CLIMATE RESILIENT AND INCLUSIVE CITIES

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URBAN ANALYSIS REPORT *2020*

01

BANDAR LAMPUNG

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FOREWORD

Addressing the threat of climate change remains a top priority for the European Union (EU). The European Green Deal is a response to these challenges; it aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy with zero net emissions of greenhouse gases by 2050.

Through the Climate Resilient and Inclusive Cities (CRIC) project, the EU and Indonesia are working together to help cities build a resilient and inclusive future. We do so by building partnerships between governments, businesses, local communities and research institutes in Europe, South Asia and Southeast Asia.

Clearly, there are hurdles along the way, especially in the midst of the COVID-19 pandemic. However, our response to this pandemic needs to be a sustainable one, addressing the challenges of climate change as well as economic recovery.

Just last month, in Sukabumi City of West Java Province, a flash flood cost lives and forced hundreds of citizens to leave their houses. According to the Indonesian National Disaster Management Agency, Indonesia is about to experience more hydrometeorological disasters due to climate change. The CRIC Urban Analysis Report is a timely reminder that cities cannot delay their sustainable transition.

This Urban Analysis Report for ten Indonesian pilot cities under the CRIC project offers a comprehensive overview of city characteristics, policy gaps and climate-related policies in the cities of Pangkalpinang, Pekanbaru, Bandar Lampung, Cirebon, Banjarmasin, Samarinda, Mataram, Kupang, Gorontalo and Ternate.

The report provides empirical evidence to help cities develop policies and tools to strengthen climate change-affected sectors. I am happy to note the consultations among a wide range of stakeholders including government officials, academicians, civil society, professional practitioners, NGOs, and the private sector, ensuring that the proposals are inclusive.

We look forward to seeing how the cities will take up the given recommendations by transforming them into local climate-proof policies and programmes and to further working together to build climate resilient and inclusive cities.

Jakarta, October 2020

Vincent Piket

EU Ambassador to Indonesia and Brunei Darussalam

WALIKOTA BANDAR LAMPUNG

Mayor's Foreword

Climate change is one issue of development priorities in Bandar Lampung. Hence, it's an honour for us to be selected as a pilot city for the implementation of CRIC (Climate Resilient and Inclusive Cities) Project. This Urban Analysis Report is one of many benefits that Bandar Lampung will receive, as this document can serve as reference in development planning in this city.

The publication of this report coincides with the momentum to conduct Strategic Environmental Assessment (SEA) - Medium Term Regional Development in Bandar Lampung. Therefore, this Urban Analysis Report offers recommendations for this city to integrate climate change mitigation and adaptation actions into long-term city development.

In addition, this report helps city government align its climate change policies and programmes with ones of national government. We are glad to see that this report discusses social inclusion, to help us ensure community participation, especially the most vulnerabe groups, in urban development.

This study was conducted in a transparent manner by considering inputs from diverse stakeholders, such as governments, universities, civil society organisations and local government. I hope that you find this report useful. Thank you.

WALIKOTA BANDAR LAMPUNG

HERMAN HN

Climate Change is an issue of humanity, it is not merely a threat to the environment only. It is one of most visible humanitarian crises of the century. On very many occasions, we have seen how climate-induced disasters disrupted local economy, food system, basic services and left vulnerable groups more powerless. As an association connecting more than 10,000 cities and local governments in the Asia-Pacific region, UCLG ASPAC is responsible for supporting cities to be climate-resilient, something that we take seriously.

The cost of inaction now is huge. It is therefore urgent for cities to act and find solutions that should be based on data and scientific rigour enabling evidence-based decisions that subsequently reduce the impact of climate change. I emphasise, continual and periodic assessment of risks and change in attributes of cities are critical in enhancing resilience. In light of this, I commend the Climate Resilient and Inclusive Cities (CRIC) team and our urban experts for their hard work to publish this Urban Analysis Report. Great thanks to all the pilot cities of CRIC for their support in producing this Report. It presents a comprehensive outlook on climate risks, programmes and policies at a city level and provides recommendations and solutions to tackle climate change.

This report also underlines the importance of coordination that transcends administrative boundary as climate has no border! It is something that UCLG ASPAC can contribute through the CRIC Programme, by connecting the dots between cities in Asia and the Pacific and beyond within the framework of sub-national and national governments for vertical integration. We intend to bring cities on the center stage of "Blue Ocean" and "Blue Sky" agenda through action-based proposals and approaches on circular economy, air pollutions and cross-cutting issues. And we are committed to ensuring that climate change best practices can be up-scaled and replicated for greater multiplier impact.

I look forward to seeing how the plans are put into actions to create climate resilient and inclusive cities. Our future will depend on how cities act today. Every concrete step on climate action we make now will bring closer our dream for inclusive, prosperous and sustainable cities and communities.

Dr. Bernadia Irawati Tjandradewi

Secretary General of UCLG ASPAC

As President of Pilot4Dev, I have had the honor to be directly involved in the Climate Resilient and Inclusive Cities Project from its very inception. It was with great pleasure that I attended the CRIC Kick-off event back in January 2020 which allowed us to meet up with our Indonesian partners in order to prepare and launch the project. A great added value from this event was the possibility to meet up with the mayors of the cities piloting the implementation of the project. Today, there is a myriad of cities in need of support in terms of urban environment and climate change resilience.

Pooling the expertise and knowledge of EU partners including ACR+, Pilot4DEV, University Gustave Eiffel, ECOLISE and Asian partners UCL ASPAG and AIILSG, this very ambitious five years project aims to establish a long lasting and unique cooperation. It is carried out through a triangular cooperation between cities and research centres in Europe, South Asia (India, Nepal, Bangladesh), and Southeast Asia (Indonesia, Malaysia, Philippines, Thailand). It aims to contribute to sustainable integrated urban development, good governance, and climate adaptation/mitigation through long lasting partnerships, and tools such as sustainable local action plans, early warning tools, air quality and waste management in consultation with experts' panels. The final beneficiaries include the local community of the cities/provinces, including women, marginalised sector, civil society and private sectors.

Now entering the 10th month of its implementation, this project has already proven to be a fruitful endeavor now implemented in 10 different cities in Indonesia. Among the chief results obtained so far, 10 urban analysis reports have been written and edited, and assess the current capacities of the different target cities. The project in itself has required the direct involvement of local authorities' officials, generating a real eagerness to make the cities more resilient and inclusive at the local level. The next steps of this project will involve the release of the Urban Analysis Reports along with policy briefs and recommendations adapted to the different pilot cities which have been involved in the project so far. This release will be completed by the creation of tools put together by the International Partners of the CRIC project, in order to equip local authorities and possibly tackle the urban and environmental challenges they face.

Due to high urban growth rates in countries such as Indonesia, Vietnam and the Philippines it is predicted that a significant share of the population of those countries will be living in cities in the next ten years. Cities in the South Asian and South East Asian regions are already impacted by climate change, and they could substantially benefit from long lasting solutions in terms of climate resilience and inclusiveness. The CRIC Project aims to inform and facilitate the equipment of local governments, cities, urban stakeholders working on climate resilience, mitigation and adaptation of those cities by pooling the best resources available and transferring and adapting as much knowledge as possible. Since urban areas host most of the vulnerable populations, as well as vital and social infrastructure, and local governments get increased pressure to develop services, infrastructure and employment, it is therefore of utmost urgency to make sure that we are all up for the challenge presented by climate change.

Isabelle Milbert, President of Pilot4Dev

The CRIC project represents for the Association of Cities and Regions for sustainable resource management (ACR+) – a network of local and regional authorities mainly based in the EU and the Mediterranean Area – a unique opportunity to cooperate and strengthen the role of cities to deliver on resiliency and inclusiveness.

ACR+'s core mission is to develop sustainable resource management initiatives involving local and regional authorities; in particular regarding waste management, one of the priorities raised by the urban analysis report. As such and for more than 25 years, we have been designing and implementing initiatives on circular economy, waste prevention, and waste management, building through this an extensive knowledge basis. Several ACR+ members have been already cooperating in the South-East region, whose experiences could be capitalized on and further developed through CRIC.

Conversely, this project provides a great learning opportunity for ACR+ members, to understand how local initiatives make a difference at global level. The present report contributes to effectively comprehend the local context, shedding the light on the key challenges and priorities. It shows that the exchange of methodologies to support decision-making processes rather than transfer solutions is crucial to successfully deliver sustainable projects.

However, more than a mere exchange of experiences, CRIC is a timely reminder that cooperation is key, at all levels and between countries. The EU cannot deliver alone the ambition of the European Green Deal for a climate-neutral, resource-efficient and circular economy. Activities like the ones developed within the CRIC project (trainings, stakeholder engagement, tools development, local action plans) can provide solid evidence to support bilateral and regional policy dialogue actions aimed at implementing the Green Deal and 2030 Agenda's objectives beyond the EU. Unfortunately, we cannot and should not forget the wider context in which the project is unfolding: the COVID-19 outbreak has been posing tremendous challenges at local level. With the hindsight we have so far, we see that local agenda based on resilient models contribute to better adapt and mitigate the negative impacts of the pandemic. Having this in mind, ACR+ has been supporting its members in overcoming the situation and is determined to also follow this path in CRIC.

Françoise Bonnet

ACR+ Secretary General

ABOUT THE AUTHORS

Hari Priyadi is the lead expert responsible for the CRIC Urban Analysis of the cities of Cirebon and Bandar Lampung. He has been working with multidisciplinary projects for over twenty years with various institutions. His experiences were dealing with management of natural resource and research in Indonesia, Asian regions and fair experiences in Europe. He holds a Forestry Degree on Forest Management from IPB University, a Master of Science from University Putra Malaysia and is at the Swedish University of Agricultural Sciences for his ongoing PhD project. He is a Senior Associate at the Faculty of Economic and Management, IPB University. He also works as World Bank Technical Advisor (consultant) providing technical advices to the central and sub-national government related with Sustainable Forest Landscapes and Climate Change. Hari previously worked with: the Center for International Forestry Research (CIFOR) as a researcher; Swedish University of Agricultural Sciences (SLU) based in Alnarp, Sweden as researcher, the KEHATI foundation as Environment and Social Safeguard Specialist; Managing Director with PT ReMark Asia and Conservation Manager with the Zoological Society of London (ZSL). He attended various trainings related to natural resource management at the University of Melbourne, the Swedish University of Agricultural Sciences, the University of Copenhagen, ProForest Oxford UK, the University of Eastern Finland and many more. He went to Florida University (USA) and CIRAD France as a visiting researcher. He participated and delivered presentations for international and national seminar as well as meetings. He published more than 30 scientific articles/publications including in peer-reviewed journals.

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Irfan Gunawan Matondang is also a CRIC team member. He is currently in his final year as a student at IPB University, majoring in Resource and Environmental Economics. His interest in environmental issues began during his 2nd university year when he had the opportunity to become a committee of the 11th GREENBASE. He was also a delegate for International Model United Nations Malaysia with UNDP Council to discuss waste management in Southeast Asia. In 2019, he took part in the 2nd Joint Seminar on Agricultural, Resources and Environmental Economics at University Putra (Malaysia) as a lecturer. He was also awarded the 2nd distinction for Most Outstanding Student of the Resources and Environmental Economics department.

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Anwar Hadipriyanto

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Maria Serenade

Putra Dwitama

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Dr. Pascaline Gaborit

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Paolo Marengo

Danko Aleksic

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GLOSSARY

3R	Reduce, Reuse, and Recycle
ACCCRN	Asian Cities Climate Change Resilience Network
ACI	Adaptive and Capacity Index
AQI	Air Quality Index
Bappeda	Local Development Planning Board
BMKG	Meteorology, Climatology, and Geophysical Agency
BNPB	National Disaster Management Agency
BPBD	Regional Disaster Management Agency
BPS Bandar Lampung	The Statistics of Bandar Lampung Municipality
Disdukcapil	Department of Population and Civil Registration
HKSR/SRHR (english term)	Sexual and Reproductive Health and Rights
IKA	Water Quality Index
IPLT	Fecal Sludge Treatment Plant
KPP	User and Maintenance Group
PDAM	Water Supply Company
Perda	Regional Regulation
POKJA	Working Group
POKJA-AMPL	Working Group of Drinking Water and Environmental Health
POKJA-PKP	Working Group of Housing and Residential Area
RAN-GRK	National Action Plan-Greenhouse Gases
RAN-API	National Action Plan-Climate Change Adaptation
RDTR	Detailed Spatial Plan
Renstra Bandar Lampung	Strategic Plan of Bandar Lampung
RPJMD	Local Government Medium-Term Development Plan
RPJMN	National Medium-Term Development Plan
RTRW	Regional Spatial Planning
TPA	Landfill
TPS	Temporary waste shelter
UMKM	Micro, Small, and Medium Enterprises

CHAPTER 1
Overview of Bandar Lampung

1.1 General Description

When Indonesia was colonized by the Kingdom of the Netherlands, Bandar Lampung was an area called *Onder Afdeling* Telokbetong which was created in 1912, under the Dutch law of Staatsbalat 1912 Number 462. The capital city of *Onder Afdeling* Telokbetong was called Tanjungkarang while the city of Telokbetong itself was known as the capital of Lampung Residency. After the independence of Indonesia, the authority of those two cities was transferred to the South Lampung District until the enactment of Law of The Republic of Indonesia (Undang-Undang) Number 22 in 1948 that declared the separation of those two cities and became known as the city of Tanjungkarang-Telokbetong. Those two cities had been experiencing several status changes since then until in 1965 when the status of Lampung Residency changed into the Province of Lampung, according to the Undang-Undang Number 18 in 1965, the city of Tanjungkarang-Telokbetong became the capital city of the Province of Lampung. In 1999, the city of Tanjungkarang-Telokbetong became the city of Bandar Lampung as it was declared by the Mayor Regulation of Bandar Lampung number 17 in 1999.

