

MANUAL FOR GENDER-RESPONSIVE CLIMATE CHANGE VULNERABILITY ASSESSMENTS



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MANUAL FOR GENDER-RESPONSIVE CLIMATE CHANGE VULNERABILITY ASSESSMENTS

JULY 2015

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ACRONYMS

BLHD	Badan Lingkungan Hidup Daerah - Regional Environmental Agency
BMKG	Badan Meteorologi, Klimatologi dan Geofisika
BNPB	Badan Nasional Penanggulangan Bencana - National Disaster Management Agency
BPBD	Badan Penanggulangan Bencana Daerah - City Disaster Management Agency
BPS	Badan Pusat Statistik - Statistical Bureau
CCVA	Climate Change Vulnerability Assessment
DKP	Dinas Kelautan dan Perikanan - Marine and Fisheries Department
GIS	Geographic Information System
Kelurahan	Neighborhood
Kecamatan	Sub-District
PDAM	Perusahaan Daerah Air Minum - Local Water Provider
PLN	Perusahaan Listrik Negara - Local Electricity Provider
PPLS	Pendataan Program Perlindungan Sosial- Documentation of Social Protection Program
NTT	Nusa Tenggara Timur - East Timor Province
RCBVA	Rapid Community-Based Vulnerability Assessment
RPJMD	Rencana Pembangunan Jangka Menengah Daerah - Mid-Term Development Planning
RTRW	Rencana Tata Ruang Wilayah - Land Use Planning Document
RUA	Rapid Urban Assessment
SC-DRR	Safer Communities Through Disaster Risk Reduction in Development Program
TKPKD	Tim Koordinasi Penanggulangan Kemiskinan Daerah - City Coordination Team on Poverty Alleviation
UCLIM	Urban Climate Risk Management Program
UNDP	United Nations Development Programme
URMP	Urban Risk Management Plan

FOREWORD

Climate change is a global crisis with increasingly evident impact on Indonesian cities. Climate change-related hazards, such as sea-level rise, coastal flooding, landslides, droughts, and storm surges, have vast and varied consequences. Climate change is damaging peoples' homes, businesses, infrastructure, and economies, as well as destroying life-giving ecosystems. What is particularly worrisome, however, is that climate change intersects with another important trend: urbanization. Together, they create additional risk and vulnerability for many communities.

Urbanization in Indonesia is occurring rapidly. Cities now house over half of Indonesia's population and concentrate a large part of the country's assets and economies. But as cities grow, so do highly vulnerable communities. People are drawn to cities for jobs and better futures, but are often unable to find homes and livelihoods in safe areas. Rapidly growing cities often struggle to provide lower-income citizens with adequate shelter and public services. As a result, many are forced to live in informal settlements, which are typically in hazardous areas such as flood-prone riverbeds.

Together, urbanization and climate change are making the challenges informal urban settlements face more difficult. Many studies show that the same societal powers that control the world's resources and denigrate the environment perpetuate social inequality (Chant 2007, 21; Otzelberger 2014, 6; Scott 1998). The world's wealthiest populations use the majority of the world's resources and contribute most to global warming emissions, while people living in poverty contribute the least and have the fewest resources to cope with environmental disasters.

Although climate change and urbanization's impacts affect everyone, the challenges women face are often relegated in planning efforts. Women are disproportionately burdened because they are responsible for securing their families' well being, and are directly dependent on natural resources to provide food, shelter, and safety for their families (Chant 2007, 22). In vulnerable informal urban communities where resources and opportunities for women are already scarce, climate change-related hazards make these conditions even worse (Oxfam 2007, 3). Planning efforts should not only target gender issues as a subset of climate change planning, but prioritize women's perspectives, challenges, and outcomes in every step of planning processes.

This said, it is important to remember that women are not always the "victims" of these circumstances; quite often they are strong leaders. The same societal roles that make women more sensitive to environmental hazards also empower them tremendous experience and local knowledge, which can be leveraged for climate adaptation and resource management strategies (McDade 2014). Boys and men also bear unique climate change-related burdens, such as "hero'-risk taking behavior" to protect communities during natural disasters like hurricanes (Otzelberger 2014, 10).

The key to ensuring gender equality and participation in climate change planning is to make sure all voices are heard at every step of the planning process, and that the assessment results reflect these inputs equally. We hope that the following Manual for Gender-Responsive Climate Change Vulnerability Assessments, produced in partnership with the United Nations Development Program, local Indonesian NGO Yayasan Kota Kita, and the City of Kupang, can be a resource for women and men in these vulnerable communities. By defining the basic concepts of gender, climate change, participation, vulnerability, and adaptive capacity, we hope to provide useful frameworks for addressing these critical challenges.

INTRODUCTION

The MPGCVA for the City of Kupang is being carried out at the request of the United Nations Development Program's Safer Communities Through Disaster Risk Reduction in Development Program (SC-DRR). It is a collaborative research process facilitated by the local Indonesian NGO Yayasan Kota Kita, together with the City Government of Kupang and local civil society organizations. The current report forms one part of SC-DRR's Urban Climate Risk Management Program (UCLIM), which also includes the creation of an Urban Risk Management Plan for Kupang City.

