UCRSEA

SITUATION ANALYSIS: KHON KAEN CITY, THAILAND

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1. Introduction

Urban Climate Resilience in Southeast Asia Partnership project (UCRSEA) is designed to fill a critical gap in understanding around regionalization and urbanization, and the growing risks posed by climate change in the country of Southeast Asia. The Partnership is based in four regional partner countries that face dramatically changes due to their political, socio-economic and environmental situations. Cambodia, Myanmar, Vietnam and Thailand have similar issues of non-pattern urbanization but they are different in specific details.

There are two cities from each country selected to be study sites. Khon Kaen city has been selected to undertake research on urban climate resilience. Khon Kaen is a secondary city of Thailand, located in the Northeast. It has historically become an educational, logistical and medical hub of the region and also serves as a transition point for the East-West Corridor regarding regionalization.

In order to understand Khon Kaen City, the reviews of Khon Kaen policies, plans and strategies should be investigated. The next section will provide more details on Khon Kaen movement and directions towards development and resilience and adaptation.

Figure 1 Map of Thailand – Khon Kaen Province [www.wikipedia.org]

2. Review of Khon Kaen City Policies, Plans and Strategies on Climate Change

There are a number of policies, plans and strategies regarding Climate Change in Khon Kaen City. They have been translated from Thailand's Central Government towards provincial level. One of the Khon Kaen Provincial Strategies have been declared that "Natural Resources and Environmental Management for Sustainable Development". This indicates that Khon Kaen Province does take an environmental issue into account. Moreover, Khon Kaen Office of Natural Resource and Environment also develops its strategies particularly on Climate Change Impact as below:

"*Prepareness for Climate Change Resilience and Adaptation Strategy:*
Policy statement: There must be preparedness and resilience to Climate Change Impact as well as increasing an ability to assess and anticipate impact and risk of climate change and natural disasters at national level, whereas at local level, there must be a long-term strategies to be prepared for early warning and uncertainty. These must be ready for long-term changes, disaster prevention. Promoting accessible information should be established at community and local levels to be ready for climate change impact and disasters.(Khon Kaen 2016-2020)."

Khon Kaen city has launched a project of Low Carbon City in accordance with Greenhouse Gas Inventory led by German Government through Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ). The German Federal Ministry for Economic Cooperation and Development is the main commissioning party. The strategy established within this project is to manage and resilient to climate change.

Furthermore, the five year plan for climate change adaptation and mitigation (2559-2563 B.E.) has been enforced to meet Thailand's climate change adaptation framework by Ministry of Natural Resource and Environment. This includes understanding of climate change along with public-private investments. The plan stated clearly that to reduce gaps between public and individuals by employing mechanisms involved with integrated agencies towards provincial plan in general.

It should be noted that Khon Kaen governors have been rather often changed due to national government instability. In some cases, the governors were on their position for a few months. This indicates how unstable political situation mainly affects provincial administration.

On the contrary, a number of action plans and strategies have been implemented in Khon Kaen regarding climate change. GIZ initiated carbon footprint project with Khon Kaen City municipality as "Khon Kaen citizen with non-polluted heart". There have also been several activities led by local people, for example, growing trees in the school and city of bike according to Khon Kaen municipality information. This systematic initiatives encourage local citizen towards public participation as much as they can join for further practice.

The next section will be explained the sitation analysis in Khon Kaen city held on 21 June 2016 and its feedback.

3. Situation Analysis

3.1 Shared Learning Dialogues (SLDs)

This method was established by ISET international to help learn from stakeholders' experiences. It starts by understanding vulnerability through assessing urban vulnerability and the result will be taken into account as trend of climate change. These can provide better understanding of urban area and prioritize urgent issues accurately and efficiently.

