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## Emerging challenges of urbanization: a case study of Kalmunai municipal area in Ampara district

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### ABSTRACT

Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. Aggregation of urban and rural population may not add up to total population because of different country coverages. The study based on the Kalmunai MC area and the main objective of this study is to identify the emerging challenges of urbanization in the study area. The study used the methodologies are primary data collection as questionnaire, interview, observation and the secondary data collection and SWOT analysis to made for getting the better result. The study finds that the SWOT analysis process provided a number of results and ideas for future planning. Collecting the results around themes has highlighted the breadth of ideas within KMC. A number of common issues emerged which require immediate action and clearly relate to developing KMC as a resilient urban. However, to generate energy requires heap quantities of plastic wastage and as a result of the process a byproduct of methane will be produced. Nevertheless, this process is not much financially viable as the quantities are limited in Sri Lanka. Control of water pollution is the demand of the day cooperation of the common man, social organizations, natural government and non - governmental organizations; is required for controlling water pollution through different curative measures. Domestic waste and sewage may treat before following them directly in drinking water sources.

**Keywords:** Urbanization; Population; SWOT analysis; Sri Lanka and Cities

## **1. INTRODUCTION**

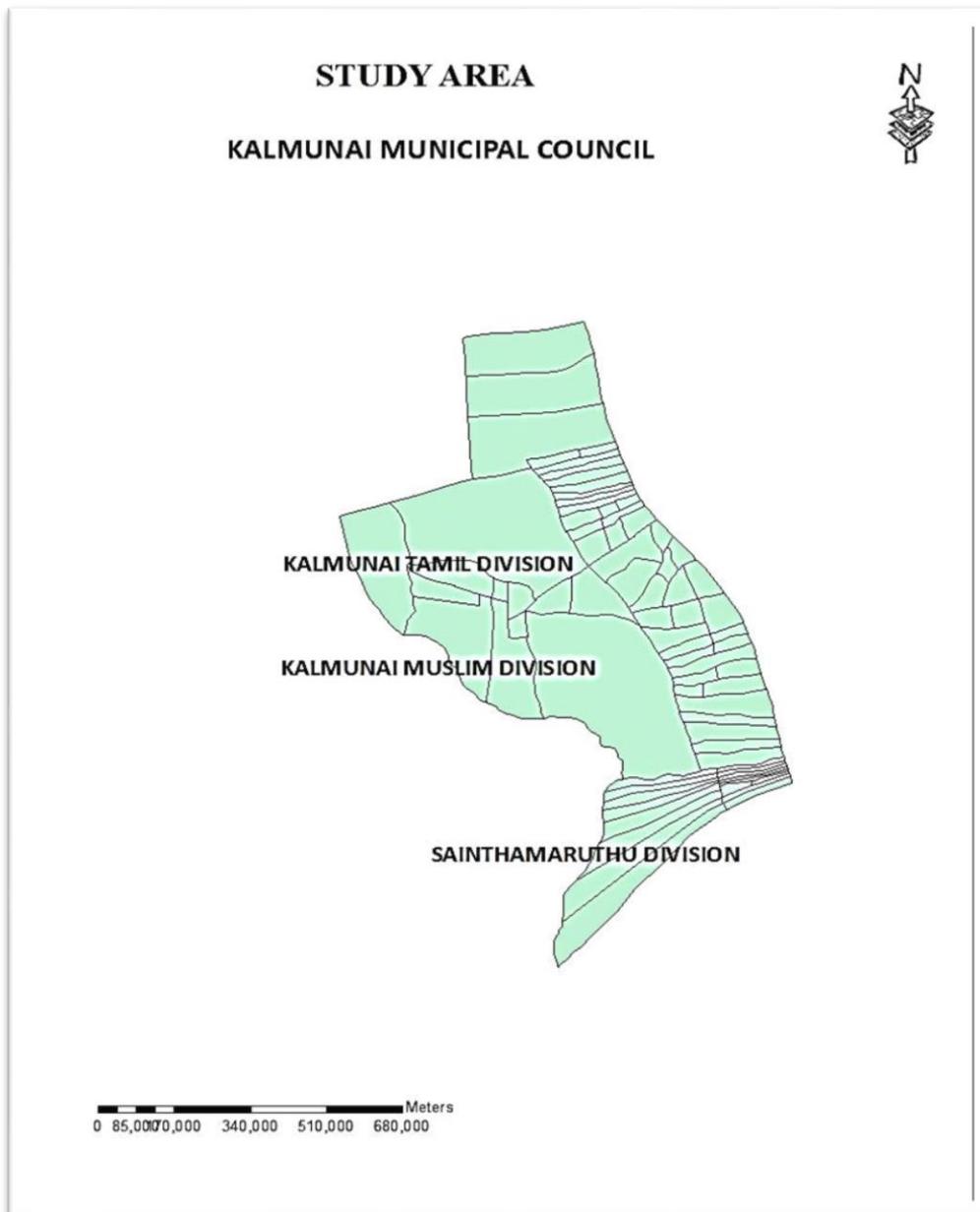
Urbanization is the growing number of people in a society living in urban areas or cities. Urbanization means increased special scale and density of settlement as well as business and other activities in the area. Urban areas trend to attract businesses because of their large and dense population. This in turn draws more people to the area working in kind of circular process [1 and 3]. Sri Lanka has significant experiences of urbanization, it is plays a major maintaining the natural environment setting. Kalmunai urban has impacts on environment and socio-economic activities. Kalmunai Municipal ha going to rapid development, Although Kamunai municipal also rapid development, but Researchers said - KMC did not achieve the targets of their expectance of urbanization, as well as increase solid wastes, diminishing wetland ,potentially water demand, pollution (land, water, air), demand for residential land, coastal erosion there are the challenges of urbanization in this area [2].