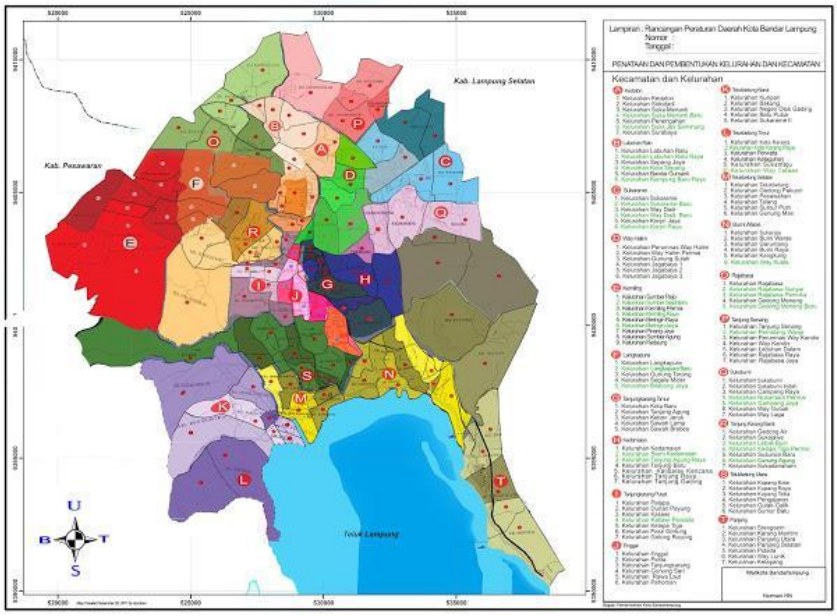
Figure 1 - Location Map of Bandar Lampung in Indonesia

Source: https://www.worldmap1.com/map/indonesia/bandar-lampung-map.asp

As the capital city of Lampung Province, Bandar Lampung is the center of economic activities in the province. It is divided into 20 subdistricts. According to the BPS Bandar Lampung (2020), there are 1,051,500 inhabitants in 2019 living in the city of Bandar Lampung with a population density of 5,332 people per km^2. However, Bandar Lampung's Disdukcapil (Department of Population and Civil Registration) recorded that the number of inhabitants

until now has reached 1,176,599 and this data is updated every month. The population from 2018-2019 has grown with an annual growth rate of 1.71%.

Figure 2 - Map of Bandar Lampung



1.2 Methodology of Urban Analysis

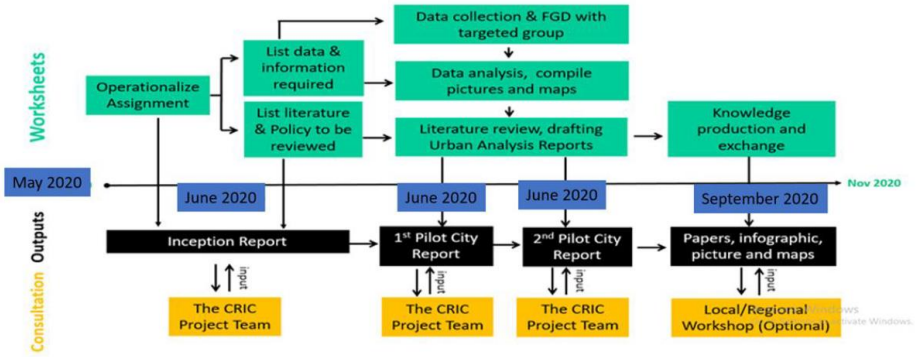
Preliminary data collections were done by searching relevant development documents, published articles, statistical reports and media content. We conducted literature reviews based on these collected materials (flow chart below). Maps and pictures were collected from our contact persons in the city. We then developed a questionnaire/opinion survey as it was suitable for assessing the success of a strategy/element in the presence of different perspectives on system performance between different groups, namely: government officials, private sectors, civil society and university/research institutions. There were several aspects to consider in conducting opinion surveys such as techniques/methodologies, questionnaire types, and analysis of findings (Abernethy *et al*. 2001).

In this study, both quantitative and qualitative methods are utilized. The quantitative method involves getting numerical data, either from relevant official websites or directly from the government of Bandar Lampung. The qualitative method uses explanations from the data gathered based on online articles, previous projects or relative research in the city, and interviews with the stakeholders, such as the city government of Bandar Lampung, NGOs, private companies, and universities in the city. Set of questions were set up to gain insights and opinions on the characteristics of selected projects and the specific impacts associated with CRIC-related beneficial activities. Three different types of questionnaires were prepared based on the target respondents who are four stakeholder representatives (governments, private sectors, civil society and university/research institutions).

The questionnaires were formulated in Indonesian language and distributed using an electronic platform in Google to the selected respondents to get their opinion in the first

week of June. Both closed-ended questions and open-ended questions were used in the survey and were divided into two parts. Part A consisted of general questions to identify the respondent's profile, and Part B intended to gain views and opinions from professionals. Some respondents were suggested by the Head of Bappeda (Regional Planning Agency Office) as they were deemed likely to understand well the objectives of the CRIC urban analysis.

Figure 3 - Flow of Urban Analysis Methodology



Source: Authors

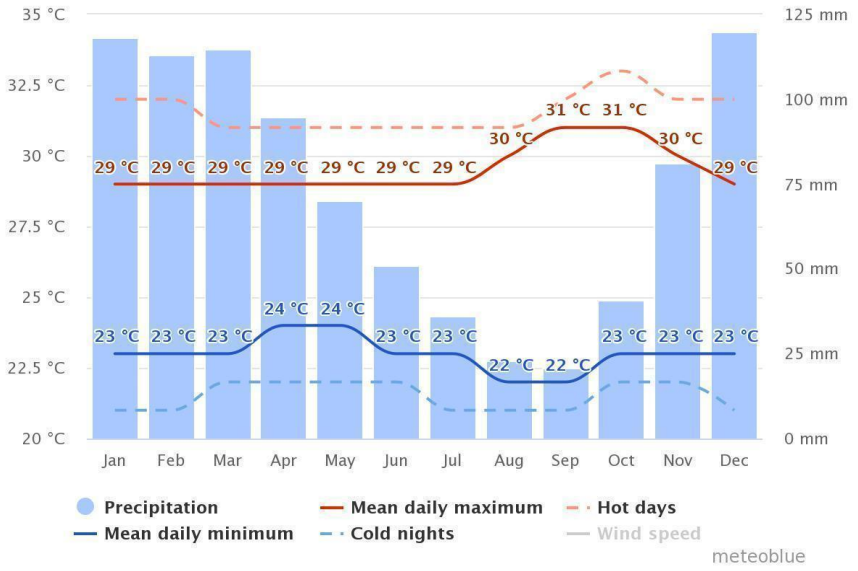
We also organized virtual meetings with government officials and had the opportunity to discuss the topics related to the CRIC urban analysis. We conducted in-depth interviews and phone discussions when clarification as well as further information from the respondents were needed.

1.3 Topography and Climatology

The city of Bandar Lampung is located at 5°20′ to 5°30′ South Latitude and 105°28′ to 105°37′ East Longitude. It is located at Lampung Bay on the Southern part of the Sumatra Islands. The city of Bandar Lampung is located at a height between 0 and 700 meters above sea level. The topography of the city consists of:

- Coastal region on the Southern side of Teluk Betung and Panjang.
- Hilly region on the Northern side of Teluk Betung.
- Highland and soft hills on the Western side of Tanjung Karang which is influenced by Balau Mount and Batu Serampok hills in the Southeastern side.
- Lampung Bays and small islands on the Southern side.

Figure 4 - Monthly Average Temperature and Precipitation in Bandar Lampung



Source: www.meteoblue.com

According to the Climate Vulnerability Report done by SNV, the city's climate is usually equatorial with hot and humid conditions throughout the year, and the temperature on land is rather constant. The figure above represents a monthly average temperature and precipitation in Bandar Lampung. This data from Meteoblue is based on 30 years of hourly weather data. It is shown that moderate rain happens during the first three months of the year and at the end of the year, whilst the highest mean for the daily maximum temperature will be around September-October.

Table 1 - Data of Extreme Climate for Past Ten Years in Maritim Panjang Meteorological Station

Station	Rainfall (mm)	Tx (°C)	Tn (°C)	Tav (°C)	RH (%)	Wx (knot)
Maritim Panjang Meteorological	204.9 Sep 8, 2013	37.0 Jan 22, 2016	16.0 Jan 15, 2014	33.9 Dec 6, 2012	64 Oct 11, 2010	1 May 11, 2018

Source : http://dataonline.bmkg.go.id/

*Information:

Tx = maximum temperature (°C)

Tn = minimum temperature (°C)

Tav = average temperature (°C)

RH = average humidity (%)

Wx = maximum wind speed (knot)

Data from BMKG was also collected and can be seen in the table above. As the Indonesia Government Agency for Meteorology, Climatology, and Geophysics, BMKG has several stations spread across the nation. Bandar Lampung city itself has its own station named Meteorological Station Maritim Panjang. Extreme data collected by the station until now can be seen in the table above. Due to climate change, the precipitation volume of the has increased from its normal condition while the dry season can occur more severely than usual.

1.4 Demographic Characteristic

As it was mentioned before, Bandar Lampung has more than a million inhabitants who are living in the city of 169,2km^2 area. In 2019, male inhabitants dominated the population. According to the data from Disdukcapil (2019), 51% of the population in the city are males, while 49% are females. The Disdukcapil (2019) has released the data of existing religions in the city, which are Islam, Protestant, Catholic, and Buddhism. Muslims are the dominating group, representing 93.2% of the population. The second religious group is Protestant which takes up to 3.5%. The third one is Catholic whose followers take up to 1.7%, followed by Buddhists, which represent 1.4% of the population. According to BPS Bandar Lampung (2020), there are 33 groups of minorities, 238 children with disabilities and 820 people with disabilities. The detailed information of minority groups is unknown. Meanwhile, according to 2019 data, the Human Development Index of the city is 77.33 with 65.52 % of labour force participation rate and 7.12 % of unemployment rate.

The population in Bandar Lampung is dominated by senior high school graduates who take up to 30.6% of the population (Disdukcapil, 2019). The junior high school graduates take up to 14.1% of the city's population, followed by the elementary school graduates that take up to 13.9%. About 9.6% of the population did not complete its education at the level of elementary school. Regarding higher education in the city, the bachelor's degree holders apparently belong to the minority groups in terms of education. They take up to 7.7% of the population while the postgraduate graduates take up to 0.8% of the population and the vocational school graduates take up to 3.3% of the city's population. Meanwhile, there are still uneducated people in Bandar Lampung municipality. About 19.9% of the population did not attend any kind of school. They are the second biggest group in the city, in terms of education, after senior high school graduates.

Table 2 - Percentage Distribution of Communities Aged 5 Years and Over by Education Level, 2019

Characteristic	Unschooled	In school			Not in school
		Elementary School/other equivalent forms	Junior High School/other equivalent forms	Senior High School/other equivalent forms	
Male	4.17	11.85	4.24	9.69	70.05
Female	4.25	12.52	3.46	13.43	66.33

Source: BPS Bandar Lampung (2020)

The low level of education in Bandar Lampung does not appear to be the cause of poverty problems in the city. The number of poor people in the city decreases every year. According to BPS Bandar Lampung (2019), there are 91,240 poor people in Bandar Lampung. To measure poverty, the Central Bureau of Statistics uses the concept of ability to fulfill their basic needs (basic needs approach). The approach sees poverty as an inability on the economic side to meet the basic food and non-food needs as measured by expenditure. The population of poor people is the population that has an average monthly per capita expenditure under the poverty line. The poverty number in 2019 is relatively lower than previous years as in 2018 and 2017.

BPS Bandar Lampung in 2019 shows that the total population aged 15 years and above who worked during the previous week is 475,244 people. There are three livelihood sectors in the city which are agriculture, manufacture, and services. The services sector dominates the employment in the city. There are 369,849 people who work in the services sector, which is comprised of 208,033 male workers and 161,456 female workers. Following the services, the manufacturing sector also plays an important role with a total of 99,030 workers, largely dominated by men (74,383 against24,647 women) Although the agricultural sector does not absorb labor forces as much as the previous sectors, it still counts as a main source of income for city dwellers, with approximately 6,725 depending on it. Women play smaller roles in this sector. According to 2019 data of the population aged 15 years and over who worked in the agricultural sector during the previous week, only 3 women identified working in the sector while the rest are men.

Table 3 - Population Aged 15 Years and Over Who Worked During the Previous Week by Main Employment Status and Sex in Bandar Lampung Municipality, 2019

Main Employment Status	Sex		
	Male	Female	Total
Own account worker	66,827	45,120	111,947
Employer assisted by worker/unpaid worker	13,971	18,705	32,676
Employer assisted by permanent worker/paid worker	13,502	5,815	19,317
Regular employee	170,377	99,203	269,580
Casual agricultural worker	1,630	0	1,630
Casual non-agricultural worker	15,494	3,475	18,969
Family worker/unpaid worker	7,337	13,788	21,125
Total	289,138	186,106	475,244

Source: BPS (2020)

In simple terms, the formal and informal activities of residents can be identified identities based on their employment status, which has been split into seven categories (see Table 3): the categories characterized by regular employees and paid workers contribute to the formal economy, while the other ones refer to the informal sector. Based on this approach, it can be estimated that 288,897 workers (86.43 %) worked in formal activities and 186,347 workers (13.57 %) worked in informal activities in 2019. Informal workers are dominated by self-employed workers, while formal sectors are dominated by regular workers. In the informal sector, the least number of workers came from casual agricultural workers, namely 1,630. Overall, the number of workers in both the formal and informal sectors are dominated by men. There is only one work status that is dominated by women, namely family worker/unpaid worker.

According to the unpublished data from the Bappeda of Bandar Lampung, there are thousands of newcomers in the city of Bandar Lampung, mostly coming from rural surrounding areas. In 2019, the total of rural migration in Bandar Lampung was over 17,000 people. Since most of the newcomers do not come from other provinces or countries, the city gained population growth only from rural migration and births.

1.5 Social Structure

According to RPJMD 2016-2021, multi-ethnicity has become one of the characteristics of Bandar Lampung. This situation is due to the transmigration program established a long time ago during the Dutch colonialism. Since the transmigration program covers an area

ranging from Java to Sumatra Island, especially to Lampung Province, the city's communities are diverse of many ethnic groups. Based on that characteristic, Bandar Lampung is also known as a land of "*Ruwa Jurai*" (two elements) due to be inhabited by both indigenous communities and newcomers. These days, Bandar Lampung is not the destination for transmigration anymore, but diversity remains in its society.