Figure 2.Vice governor of Khon Kaen

Figure 3. Dean of Faculty of Environment and \Resource Studies

Figure 4.SLDs participants

Figure 5.SLDs workshop

3.2 Khon Kaen City Situation Analysis

Table 1. Look back at the past, analyze the present and anticipate the future

Key themes/ Timeline	Past (30 years)	Present	Future (next 30 years)
Significant incidents	-2508 Khon Kaen University was established -2523 Severe flood -2536 Dinosaurs fossil was found in Phuwiang district - 2538 Khon Kaen Town Municipality was promoted to 'City Municipality' and expanded its boundary. -2540 Phong River was toxicated by the sugar	- Very rapid urban expansion - Water level in Ubonratana dam in crisis that only reserves for consumption and maintain ecological system - Flooding in some areas - Academic year change due to AEC implementation - Medical and	- Severe drought - Water conflict among household and industrial usage - More political disputes - Conflict of interests - Urban sprawl due to real estate arbitrage without development

	factory - 2544-2545 Flood over Busarin Housing Estate, Si Chan Road from Kham Hai Market to Sithan Lake -2553 Khon Kaen City Hall was fired - 2554 Severe Flood in Khon Kaen City -2558 Tropical storm devastated 7,602 families, 634 villages, 171 subdistrict and 23 districts	educational hubs - Real Estate investment and arbitrage - Large expansion of urban area - Transportation problem - Waste disposal issue	
Socio-political feature	- Extended family - Close and sharing family - Political conflict - Newly established faculties, more university students - burglary	- Overpopulation - Local administrative organization establishment instead of sanitation districts - Not obvious single power of political party - Political conflict existence - More patients in hospital - More burglary - More nuclear family - More working outside - Less sharing and more selfishness in society	- Lifestyle change as big cities - Less close relationships in family - More individual life - Digital society - Loneliness in ageing society - Khon Kaen would become second largest ageing society of Thailand - Existing social conflict - More students, patients and hidden population - More migrant workers
Economic feature	-Dualistic economy - Subsistence agriculture - 2540 B.E. Thailand economic problem - pulp and paper factory construction in Kud Namsai Sub-district, Nam Phong District - Less profits from	-Existing dualistic economy but different between urban and rural area - Dependent markets and single crops - Economic slowdowns in 2557 B.E. - More factories and migrant workers - Central Khon Kaen	- More household debts - Less self dependency - Lack of labour crisis in agricultural sector - Less agricultural lands - Urban expansion - More foreign investments and investors - Regressive economic

	shops in Khon Kaen city - Few large scale of shops - Natural gas project development in Namphong District in 2549 B.E.	Shopping Center opened in the city center - More hypermarkets - More meetings, incentives, conferences and exhibitions (MICE) - More investments from Bangkok - Rapid urban economy	growth in rural area - More Modern Trade
Environmental features	- Large area of rice paddy fields - Less housing estates - Usage of carts and bicycles rather than cars - Household Waste disposal self management - No air pollution - Single-storey houses -No resource usage disputes - No traffic congestion -	- Urban sprawl - More housing estates - Condominium buildings construction - More investments in Khon Kaen due to flood problem in Bangkok - Heavy traffic congestion - Severe air and noise pollution - Acute waste problem - Offensive odours and smells from waste - More natural resource consumption	- Flooding in urban area - Land use problem inconsistency with urban planning - Severe air pollution without effective management - Drainage and catchment area changes due to construction - Planning permission for high rise buildings results in more energy consumption and health impact - Environmental collaboration in urban area - Expansion of industrial sectors - Severe air pollution - Severe drought affecting insufficient waterworks - Heavy storm - Non-recyclable waste increase - Land degradation - Better public transports
Infrastructure	- Few cars - Two-lane roads - Less water usage and good water flow - Very few times of electricity blackouts - People used public transport - Less wastewater - Only shops	- More high-rise buildings - More water usage and poor water flow - Frequent blackouts - Large amount of cars - Cars parked along the roads affecting traffic flow - Affordable cars so	- Water Scarcity and ineffective water strategies - Renewable energy use increase (e.g. Solar cells, Biogas) - Dual and high spee railway - Quality and quantity of water and electricity

	accumulated in inner city, particularly Srichan Road, Klang Meuang Road and Lak Meuang Road	more car owners - Less use of public transports - Heavy traffic -More accidents from privately-own vehicles - Logistical hub	- Better efficient public transport - Larger scale of urban area due to dual railways