Although Kamunai Municipal also rapid development, but Researchers argue -KMC did not achieve the targets of their expectance. This research will be moved to base on urbanization of Kalmunai Municipal Council. The regional climatic data defined: The amount of annual rainfall is 115.45 mm to 225.5 mm and high rain fall season is September to February. The region gets more rainfall from North East monsoon wind. High temperature is 28.5 c to 33 c and low temperature is 25 to 25.2 c. This region wind velocity is 5.6 to 7.9 km/h. In addition, sea level pressure is 1005.2 to 1013 mb. (Source of KMC) [9]. It is 40 km away from Batticaloa District and 22.0 sq. km legal power boundaries of KMC. Multi-cultural groups are living this region and also they are living with freedom and peaceful society. 110,000 people are living it is include about 27,097 families (KMD hand book). And now a day's Muslims 70%, Tamils 27.85%, Sinhalese 0.65%, and others 0.66% are living. They are doing industries, fishing, agriculture, weaving and cottage industries and self-employment for economic development and fulfilment of basic needs [6 and11]. KMC has three Divisional secretes Divisions there are Kalmunai Muslims Divisions, Kalmunai Tamil Divisions and Sainthamaruthu Division. And of has 75 Grama Niladhari Divisions there are completely include Kalmunai electoral divisions, their population distribution based on their religious, most of the population living in Kalmunai Muslim Division and Sainthamaruthu division, according to this area population totally 74,021 Muslims, 379 Tamils and Kalmunai Tamil Division has 27,550 Tamils and 2596 Muslims [11]. Kalmunai is one of the urban in Ampara District. That is located in the South Eastern part of the district, about 40 km away from Baticaloa district. Ampara District is the one of the three districts in the Eastern Province. The KMC spreads over an area of 22.8 sq. km. This is the one of the largest area in terms of the District. There are most villages covered by 75 Grama Nildaries' divisions. Kalmunai is a high population density area having 4,521 persons per square Kilometres of its total land area 22.8 sq. km. The total population of the area was estimated at 110,000 persons from about 27,097 families in 2013. The Administrative setup has been commenced in 1987 [10 and 12].

Moreover, these area people are doing economic activities are fishing, industrial, weaving, government jobs and foreign employments. This area has Tamils, Sinhalese, Muslims and Christians. This area has low land, high land, settlement land and wetland. Today KMC urban environment directly and indirectly face lot of challenges through the natural disaster as Tsunami, flooding, coastal erosion, settlement planning, deep soil, expansion of transport, land declaration due to domestic wastages and agro chemical usages and wetlands impacts due to industrial wastages [4].

Therefore this research will be identify KMC emerging challenges through the urbanization and give the solution and better management, and awareness to living with clean and green environment [5]. According this research identify KMC environment has emerging challenges due to the urbanization through the data, urban development project, KMC profile and trend of urban development. In addition, population growth, development project, tsunami resettlement project and other significant reasons of economic, culture and physical based on these concentrations of problems [7 and 8].

## 2. STUDY AREA



Source: Kalmunai Municipal Council

KMC seem to be South Eastern in Ampara district coastal area. The marginal boundaries are from Batticaloa in North direction, Karaitivu is in South and Indian Ocean in East, Navithanvelli of Sammanthurai in West. It land area is 22.68 sq. km. High land is 9 m from sea level. This area has 3 divisional secrete divisions and 75 Grama Niladhari Divisions. North latitude  $7^{\circ}25'' - 7^{\circ}27''$  and East longitude  $81^{\circ}45'' - 81^{\circ}50''$ . These are international latitude and longitude of this research area.

It is a coastal regional its include Kalmunai Muslim Divisional Secrete Divisions, Kalmunai Tamil Divisional Secrete Divisions and Sainthamaruthu Divisional Secrete Divisions. According to this image are here.

The regional climatic data defined: The amount of annual rainfall is 115.45 mm to 225.5 mm and high rain fall season is September to February. The region gets more rainfall from North East monsoon wind. High temperature is 28.5 c to 33 c and low temperature is 25 to 25.2 c. This region wind velocity is 5.6 to 7.9 km/h. In addition, sea level pressure is 1005.2 to 1013 mb. (Source of KMC).

KMC area population is 48,104 men, and 48,920 women, total amount of population is 97,024. Moreover, these area people are doing economic activities are fishing, industrial, weaving, government jobs and foreign employments.

It is a coastal regional its include Kalmunai Tamil Division, Kalmunai Muslim Division, Sainthamaruthu Division. According to this image are here,

### **3. OBJECTIVES**

This research includes the following main and sub objectives.