1.6 Economic Structure

National and regional policy has set Bandar Lampung as a national growth center and orientation for interregional development center, regional development center, and local center.

Table 4 - GRDP growth rate of Bandar Lampung Municipality at Constant Market Price by Industry, 2016-2019

Industry	Growth Rate (%)			
	2016	2017	2018	2019
Agriculture, Forestry, and Fishery	2.28	-0.35	0.07	2.36
Mining and Quarrying	6.47	7.58	6.23	5.51
Manufacturing	6.25	6.02	6.12	7.05
Electricity and Gas	5.82	5.69	5.45	6.51
Water Supply; Sewerage, Waste Management, and Remediation Activities	4.13	2.47	1.73	5.43
Construction	10.09	9.16	9.91	5.56
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	3.6	3.96	4.28	6.09
Transportation and Storage	7.84	6.3	6.48	6.94
Accommodation and Food Services Activities	8.89	5.03	7.67	8.56
Information and Communication	9.95	9.91	9.96	8.01
Financial and Insurance Activities	4.74	6.85	2.15	3.23
Real Estate Activities	5.71	8.31	7.16	5.83
Business Activities	2.85	5.25	4.59	4.41

Public Administration and Defense; Compulsory Social Security	5.46	5.66	5.35	4.79
Education	6.46	6.95	7.03	7.73
Human Health and Social Work Activities	7.93	7.49	5.89	7.02
Other Services Activities	7.05	7	7.78	7.84
Gross Regional Domestic Product	6.43	6.28	6.21	6.24

Source: BPS Bandar Lampung (2020)

In general, all economic sectors in Bandar Lampung throughout 2016-2019 have had positive growth. The growth rate fluctuates every year, but in 2019 the majority had an increased growth rate compared to previous years. Accommodation and food services activities become an industry sector featuring the highest growth rate in 2019. According to RPJMD 2016-2021, manufacturing, trading, and service are the main support of Bandar Lampung's economic structure. In consequence, municipal policies and strategies must be formulated in a way to support these sectors, as well as the tourism sector. Tourism in Bandar Lampung is expected to bolster tourism of Southern Sumatra, and to exploit the potential of Bandar Lampung's natural beauty. Meanwhile, several sectors still have a low growth rate such as agriculture, forestry, and fishery sector (2.36%), as well as the financial and insurance activities sector (3.23%).

1.7 Environmental Data

Along with Banten and West Java Province, Lampung Province was included in one of the provinces with poor Environmental Quality Index (IKLH) by value 59.89 in 2018. The situation of land cover was not any better as the Land Cover Quality Index (IKTL) of the province was categorized in alert (35.93). Meanwhile, the value of Air Quality Index (AQI or *Indeks Kualitas Udara/IKU* in Indonesian) and Water Quality Index (WQI or *Indeks Kualitas Air*/IKA in Indonesian) were respectively 82.98 and 68.73. The value AQI/IKU was still categorized as good, but the value of WQI/IKA was considered as one of the lowest values. The low value is, in general, caused by domestic waste management, sanitation and livestock waste that have not been handled properly.

1.7.1 Waste Management

Bandar Lampung city uses an open dumping system for waste management. Firstly, household waste is brought to TPS by the waste management body that is locally managed by *kelurahan* (*kelurahan* is an Indonesia term for urban village, refers to a subdivision of subdistrict). This local waste management body is usually called *Sokli*, a janitor that picks up waste from homes. After that, the waste collected in TPS is brought to TPA or landfill. Bakung Landfill is the main landfill of the city that collects all the garbage produced in the city. There are 96 unit of garbage trucks used to carry waste to the landfill (each truck does on average 1 or 2 round trips per day). There is no system to manage the inorganic waste in the city, but there are three machines that process organic waste into compost. The organic and inorganic waste is separated when the waste arrives at the landfill, then the organic waste is processed into compost. This composting activity, according to data in 2013, was carried out every few weeks with approximately 200kg of fertilizer production.

Table 5 - Waste Handling in Bandar Lampung, 2012-2016

Year	Volume of Waste (tons)	Volume of Waste that Being Handled (tons)	Percentage (%)
2012	260,975	234,300	89.77
2013	282,875	253,750	89.70
2014	306,000	275,000	89.70
2015	319,010	287,600	90.15
2016	329,730	297,500	90.22

Source: BPS Bandar Lampung (2016)

It can be seen in the table that the trend of waste production tends to increase every year. NGO WALHI's data shows that waste production that enters Bakung Landfill in 2019 reached 1,000 tons/day, so it could be estimated that the volume of waste in 2019 was around 365,000 tons. Considering this number, it is no surprise that the landfill produces greenhouse gases (GHG), as proved by Iryani *et al*.'s research (2019) which stated that Bakung Landfill had produced 788.404 m^3 of methane in 2018. From the potential methane calculation, it is shown that potential methane gas generated from the landfill each year is quite big, and this number continues to increase every year. The most significant increase happened in 2019 where there was an increase of 567,397 m^3 in volume of methane gas from the previous year.

Figure 5 - Bakung Landfill

Source: Authors

Figure 6 - Waste Bank in Kemiling Subdistrict

Source: Authors

There are several waste banks in Bandar Lampung City, but they have poor effectiveness. This is also compounded by sea pollution caused by industrial waste. For mining companies, industrials have a Temporary Storage Permit for Hazardous and Toxic Waste based on the Decree of the Mayor of Bandar Lampung Number: 744 / III.20 / HK / 2014. The types of hazardous waste that are permitted to be stored are used oil, contaminated waste, sludge oil, used toner/cartridge, used TL lights, used oil filters, used grease, electronic waste, expired chemicals, contaminated sawdust, used batteries, used hazardous packaging and sludge from wastewater treatment plants.

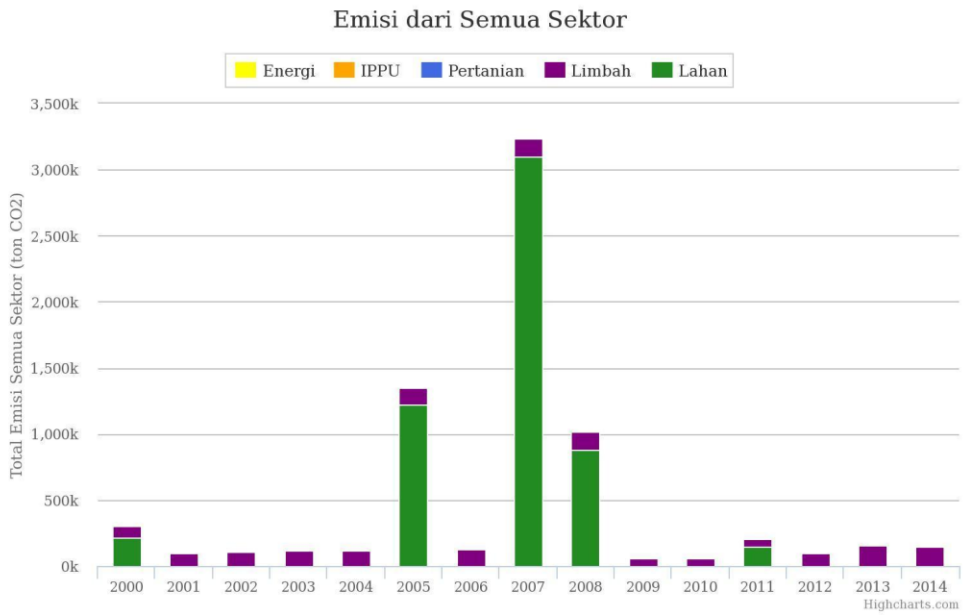
Regarding waste in the coastal region, its management is quite concerning. The situation is that the coastline has been expanded into the sea due to local communities using household wastes as raw material for coastline landfill (Fahmi *et al*. 2014). This 'waste reclamation', however, still continues until now. Fakta Pers (2019) also states that seawater pollution on Lampung Bay due to waste has killed marine habitats and ecosystems. Many fishermen said

that their fish catches decline, and instead there is a lot of plastic waste found on their nets (Republika, 2020). In 2019, the Head of Waste Management for the Lampung Province Environment Agency admitted that 80 percent of Bandar Lampung's coastal waste came from the mainland. Not only from coastal communities but also from Koala, Way Lunik, and Kuripan estuaries. Therefore, the waste that has been piling up in Lampung Bay not only originates from Bandar Lampung's upstream, but also outside the Bandar Lampung region.

1.7.2 Greenhouse Gas Emissions

From the figure below, it is shown that the CO_2 emissions in the city for the time period 2000-2014 originated from the waste and land sectors. The CO_2 emissions from the waste sector are represented by the purple color and green is for the land sector. The highest emission occurred in 2007 as the land sector contributed more than 3 million tons of CO_2 to the city. The cause is unclear but it is estimated that this huge contribution was due to land conversion and fire activities. The emission then fluctuated, but mainly decreased over the years. The emissions from the land sector also declined sharply until in 2014, only the waste sector contributed to CO_2 emissions in the city with a number of 143,767 tons of CO_2.

Figure 7 - Carbon Dioxide Emission from All Sectors in Bandar Lampung, 2000-2014



Source: http://signsmart.menlhk.go.id/

1.7.3 Air Quality

Besides the waste and land sectors, the sources of air pollution in the city of Bandar Lampung are found in the industry and motorized vehicles. Industry in the city produces particulate pollutants from industrial chimney emissions. Based on the research by Jyoti and Setiawati (2019), industries in Bandar Lampung in 2018 produced 37,69 μg/Nm^3 of particulate pollutants. It shows that there are industrial activities that produce emissions in Bandar Lampung City. The table below represents ISPU value calculation results for three locations in the city. Based on the pollution category, the three locations still have a good SO_2

pollution category, which is in the range 50-100. Meanwhile, for O_3, NO_2, and PM_{10} based on the pollution category, the results are similarly good.

Table 6 - ISPU Value Calculation Results Data for Three Locations in Bandar Lampung City, 2015

No.	Parameter	Unit	Location 1	Location 2	Location 3	Pollution status
1	SO_2	µg/Nm^3	59,87	56,37	58,72	Good
2	O_3	µg/Nm^3	21,79	70,36	45,20	Very Good
3	NO_2	µg/Nm^3	12,20	13,10	15,00	Very Good
4	PM_{10}	µg/Nm^3	21,48	28,45	7,23	Very Good

Source: Yunita and Kiswandono (2017)

1.7.4 Water Quality

Regarding inland water, there are 19 rivers crossing the city. Two of the major rivers, Way Kuripan and Way Kuala, are the main sources of water catchment area. The catchment area of both rivers is consecutively 8,698 and 6,782 hectares, whilst the other river's catchment area is below 1,500 hectares. Way Kuripan River plays an important role as the majority source of pipe water supply. On the other hand, flow utilization in the Way Kuala River is relatively lower because of its steep geography. Based on SLHD (Regional Environmental Status) in 2016, there are three types of river statuses in Bandar Lampung. Although the statuses of several rivers are not known, the majority of rivers in the city are moderately polluted.

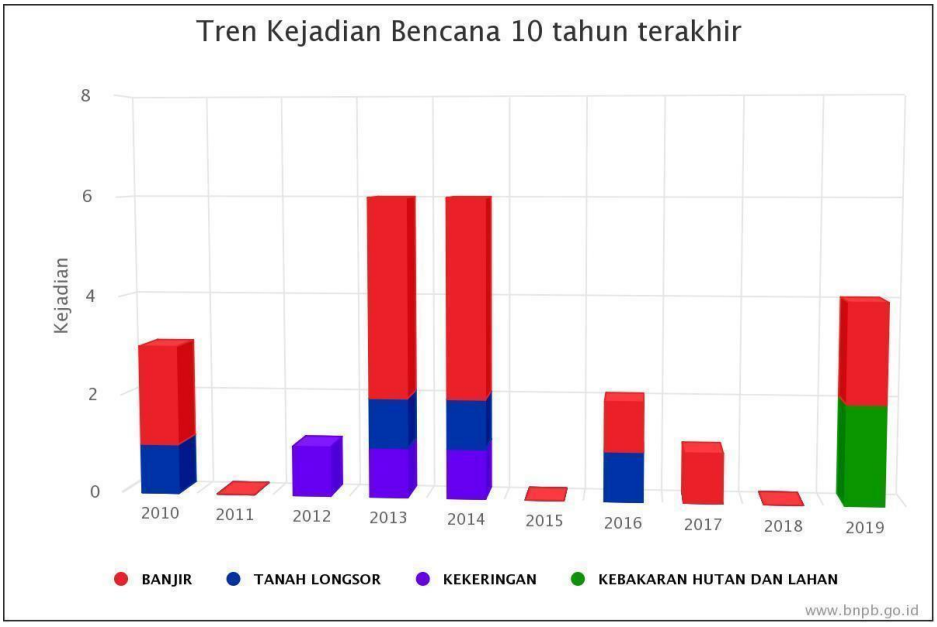
1.8 Disaster Risks

According to studies done by ACCCRN (2010) and SNV (2018), Bandar Lampung is very vulnerable to natural disasters. Many types of disasters strike the city including flood, landslide, drought, high tide causing robs and tsunamis. Abrasion, erosion, and sedimentation also happen in coastal regions. Among all disasters, flood is considered as the most frequent to occur (around five times a year). Other disasters that possibly happened in Bandar Lampung are volcanic eruptions and earthquakes. Bandar Lampung is bordered by the Sunda Strait where the subduction of the Indo-Australian tectonic plate is located. Earthquakes are triggered when the plate is in motion. In other words, the city faces a great risk of earthquakes as well as tsunamis.

During the ten years period between 2010 and 2019, Bandar Lampung had undergone 28 natural incidents, and 23 of them were disasters. From early 2020 until now, thirteen incidents have been recorded in Bandar Lampung. The detailed disasters are shown in the figure below. For ten years, the death toll was 8 with several missing victims, 18 injured, and 11,290 people who were affected and needed evacuation. Meanwhile, incidents that occurred in 2020 have not had any victims. Aside from victims and death tolls, the city has faced other risks from the occurrence of disasters, such as:

1. The submersion of facilities
2. Containment of overflowed septic tanks that later caused environment contamination from bacteria such as *E. coli*, etc.
3. Buried and malfunctioning facilities
4. Malfunctioning facilities due to the unavailability of water caused by drought
5. Seawater intrusion
6. The submerged and malfunctioning facilities in coastal area because of seawater rising
7. Risks of diseases such as diarrhea, itchy skin disease, etc.