3.3 Problems Identification

In summary, there have been a number of problems occurred in Khon Kaen City as mentioned in the SLDs. These include:

1. Water resource
2. Land Use and urban planning
3. Population growth- overpopulation, hidden population, alienated workers and aging society (2nd rank of Thailand)
4. Traffic and transportation
5. Public health insufficiency
6. Energy consumption- electricity
7. Disaster

However, the first two issues were selected to present the urgently needed problem solutions . As such, water resource and land use and urban planning issues. The water resource problem has become more severe and led to disagreements and disputes. Khon Kaen city has faced the problems both quality and quantity of water usage. The details will be presented below.

3.4 Key Issues Found in Khon Kaen City

3.4.1. Water resource issue

Once the issues had been ranked, the first two key issues were selected to be discussed further. On the one hand, Water Resource issue was discussed on to whom or which organizations were related. It was found that both direct and indirect persons and organizations had been placed in the categories. The responsible bodies are:

Irrigation Department,
Water Resource Regional Office 4,
EGAT,
Provincial Industrial Office,
Department of Fishery,
Provincial Waterworks Authority,
Provincial Disaster Prevention and Mitigation Office,
Provincial Groundwater Resource Office,
Provincial Meteorological Office,
Civil Society and NGOs/ Local Communities, Business Sector
Department of Royal Rainmaking and Agricultural Aviation
Academic Institutes/ Government office
Provincial Office of Commercial Affairs
Industrial factories

Local Administrative Organizations
Office of Policy and Planning/ Forestry
Marine Department
Armed Force Development Command
Provincial Watershed Committee
Provincial Livestocks Office
Pollution Control Department
Farmers
Hotel and other accommodations
Tourists

The use of water resource in Khon Kaen have been continuously changed as agricultural area,
Conference Center,
Public Health area,
Religious-purposed area,
infrastructure and highways (including roads and streets),
educational area,
industrial area,
public water source,
recreational area,
community forest,
waste disposal area.
Electricity generation
Fishery purpose
Livestock consumption
Catchment and drainage area
Wetland, Conserved area, natural source of water
Dam and weir.

There are several practices referred to Water Resource which include laws and regulations, policies and plans. For example, Water Resource Framework,
Policy on economic use of water,
Drought Prevention Plan
Flood Prevention Plan
Environment Act
Industrial Works Act/ Notification of Department of Industrial Works
Energy Act
Regulations and agreements on water use
Fishery Act
Groundwater Act
Agreement on Regional Water Resource
Local Administrative Organization regulations
Livestocks Office Policy, Green Farm Policy, Standard Farming Policy
Practices for Sufficiency Economy, New Theory Agriculture, Agricultural Integration
Notification of Ministry of Industrial Works
Notification of Ministry of Natural Resource and Environment
Cabinet Resolution on Wetland

After the review of responsible bodies, the uses of land and the related practices including laws and regulations, policies and cabinet resolutions, the strengths and weaknesses of Land Use and Urban Planning would be analyzed and shown below.

Table 2. Use of Water Resource – Strength and Weakness Analysis

Use of Water Resource	
Strengths	Weaknesses
Provincial Water Resource Management Committee	Weak law enforcement and no punishment
Good quality of groundwater	Water Resource Allocation Committee have arranged the priorities for consumption, agriculture and ecological sector respectively which are insufficient during dry season.
Surface water (Phong river) from Ubonrat Dam	Water use exceeded threshold and uneconomic use
Effective local community participation of monitoring water quality and network established	No measures for water use wisely
Available active automatic water quality monitoring stations which assess every 30 minutes	Lack of Public Participation on decision making in the Water Resource Allocation Committee
	Waterworks quality and quantity
Well-planned Monkey Cheek areas (detention basin)	Cage fish culture produced more wastewater
Good cooperations between Government and Local Communities to increase more wetlands (from Phu Kradueng)	Insufficient water allocation in case of expanding urban areas
A number of wetlands in the area (Nong Kot Reservoir and Ubonratana Dam)	Water use from Dam and Reservoirs
80% of Wastewater treatment from the whole area	Very few forest area, low soil moisture, alkaline soil, sandy soil
Treated wastewater passed Pollution Control Department Standard	No dredging sediment from bed of rivers and canals, shallow river
Effective plan for future wastewater	No fine and fee for water use
	Injustice water allocation--Industrial sectors gain higher priority on Water Allocation than agricultural sector
	Wastewater treatment system development for future problem solution
	Lack of water use awareness and preparedness of Local communities