#### **Main Objective:**

- ❖ To identify the emerging challenges of urbanization

#### **Sub Objectives:**

1. To create a healthy living environment and urban growth of the study area.
2. To create reducing the urban challenges and keep urban sustainability.
3. To make awareness about the Environment forwards the people and other organizations.

### **4. RESEARCH METHODOLOGY**

Primary and Secondary data have been collected for the study.

#### **Primary Data**

Primary Data has randomly collected in Kalmunai Muslim Division, Kalmunai Tamil Division, and Sainthamaruthu Division through the 100 questionnaire from this regional secretaries, Grama Niladhari, regional businesspersons, government and non-government employers, social well-wishers and educated and non-educate people and getting information through the interviews from 10 persons in each Divisional secretes Divisions.

- Questionnaire for 100 households
  - ✓ MCQ questions
  - ✓ Open questions
- Interview with 30 people
  - ✓ Direct with 15 people
    - Discussions
  - ✓ Indirect with 15 people
    - Phone calls, e-mail
- Observations
  - ✓ Field work
  - ✓ Photograph
  - ✓ Video clips

100 Questionnaire were randomly distributed to the different individuals from KMC for collecting the primary data. It was allocated according to the density of population of the GN Division that was taken by 40 models from Periyaneelavanai Tamil Muslim Division to Maruthamunai, 25 models from Sainthamaruthu area, 15 models from Karaivahupattu, 12 models from Periyaneelavanai Tamil Division and 8 models from Pandiruppu.

### **Secondary Data**

- Related Books of models and theories for urban.
- Related articles about challenges of urbanization
- Magazines publications of according to this research
- Statistical data analyzing Municipal Council
- Tables and charts were estimate the urban development and declaration.
- KMC profile data of physical and human features.
- Newspaper articles related to urban challenges.
- Divisional secretes division development projects
- Magazines, Journals, Democratic Gazettes and Notices
- Web collection and publications

### **Data Analysis**

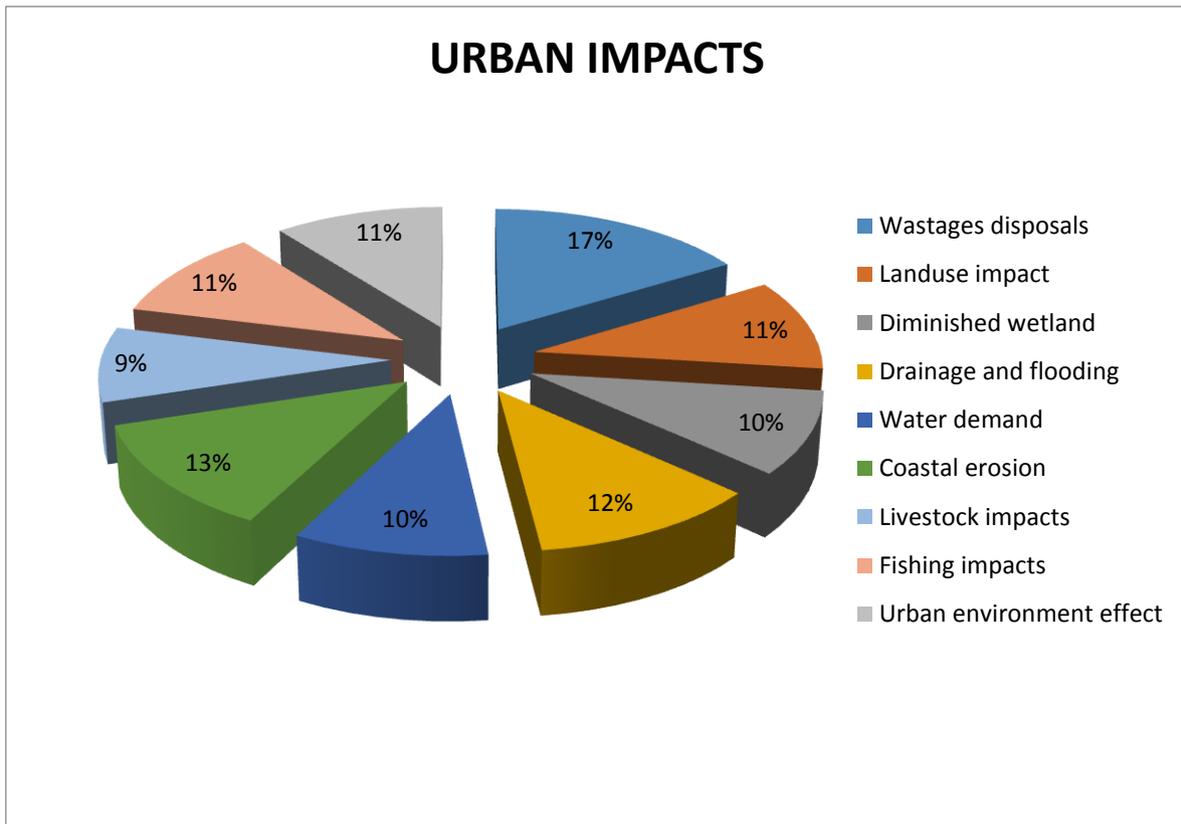
#### **SWOT Analysis**

This SWOT analysis is a key tool to identify comparative advantages of different elements in the city providing evidence for the strategic direction to be presented in the study. It is a bridge between the present situation and the future. The SWOT analysis is a very important element in the strategy building process. It is an assessment of strength, weakness, opportunities and threats of Kalmunai MC.