Figure 8- Trend of Disasters for Past 10 Years in Bandar Lampung



Source : https://bnpb.cloud/dibi/

*Information:

Banjir = flooding

Tanah longsor = landslides

Kekeringan = drought

Kebakaran hutan dan lahan = forest and land fire

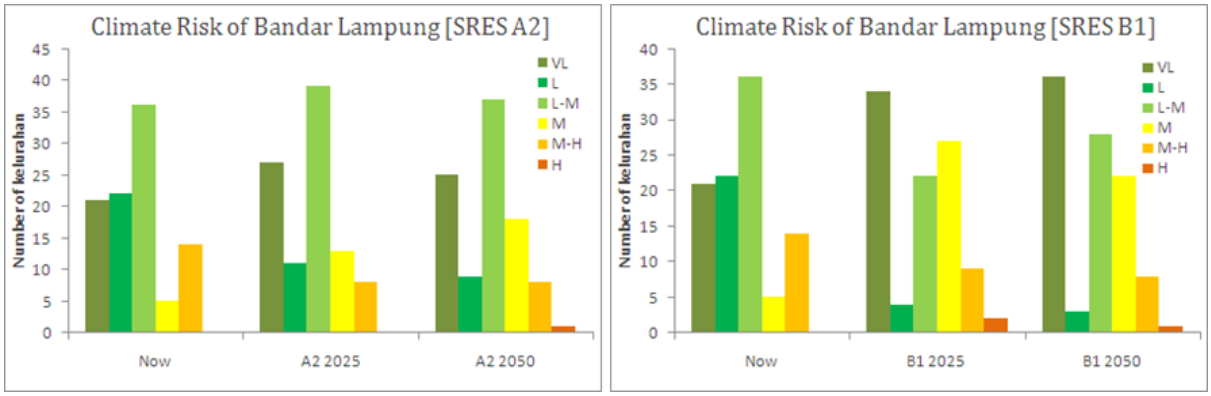
Furthermore, some areas are considered vulnerable to certain disasters. Based on Climate Vulnerability and Resilience Assessment by SNV (2018) and a field study performed by POKJA AMPL of Bandar Lampung, there are 51 areas in Bandar Lampung that are prone to flooding. Most cases are caused by insufficient drainage, while the other causes are overflow from the river, clogged drainage channel, low land geography (basin), or because settlements are located on top of the riverbanks. Regarding landslides, Gunung Betung, Gunung Balau, and Eastern Perbukitan Serampok constitute risky areas due to their steep

land condition. Also, in many cases, it has been found that the cause of the landslides is poor drainage system due to malfunctioning or clogged system i.e. covered with trash.

It is stated in RPJMD 2016-2021 that several subdistricts i.e. Telukbetung Timur, Telukbetung Barat, Telukbetung Selatan, Bumi Waras, and Panjang are considered tsunami-prone. The total population in the tsunami-prone area was estimated to be 154,331 in 2017, and the number is likely to have increased since then. Drought in Bandar Lampung also happens in many places. It occurs quite often and can even for several months. According to SNV (2018), severe drought also happens every few years in association with El Niño. When the drought lasts longer than usual, groundwater dependency can rise up and affect around 70% of the population.

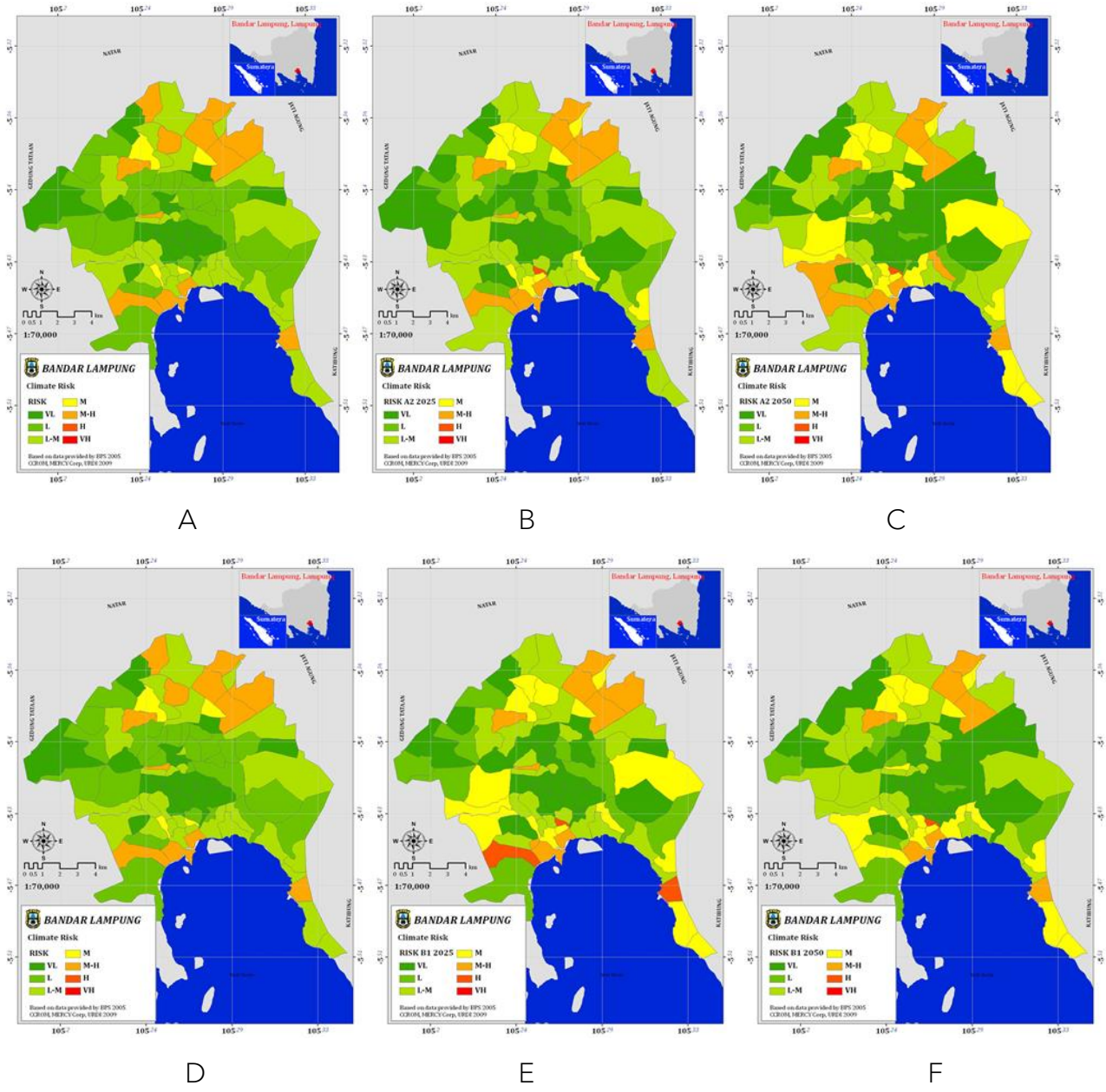
Other than that, the ACCCRN program (2010) has also produced the two figures below. The first figure shows the number of *kelurahan*/urban villages based on climate risk categories in 2005 (shown on figure as *now*), 2025, and 2050, while the location of climate risk areas is represented in the second figure (figure 10). The categories were generated by overlaying the coping capacity index map and the composite climate hazard index under year 2010 and future climatic conditions. There were two scenarios, namely a high one (SRESA2/A2) and a low one (SRESB1/B1) according to the atmospheric concentration of the scenario.

Figure 9 - Number of *Kelurahan* by Climate Risk Index Category



Source: ACCCRN, 2010

Figure 10 - Classification of *Kelurahan* based on Their Level of Exposure to Climate Risk (A) & (D) in 2005, (B) Climate Risk A2 2025, (C) Climate Risk A2 2050, (E) Climate Risk B1 2025, (F) Climate Risk B1 2050

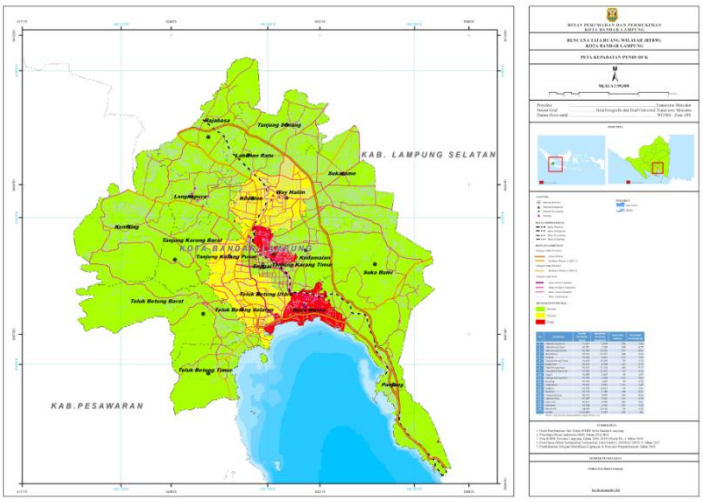


Based on the 2018 IRBI (Indonesia's Disaster-Prone Index), Bandar Lampung city is included in the high disaster risk region with a score of 165.56. This value has decreased compared to 2017 when it was evaluated at 182.00. IRBI itself is a disaster analysis tool (in the form of an index) that shows a history of disasters which have occurred and caused losses in Indonesia(https://bnpb.go.id/irbi). The forming process of IRBI needs sources from various complex data, such as level of natural hazard, number of death tolls, number of injured victims, number of damaged houses, number of damaged public facilities and infrastructure, number of the city's population density, base map, BIG (Geospatial Information Agency), and administrative boundaries of BIG (https://www.big.go.id/).

1.9 Spatial and Infrastructure Condition

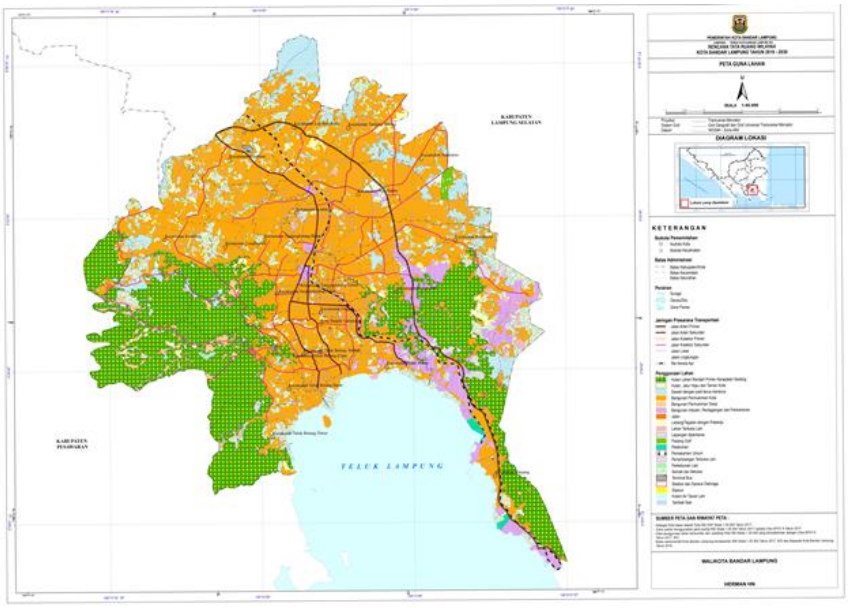
As it was said before, the city of Bandar Lampung has 20 subdistricts. The distribution of the population can be seen in the figure below. The government of Bandar Lampung has divided the city's population density into three categories which are the green, yellow, and red zones. As it can be seen on the map, the green ones are the districts with low population density. The yellow ones are districts with medium population density and the red ones are districts with high population density.

Figure 11 - Map of Population Distribution in Bandar Lampung, 2019



In 2019, the population of Bandar Lampung was 1.051.500 people with 1,01 sex-ratio, which means there were more males compared to females. Population in Bandar Lampung is increasing every year with an annual population growth rate of 1,71%. The district with the highest population density was Tanjung Karang Timur with 19,633 people/km^2 while the lowest population density was in Sukabumi District with 2,609 people/km^2.

Figure 12 - The Land Use in Bandar Lampung



The land use map of Bandar Lampung can be seen above. The land of Bandar Lampung has various uses. Due to the high population rate, the city is dominated by urban residential buildings, represented with the bold orange color on the map. Although Bandar Lampung is known as a city, there are districts which are known as villages. The village settlement buildings are colored with light orange on the map and are easily found near the green areas with yellow dots which symbolize the primary lowland forest. There is no regulation that restricts the number of buildings allowed to be constructed each year. The government is open for any investment opportunities, including investors who are willing to build in the city. There used to be a restriction for the building floor, but the regulation was later removed.

Bandar Lampung is set to function as a transshipment point from various transportation modes. This is carried by various development plans in the regional transportation system. Trans-Sumatra Toll Road construction is expected to affirm the economy of Sumatra as one of the main backbones of goods and services in Western Indonesia. It is also expected that the Trans-Sumatra railroad becomes one of trans-mode mobility's alternatives. Besides, there are also several city transportations in Bandar Lampung, i.e. public transportation (*angkot* and *bemo*) and BRT Bandar Lampung. There are also online transportation services such as Grab, Gojek, and MAXIM that have been widely used by communities since 2018. In addition, there is an individual transportation service which allows people to order a ride by mobile application (Wallsten, 2015). This transportation service has been well-liked by Indonesia's society for the past few years because of its convenience and safety.

1.10 Social Infrastructure and Service

Healthcare facilities in Bandar Lampung range from the smallest level of service like Auxiliary Public Health Centres, Medical Centres, doctor practices to hospitals. The number of health facilities in Bandar

Lampung, according to statistics data in 2007, reached 157 units, while the number of health facilities in 2019 reached 890 units, consisting of 13 hospital units, 7 maternity hospitals, 30 main public health centers, 50 sub-main public health centers, 4 maternity clinics, 80 health clinics, 704 integrated healthcare centers, and 2 eye hospitals. The amount of health personnel in Bandar Lampung in 2019 is 2,064.

