth data collection, organizing small city level workshops to validate the data, and improve the methodology through mutual learning among the city professionals and researchers.
- To use CDRI in ward or neighborhood level. CDRI is non-scale: it can be used for a city, or it can also be used for ward or neighborhood level. Ideally, it is desirable that CDRI be used in the neighborhood level, and through detailed data collection, the city should be able to get a clear resilience map of its own, and identify the vulnerable areas as well as future potential areas.