The process of creating this report has been participatory and also pedagogic, it has sought to bring together key city officials and stakeholders, to educate them about the impacts of climate change, and identify how it makes their city vulnerable. This process can be broken down into several key steps:

- Building understanding about the city through data collection, analysis and discussion
- Studying local communities through observational visits and interviews
- Facilitating stakeholder dialogues to encourage consensus about climate hazards, indicators and vulnerabilities
- Promoting discussion and reflection about suitable recommendations and responses to climate change vulnerability
- Analyzing and presenting a city assessment that is understandable and easily accessible to different stakeholders, institutions and the public

The Vulnerability Assessment proposes both qualitative and quantitative approaches to evaluate and identify vulnerability. We developed these approaches taking into account both the challenges of collecting sufficiently fine-grained comprehensive data, as well as the complex, anthropological nature of the social, economic, and political phenomena underpinning the city's vulnerability measures. This report seeks to balance a range of perspectives, using Kupang City to illustrate the CCVA process, and can serve as an educational tool for stakeholders.

The assessment aims to be accessible, visual and explanatory, and enable the reader to understand the methods and analysis clearly. Maps, diagrams and explanatory text are used to help the assessment communicate findings. There are five chapters in all of this assessment. Following this Introduction, Chapter 1 defines basic terms and the Climate Change Vulnerability Assessment (CCVA) process, and the importance of the pedagogic approach used for this manual. Chapter 2 outlines climate and urbanization trends in Indonesia, specifically in Kupang City and the NTT Region. Chapter 2 also explains the methodology for facilitating a workshop, collecting, and analyzing data. Chapters 3 and 4 explain the metrics for the CCVA: exposure, sensitivity, exposure, adaptive capacity and vulnerability, in order to better understand the people, systems, and places which are most at risk of climate change. The final chapter explores ways to further engage this process, and resources for gender-sensitive and participatory planning strategies moving forward.

MANUAL OBJECTIVES

How does this manual work?

This manual is an educational tool designed to show how climate change and urbanization can make communities vulnerable, and how stakeholders can overcome these challenges by prioritizing gender-sensitive and participatory steps. The manual can be read straight through, or it can be treated as a toolkit, using the sections most relevant for its reader. While this CCVA process pertains to workshops held in Kupang City, the issues and processes involved are relevant to many other cities in Indonesia and beyond.

Who can use this manual?

Anyone who wishes to make his or her city a safer and more resilient place may find this manual useful. It is intended for men and women from at-risk communities, planners, activists, local governments, and civil society organizations alike.

What can it do?

Having a basic understanding of gender, climate change, and participation, is critical for successful planning. While these concepts may seem distinct, they are deeply connected by the systems, cultures, and power structures that govern our societies. Planners must think holistically about these issues in order to make changes that benefit everyone. Hearing everyone's perspective—especially marginalized groups—is the only way to understand the diverse, dynamic, and sensitive issues communities face. Using the cities of Kupang, Makassar and Manado as examples, this manual provides context and data from a number of participatory and gender-responsive workshops to show how others can conduct their own CCVA processes effectively.

What can it not do?

This manual does not cover planning design, implementation, policy recommendations, or monitoring practices. It should be used to provide a foundational knowledge of important planning concepts, and as a starting point for interpreting local contexts, issues, and perspectives.

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Chapter 1 - Basic Concepts

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- 1.2 What is climate change?
- 1.3 What is participation?
- 1.4 Vulnerability and the CCVA Process

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CHAPTER 1

BASIC CONCEPTS

1.1 What is gender?

1.2 What is climate change?

1.3 What is participation?

1.4 Vulnerability and the CCVA Process

We will begin by introducing three key concepts: gender, climate change, and participation. These concepts can serve as frameworks, or ways of thinking about vulnerability and the CCVA process. Frameworks make us more alert to the types of challenges people face, and be more sensitive to the range of perspectives that shape people’s experiences. They can also help us understand the factors that underlie societal norms.

1.1 WHAT IS GENDER?

Topics Covered:

- Defining gender
- Gender equality
- Gender mainstreaming

Gender refers to the social differences between women and men. Gender differences are not defined by biology, but by learned behaviors shaped by internal and external factors (Oxfam 2010, 3). External factors include culture, religion, and place. These factors influence the roles, power, and access to resources men and women have in any culture. Internal factors, or a person’s “social identity,” include class, race, and family dynamics that determine how a person understands his or her own gender (Oxfam 2010, 3). It is important to remember that gender occurs on a spectrum, and that people’s self identity may change or fluctuate over time. Because there are many internal and external factors influencing a person’s self-identity, gender can be a sensitive, complex issue, and it is important to understand how that affects the climate vulnerability assessment process.

Gender equality refers to the ability of men and women to have equal power, enjoyment, respect, opportunity, and rights, in their daily lives (Oxfam 2010, 3). Gender equality does not mean that men and women are the same; it means that they are able to make decisions, participate, and seize opportunities equally within a system.

Gender mainstreaming is a way to involve both men and women in program policy and design. It has been used internationally since the mid 1990s as a standard for gender equality (Tolhurst et al. 2012, 1826). Despite different ideas of what the “mainstream” is, the primary goal of gender mainstreaming is “deliberate and systematic approach to integrating a gender perspective into analysis, procedures, and policies” (ibid.).. In this manual, gender mainstreaming is incorporated into data collection and analysis, workshop facilitation, and adaptation strategies. The primary goal of gender mainstreaming is to make sure that gender is prioritized at every step of the process so that inequality is not perpetuated (Otzelberger 2014, 7).