The number of houses and developers in Bandar Lampung in 2019 is 41,483 and 395 respectively (BPS, 2020). There are 71.95% of households who live in their sole ownership houses, while the rest of them live in other than sole ownership houses (official residence, etc.).

1.11 Climate Change Adaptation and Disaster Risk Reduction

As a city that is prone to climate change and disasters, it is important for Bandar Lampung to reduce and manage the risks faced by the municipality. The disaster risk of the city is managed by BPBD Bandar Lampung. They have undertaken several disaster management actions. For instance, 350 signposts have been installed to aid communities in looking for safe and fastest routes when a disaster occurs. The target is 1,500 installations, but right now, BPBD is still focusing on COVID-19 handling. BPBD also carried out a study about disaster risk reduction management associated with BNPB. It was done in several urban villages (*kelurahan*) at coastal areas to educate the coastal community about tsunami risk reduction management.

Furthermore, and based on ACCCRN (2010), the community has carried out adaptation behavior toward disasters.

During floods, the adaptations would vary from staying at home, relocating to un-flooded areas, deepening water channels, and/or raising floor level. For drought, the communities would reduce water consumption and pump water from the nearest source. The farmers also adapt through agricultural intensification (diversifying crops) and double pattern income (favorizing income diversity and empowering members of family).

Bandar Lampung city does have an early warning system, but it needs improvement. Ten points of Warning Receiver System (WRS) are spread in Lampung Province for earthquake and tsunami mitigation, whereas the city government has provided panic buttons with number 126 for emergency or danger. The buttons spread throughout the villages are synergized with the Serve and Protect Integration System (SPIS) application and 110 hotlines. If the community has an emergency related to disaster or even crime and health, they can directly push the button, and the server will receive it. After that, the server will send personnel in the field, such as the police, ambulances and/or BPBD.

The identification of disaster-prone areas has been made not only by the municipal government but also by the Lampung Province government. A map identifying the areas vulnerable to disasters is one of the priorities in the provincial government in order to manage disasters more quickly. This map database is updated every month. The government at city level also has supporting data that identifies disaster-prone areas in the city, such as Lampung Province according to RTRW 2009-2029 and a 2009 disaster mitigation study of the region.

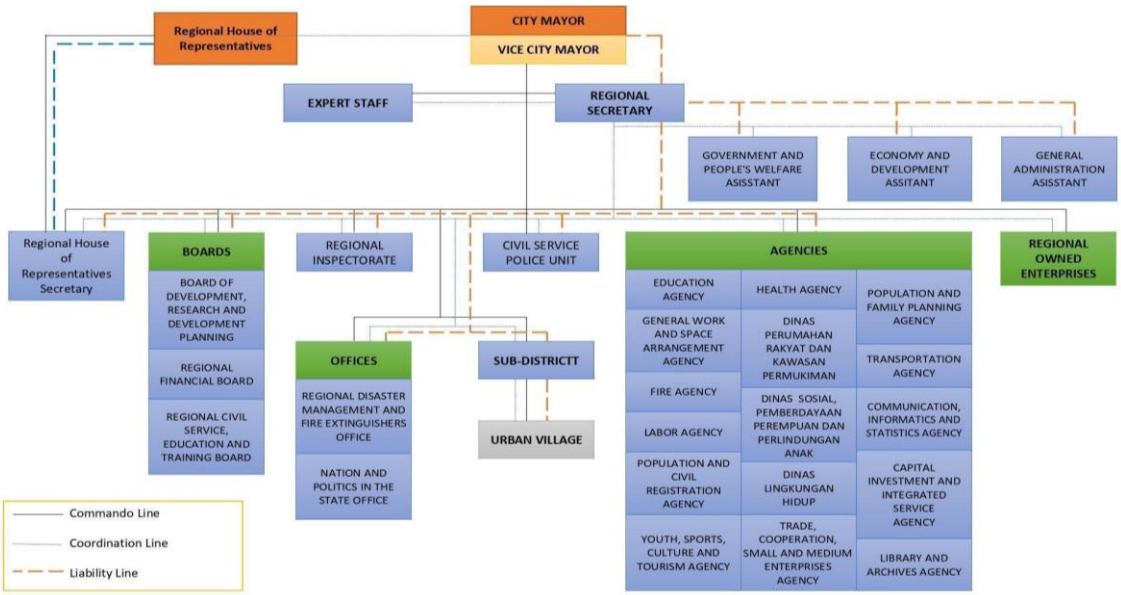
At the national level, the Ministry of Environment and Forestry established the SIDIK or Vulnerability Index Data Information System. SIDIK presents data related to the classification of climate change vulnerability. The classification is divided into 5 levels and refers to an assessment of 9 indicators, namely: 1) availability of electricity; 2) health facility; 3) education; 4) road infrastructures; 5) family living on riverbanks; 6) settlements on the riverbank; 7) drinking water source; 8) poverty rate; and 9) main source of income.

According to SIDIK 2018 data, most of Bandar Lampung's region has a moderate vulnerability (level 3). Two subdistricts, Tanjung Karang Pusat and Enggal, are in a low vulnerability level (level 2) while Langkapura Subdistrict has very high vulnerability (level 5). On the other hand, the adaptability level of the community is reflected on ACI (Adaptive and Capacity Index). Inspecting the sample of ACI from each level of vulnerability, it can be concluded that the regions with high vulnerability tend to have low adaptive capacity.

1.12 Urban Governance

The city of Bandar Lampung is led by a city mayor who is elected democratically once in five years. The mayor is assisted by a vice mayor and together they lead 20 heads of subdistricts (*kecamatan*) and 126 heads of urban villages (*kelurahan*) for five years. The mayor and his vice have an equal position with the Bandar Lampung's DPRD (Regional House of Representatives of Bandar Lampung). Bandar Lampung's DPRD has a control function to the executive role of the mayor in running the government of Bandar Lampung as well as the function to prevent abuse of power by the mayor and his vice. The structure of the Bandar Lampung government is similar to other cities in Indonesia. It can be seen in the figure below.

Figure 13 - The Structure of Bandar Lampung City Government



Source: Authors

In 2019, the city of Bandar Lampung had 8,766 people who devoted themselves to be civil servants, employed in the public sector by government departments or agencies. More than 50 percent of them or 4,757 people in have bachelor's degrees. The group is followed by master's degree holders in second place or 1,086 people in number. It can be concluded that Bandar Lampung's government is run by well-educated people. The municipal government is not only known for its well-educated civil servants but also known for its inclusive governance. Based on gender, the civil servants in Bandar Lampung municipality are dominated by women. To be precise, there are 5,897 female civil servants in the city while men are only 2,869. In other words, more than 65%of civil servants in the city are women.

Governance and institutional systems determine the resilience of a city to climate change. Good governance and strong institution would lead the city to be a climate resilient city. In Bandar Lampung, the climate change risk management involves stakeholders internal and external of the city. The ACCCRN project in 2010 facilitated these stakeholders to form a group called The City Team. Each stakeholder has its own role and contribution to adapt and strengthen society for climate change. This partnership is a precondition for creating communities that have the capacity to adapt to climate change.

CHAPTER 2
Policies and Strategies for Climate Resilient and Inclusive City

2.1 Nation-wide Policies, Strategies and Targets

Nation-wide policies have been adapted to climate change. There is Presidential Decree 61/2011 which discusses RAN-GRK in Indonesia. The policy establishes details of mitigation action plans to reduce GHG emissions in five sectors. The five sectors consist of forestry and peatland, waste, energy and transport, agriculture, and industry. The national target stated in the policy is a 26% emission reduction compared to business as usual in 2020 by national resources and up to 41% with international support. The highest reduction target is allocated to forestry and peatland since this sector is considered to contribute most to the national emissions. Based on the Biennial Update Report in 2015, 45 of more than 50 actions to reduce emissions had already been implemented, and there were other 27 mitigation actions in addition to Presidential Decree 61/2011.

In general, the development policy in the RPJPN 2005-2025 is to strengthen overall development in various fields by emphasizing the achievement of economic competitiveness based on the excellence of natural resources and quality human resources, as well the increasing ability of science and technology. There are 7 national development priorities which have been determined for the next five years, according to RPJMN 2020-2024:

1. Strengthening economic resilience for quality growth
2. Develop areas to reduce inequalities and ensure equity
3. Improving quality and competitive human resources
4. Building the culture and character of the nation
5. Strengthening infrastructure to support economic development & basic services
6. Building the environment, increasing disaster and climate resilience
7. Strengthening politics, law, defense and security stability and transformation of public services

According to Presidential Decree 18/2020, the effort to build a disaster and climate resilient environment is designated as one of the priority sectors of 2020-2024 RPJMN. The priority sector is specifically outlined in 3 policies: 1) improving environmental quality, 2) improving disaster and climate change resilience, and 3) low-carbon development.

Strategies to improve disaster and climate change resilience are as following:

1. Disaster management, done through:
    a) Strengthening data, information, and literacy about disaster

b) Strengthening system, regulation, and governance of disaster

c) Strengthening disaster risk reduction's plan by integrating Action Plan-Disaster Risk Reduction, nationally and regionally, with Action Plan-Climate Change Adaptation

d) Improving facilities and infrastructure for disaster management and mitigation

e) Cooperation integration between regions related to policy and spatial planning that is disaster risk-based, etc.

2. Climate resilience improvement by implementing RAN-API on priority sectors. Strategies to manifest low-carbon development according to 2020-2024 RPJMN are:

- Sustainable energy development, done by:
  a) Managing new renewable energy (renewable energy generator, biofuels, low carbon material)
  b) Energy efficiency and conservation
- Sustainable land recovery, done by:
  a) Peatland restoration and recovery
  b) Forest and land rehabilitation
  c) Reducing the rate of deforestation
  d) Enhancing agricultural productivity and efficiency by sustainable agriculture
- Waste management, done by:
  a) Household waste management
  b) Wastewater management
- Green industry development, done by:
  a) Industrial energy use conservation and audit
  b) Practice of process modification and technology
  c) Industrial waste management
- Low coastal and sea carbon by coastal and sea ecosystem's inventory and rehabilitation

2.2 City-wide Policies, Strategies, and Targets

The RPJMD preparation process is based on several documents, one of which is the results of the Vulnerability Assessment and City Resilience Strategy conducted by international experts in Bandar Lampung. The results from the VA have been incorporated into key city policy documents. These include the City Resilience Strategy 2011–2030 and the Integrated Solid Waste Management Master Plan (funded by ACCCRN) drafted in 2011. The recent

city resilience strategy has been adapted based on existing situation and summarized into 12 strategies for climate resilient and inclusive city, namely:

1. Community empowerment in doing climate change adaptation
2. Infiltration wells and biopores making
3. Construction and maintenance of integrated drainage
4. Improvement of environment road
5. Enhancement of clean water service coverage
6. Construction of retaining walls (*talud*) at landslide-prone areas
7. Management of settlements that are resistant to climate change and disasters
8. Integrated waste management
9. Enforcement of Regional Regulations (Perda)
10. Water saving and reuse
11. Integrated management of household, market and industrial waste.
12. Air quality stewardship

As a disaster-prone city, an early warning system becomes an essential need for Bandar Lampung. Other than provisioning tools and infrastructure such as panic buttons and signposts of evacuation routes, the city focuses on educating about disaster risk and community's coping ability. Programs that had been done are:

1. Disaster coaching by BPBD and Satgas Bersih Kali with total of around 270 members from many agencies
2. *Desa Tangguh Bencana* (Destana) or Disaster-Resilient Village as a community-based disaster management. The chosen urban village is given knowledge about disaster mitigation, especially for disaster that is prone in that region. The program has been previously implemented in 2 *kelurahan* (Kota Karang and Kota Karang Raya) and it is planned in 2020 to be implemented in 2 other *kelurahan* in Panjang Subdistrict
3. PRBBK or Community-Based Disaster Risk Reduction Program by the World Bank (2015) with activities such as drafting disaster contingency plan, education on how to deal with disasters and supporting infrastructure for disaster risk reduction

The city government also realized that the water and sanitation sector has been very much affected by the impacts of climate change. The policy to fulfill drinking water access, as well as a safe and feasible sanitation access is in progress. RPJMD 2016-2021 set targets for households with access to proper sanitation facilities at 60%, and for communities with drinking water access at 80%. Bandar Lampung Mayor Regulation Number 62 Year 2013 also regulates rainwater harvesting in order to increase water supply, especially during drought.

The regulation also plans the construction of infiltration wells and biopore infiltration holes. There have been around 1 million units of biopores constructed in 126 urban villages for

flood prevention and groundwater conservation. The other programs that has been taken are:

1. The development of a 4,545 meters long city drainage system (2019)
2. Increasing clean water access by: a) The advancement of clean waterways by a connection target of 300,000 people; b) The provision of clean water access by PDAM and Special Allocation Fund mechanism; c) Water distillation to increase clean water for communities of the coastal region in Panjang Selatan District
3. Creating a Master Plan composed of City Drainage (2016), Drinking Water Supply System (2013), City Sanitation Strategy 2016-2021 (reviewed in 2018), and Wastewater
4. The dredging and normalization of river with 2,345m concerned (2019)
5. Optimizing IPLT and conducting a study about fecal sludge's reuse
6. Improving sanitation access with SNV with the result of 70 *kelurahan* being declared as Open Defecation Free (more than 50% of all *kelurahan* in the city)
7. Bandar Lampung Perda 4/2017 on Prevention to Slums
8. Slum Improvement Action Plan (SIAP) Bandar Lampung and KOTAKU Program. The objective of both program or policy is to handle slums in the city that also include water and sanitation in it. It is recorded that the KOTAKU Program has reduced slums area from 266.4 hectares (2014) to 80.11 hectares (2018).