- A source of information
- An understanding of KMC's strengths
- Starts working towards reversing KMC's weakness
- Maximizes KMC's response to opportunities
- Identifies way to overcome KMC's threats and
- Identifies KMC's needs for and position on urban management

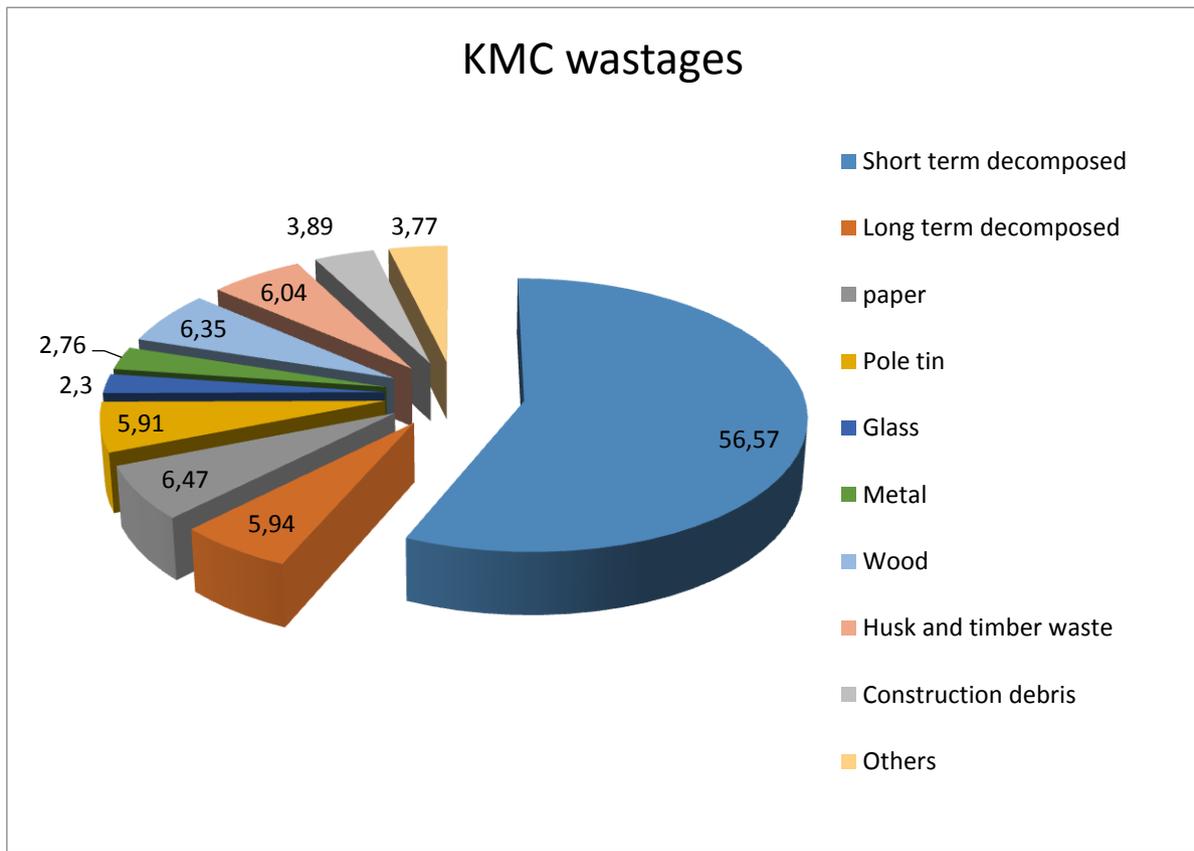
## 5. RESULT AND DISCUSSION

Questionnaire analysis explained mostly 85% percentage people know about the urbanization and its impacts and 15% percentage people have not knowledge about the challenges of urbanization. Public comments and secondary data help to analysed and identified this regional impacts.



**Figure 1.** Urban impacts  
Source: Field study in KMC

Solid waste disposals is a common threat to environment in KMC since most of the solid waste great ended up directly in open landfill or dumps. In KMC, there is approximately above 27 tons of wastes every day and of that, only 50 % are collected. The rest of 50% are just lying around the neighbourhoods of us and nobody cares. In the past solid waste disposal was not a concern because of the free availability of degraded land. However land scarcity is now a major problem face by the municipality and therefore finding land for municipal solid waste disposal is becoming increasingly difficult. This has resulted in the spreading of various chronic diseases.



**Figure 2.** KMC wastages  
Source: KMC solid waste unit

Along with assessment of SWOT, it helped to setting of objectives for the urban impacts assessment plan. The KMC’s SWOT analysis is presented in four tables. Table 1; SWOT analysis strengths, Table 2: SWOT analysis weaknesses, Table 3: SWOT analysis opportunities and Table 4: SWOT analysis threats.