An example of gender mainstreaming in Kupang policy design might be to balance men and women’s concerns about the effects of climate change in the coastal economy. Men are concerned that they have a lack of weather information to help them with fishing, while women are more concerned about risk of high winds on flooding and disrupting the market. In some areas near the downtown, women are concerned about money and time spent waiting in line to get clean water during prolonged droughts.

1.2 WHAT IS CLIMATE?

Topics Covered:

- Defining climate change
- Climate change impact on cities, specifically on women living in cities
- Current policies affecting local level climate change planning

Climate change refers to changes in the average temperature, or variability of weather patterns, for a given place over an extended period of time (IPCC 2007). Because climate change refers to a trend over time—typically decades or longer—it is different from “weather,” which refers to short-term temperature, rainfall, and storm patterns. Scientists

agree that climate change is largely due to manmade factors like pollution and urbanization, which alter the earth's ecosystems and change its natural patterns. The effects of climate change are many, but the ones that affect Indonesia most specifically are: sea-level rise, coastal flooding and erosion, landslides, droughts, and storm surges, temperature increase.

1.3 WHAT IS PARTICIPATION?

Topics Covered:

- Defining participation
- Importance of participation in the CCVA process

Participation is a way for women and men of all ages, backgrounds, and identities to contribute to the planning process, by being involved in finding solutions for their most urgent challenges. Participation is also an attitude and philosophy which allows people to share equal power, respect, and protection in the planning process (Jost et al. 2014, 19). Participation incorporates gender mainstreaming principles because it allows everyone's voice to be heard, and for his or her concerns to result in meaningful action.

In the 1960s, participation emerged as a way to overcome inequality inherent in governance, and to bridge the gap between local efforts and government planning. Today, participation is used more widely, but there are still barriers to ensuring equal participation across all groups. It is especially important to prioritize participation in the CCVA process, as climate change affects different communities differently, and assessing vulnerable communities' needs is a dynamic, nonstandard process. If CCVA processes are not participatory, vulnerable people's needs will not be as effectively served, and their conditions will likely worsen as climate change hazards increase.

1.4 VULNERABILITY AND THE CCVA PROCESS

Topics Covered:

- Defining vulnerability
- The importance of a participatory and gender responsive approach
- CCVA Process and how this leads to the URMP and resilience planning
- Exercise: Starting the CCVAs

Vulnerability is a complex idea that refers to both physical and social measures. As a planning concept, vulnerability describes how well a person, place, or system can deal with the negative effects of climate change, including climate variability (drought or monsoons) or climate extremes (IPCC 2007). This ability depends on the type, extent, and rate of climate change impacts on a person, place, or system. We measure this ability in terms of three concepts: exposure to natural hazards, sensitivity to these natural hazards, and adaptive capacity to cope with these hazards.

Meaningful participation allows the most marginalized groups to involve and expressing their ideas, experiences and needs in CCVA process. In Kupang, recently migrated women-headed households, often found in informal settlements, may not be involved in village processes. They might also be invisible in official government data. One way to engage women-headed households, or other marginalized groups, might be to facilitate a separate process, through FGD. This might be an or in-depth interview used during the neighborhood assessment. Whatever method is used, workshop facilitators should aim to ensure people's participation regardless of their age, sex, backgrounds and identities.

CLIMATE CHANGE VULNERABILITY ASSESSMENT (CCVA)

The CCVA is both a process and a document that identifies a city's vulnerabilities to climate change, and sharing this knowledge with stakeholders in the city. It also responds to gender-specific vulnerabilities, and emphasizes a participatory approach to understanding and solving these challenges. The objective of the CCVA is to build awareness and understanding of specific climate change vulnerabilities so that they can be addressed through planning, policymaking and regulation enforcement. Doing so will strengthen their resilience to climate change.

The CCVA diagnoses the problems, raises awareness, and builds knowledge – all of vital importance to understanding where to start. The CCVA is the first step in the process of creating and implementing a strategy to reduce vulnerability and increase adaptive capacity. Following the CCVA is the Urban Risk Management Plan, in which policies, regulations and projects are prioritized as part of a city vulnerability reduction strategy.

CCVA WORKSHOPS

There are three participatory workshops scheduled as part of the CCVA process. They follow a sequence in which in each case stakeholders are able to receive information, discuss, give inputs and additional information, and then verify the results. Through this iterative process of discussion and verification the stakeholders will arrive upon a consensus understanding of the city context.

1. City Context Workshop

The first workshop invites participants to discuss climate hazards and issues related to gender and urbanization specific their city.

2. 1st CCVA Workshop

Presentation of preliminary analysis about climate change vulnerability is shared with stakeholders to solicit feedback on the identification of vulnerable areas, groups and systems, and the analytical methods to conduct the assessment.

3. 2nd CCVA Workshop

The 2nd CCVA workshop presents the final analysis and findings, and facilitates the development of a set of recommendations by stakeholders for further actions.

ASSEMBLING A TECHNICAL TEAM

The team that will conduct the CCVA will be fully engaged in collecting data resources, analyzing urban data, creating maps, and organizing and facilitating workshops. This team can either be made up of consultants, a local NGO, academics from a local university, or a special Task Force team from the city government. The team should have the capacity to analyze urban data, create maps, facilitate workshops, consolidate research into a final report. It is also critical to have a gender expert on the team who can lead the gender mainstreaming process, to make sure that gender is integrated into data collection, workshop processes, and final implementation.