Guidelines to be resilient on Climate Change

1. Drainage Basin Plan
2. Recovery for Water Use (Polluters Pay Principle)
3. Conservation and rehabilitation of Monkey Cheek (detention basin)
4. Reforestation
5. Farmers must be prepared for less water cultivation, plants for dry season, alkaline soil and

soil nutrition and less use of insecticide
6. Local readiness for wastewater management
7. Adopt new technology for wastewater treatment and recycle
8. Dissemination of research on watershed and temperature changes to public
9. Local communities planning on wastewater treatment and sewage pipe system
10. Cooperations between Khon Kaen City Municipality and Provincial Waterworks Authority to set on agreement of wastewater treatment
11. Construction of wastewater treatment system in Kaen Nakhon Reservoir, Nong Kot Reservoir, Tungsang Reservoir, Sithan Reservoir and Nong Lerng Reservoirs to be able to produce waterworks
12. Maintain water level in Ubonratana Dam and buying electricity from Lao PDR
13. Diversion of water from Chi River
14. Groundwater conservation and fill in groundwater every year
15. Raising awareness of water value and educate new generations on water values
16. Laws and regulations must be up to date and to be even without partiality
17. Engage private sector in river and canal dredging under government regulations

3.4.2. Land Use and Urban Planning

On the other hand, Land use and urbane planning also considered in the meeting. These can be sorted in three categories i.e. Individuals, civil society and NGOs, and organizations. For example, while farmers and investors have been classified in the individual group,
Civil Society and NGOs (local), for instance,
The Chamber of Commerce,
The Federation of Thai Industries, are another group among others .
The office of Civil service and town planning,
the Treasury Department,
Land Development Office,
Land Department,
Irrigation Department,
State Railway of Thailand,
Department of Highways,
Provincial Electricity Authority,
Provincial Waterworks Authority,
Provincial Industrial Office,
Office of Central Land Consolidation had also been reviewed as the relevant organizations.

Land use in Khon Kaen have been continuously changed as residential area, agricultural area, commercial area and shopping center,
Conference Center,
Public Health area,
Religious-purposed area,
infrastructure and highways (including roads and streets),
educational area,
industrial area,
public water source,
recreational area,
community forest,
waste disposal area.

There are several practices referred to Land Use and Urban Planing which include laws and regulations, policies and plans associated with Land Use and Urban Planning.

The Environment Act
The Town Planning Act
The Land Consolidation Act
The Strategies of Water Resource Management,
The Public Health Act
Land Taxation Laws and Regulations,
The Forest Act
Municipal Regulations,
Mass Transit Policy,
The Cabinet Resolution,
The Energy Act
The Authority of State Railway of Thailand Act
The Fisheries Act
The Treasury Department Act
The Sangha Act

Figure 6.Flooding in Khon Kaen (2015) \source: www.khonkaenlink.info

Figure 7.Flooding in Khon Kaen (source: www.khonkaenlink.info, 2015)

After the review of responsible bodies, the uses of land and the related practices including laws and regulations, policies and cabinet resolutions, the strengths and weaknesses of Land Use and Urban Planning would be analyzed and shown below.