**Table 1.** Urban Strengths.

ELEMENTS	STRENGTHS
Location and Regional linkages	Kalmunai is located strategically and connected to two main economic nodes ( Batticaloa and Ampara) 2 <sup>nd</sup> order service centre in Ampara district The commercial hub for trading activities in Ampara district Border by bay of Bengal on the East and low land paddy fields on the west Act as a bridge between tourist destination ( North

	Passikudha, South Oluvil harbor, Arugam bay )
Urban economy	Urban is gaining importance as agro economic centre Rapid urban growth in post war period High level of employment in agriculture, fisheries, cottage industries and other related business activities.
Image and identity	Urban is surrounded by nature Indian Ocean and paddy field All civic services are provided along the main arteries such as hospital, library, schools, religious place and administration centres.
Tourism	Connectivity to tourist destinations such as Passikudha and Arugam bay
Institutional setup	Presence of a number government development bodies
Infrastructure	After the war main road were renovated and this has increase the accessibility and connectivity Availability of electricity and other social infrastructure facilities
Urban form	Development along main linear roads provides easy access to the public Commercial development concentrated along the main arteries
Hydrological system	Cascade system between the tanks ( Senanayaka Samudra tank and Kittangi tank) Inter connected hydrological system with sea and thonas
Vegetation pattern	Rich paddy lands, marshy lands

Source: Field work (SWOT analysis), 2015

**Table 2.** Urban Weakness

<b>ELEMENTS</b>	<b>WEAKNESS</b>
Institutional setup	Lack of coordination between central, provincial and local governments on development initiatives Absence of join project and many dispersed operations Lack of data base management system among institution Lack of training and expertise to implement and monitor guidelines and regulation Overlapping jurisdictions between UDA, CEA, MC, DMC, and DSD Lack of technical knowledge about urban vulnerability and software by government staff and regional officers (GIS)

<p>Location and Regional linkages</p>	<p>Traffic lack of pedestrian pathways of traffic lights and no appropriate signage especially in the urban area causes difficulties for new visitors in finding places Poor interior road conditions</p>
<p>Infrastructure</p>	<p>Topographical and geomorphologic features are not considered when designing the drainage network Drainage network is limited only to a particular area and the culverts do not have enough capacity for discharging water No proper sewage treatment plant Lack of solid waste management facilities resident illegally dispose of solid waste along the river or marshy lands and the location of dumping site is in the middle of KMC bringing outdoor issues Interior roads are in a poor condition, unpaved and without proper drainage facilities</p>
<p>Hydrological system</p>	<p>Mainly proper use wells to drinking water and many wells are situated to close to latrine pits causing groundwater contamination Pollutions of thonas Disposal of solid waste in to thonas, lake and sea Encroachment in to thona areas</p>
<p>Urban form</p>	<p>Marshy land was filled with sand after tsunami Unauthorized construction of buildings Land degradation due to increasing human activities and settlement Canals drainage are blocked by disposal of solid waste High density of buildings in the urban centre which block the natural setting and drainage Scarcity of land for development Many paved surfaces creating excess runoff</p>
<p>Hazard vulnerable</p>	<p>Lack of proper data base management in urban management Lack of hazard preparedness and infrastructure facilities to face disaster No proper risk reduction training for the community Lack of community mobilization initiatives on vulnerability</p>
<p>Natural system / Environment</p>	<p>Loss of natural habitats due to marshy land filled with sand Encroachment o paddy fields which creates high exposure to floods</p>

Source: Field work (SWOT analysis), 2015

**Table 3.** Urban Opportunities

<b>ELEMENTS</b>	<b>OPPORTUNITIES</b>
Economic competitiveness	Due to the urban form, the urban has the potential to attract investment from the private business development and infrastructure sectors Urban has potential to build upon the existing portfolio of businesses and the fishery sector
Proposed project	Vulnerable urban development strategies for urban project Eastern development and urban centres structures plan by NPPD Proposed Oluvil harbor development and Matara to Karaitivu road development project Eastern coastal towns of Ampara district phase 11 pipe borne water supply project storm water drainage scheme SWM program Thona development project Batticaloa railway extension project Ampara domestic Airport improvement
Hydrological system	Existing canal network could be improved along with the drainage network and link with Kittangi tank and sea
Urban form	Low level but high density development within the town availability of vacant land for development on the periphery Availability of infrastructure facilities for development activities High quality and strong (resilient) buildings to face hazard

Source: Field work (SWOT analysis), 2015

**Table 4.** Urban Threats

<b>ELEMENTS</b>	<b>THREATS</b>
Infrastructure	Lack of sewerage system, SWM, poor distribution of portable water and environmental pollution leading to health problems Infrastructure facilities in the households with a low level of income are inadequate resulting in very poor living conditions Lack of maintained of infrastructure facilities such as drainage system and roads Tendency to sub divided existing small plots

Institutional setup	Political influences Identification of UDA laws as a threat by the DS
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Source: Field work (SWOT analysis), 2015

The SWOT analysis process provided a number of results and ideas for future planning. Collecting the results around themes has highlighted the breadth of ideas within KMC. A number of common issues emerged which require immediate action and clearly relate to developing KMC as a resilient urban.