CONVENING STAKEHOLDERS

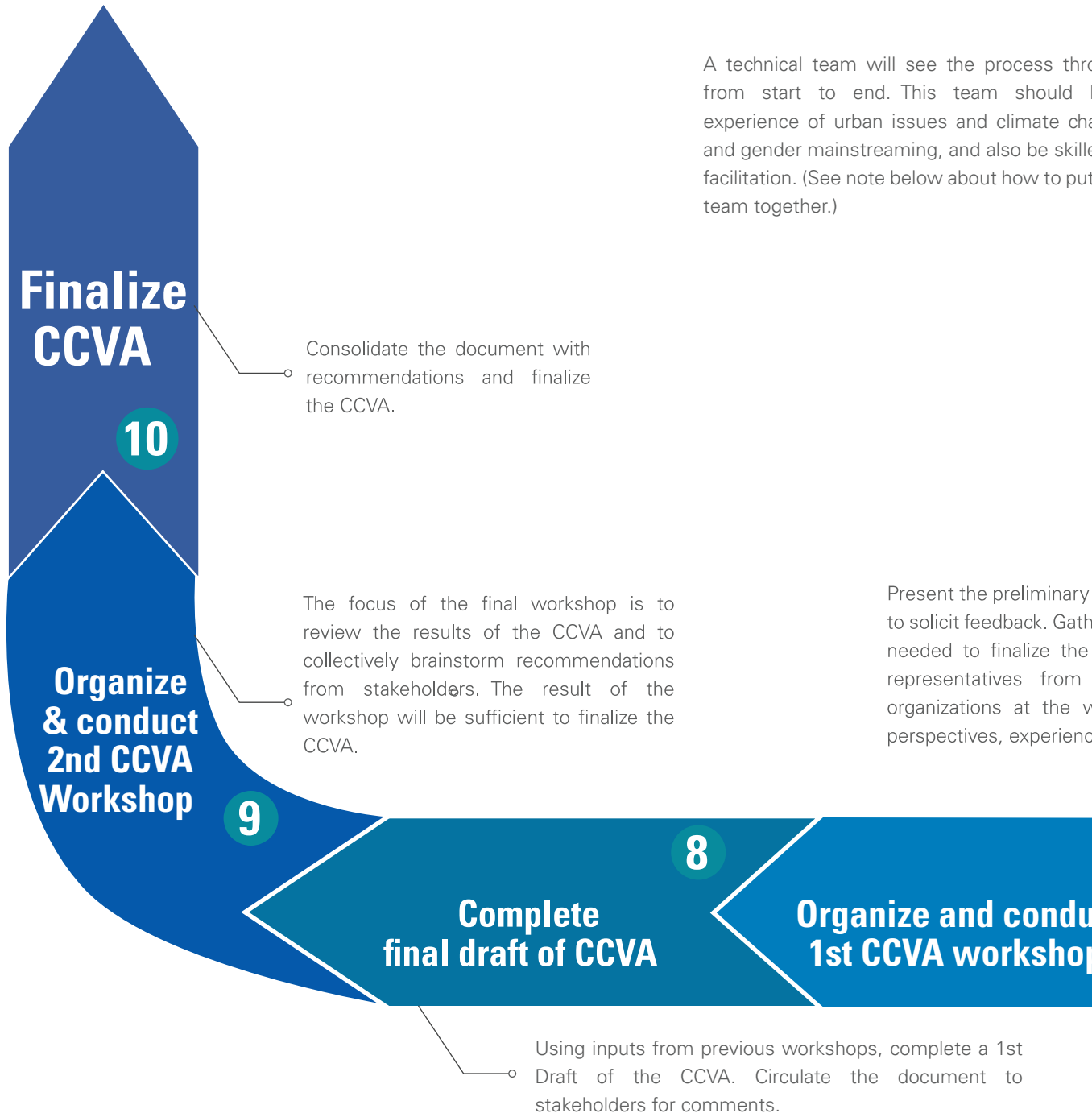
Perhaps the most important aspect of the CCVA process is to ensure that you have a diverse and relevant set of stakeholders who are involved at each step of the way. There are three participatory workshops stakeholders should attend. Stakeholders should be both men and women, and representative of a varied set of interests and groups in the city. Therefore the stakeholders should include officials from the local government, representatives from civil society (local neighborhood associations, civic groups and NGOs), the private sector, and local universities. To ensure that they are committed to the process circulate invitations, drafts and updates should be requested as often as possible. Also, do not leave too much time between workshops as stakeholders may lose interest.

EFFECTIVE WORKSHOP FACILITATION

The success of the CCVA workshop relies heavily on the capacity of the facilitators to be prepared and anticipate any issues that will come up. Facilitators should provide a very clear guide for the activities so that participants will understand what they are doing at each stage, and how it fits into the overall vision for identifying vulnerability issues for the city. This can be achieved through the creation of a very detailed facilitation guide.