Regarding solid waste policy, based on Bandar Lampung Perda Number 6 Year 2015 on Waste Management, the city government encourages 3R practice i.e. Reduce, Reuse and Recycle. 3R practice is planned to be developed in all TPS. Revitalizing and regenerating the landfill as well regional landfills also became part of the Bandar Lampung RPJMD programs, where regional landfill describes the concept of a shared landfill between different regions that accommodates waste from many regions. Bandar Lampung has been in the negotiation stage with South Lampung Regency, East Lampung Regency, Pesawaran Regency, and Metro City to build a regional landfill (Rilis Lampung 2019). The coastal management program is also contained in the RPJMD 2016-2021. Program plans will be implemented to strengthen the resilience of coastal areas i.e.:

1. The construction of a polder system to cope with river overflowing during low tide
2. The construction of a wave break embankment
3. The development and development of coastal management areas
4. The arrangement and development of coastal areas

Meanwhile, other activities to improve waste management concern the following:

1. The development of 20 waste bank units
2. Plastic reduction
3. Urban Farming
4. Urban farming activities in Bandar Lampung city vary from seeding, composting households' waste, planting, and making biological pesticides. The government sees

these practices as one of the ways to increase urban green open spaces. There has been a pilot study for urban farming under Kampung Hijau (one of city programs) led by Women Farmer Group of *Kelompok Wanita Tani* (KWT), for example, KWT Merpati Asri in Teluk Betung Utara. The main problems of urban farming are water provision and marketing the products. So far, they sell the products (vegetables) from door to door and make spinach crackers

5. Green village or Kampung Hijau
6. The green village is more focused on raising awareness and changing behaviour of the community in managing household waste. This village concept has been implemented in Beringin Jaya *Kelurahan*, Langkapura Subdistrict, and Panjang Selatan *Kelurahan*.

Figure 14 - Urban Farming Activities by Women Farmer Group in KWT Merpati Asri, Bandar Lampung

Source: Authors

Air pollution is one of the city's environmental problems as it is a by-product of industrialization and transportation, river and land pollution due to industrial and household waste. To solve this, Lampung Province Perda Number 20 Year 2014 enforces that air pollution has to be controlled to prevent and countermeasure pollution in Lampung Province. Bandar Lampung RPJMD also intends to measure AQI and increase the percentage of businesses which fulfill administrative requirements, and which use air pollution prevention techniques up to 65% (in 2015: 40%). Measures have been implemented to help increasing air quality, such as tree planting, ambient air quality monitoring, coaching communities to utilize home yard for TOGA (Family Medicinal Plant) planting and green environment planning.

Other than the four priority sectors mentioned above, the city government also tried to improve other sectors that are too affected by climate change. Policies and programs that have been made to help achieve climate resilient and inclusive city objectives are:

1. The development of 10 flyovers and 1 underpass to reduce traffic jams
2. Improving the quality of 5,261m long city roads (2019)
3. Improving the quality of 16,265m long side roads (2019). Side roads are public roads that are used to serve vehicles with close range and low speed trip.
4. Repairing uninhabitable houses in 67 *kelurahan* (urban villages)
5. The development and rehabilitation of health and government facilities in 20 urban villages

6. Teaching material and education about climate change in several elementary and junior high schools (2012-2015)
7. Environmental Agency's strategic plan of Greenhouse Gas Inventory
8. Considering our findings, here are some of the gaps in policy implementation:
9. Community empowerment that aims at raising the adaptive capacity of a community is sort of partial and not comprehensive. Many programs implemented are only undertaken in certain urban villages and lack continuity;
10. Policy and programs related to waste management have not been solving the waste problem in coastal regions. As seen in Chapter 1, the waste management in coastal regions lacks coordination and ought to construct its own policy;
11. City drainage development is not supported by a change in community's behavior. Consequently, the maintenance of drainage channels, in implementation, has not been optimal yet;
12. RTRW's revision should address the issue of increasing green open spaces and water catchment areas. Bandar Lampung should increase its public green open space to 20% of the city's total area, which can be supported by private sectors and NGOs. The current percentage of green open spaces is 11.08%;
13. The plastic reduction and 3R practice program only stand out on the campaign and socialization, but still lack in the implementation on the ground by community members;
14. Although SIAP Bandar Lampung is intended to handle and improve slums, the implementation -by some parties- is still considered sectoral and has not embodied all seven indicators of slum;
15. The climate change curriculum has not been applied in some schools;
16. Integrated early warning system for flooding where flood occurs pretty frequently needs to be integrated
17. GHG inventory needs to be well-implemented following proper methodology.

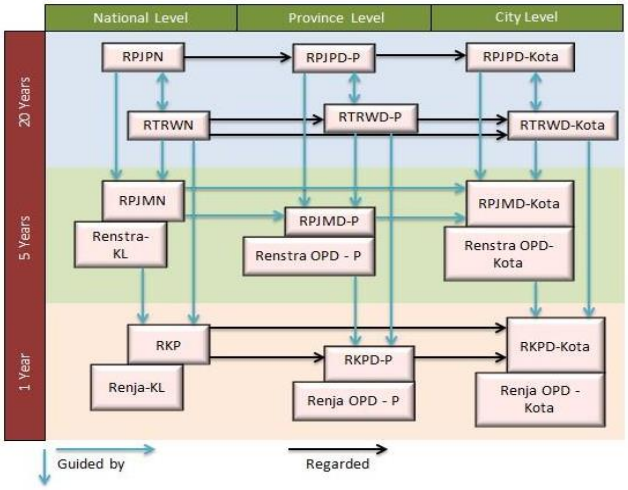
2.3 Description of the City Government's Structure and Decision-Making Process

According to Law of the Republic of Indonesia Number 32 Year 2004 on Regional Government, it is said that in carrying out regional autonomy, regions have rights to:

1. Manage their own governmental affairs
2. Choose regional leaders
3. Manage regional apparatuses and regional wealth
4. Collect local taxes and retributions
5. Obtain revenue sharing from the management of natural resources and other resources in the area

6. Get other legitimate sources of income
7. Get other rights that are regulated in laws and regulations
8. In planning regional development, decision-making is carried out cohesively in order to enhance the community's welfare in Bandar Lampung. Development planning documents, both at the national and regional level, consist of several documents that are interconnected and mostly considered based on the development period. In the making process, RPJMD as city's development planning has been made in such a way to be in line with other planning documents at national and sub-national levels such as RPJMN (National Medium-Term Development Plan) and RPJMD-P (Local Government Medium-Term Development Plan in Sub-National Level). Development planning documents as well as linkages between them can be seen in the figure below.

Figure 15 - Development Plan's Linkage between Central Government, Sub-National, and City Government



Source: RPJMD 2016-2021

2.4 Stakeholder Involvement in Policymaking

According to the respondents' survey, Bandar Lampung has involved stakeholders in the policymaking process. The stakeholders vary from government bodies and academic institutions to NGOs. But in terms of decision-making, it is mainly only involving government bodies such as the Local Development Planning Board (Bappeda), the Environmental Protection Agency, the Cleaning and Park Agency, the Health Agency, the Forestry and Poultry Agency, the Public Works and the Agriculture Agency while NGOs are generally involved only in discussion.

Each stakeholder has its own role and contribution to adapt and strengthen society for climate change and to improve the inclusivity of Bandar Lampung municipality. This partnership is a precondition for creating communities that have the capacity to adapt to climate change. Meanwhile, Bandar Lampung's regional government played a large role in climate change adaptation both for financial support and program implementation. Several NGOs are involved in the discussion, e.g. Mitra Bentala, Lembaga Advokasi Perempuan DAMAR, and WALHI (*Wahana Lingkungan Hidup*). WALHI, for instance, has collaborated several times with the Bandar Lampung city government regarding coastal waste

management. WALHI also recommended that policy susceptible to become the basis for sustainable coastal waste management should be made, but according to respondents, the recommendation was not acted on by the municipal government. Even though the involvement is frequent, oftentimes NGOs recommendations and ideas are not being considered. Because of that, the municipal government and stakeholders' engagement to create a climate resilient and inclusive city somewhat feels ceremonial and lacking.

CHAPTER 3
Key Problems, Challenges and Opportunities in Priority Sectors

3.1 Disaster Risk Reduction

Chapter 2 discussed policies and strategies for climate resilient and inclusive city as a foundation to deep dive into the priority sectors in this chapter. Though the city already has an early warning system as described in Chapter 1, the system still needs improvement. While disaster-related information has been improving with the help of recent technology and BMKG's forecast information, disaster handling information in communities is seen as pretty weak. The communities are undeniably improving since the ACCCRN project (2010) was being held, but the capability in several regions is still considered low. One of the causes is the lack of equitable socialization and education regarding disasters. Most of the communities got information on climate forecasts from traditional or community leaders, while some obtained forecast information through television.

Disasters constitute important threats to the regions with high vulnerability and low adaptive capacity. Bandar Lampung itself, based on its vulnerability index (SIDIK 2018), has one highly vulnerable subdistrict that is Langkapura Subdistrict. This situation is quite crucial and has to be taken seriously. Therefore, it is important to prioritize Langkapura Subdistrict in disaster risk reduction.

3.2 Climate Change Adaptation and Mitigation

There are several factors affecting the success of climate change adaptation at the community level (ACCCRN, 2010) namely: 1) availability of funding; 2) capacity levels; 3) access to information; 4) collaboration and engagement of local government; 5) migration and growth rate; 6) public service delivery and 7) mobility. Bandar Lampung is considered in a good position to evolve into a resilient city since there are already: 1) many supporting documents that can be used; 2) existing cases that exist and are workable; 3) possible social networks of people in similar situations with know-how; 4) local governmental agencies; 5) municipal and national governmental programs; 6) local leadership; 7) community cohesion; 8) local civil society organizations; 9) utilized existing resources (such as subsidies, sharing community narratives and networks, low cost financing of incremental housing improvements, a Vulnerability Index, detailed maps for local government agency use, and broad coalition base to deal with climate change issues). Local government agency is comprised of people who rule communities at the local level.

According to Fahmi *et al*. (2014), Bandar Lampung has evolved from a climate-change-ignorant city to a climate-change-sensitive city. There have been many

NGOs, as described before, that are very active in participating directly among communities. Many of them are engaged in environmental matters (e.g. WALHI Lampung, SNV, and Mitra Bentala) and have been very supportive and achieved successful programs. This active participation of NGOs can become a great opportunity for the city to conduct a collaborative program in the future.

The city progress can also be reflected from the city's policy and program (see Chapter 2) document agenda, and in the budget of the city which has integrated climate change issues such as RPJMD 2016-2025. However, many municipal documents, as local NGOs stated, have not been utilized optimally. The ACCCRN project in 2010 has been known to produce important documents such as a Vulnerability Assessment and City Resilience Strategy. An investigation conducted in 2014 revealed that these two documents were not cited in RTRW Bandar Lampung 2010-2030 (Fahmi *et al*. 2014). One of the reasons was that the consultants selected for preparing RTRW 2010-2030 did not have adequate climate adaptation literacy, while the City Team was selected as key consultant for other document preparation. RTRW as a spatial planning framework, in fact, is usually to be reviewed every five years. Many NGOs and media exposed that the revision of RTRW Bandar Lampung in 2019 had some changes like green open spaces, green belts, and water catchment areas which kept on decreasing. RTRW also has accommodated the Strategic Environmental Assessment or *Kajian Lingkungan Hidup Strategis* (KLHS). Even though these ACCCRN's documents now have been used and cited, this case shows that consistency should be taken seriously, both for ongoing and future urban planning.

3.3 Energy and Transport

On the one hand, fossil fuels are used for transportation and energy purposes in Bandar Lampung. This is reflected in mass transportations in Bandar Lampung as well as in private vehicles that still use fossil fuels. On the other hand, burning fossil fuel has become the largest source of carbon dioxide emissions, a widely known greenhouse gas which results in increased temperature in the city. It is also stated in RPJMD 2016-2021 that limited supply of electrical energy is one of the problems that should be addressed in priority. According to the Head of Bappeda of Bandar Lampung, the whole city of Bandar Lampung has got electricity. However, PLN (State Electricity Company) will do a rotating blackout throughout the city to prevent the overuse of electricity in the city. However, blackouts are not a reliable solution to save electrical energy. In conclusion, it is important to encourage diversification into renewable energies as a way to reduce this fossil fuel use.

According to governmental bodies, there has been an investment plan to develop a solar cell and diesel power plant in Bandar Lampung. Several solar cell utilizations can be found at residences (for household needs) and traffic lights. The diesel power plant located in Tarahan, South Lampung Regency as well, is becoming one of the main sources of energy used by PLN along with South Sumatra's transmission supply. Lampung Province has a huge potential for geothermal resources, but unfortunately, there is no geothermal resource in the city.

Regarding transportation, mass transportation modes often are not the main city transportation chosen by citizens. Mass transportation modes, like *angkot* and *bemo*, are less liked by people

due to their considered lack of comfort compared to private vehicles and online transportation services. BRT Bandar Lampung's condition is not quite well due to poor planning and management as well as the absence of subsidies from the city government (Lampung Post, 2018). Indeed, there is no special lane, the transportation is lacking in punctuality, and the bus stops' condition is also poorly managed. Other than that, there are only a few buses equipped with flat tracks, and the 5% maximum slope required for the safety of wheelchair users and Bandar Lampung cannot be considered as pedestrian-friendly either.

3.4 Water and Sanitation

The main source of drinking water in Bandar Lampung is provided by a local water enterprise known as PDAM Way Rilau. In 2002, PDAM could serve almost 66.1% of total households in Bandar Lampung (HDI Report, 2004), but the water supply coverage in 2015 then dropped to around 21% (SNV, 2018). Many middle to low-income communities do not have access to a healthy water supply provided by PDAM, so they commonly use other sources such as from groundwater and spring water. Low supply coverage is predicted due to the lack of water supply caused by catchment and sub-catchment areas issues, added to decreasing groundwater —which also became one of the water sources for PDAM. Study from the World Bank (2013) showed that the city's groundwater, in quality and quantity, is worsening due to climate change, high demand, and expanding area of impermeable surface However, the construction of new Water Treatment Plant has been issued and estimated to increase the coverage from 21% to 43% by 2021..

The Ministry of Environment and Forestry 2016 report showed that fecal contamination of groundwater had become quite an issue in Bandar Lampung. Other sources also reported the occurrence of wells contamination with coliform and *E. coli* bacteria. In one case happened in Bakung Village, the contamination was caused by the distance between wells and drainage, which was too close (Kupas Tuntas 2019). It is also shown in Chapter 1 that most of the rivers in Bandar Lampung were moderately polluted. The situation is quite alarming given the fact that two of the largest rivers in Bandar Lampung, Way Kuripan and Way Kuala are included in it. The pollution is known to be principally caused by household wastewater and fecal sludge.