3.5 Strength and Weaknesses Analysis of Key issues

Table 3. Land Use and Urban Planning – Strength and Weakness Analysis

Land Use and Urban Planning	
Strength	**Weaknesses**
Good urban planning	Law enforcement
Government Complex and Land of Treasury Department are well-located in the city center	Land owner neglect Town Planning Laws and Regulations
The Airport is located near to the city	The expiry of town planning and no enforcement during expiry
Waste disposal area	Ineffective public participation
The city attracts the investors	Land filling on drainage area/ catchment area
Medical hub, educational hub, logistic hub	The land ownership are in the hands of very few owners
Relatively high land price	accumulation
A vast of Livestock production area (within 10 km from the city)	
Excellent educational institution which produce good human resources and good network	

collaboration	
Center of CLMV (Cambodia, Lao PDR, Myanmar and Vietnam)	

Guidelines to be resilient to Climate Change

1. Emergency Response Planning and Mitigation/ Disaster Planning by Regional
2. Environmental Office 10 and Federation of Thailand Industries.
3. Disaster Mitigation Plan (Drought and Flood) by municipality
4. Emergency Alarm System of Khon Kaen City
    4. Integration among collaborative organizations e.g. Meteorological and Disaster and Mitigation Department
    5. Local Administrative Organization are well-participated
    6. Integration plan and practice in case of emergency
    7. Technology enhancement and build floodway to release water level
9. Sewage pipe management

4 Understanding Vulnerability

Climate change issue is uncertainty that needs to understand including natural disasters and other challenges. Asian Cities Climate Change Resilience Network (ACCCRN) and M-BRACE developed the Climate Resilience Framework (CRF) as a conceptual framework for assessing vulnerabilities and risk to address uncertainties of climate change through action and implementation. The CRF is presented below (Figure 8)