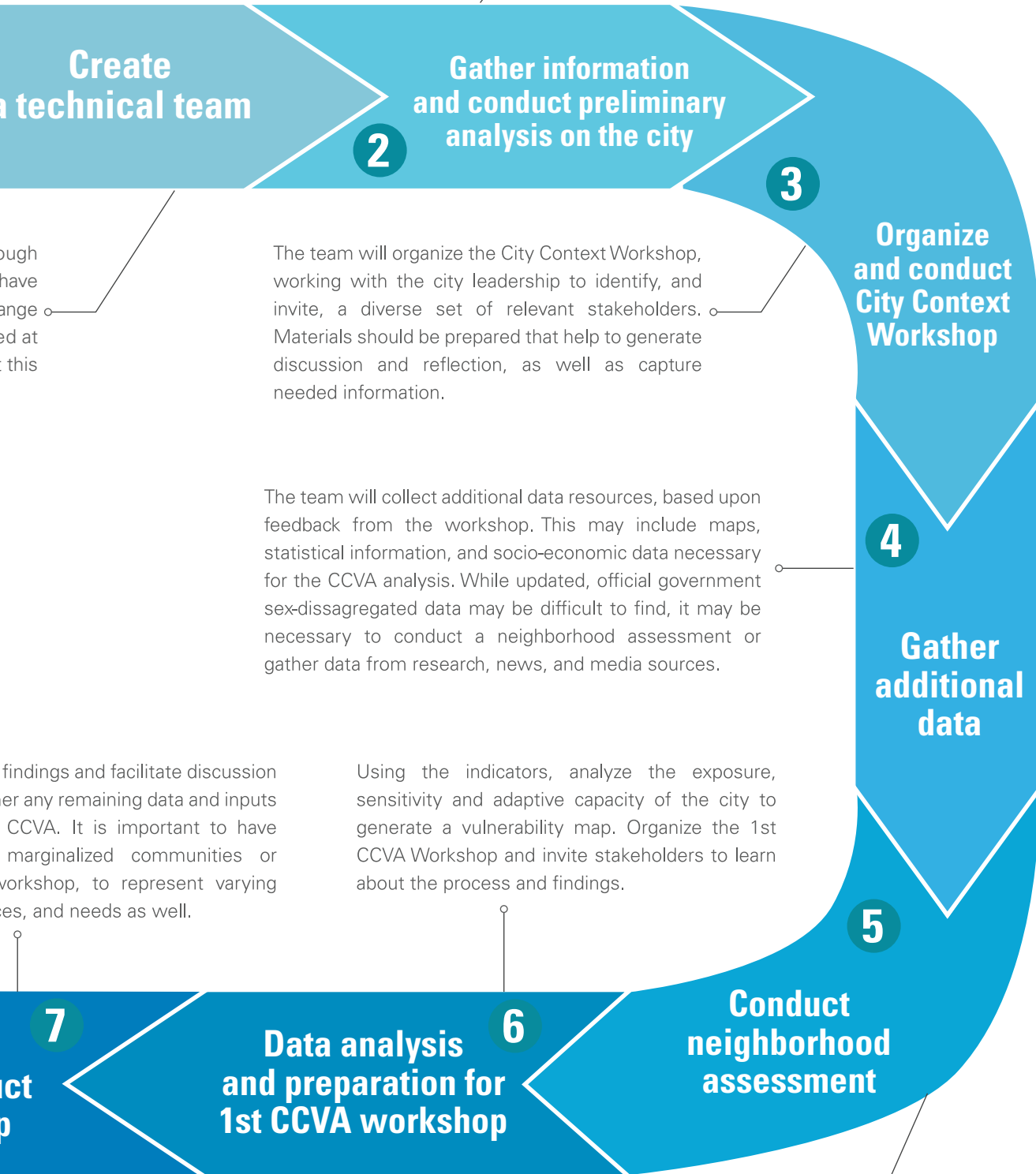
EXERCISE: GETTING STARTED ON THE CCVA

Once the city leadership has decided to undertake the CCVA the next step is to begin the process. Remember that the CCVA is just the first step in a longer planning and implementation process to build resilience; the CCVA will lay the foundation for that to take place. You can see from this diagram the sequence of steps for undertaking the whole CCVA process. The timing of each stage depends largely upon local factors, but overall the CCVA should not take longer than six months to be completed.



FOR CCVA

The technical team (following the manual's instructions below) will gather data and create maps to create a baseline set of information about the city context by ensuring adequate data on gender and development.



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The team will organize the City Context Workshop, working with the city leadership to identify, and invite, a diverse set of relevant stakeholders. Materials should be prepared that help to generate discussion and reflection, as well as capture needed information.

The team will collect additional data resources, based upon feedback from the workshop. This may include maps, statistical information, and socio-economic data necessary for the CCVA analysis. While updated, official government sex-dissaggregated data may be difficult to find, it may be necessary to conduct a neighborhood assessment or gather data from research, news, and media sources.

findings and facilitate discussion
er any remaining data and inputs
CCVA. It is important to have
marginalized communities or
workshop, to represent varying
es, and needs as well.

Using the indicators, analyze the exposure, sensitivity and adaptive capacity of the city to generate a vulnerability map. Organize the 1st CCVA Workshop and invite stakeholders to learn about the process and findings.

By this stage, all vulnerability indicators should be gathered. If data is still missing, or if smaller-scale data is needed, conduct a neighborhood assessment. For example, teams could personally target and interview marginalized groups like women in female-headed households, if these women do not participate in the City Context Workshop.