### **Core Problems by Analysing with SWOT**

Kalmunai is located in an area which possesses a number of natural assets that could play a major role in the potential growth of the township. This region consists of a primary sector (fisheries and agriculture) and agro food industry and links to a number of tourist attractions. Kalmunai has strategic linkage with Batticalloa in terms of accessibility and economic conditions. The existing urban form and development pattern is creating a barrier to the future development of the city. The Eastern site of the city is bordered by the Indian Ocean and the west by paddy lands, leaving a 1.5 km wide strip for development. This results in generally good accessibility and spatial distribution around Kalmunai where by the population can fulfil their daily needs easily. Several small satellite towns like Maruthamunai and Sainthamaruthu complement Kalmunai and also provided for the day to day needs of population. A lack of planning and enforcement of development regulation however has led to the sprawl of Kalmunai on to low lying land and paddy lands which have been covered into relatively dense build up uses. This existing unregulated and uncontrolled development has led to encroachment of natural drains and drainage patterns as well as blocking urban drainage which has aggravated the hazard of flash flood. A resistance to high rise development coupled with the ease of developing paddy is further exacerbating the issue.

Kalmunai does have a relatively good spatial distribution system and easy access to basic education facilities and institutions. This could enable investors to draw on skilled labor from within the area. Infrastructure development in KMC expanded rapidly since 2009. Most major arteries within KMC have been renovated which has also led to more visitors coming to the area. This in turn has assisted small and medium scale industries and business to develop in the area. The interior road network is however still in a poor condition with roads unpaved, of an inadequate width and with no drainage. This institutional setup in Kalmunai lacks coordination among various institutions on development initiatives which has led to development pattern aggravating the effects of vulnerability. There is a low level of involvement of the civil society in policy making and local development and lack of consistent application and implementation of policies. There is also no proper development plan for KMC currently available. The infrastructure system is outdated, insufficiently maintained and unable to cope with the vulnerability that regularly affects the urban. This also leads to KMC inhabitants occupying unsanitary living conditions. The outer area with lower income levels and marginalized social status when compared with those living in the urban centre. The environmental management system (particularly solid waste and water waste) are weak and poorly developed with interior. Areas left without proper facilities including drainage.

An understanding and practices of environmental protection are also lacking amongst the population and a prevention culture and community based initiatives addressing environmental risk have to be taught and supported. There are indications of considerable potential in Kalmunai for developing the tourism sector, but the uncoordinated institutional setup and the inability of the urban to cope with impacts are major barriers to these initiatives.

The SWOT analysis of KMC identified the two main gaps and challenges articulated through the following themes,

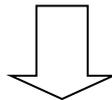
- Lack of proper governance in urban management in the city
- Lack of vulnerable resilient infrastructure development
- Lack of mobilization and capacity development for the community on reduce the urban impacts
- Social economic developments are not integrated with urban management
- Poor and illegal environmental and natural resource management practices

The conceptual model provides a framework for the urban management strategies of Kalmunai. The SWOT analysis of the urban revealed the gaps that have been identified on several aspects of the city. Therefore these gaps must be filled in under the build KMC as vulnerable resilient city. In addition to the SWOT and core problem analysis, the HFA was also considered in developing the plan.