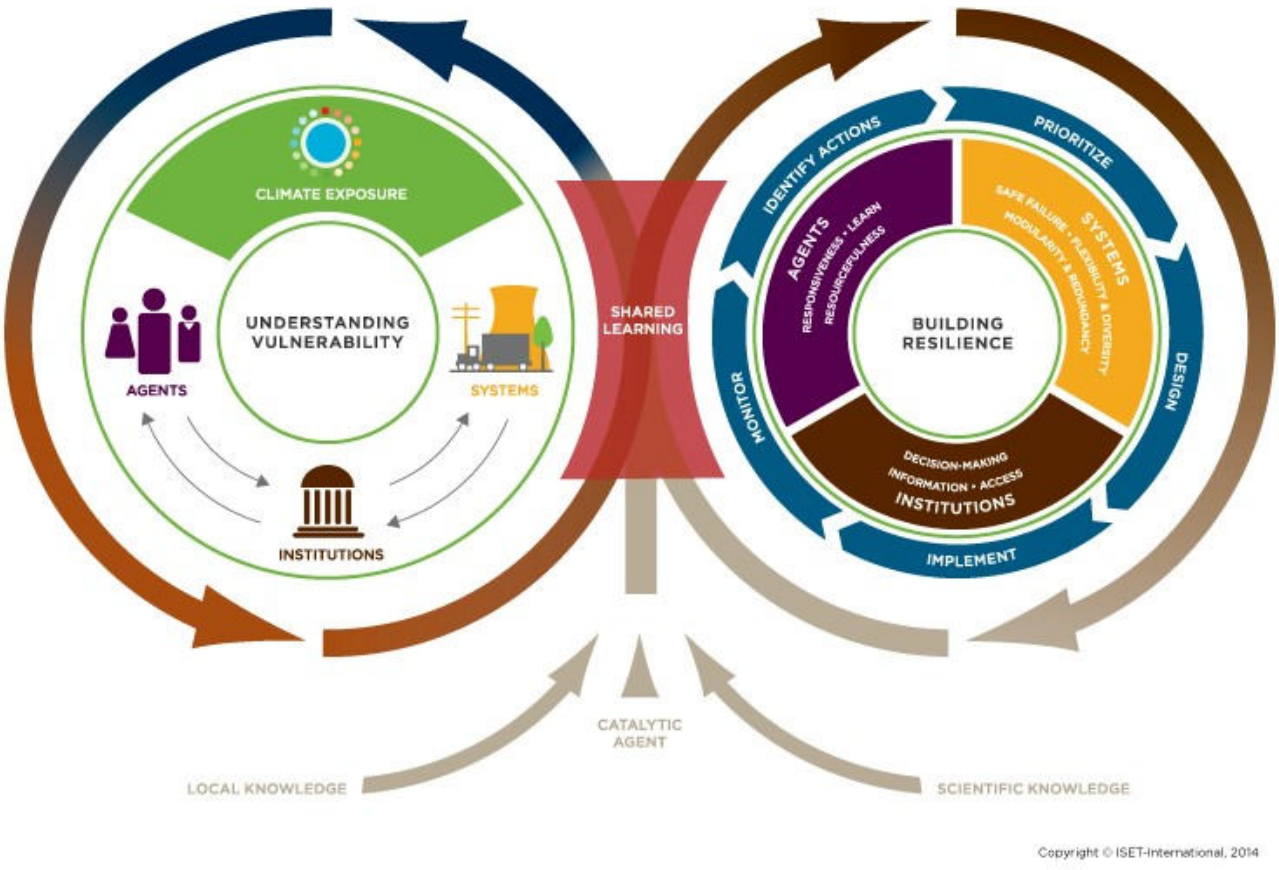

Figure 8.Climate Resilience Framework (source: ISET, 2014)

Climate Resilience Framework

According to Mekong-Building Climate Resilience in Asian Cities (M-BRACE) (2013), "*the Climate Resilience Framework (CRF) provides a conceptual framework for assessing vulnerabilities and risk, identifying resilience strategies- and creating an open, inclusive learning process to identify specific measures and processes that can address the uncertainties of climate change through action and implementation.*"

Urban area consists of 3 sectors including (ACCCRN, 2013):

1) Agents- they are identified as individual, organization or management.
2) Systems- urban systems include infrastructure and ecosystems.
3) Institutions- it is defined as ways to assist for implementation with support of accessible and sufficient information. It also includes decision-making processes which are transparent and just.

These 3 sectors interlink systematically among themselves and may result in urban vulnerability. Vulnerability of urban area to climate change can be differed depending on exposure to impact or risk of climate change. Therefore, urban area must be able to understand clearly about vulnerability of climate change in order to analyze systematic vulnerability and to be resilient to climate change by adopting the concepts of 3 sectors integration.

Khon kaen city consists of Agents, all of whom are individuals, civil society and NGOs and public and private organizations. Agents should be responsive and able to learn through available resources and attentive to participate in climate change mitigation. Government sector provides administration and management in terms of climate change prevention and mitigation towards adaptation and resilience. It also provides decision-making process and accessible information through community leaders, governor etc. They have learnt via system and also share information and experiences through institutions in order to understand vulnerability so that climate change issue will be efficiently tackled. The next section will be discussed over the barriers and what were found from the second year.

5 Discussion

After the review of relevant documents have been done in the previous sections as well as Share Leaning Dialogues from the meeting with Khon Kaen City stakeholders. This section will be discussed how similar and different critical points found in the situation analysis.

There are a number of policies, plans and strategies clearly mentioned Climate Change and its impact as well as how to be adaptive to this issue. However, the SLD participants stated that there is a need to be more collaborative between government and private sectors. It was obvious that on the SLD meeting, very few participants from private sectors had joined. Although the invitations were sent ahead of the meeting date, the response from non-government sector had been lower than expected. This explains how well the collaboration between government and non-government sectors work together.

5.1 Barriers to the management and administration of the stakeholders

The SLDs conducted with the Khon Kaen city stakeholders shows significant relationships among themselves. The barriers found from this meeting can be discussed here.