Table 7 - Progress of Access to Toilet in Bandar Lampung Based on the Number of Head Family, 2019

No.	Name of subdistrict	Progress				
		JSP*	JSSP**	Sharing	BABS***	% access to toilet
1	Way Halim	14,022	131	108	0	100
2	Sukarame	11,594	214	102	0	100
3	Rajabasa	10,989	907	369	0	100
4	Langkapura	12,601	51	50	0	100
5	Tanjung Karang Timur	6,306	1,375	404	1	99.98
6	Tanjung Senang	9,368	255	34	7	99.92
7	Tanjung Karang Barat	10,895	837	412	34	99.73
8	Kedamaian	8,737	834	952	67	99.46
9	Labuan Ratu	8,593	102	36	43	99.40
10	Sukabumi	10,580	705	753	119	98.41
11	Panjang	7,184	7,200	778	977	95.48
12	Kedaton	9,338	0	609	588	94.61
13	Enggal	4,198	1,093	22	300	93.90
14	Bumi Waras	10,237	177	1,629	1,213	91.55
15	Teluk Betung Selatan	4,875	2,257	101	1,224	85.35
16	Teluk Betung Barat	4,446	144	1,414	80	78.92
17	Teluk Betung Utara	2,658	2,544	419	109	64.34
18	Kemiling	2,969	712	621	31	22.07
19	Tanjung Karang Pusat	0	0	0	0	0
20	Teluk Betung Timur	3,730	494	1,076	72	49.28
TOTAL		153,320	20,032	9,889	4,865	81.85

Source: monev.stbm.kemkes.go.id/monev/

*JSP: permanent healthy toilet

**JSSP: semi-permanent healthy toilet

***BABS: open defecation

The table above represents the progress of communal access to toilets in Bandar Lampung in 2019. The table indicates that there are only 4 of 20 subdistricts that have full access to toilets. For the record, data from Tanjung Karang Pusat Subdistrict, as seen in Table 7, has not been included. But it can be estimated that the percentage of toilet access is 81.85% for the 996,594 inhabitants in Bandar Lampung (all city inhabitants excluding Tanjung Karang Pusat), while around 18.15% do not use toilets and do open defecation. Although the coverage of sanitation service has not succeeded to reach 100%, we can note a progression from 2008 when the sanitation coverage was about 69%.

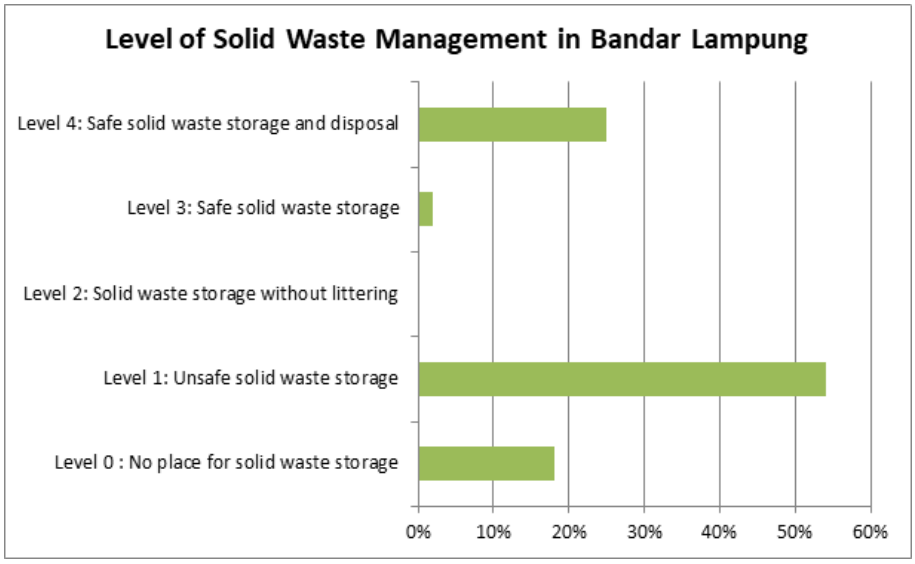
Moreover, drainage in Bandar Lampung is inadequate, and the system has not been managed optimally. Drainage often cannot accommodate high rainfall and becomes the cause of flooding. This structure of drainage is a consequence of development activity that does not pay attention to river boundaries. There are still many people who throw waste directly into the river, especially houses adjacent to the river. Sanitation infrastructure for wastewater built by the government is poorly maintained. The management of sewage sludge has been very bad and has been a problem for the past few years. Furthermore, the city has not yet declared itself Open Defecation Free (ODF). However, there has been good progress as more than half of the *kelurahan* in Bandar Lampung has been declared ODF with the help of SNV. This shows that there is a great opportunity to achieve city-wide ODF by continuing this progress.

3.5 Solid Waste Management

With an average waste of 1,000 tons each day, Bakung Landfill faces challenges. It is estimated that the city requires 30ha area to accommodate all municipal solid waste, whilst Bakung Landfill only fulfills 14.1 ha area. The staff of Bakung Landfill also indicates that they can only collect 68% of the city's waste while the rest is either burned, buried, disposed of into rivers and drainage channels or left in the open such as what has been doing for coastal waste. IPLT Bakung is also known to be over capacity (SNV 2018). Because of that, trucks carrying fecal sludge sometimes dispose of untreated fecal sludge in Bakung Landfill. However, there should be noted that a program exists to optimize IPLT Bakung.

According to SNV (2018), solid waste from the traditional market, stores, restaurants, hotels, the municipality and industries generates most of Bandar Lampung's solid waste. The research about waste management also shows that only 25% of 2,401 households practice safe solid waste storage and disposal. The majority of households are in level 1 where they practice unsafe solid waste storage. The details of SNV's survey as well can be seen on the chart below.

Figure 16 - Solid Waste Management Level in Bandar Lampung



Source: SNV (2018)

Lack of solid waste management has become one of the problems that Bandar Lampung has been facing for a long time. SNV states that solid waste is considered a huge problem in Bandar Lampung. Without interventions or changes in the current waste management system, the landfill will only continue to grow and pose environmental risks in the surrounding area and beyond (pollution, bad odor, etc.). However, the ACCCRN project in 2010 has succeeded in producing the Integrated Waste Management Master Plan marking the beginning of an improved waste management framework. The masterplan contained studies present at the time and identified waste management problems as well as for instructions for waste management patterns in the city. After that, Bandar Lampung has consistently increased its investment in waste management policy and practice (Fahmi *et al*. 2014).

Regarding waste in coastal regions, it seems that the management needs extra attention compared to mainland waste. The municipal government has attempted to overcome this problem by carrying out routine cleaning activities in the coastal areas of Bandar Lampung City since 2011, using the city budget (APBD). In addition, the cleaning of coastal areas is also carried out by the other stakeholders such as the National Police, NGOs, and local residents. However, in order to overcome this problem, public awareness is needed. Therefore, the NGO WALHI set up a program to empower coastal communities and change people's habit of throwing garbage in the sea. In conclusion, it is crucial for the good coordination across sectors to be present on coastal waste management because there are many parties, ranging from communities and industry to governmental bodies, involved in it.

In addition, many stakeholders also routinely carry out mangrove planting activities. Various communities play an active role in mangrove planting programs. For example, Earth Hour Bandar Lampung routinely plants around 100-200 mangroves every month. Apart from planting, this community also conducts monitoring efforts every month. Furthermore, the Polairud of Polda Lampung also has a program to plant thousands of mangroves through the Internal Police in the Puri Gading Coast area, Bandar Lampung.

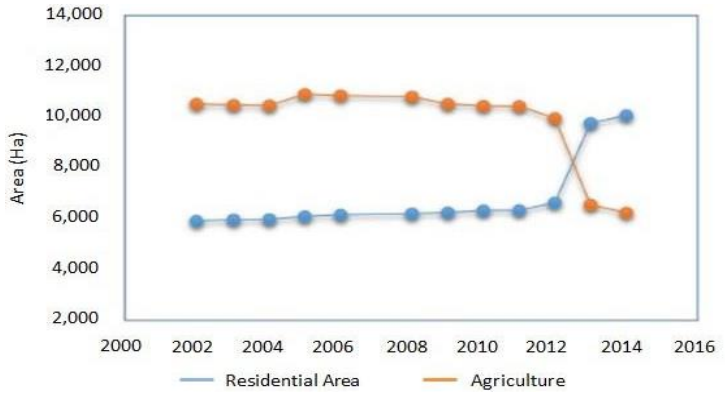
Bandar Lampung as a big city also generates a great number of construction and demolition waste (Siregar and Kustiani, 2019). Though its considerable amount, around half of construction waste is discarded into landfill. It is revealed that most construction projects in the city are aware of the importance of waste management, but the construction waste management plan has not been implemented yet. So, it is important for the authorities to authorize the release of the project's approval for a policy to be established.

3.6 Sustainable Use of Resource

Lampung Province has a huge potential in the marine and fisheries sector. To ensure sustainable use of fish resources, Bandar Lampung's government has enacted: (1) a restriction on using prohibited fishing gear; and (2) the IUU fishing regulation by substituting environmentally friendly fishing gear and reducing by-catch. Those regulations caused fishery production in 2016 to decrease pretty drastically. The number of by-catch in capture using trawl etc. tends to be bigger, so this restriction contributes to reducing capture fisheries production. However, there are some weaknesses and opportunities in policy implementation. The weaknesses are (1) limited government budget; (2) policy that is "top-down", and (3) ineffective communication between fishermen and the government. Meanwhile, the opportunities are 1) a high demand of fish; (2) a welfare enhancement support for fishers who do not use *cantrang*; and (3) an environmentally friendly fishing gear to substitute *cantrang* (Hardian *et al*., 2020)

Land use in Bandar Lampung has also faced changes over the years. It has been shown in Chapter 1 that urban residences dominate land use. The graph below shows the sharp increase of residential areas during 2012-2014, while agricultural land tends to decrease. Limited resources also cause the government to find difficulty in expanding green open spaces. Surveilling and issuing permits to businesses and buildings using land resources have to be seriously restricted, considering that illegal practice can still be found. For instance, exploitation activities (mining, residence, tourism) have damaged hills in the city.

Figure 177 - Temporal Change in Land Use for Residential Area and Agriculture Purposes, 2002-2016



Source: SNV (2018)

3.7 Healthcare and Education

Regarding healthcare in Bandar Lampung, there are some problems related to the health facilities. Several public health centers have not been equipped with a well-completed laboratory, counseling rooms, and enough doctors as well as nutritionists. The health insurance program (BPJS) also often faces many problems such as BPJS participants still having to pay for medical treatment and medicine, hospitals refusing to accept patients due to overcapacity reasons, and the continuously changing and untransparent policies related to BPJS. In providing service and handling for female victims of violence, healthcare has not applied or fulfilled the HKSR concept (Sexual and Reproductive Health and Rights).

In the education sector, Bandar Lampung has enough education facilities or centers. According to RPJMD 2016-2021, the average length of schooling in 2012-2016 tended to have positive growth. The government has also sought to provide space for persons with disabilities to fulfill their rights as it is the case, for example, at SMAN 14 Bandar Lampung, which proposes services for students with special needs. However, it significantly lacks in teaching competences and knowledge of appropriate ways of learning for students with disabilities, while facilities and supporting tools are inadequate and relatively expensive. Accessibility to enter classrooms for people with disabilities is also inadequate. All in all, there are many aspects that must be taken care of regarding education provision for disabled students.

3.8 Local Engagement and Social Inclusion

3.8.1 Local Engagement

There are several community-based programs organized by the government of Bandar Lampung. One of the programs addresses community empowerment in order to improve the ability and awareness of the community to adapt to climate change. In addition, the Bandar Lampung government also put climate change education into the elementary school curriculum which has been held in various elementary and secondary schools, such as SDN 1 Langkapura, SDN 1 Karang Maritim, SMPN 7, and SMPN 27 Bandar Lampung. However, it is known that this program has not been implemented yet in private school. This program's

continuation in the future is critical for the city to achieve a generation aware of climate change.

Other than that, in order to accommodate people's aspiration, the government of Bandar Lampung City is using the Musrenbang forum, the Public Consultation Forum, City Complaints, the SMS Center, and the Bandar Lampung City Government website. However, according to an FGD study done with Way Lunik communities (marginalized communities in the city), women's aspiration is rarely taken seriously in the village development planning meetings because of a lack in prioritization (Wulandari *et al.* 2018).

3.8.2 Social Challenges and Projects

Based on data from the Bandar Lampung Social Service, there were 1,307 neglected children, 1,635 neglected older people, 427 vulnerable women (women aged 18-59 who live in poor households), 820 people with disabilities, 50,576 poor people, and 151 scavengers in 2019. The data collection conducted by the Bandar Lampung Labour and Transmigration Office records that only 30 % of the approximately 300 large scale companies in Bandar Lampung City are willing to employ persons with disabilities. Also, there are limitation such as: (1) a limited involvement of women occurring in various sectors; (2) limited facilities and infrastructure; (3) high levels of underprivileged families; (3) school dropouts; (4) homelessness; and (5) a limited number of experts who have the qualifications to teach people with disabilities. All these factors have led to the situation in which the role and development of women, children, youths and families, people with disabilities, immigrants and minorities are very low.

Based on data from the Central Statistics Agency, the ratio of female and male workers in the agricultural sector is 1:2240, meaning that out of 2,241 workers in the agricultural sector, there is only 1 female worker. This also applies to the manufacturing sector in which, out of 90,030 workers there are only 24,647. Problems related to Women's Empowerment and Child Protection in Bandar Lampung City include:

- The efforts to protect women and children from various acts of violence, exploitation and discrimination, including efforts to prevent and deal with them are still low;
- The quality of life of women, especially in the fields of education, health, socio-politics, law, employment, environment and economy is very low;
- The implementation of communication, information and education (IEC) is not yet optimal in improving the quality of life and protection of women;
- The system of recording and reporting, as well as the system for handling and resolving cases of violence, exploitation and discrimination against women and children is still low;
- The capacity of the institutional network to empower women and children in Bandar Lampung is still low;
- Lack of policies and regulations aimed at protecting women and children;
- The role of the community and media in protecting women and children is still insufficient

3.9 Informal Settlement

Rapid urbanization and population growth contribute to the emergence of informal settlements in Bandar Lampung. As a center of activity in Lampung Province, it represents 12.4% of the Lampung Province's population. Bandar Lampung has provided various services for a wider area, both in fields of government, commerce, financial services, education, and so on. Its role as a growth center is supported by plans to increase accessibility to and from Bandar Lampung City.