CHAPTER 2

UNDERSTANDING THE CITY CONTEXT

2.1 What are climate projections?

2.2 National Scale: Overview of Climate Risks in Indonesia

2.3 Urbanization and climate change

2.4 A Rapid Urban Assessment: Collecting, mapping, and analyzing data

To understand how gender, climate change, and participation issues converge, we will discuss their impacts at both the national and city scale. The International Panel on Climate Change's most recent report confirmed that urban climate change risks, vulnerabilities, and impacts are increasing globally, in cities of all sizes (IPCC 2013, 8). These risks and vulnerabilities are often disproportionately assumed by women, who typically have fewer resources but greater responsibility towards the security and wellbeing of their families (Evans et al. 2013, 2). In this chapter we will demonstrate how to find and use climate projects, and then how to undertake a Rapid Urban Assessment (RUA). We will use the example of Kupang City to show how urbanization, gender issues, and climate trends intersect at the city scale.

2.1. WHAT ARE CLIMATE PROJECTIONS?

Scientists make climate projections to show how a climate system will respond to increased greenhouse gas emissions or other pollutants (IPCC 2007). **Projections** are different from predictions because they are calculated using computer models, and are based solely on global warming emissions. **Predictions** are based off of projections but make assumptions about how these projections will affect people, economies, and other systems (ibid.). Both projections and predictions This evaluation includes both projections and predictions about how climate change will affect Indonesia and Kupang City.

2.2. NATIONAL SCALE: OVERVIEW OF CLIMATE RISK IN INDONESIA



Indonesia's unique geography as an island chain makes it a beautiful place to live, but also particularly exposed to climate change hazards. Whether it is the prolonged effect of dry seasons, extra heavy rains, or fluctuating food prices due to affected harvests— we are beginning to experience climate change in our daily lives. In the future, we can expect temperatures to increase 0.2C each decade during the dry season, and 0.1C each decade during the rainy season (UK Met Office 2011, 12). Because Indonesia's temperature range is very narrow, even slight changes may alter ecosystems drastically. Understanding which climate change trends are most relevant at the national, regional, and local level, and how they impact vulnerable communities, can better inform short-term and long-term planning decisions.

Since the 1980s, the frequency of extreme weather events has increased. The top twenty worst natural disasters in Indonesia have all occurred in the past thirty years, and they will likely get worse (UNFCCC, 2010, xiv). In coastal regions, sea levels are estimated to rise by 25 to 50 cm in 2050. In the worst case, nearly 50% of areas near Semarang, Surabaya, and Jakarta will be underwater by 2100 (UNFCCC 2010, xviii). While sea-level rise affects 600,000 people today, as many as 2.7 million people could be affected by 2070 (UK Met Office 2011, 3).

In the Nusa Tenggara Province (NTT), sea-level rise and extreme weather trends are also particularly severe. Agriculture is particularly affected by these trends. Since the Asian Financial Crisis in the late 1990s, the agriculture sector has grown significantly. Recently, prolonged drought during the dry season, and increased rainfall during the wet season,

may significantly reduce rice and corn crop yields in some areas, while increasing them in other areas with more rain in eastern Indonesia. El-Nino, a warm ocean current triggering strong winds, monsoons, and cyclones, has also worsened the effects of draught and flooding on agriculture. Sea-level rise might also reduce shrimp, prawn, and fish yields for fisherman. Not only might these conditions threaten the economy and the livelihoods of farmers and fisherman, they also pose a threat to food supply (UNFCCC 2010, I-iii).

A final climate change trend to consider, which is especially felt at the local level, is the issue of water scarcity. Increased demand in growing mid-sized coastal cities, combined with prolonged droughts, may create water shortages (UNFCCC 2010, xviii). Water basin capacity, or the natural ability of cities to store water, may also impact scarcity (UNFCCC 2010, xviii). Some areas may have excess water supply while others, like West Nusa Tenggara, will not have enough. This could affect decisions at the local level to allocate water resources.

Women and Water Scarcity

Poorer communities, particularly women, are disproportionately affected by water scarcity because they lack infrastructure, and must pay more to obtain water during a drought. When water is not available in the premises, women are more often responsible for water collection than men. This is true in both rural and urban areas in Asia and sub-Saharan Africa (Wedo-IUCN 2013). From the neighborhood assessment in Kupang City, the pattern is quite similar. Women are responsible for water collection, and during prolonged drought, they have to spend lot of time collecting water. They also have to spend a lot of money buying clean water because it is not publicly provided.

In such situations, understanding gender and its relation to climate change is fundamental to understanding livelihood strategies and priorities for different socio-economic groups, and developing more effective risk management strategies. Gender is a central organizing factor in societies, and it can significantly affect the processes of community life. In fact, the influence of gender on people's lives in the city and their livelihoods is so substantial that by most gender-related development indicators, women's power and resources are lower in many areas such as education and economy (KPPA-BPS 2013).

Gender also often constrains women to an unequal position in society in comparison to men. Because women often have less control over resources than men, they may be more sensitive to climate impacts and disasters. Adding to this complexity are differences amongst women of different class, race, caste, culture, wealth, age and ethnicity. Opportunities to cope and adapt vary amongst groups and influence the kinds of actions they can take and the roles they can play.