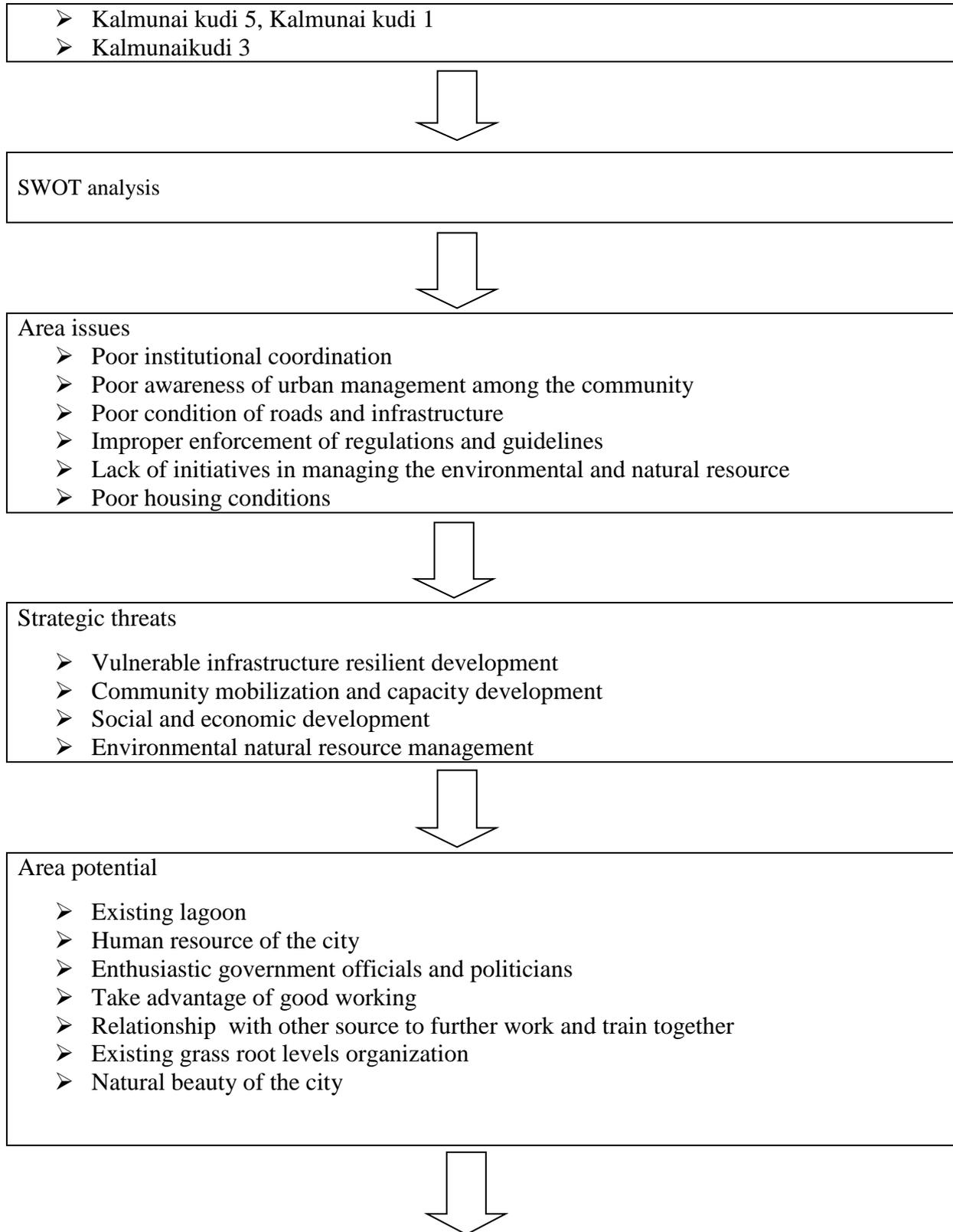
The SWOT analysis revealed the gaps that must be filled in order to build KMC as a vulnerable city is a diagrammatic representation of the findings of the vulnerability and impacts assessments, the SWOT analysis and how this, coupled with the background research have gone together to shape this plan for Kalmunai. Prior to developing the strategic directions in chapter 4 a review of some international case studies was conducted. This was done to examine the policies and strategies other cities and implementing to anticipate and respond to hazard, in particularly floods. The experience from this exercise provide a comprehensive view towards development the applications of new strategies, practices and innovations to positively influence impacts prevention, mitigation, response and reconstruction policies as well as practices. The case studies are included at appendix. The studies strengthened the strategies and resilient measures proposed in chapter 4 and 5.

## **6. PROCESS OF SWOT ANALYSIS**

High risk area in KMC



- Maruthamunai 4, Maruthamunai 1
- Pandirupu 18, Kalmunai 24
- Natpatimunai 2, Natpatimunai 3
- Kalmunai kudi 14, Kalmunai kudi 12
- Sainthamaruthu 16, Kalmunai kudi 7



Plan of Kalmunai risk reduction

- Vision and strategic thrusts
- Revision of existing development guild lines and regulation
- Action projects

The chapter has provided key information; first the form of vulnerability maps, where the vulnerable and then integrated with the baseline research to identify risk levels. This process culminated with the multiple hazards composite risk map for KMC. A summary of SWOT analysis core problem analysis shaped the issues and opportunity that KMC has and can build on. The analysis came from the view of wanting to make Kalmunai a vulnerable city. Poor institutional coordination and integration within KMC especially between the field of urban impacts assessments and socio economic development including the lack of hazard resilient designs and infrastructure as well as poor management of environmental resources are the major issues identified.

## **7. CONCLUSIONS**

Kalmunai municipal council has signification of it socio-economic, environmental and cultural. But now a day this region facing more challenges on environmental impacts and vulnerable due to the population growth, improper urban development planning activities and lack of resources. Therefore we want to propose managing activities for the reduction of environmental impacts due to the urban development.

- This research purpose on the emerging challenges due to the urbanization. Which is consisting of this Kalmunai urban has faced the challenges on its environment. This conclusion has been analyzed through the observation, questionnaire and interview.
- This regional people 88% impact by coastal erosion is problem of this region such as Kalmunaikudi, Sainthamaruthu and Maruthamunai. That occurs due to the natural process due to monsoon generated wave attack, man -made induce changes occur due to extraction of sand and coral from the coastal zone and improperly cited building and maritime. Human activities such as mining of beach and mining of coral reef, Oluvil harbor project and urban development project are major factors contributing significantly to coastal erosion.
- KMC wetlands are diminished due to the urban development activities. Mostly these area people 85% impacts due to wetlands are filled by garbage sediments and the refill for the future accommodation and resettlement project. Mainly these problems occur in Kalmunai. Sainthamaruthu and Neelavanai. Urban development, population growth and improper developments are caused to diminished wetlands.
- Solid waste disposal is a common threat to environmental in KMC. Since most of the solid waste grated ended up directly in open landfills or dumps. This area 75% people impacts due to the waste disposal particularly Kalmunai and Maruthamunai. Lands scarcity is a major problem face by the municipality and therefore finding land for municipal council solid waste disposal is becoming increasingly difficult this has resulted in the spreading of various chronic diseases.