There are seven indicators of slums, namely (1) slums in terms of buildings; (2) environment roads; (3) drinking water supply; (4) drainage and environment; (5) wastewater management; (6) solid waste management; and (7) fire protection. Bappeda of Bandar Lampung noted that 18 urban villages in the city are categorized as slummy areas, especially their settlements. Villages listed include Bumi Kedamaian, Way Gubak, Way Laga, Ketapang, Campang Raya, Kangkung, Sawah Berebes, Rajabasa Nunyai, Rajabasa Raya, Rajabasa Jaya, Way Dadi Baru, Kaliawi Persada, Pasir Gintung, Kebon Jeruk, Pesawahan, Kaliawi, Kelapa Tiga, and Gulak Galik. The municipal government of Bandar Lampung has determined a program implementation policy, including one data, one map, and a planning document for all in dealing with slums. During this implementation, the synchronization and harmonization between actors/sectors, funding sources and the infrastructure that must meet the standards have to be taken into account in order to handle slums and informal settlements successfully. After being calculated, the area of slum locations is 537ha while the area of slum in 2016 was of 2,400ha. There is a significant decrease in the programs that have been implemented.

CHAPTER 4
Policy Decision, Recommendations and Enabling Strategies

4.1 Current/Expected Policies Related to Priority Sectors

Chapter 3 and this chapter have a solid connection to provide further direction. After noticing various problems, challenges, and opportunities in priority sectors, there are several policies that are expected from the city government, such as:

1. Restriction of business permit for companies/businesses that have an impact on the environment
2. Enhancement of green open spaces
3. Disability-friendly Bandar Lampung. There are a lot of improvements that have to be made until Bandar Lampung becomes disability-friendly, such as facilities like sidewalks equipped with guiding blocks, pedestrian bridges that can be passed by wheelchair users, lifts in buildings, especially in public facilities, and many more
4. Improvement of household wastewater and sewage sludge infrastructures. Both are considered major river polluters, so managing household wastewater and sewage sludge is necessary to solve river pollution
5. Sustainable coastal waste management. The concerning condition of the coastal region needs cooperation from the government, business entities, and communities themselves
6. Sustainable sanitation. Adequate sanitation is essential for public health
7. Drainage systems improvement. Poor drainage system has become one of the causes of flooding in Bandar Lampung. In order to reduce climate change risk, the enhancement of the drainage system is important
8. Development of climate resilient infrastructure
9. One data, one plan, one map, and bottom-up planning
10. Sustainable spatial planning. According to several sources, there is inconsistency in the city's spatial planning even though many planning documents have been taken into account

4.2 Enabling Strategies Related Challenges and Opportunities in Priority Sectors

The city of Bandar Lampung has the potential to be a smart city as it has a strategic location, not only to be an example city in Lampung Province but also in the South Sumatra region. However, a challenge lies in Bandar Lampung's pluralism. The diverse culture in the city obliges the municipal

government to do several kinds of research regarding the area's situation.

4.3 Instruments or Tools Used to Implement such Policies

1. Instruments or tools that can be used to close the policy gaps and implement expected policies are:
2. Climate change curriculum for all education level, in private and non-private schools
3. Updating the Disaster Contingency Plan document from the World Bank project, then integrating it in Disaster Contingency Plan of Bandar Lampung City
4. Wastewater Management Information System (WMIS)
5. Reviewing SIAP document with the inclusion of involved stakeholders to sharpen the study and to be adjusted with other programs
6. Doing a participative review for the Master Plan for City Drainage. The inability to drain runoff, the obscurity of water flow from upstream to downstream and city drainage that is not connected to external drainage in several regions has to be considered
7. Procurement of waste containers in every *kelurahan*
8. DPA (Budget Implementation Document) to support programs/activities' financing
9. Obtaining the construction project requirement to conduct a waste management plan
10. Roadmap of Safe Sanitation and reviewing the Master Plan for Wastewater
11. Upgrading Master Plan for City Sanitation Strategy and then adjusting it with safe sanitation target
12. RPJMD 2021-2026 and upgrading RTRW and RDTR (Detailed Land Use Plans)
13. Study for sanitation handling in coastal regions

4.4 Challenges and Opportunities for Mainstreaming Sustainable Development

4.4.1 Policy Instruments: Regulatory, Procurement, Information, Measuring, Monitoring

Sustainable Development Goals (SDGs) have been ratified and included in Presidential Decree 59/2017 on Achieving Sustainable Development Goals. At the city level, all the SDGs also have been integrated into the missions of RPJMD 2016-2021. Meanwhile, the information, measuring, and monitoring of policy instruments in the city are present, but in several cases, they need improvement. For instance, it is said that the content of the Master Plan for City Drainage is barely known, so this case later stirs assumptions among stakeholders. The effectiveness of policy instruments, for example, infiltration and biopore infiltration holes, is also not yet known. Therefore, the evaluation of the policy is absolutely necessary so that the program's effectiveness can be evaluated. In

addition, the monitoring of certain policy instruments is pretty weak, such as ambient air quality, coastal waste management and industrial activity. This monitoring, especially on priority sectors, must be taken into account.

4.4.2 Tools, Early Warnings, GIS

Due to the frequent occurrence of floods, the city highly needs a flood early warning system. Bandar Lampung also needs an integrated early warning system. The WRS that are spread in Pesawaran, Bakauheni SAR post, BPBD Lampung Selatan, and Kahai Beach, can be a tool for disseminating earthquake information and tsunami early warning in the city. It is equipped with BMKG info (weather, climate, etc.) and WebGIS features. WebGIS is an advanced form of GIS technology that is uploaded on the internet. The information from WebGIS can be widely utilized for public use.

4.4.3 Technology Use (Waste, Energy)

There has been a preliminary study about waste to energy (WtE) plants in Bandar Lampung City. WtE is the process of generating energy from waste by combustion, then converting combustion heat to steam that is afterwards used to generate electricity, for industrial purposes, or both. According to the study, the bottom ash can be stored in normal sanitary landfill without further processing and has a sale value. However, many consider bottom ash as a hazardous waste that can expose people to health risks. Therefore, this could be a challenge for further WtE construction. In other cases, incinerating bottom ash is quite widely used for road building after some processing, where it is sealed under a cover of asphalt.

This step is a great opportunity for the city, but the fact that Bandar Lampung is not included in the priority list for development of waste-to-energy plants as enforced in Presidential Decree 18/2016 could represent quite a challenge. It is going to be difficult to attract investment that supports this waste-to-energy plant development. However, it has been revealed by the government body that there has been a discussion with an investor related to this, so there might be an opportunity for this problem. Other than that, the investment plan to develop a solar cell and diesel power plant has also been discussed. Cooperation with business entities could be a way to achieve the development of these technologies.

4.5 Financing Instruments

Bandar Lampung has various sources of income. The main income sources of the city are taxes and regional retribution. The mayor decides on which environmental agenda to fund although the city legislators also have some powers in this. Officials at the Environmental Department Office and the Development Planning Office have the discretionary power to propose smaller-scale budget lines. The investments in Bandar Lampung City are financed by several sources, namely:

- Regional Government Budget (APBD). Since 2010, BPPLH has shown a commitment to invest in climate change adaptation.
- State Budget (APBN). Some of the city's annual budget comes from funds transferred by the central government through DAK (special budget allocation), often made by ministers at central government level.

The city could also gain funds through partnership and/or cooperation with NGOs or any relative institution, which will be explained in the next subchapter.

4.6 Partnerships and/or Cooperation

There are several collaborations between the municipal government and NGOs. Even on ACCCRN program (2010) the pilot projects were done by NGOs because, at that time, the local government budget system did not allow flexibility for tapping into external resources. Considering the many active NGOs in the city, there is a high opportunity for collaborative actions in the future. For instance, the city government could work with Mitra Bentala (local NGO) for waste management and coastal region sector; SNV for water and sanitation sector; WALHI Lampung for environment or waste management sector, and Lembaga Advokasi DAMAR for women and child development.

Other than that, we found that the city government has not yet involved the private sectors in order to achieve the Climate Resilient and Inclusive Cities goals in Bandar Lampung. In terms of climate adaptation and mitigation, private sectors in Bandar Lampung are working independently through their CSR programs, and they also have a collaboration program named Forum CSR Lampung. Cooperation with mass media could also help to publish programs implemented in the city, amplify community's enthusiasm, and possibly attract other stakeholders to get on board.

4.7 Capacity Building

Bandar Lampung communities, especially communities that are threatened with high disaster risk, certainly need capacity building in order to improve their resilience to climate change. It is important for human resources that work as state civil apparatus to improve their competence and capacity in order to understand the city's technical problems. Renstra Bandar Lampung has proposed to improve education and training for human resources in governmental bodies for good governance; however, the implementation and continuity still need to be ensured.

Because of the urgency of waste management, the socialization and the capacity building of waste bank management can help improve a community's ability. Related to the climate change curriculum, there must be training and socialization about climate change education. Groups such as the *Taruna Siaga Bencana* (Disaster Alert Cadets) and volunteers of PRBBK from *kelurahan* city level need to be revitalized or restructured. It is also important to empower KPP for communal wastewater treatment plant, fecal sludge and wastewater service operators, POKJA-PKP, and any other POKJA. In addition, the training would be necessary to help developing a GHG inventory.

CHAPTER 5
Conclusion and Recommendations

5.1 Conclusion

Bandar Lampung City is at high risk from natural catastrophes and natural hazards such as droughts, landslides, high tides (tsunamis), earthquakes, fires and floods. Most communities have a lack of knowledge about disaster handling, climate change and its impacts. Community awareness on the importance of disaster-related information is still low. Besides challenges in managing energy, transportation, and telecommunication, the government of Bandar Lampung also has big concerns concerning city waste production. Integrated Sustainable Solid Waste and Resources Management development is required.

Bandar Lampung faces many challenges and problems regarding climate change adaptation and mitigation such as physical infrastructures that are still vulnerable to climate change or disaster; fossil fuels use that is still widely spread and contribute a lot of greenhouse gases, and so on.

Facilities for transportation and accessibility in Bandar Lampung are still limited. Mass transportation modes still struggle to establish themselves as the main chosen urban transportation mode. There are only a few buses that have flat tracks and maximum 5% slopes that are safe enough for wheelchair users. In addition, Bandar Lampung has not become pedestrian-friendly over time.

Efforts to disseminate information regarding disaster and climate change are absolutely needed, especially for groups who are vulnerable to climate risks (women, the elderly, children and coastal residents). Bandar Lampung has proved to be lacking a gender component in regulation as well as elderly-focused activities in disaster risk reduction regulation. A lack of women participating in meetings has been pointed out since 2010, while the elderly, children and women again are at huge risk in case of disasters and natural hazards. In order to reduce the vulnerability of these communities, Bandar Lampung needs to pay more attention to them.

5.2 Recommendations

From some Bandar Lampung City development documents, publications and analysis, here are some recommendations based on different issues for Bandar Lampung City to become a climate-resilient city:

- Early Warning System

1. With the support from Provincial Government, Bandar Lampung needs to develop more integrated early warning system and add more the Warning Receiver System (WRS) in the entire city in order to properly tackle the risks of catastrophes such as earthquakes, tsunamis, fires and floods;
2. Together with NGOs and universities, the city could enhance public education and campaigns as most communities in Bandar Lampung City lack knowledge about disaster handling, climate change and its impacts;

3. In collaboration with academia, NGOs and the private sector, the city could organize, manage, and pay more attention to coastal communities and other communities that are vulnerable and marginalized.

➢ Transportation

1. With investors from private companies, facilities for transportation and accessibility in Bandar Lampung City could be improved as they are still limited;
2. There is a need to get support from private companies to substitute fossil fuel usage with environmentally-friendly fuel. There are many opportunities to develop mass transportation in Bandar Lampung as well as natural gas use for mass transportation.

➢ Multi-stakeholder collaboration

In order to integrate the policies, the climate change risk management in Bandar Lampung City should:

1. Involve both internal and external stakeholders to form a better partnership collaboration, including mass media;
2. Enhance the collaboration between sectors in the city, the role of private institutions and non-government organizations (NGOs), and community empowerment to create a sustainable city.

➢ Policy, regulations and funding resources

1. The government needs to address the problematic lack of policies and regulations aimed at protecting women and children.
2. With advice from scholars and research institutions, the city government needs to support local regulation and additional funding resources in order to achieve its goal of becoming a climate resilient and inclusive city.
3. By expanding its network with development partners, the municipal government can search for many international funding resources to encourage sustainable development implementation in Bandar Lampung, such as Green Climate Fund (GCF), Global Environment Fund (GEF), Corporate Social Responsibility (CSR) funds and other funding resources.

➢ Waste, clean water and sanitation

Together with the community (NGOs) and the private sector, the city must implement programs to increase access to clean water, proper sanitation, revive waste banks by the community and expand urban farming practices. Besides, investors to realize Waste to energy (WtE) activities at TPA (landfills) Bakung must be found.

➢ Energy

Lampung Province itself has a huge potential on geothermal resources, so as the capital city of the province, Bandar Lampung can encourage the development of this renewable energy source in collaboration with the university research center and private companies (e.g. Pertamina and PLN).

➢ Education

1. Together with NGOs, the city could develop a performance concept of Women's Protection Center that is intended for services, complaints, and learning; for women of all ages, especially for poor women and young women;
2. With the NGOs and the private sector, the city could get an opportunity to

increase awareness and strengthen knowledge in the form of education and services for the community. This concept is also applied and developed in public health centers.

- Capacity building

1. Capacity-building activities addressed to government officials are needed in some technical areas, such as calculating greenhouse gas emissions, preparing for the risk of natural disasters (floods, earthquakes, fires, etc.) through hands-on training;
2. Acquiring knowledge by having training to make a tool and developing an indicator to measure the urban resilience achievement.
3. Create exchange studies of Bandar Lampung city's staff to selected countries in Europe in order to learn about waste management, sanitation, environmentally- friendly transport system as well as urban forest management.

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