2.3 URBANIZATION AND CLIMATE CHANGE

In this manual, we explain how urbanization intersects with climate change to create vulnerabilities within a city, specifically for women. Explaining this connection is critical for beginning the CCVA process, so that the risks associated with different aspects of cities are understood. We explain this connection generally, and in the Kupang City context for a specific example, both because we conducted our initial CCVA workshop there, and because it is very similar to other mid-sized Indonesian cities dealing with rapid growth and climate change.

Urbanization in Kupang

The City of Kupang is growing rapidly. The population is estimated to double in fifteen years, from 378,425 to just over 750,000. Urbanization is being driven by the large-scale immigration of people from rural areas of Timor, as well as from neighboring islands. These people are drawn to Kupang City to find jobs and opportunities, or perhaps to escape droughts or other situations of risk— but certainly to seek a better life.

Cities like Kupang can certainly provide these opportunities, and make it easier to access education, markets and basic services. They can also provide stability and safety. However, they can also increase vulnerability as people may be forced to live in areas that are exposed to risk, or because their jobs are precarious. This chapter will provide some insight into the current situation of the city, and also indicate what are some trends that are shaping its future. By considering the critical issues we can begin to understand how different places and communities face different risks, and thus expose people to vulnerability.

Urbanization and Climate Risks for Women in Kupang

In Kupang, the percentage of women-headed households is quite high relative to other Indonesian cities. Many of these women live in informal settlements. They are often tasked with building temporary houses as well as maintaining them, or repairing them after climate-related hazards like flooding. They must also take of family and maintain their security during disasters. Besides this labor and responsibility, women and their families are also vulnerable because they may not have formal property rights or land tenure in these informal settlements.

When cities grow, land becomes more expensive. Many poorer urban residents have no option but to move to informal settlements, because it is the only place they can afford. Living in such areas means that residents may face issues like lack of adequate water supply and lack of good sanitation. Informal settlements are also frequently located in hazard prone areas, such as river basins, which are exposed to landslide risks. Women in informal settlements may face increasing domestic burdens such as spending more time for collecting water during prolonged drought, or cleaning their home in the aftermath of flood.



2.4 A RAPID URBAN ASSESSMENT: COLLECTING, MAPPING, AND ANALYZING DATA

A Rapid Urban Assessment (RUA) helps to provide a basic understanding of the city's context. This will demonstrate how and where climate change will impact certain areas and people that are more vulnerable than others.

It is not important to understand everything about how the city you are studying works, but you will need enough information to know how basic characteristics (such as poverty, demography and public services) are distributed across the city. The RUA will be enriched by discussion and additional inputs gathered from stakeholders during the City Context Workshop. Thus the objective of the first stage is to present a snapshot of the city, and then collect further information, and verify that preliminary analysis, with stakeholders.

You should be able to show: where people live, where public services are distributed, the environmental characteristics of the city, and what trends the city is experiencing. This data should also be collected in a way that highlights any gaps between men and women. For example, when collecting public service data, education rates for men and women should be identified. For the purposes of assembling and mapping city-scale data, you should work at the kelurahan level, and create maps with information for each kelurahan in the city. While there is plenty of information available about Indonesian cities it will be necessary to not only visit neighborhoods to conduct one's own assessment, but also to seek insights, knowledge and verification of your analysis from stakeholders.

To assemble enough data to undertake the RUA you will need the following:

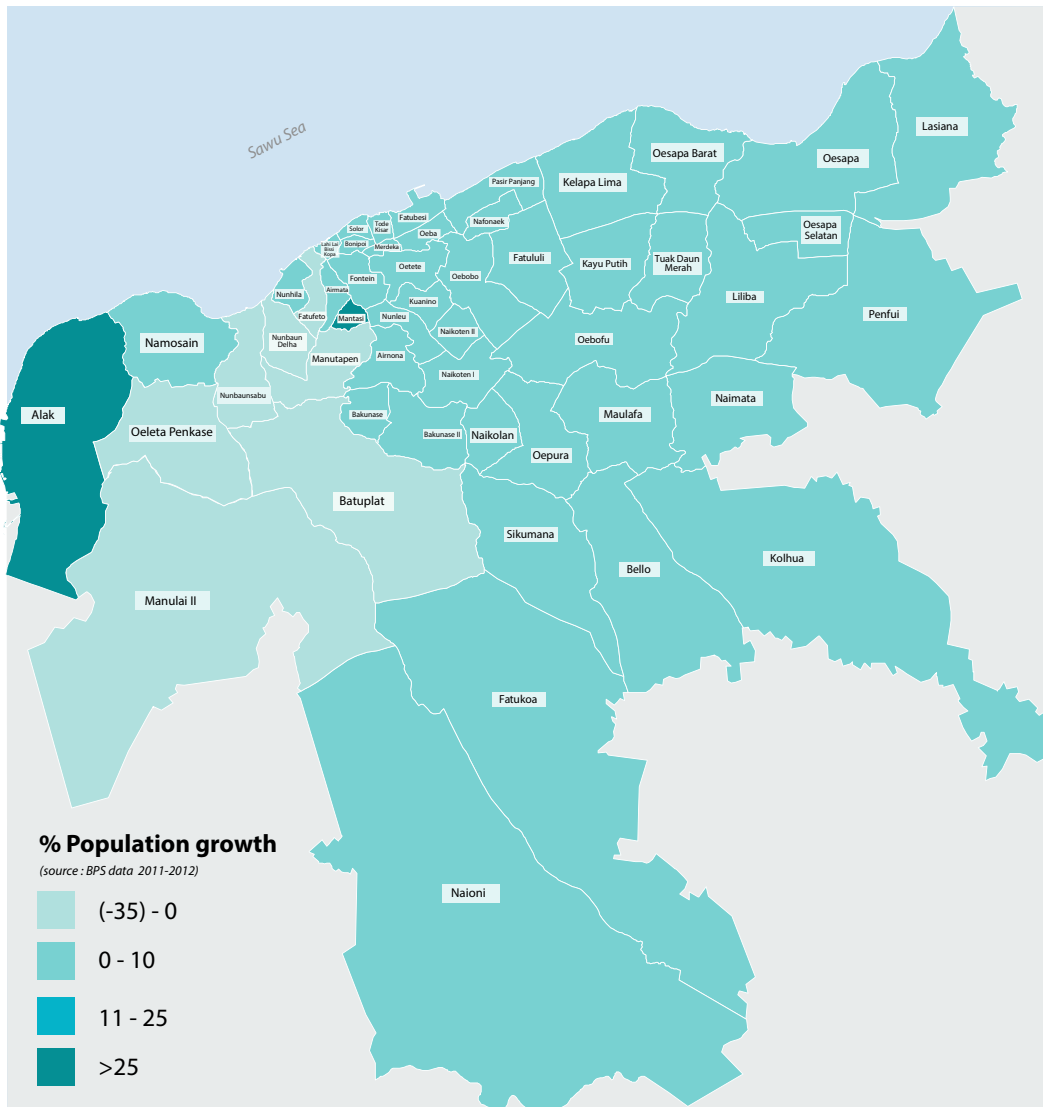
- Dalam Angka Data Profile of the city
- GIS Shapefile of the kelurahan boundaries of the city
- Google Earth aerial photo of the city