5.1.1 Structural Barriers

Thailand has long established cultures and practices. Historically, Thai administrative system has its own characteristic as it is called 'Client-patronage system'. This reflects how bureaucrats treat the sub-ordinates since the top-down approach has been widely adopted. It roots over Thai cultures and rather impede the public participation. For example, bureaucrats take controls of decision-making process and rarely let grassroots people participate in the system due to their full authorisation (Awakul and Ogunlana, 2002). It was obvious that very few grassroots participants joined the SLDs and this implication embedded in Thai society unless the grassroots have personal contacts with the bureaucrats previously. Furthermore, a study by King Prajadhipok's Institute stated that Thai government is so powerful that this can lead to corruption in the implementation process (Warsta, 2004).

Nevertheless, the SLDs in Khon Kaen city allowed a number of the city stakeholders to discuss together and strengthen its network regarding Climate Change. This presents an effective collaborations among the stakeholders, all of whom are willing to contribute for their hometown. Although most of the participants who attended the SLDs had already known each other prior to the meeting. On the other hand, More importantly, there is a significant question that how to let the key stakeholders in other sectors, private sector in particular, to join such event so that the movement will be able to attain its goal for urban climate resilience.

5.1.2 Legislative Barriers

From the documents reviews and the SLDs, both also indicated that the legal framework is a constraint to the effective management and administration. Laws and regulations have not been up to date since there is a gap in political, socio-economic and environmental conflicts whilst many attempts were done. The power and interest entirely influences Thailand system of politics and economy while Thailand environmental protection laws may be partially obsolete to follow how the world turns and the economy grows. Additionally, ONEP (2014) stated that the legal enforcement needed more efficient and effective implementation in order to achieve the objectives of natural resource and environmental issues. Besides, economy has been perceived as more important than environmental problem except for the case of critical environmental issues happened in local communities that needed urgent mitigation. For example, Khon Kaen city faced a problem of garbage mountain (more than 800,000 tonnes) which accumulated over half century. The problem was finally solved by building an electricity-generating power plant, although conflicts amid in the communities (The Nation, 2015). These also relate to institutions and system which play a key role in urbanization (ISET, 2014) and whether specific measures have been employed.

The critical points which must be discussed are drainage system and transport system. The contradiction of the documentary reviews and the actual practice must be indicated that all presented so well on the paper without successful implementation. Drainage system in Khon Kaen has been affected by poor urban planning. The authority has not legally enforced the Khon Kaen town planning regulations, whereas urban sprawl has continuously expanded towards green area. This causes flooding because the catchment area is blocked by the housing estates and commercial buildings.

On the other hand, transport system of the city should have been constructed before the influx of housing estates and arbitration of land specifically in the city centre. The authority of Khon Kaen province itself and city municipality is the weakness of the institutions that must be urgently improved.

6 Conclusion

Following the situation analysis of Khon Kaen city in the previous sections, the study is important to investigate and analyze how the management and administration have been implemented. Climate change is a very challenging to tackle since it is an ongoing problem in the world. The achievement of the objectives of the project needs several sectors participating for effectively early warning, to be resilient and adaptive to the climate change.

Khon Kaen city is a provincial administration which adopts a number of policy, plan and strategies from national level to transfer into practice. Many attempts from all sectors, including government, civil society, private sector as well as joint venture as public-private company to tackle the problems in terms of urbanization and economic growth have been established for decades, yet there are many perspectives to examine and direct further concerning climate change in the urban area. UCRSEA is designed to fill the gap and to better understand vulnerability which required flexible and adaptive institutions dealing with uncertainty and unpredictability of all changes (Folke *et al*. 2005; Tyler and Moench 2012).

Within the second year of the project, SLDs was conducted in Khon Kaen city stakeholders and presented various viewpoints and this will be brought further for the next three years so that the three research questions will be clearly answered. It can be concluded that the activities such as SLDs required communication via the researcher and its collaborative network. It should be noted that many personal contacts were employed and carried further to the key stakeholders, otherwise it may not have been successful.

Nevertheless, there will be more activities to be launched so that the urban climate resilience and adaptation will be effectively successful in the coming years. In particular, learning from previous activities can provide more efficient and flexible to what the project focuses on. It may also be able to gather other stakeholders and relevant intensive information from existing sources if the plan will be promptly prepared well in advance for further collaborative organizations.