- Kalmunai urban face a challenges of water demand. Achieving the demand created by urban settlement, population growth, waste water discharge, solid waste disposal in the water bodies. 85% people have been faced challenges of water demand.
- Human and his development activities, urban development projects, industrial activities and fishing are encourage to Kalmunai municipal coastal erosion. Fisheries are often damaged and destroyed by liquid effluents from city-based industries. Thousands of people may lose their livelihood, because of a small scale city situated close to the regional productive fishing regions. Their people have been 68% impacts due to the improper fishing activities. Particularly, Maruthamunai and Kalmunai also affected. The cities that are close to the coast often dump untreated sewage to the sea. Most of the coastal cities have serious problems with dirty, contaminated beaches and water which is a serious health risk to the bathers and for the whole city.
- Kalmunai is a town prone to severe flooding during the monsoon seasons. This greatly inconvenienced local residents going about their daily activities. 65% people have been affected due to the improper drainage and flood. In many parts of the town flood water would remain stagnant for weeks, if not months. This had severe consequences upon the health of the residents in the Kalmunai area. Under the European Commission's overall post-tsunami assistance program, this issue was addressed by the creation of an efficient surface water drainage system.
- Solid wastages are leading a major part of making environmental pollution in this division. Mostly 98% people agreed and practiced impacts of environmental. There are more solid wastages scattered here and there in this region. This is a major issue in this area. Liquid wastage also left in the environment without proper disposal it is a major environmental hazard in this area.

### **Recommendations**

The KMC urban have been faced challenges due to the urban development activities as economic cultural developments on the account of environmental impacts. These improper urban planning activities encourage impacts will be held on the environment. Therefore we can identify the problems of urbanization through impacts analysing process and proposed to development project of sustainable environment for the future generation.

- Mostly this regional people establish their settlement as is it illegally after the tsunami they refill the wetlands for their settlement activities and future accommodations. And these are caused by the growing population in this area. This will be continuously happened KMC environment face vulnerable challenges. Therefore we want to reduce and stop these activities through the ordinance of environmental protection and coast conservation Act No 57 of 1981. And get penalty from violation of ordinance.
- Control of water pollution is the demand of the day cooperation of the common man, social organizations, natural government and non -governmental organizations; is required for controlling water pollution through different curative measures. Domestic waste and sewage may treat before following them directly in drinking water sources. Use of treated water may be made for cooking vegetables, which may be grown on sewerage farms. Bathing and washing should be banned near drinking water source

because detergents used in washing clothes pollute water. It difficult to treat water mixed with detergents.

- Bathing animals near water source should also be prohibited. People may be made aware about dangerous created by water pollution so that they feel their responsibility and take the control.
- Central Environmental Authority with the concept of reusing the resources available in the collected garbage to the maximum before final disposal. This project is well received and has a good response from the community. Segregation is very important in waste management. So, if each household separates the wet waste from the solid waste; it is actually a very small portion that needs to go to the landfills. Countries like India make use of these waste plastic to derive energy. However, to generate energy requires heap quantities of plastic wastage and as a result of the process a byproduct of methane will be produced. Nevertheless, this process is not much financially viable as the quantities are limited in Sri Lanka.
- In Sri Lanka, 56% of the waste is biodegradable, which is also known as wet waste. This is very good to make compost, which is very useful for organic farming. With Sri Lanka aiming to increase its agricultural production, this compost will help to uplift the agriculture sector. Compost is a very lucrative business, which also promotes green jobs.
- When follow the 3R system we can reduce the solid waste sediment on the environment
- Coastal erosion control methods:

- ✓ Hard-erosion controls

Hard-erosion control methods provide a more permanent solution than soft-erosion control methods. Seawalls and groins serve as permanent infrastructure. These structures are not immune from normal wear-and-tear and will have to be refurbished or rebuilt. It is estimated the average life span of a seawall is 50–100 years and the average for a groin is 30–40 years. Because of their relative permanence, it is assumed that these structures can be a final solution to erosion. Seawalls can also deprive public access to the beach and drastically alter the natural state of the beach. Groins also drastically alter the natural state of the beach. Some claim that groins could reduce the interval between beach nourishment projects though they are not seen as a solution to beach nourishment.

- ✓ Soft-erosion controls

Soft erosion strategies refer to temporary options of slowing the effects of erosion. These options, including Sandbag and beach nourishment, are not intended to be long term solutions or permanent solutions. Another method, beach scraping or beach bulldozing allows for the creation of an artificial dune in front of a building or as means of preserving a building foundation. However, there is a U.S. federal moratorium on beach bulldozing during turtle nesting season, May 1 – November 15. One of the most common methods of soft erosion control is beach nourishment projects. These projects involve dredging sand and moving it to the beaches as a means of reestablishing the sand lost due to erosion.

- Making proper housing scheme for reducing vulnerability and reduce the emerging challenges of urbanization in this region.

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