SOURCES OF DATA FOR RAPID URBAN ASSESSMENT

Sector	Source of Data
Demography	Demographic data of the city is available in Dalam Angka [BPS]. It is useful to compare data from previous years to see the growth of the population.
Jobs and Economic Development	Data on the economic profile of the city is available in Dalam Angka [BPS]. It is useful to compare data from previous years to see if there are trends (e.g. certain growth sectors)
Public Service Delivery	<ul style="list-style-type: none"> • A general map of the city's water provision network is available in the RTRW planning document. Detail maps provided by PDAM (city water provider). • General information and maps on transportation systems are available in RTRW planning document. • Health service delivery information like numbers of health facilities and numbers of disease are available in Dalam Angka [BPS].
Ecosystems	Maps on the city's ecosystems are available in the RTRW planning document.
Poverty	Data on poverty is available from PPLS, this information is assembled for each city by TKPKD.
Disasters	Data and maps on previous disasters can be available in the RTRW documents, but it is usually quite general, and you can also get from the BPBD department which is usually provide more detail information.
Infrastructure and Urban Systems	You can create a map of the city's main infrastructure using GIS Shape files, or simply tracing a Google Earth aerial of the city and identifying important systems with workshop participants.

DEMOGRAPHICS

Demographic information informs us about the characteristics of the population. We can use it to understand where people live and how fast the population is growing. Understanding demographic change is important because some areas of the city are growing faster than others, while some areas have very few people that work or live there. By understanding the changing nature of cities, the City Government can better respond to changing needs or situations. For example, different areas face different issues and need different policies and planning.



The population is growing most quickly in the periphery of the city along the coastline. These areas are attracting people who seek jobs and land for their homes. For example, in the neighborhood of Alak, near the port, many people come to find jobs in factories and warehouses, and because there is a lot of land to build homes. In the east of the city you also have high population growth too, but these people are seeking to live near the coast and may have different skills.

Kupang City is growing by 4.6% each year. This is significantly higher than the growth rate of the rest of Indonesia, which is growing at a rate of 1.04%. Migrants come from other areas of Timor, Flores and Lombok to seek jobs and opportunity. Migrants can promote economic development but often live in marginalized conditions which are vulnerable.

The population map on the left shows how people are distributed, while the population density map on the right indicates the concentration of people in relation to area. Density is different to pure numbers of people because it denotes how close together they live. The higher the density the greater the demand for services and more concentrated issues can be.

JOBS AND ECONOMIC GROWTH

Jobs and economic growth concern the basic characteristics of the city's economy. For cities to be resilient to climatic shocks, it is important that they are not overly reliant on climate-sensitive economic sectors like farming and fishing. If there are long periods of drought then these sectors become very fragile. You should create an economic profile of the city that demonstrates what are the jobs today, what the trends are (compare the current economic profile to that of previous years), and also demonstrate the unemployment rate.

MAKASSAR FACTS

1,350,192
Population

19.4%
%Poor Population

LAND

Total Land Area	17,577 ha
# of Districts	14
# of Neighborhoods	143
% Residential	42%
Population Density	76.8 people / ha
% Open Space	30%
Open Space per 1,000 persons	3.9 ha

ECONOMY

Economic Sectors (% of GDP in 2010)

Agricultural & Mining	0.7%
Manufacturing	21%
Utilities	1.98%
Construction	8.9%
Trade, Hotel, Restaurant	29.6%
Transportation	16.2%
Finance & Business Services	10.7%
Other Services	11%

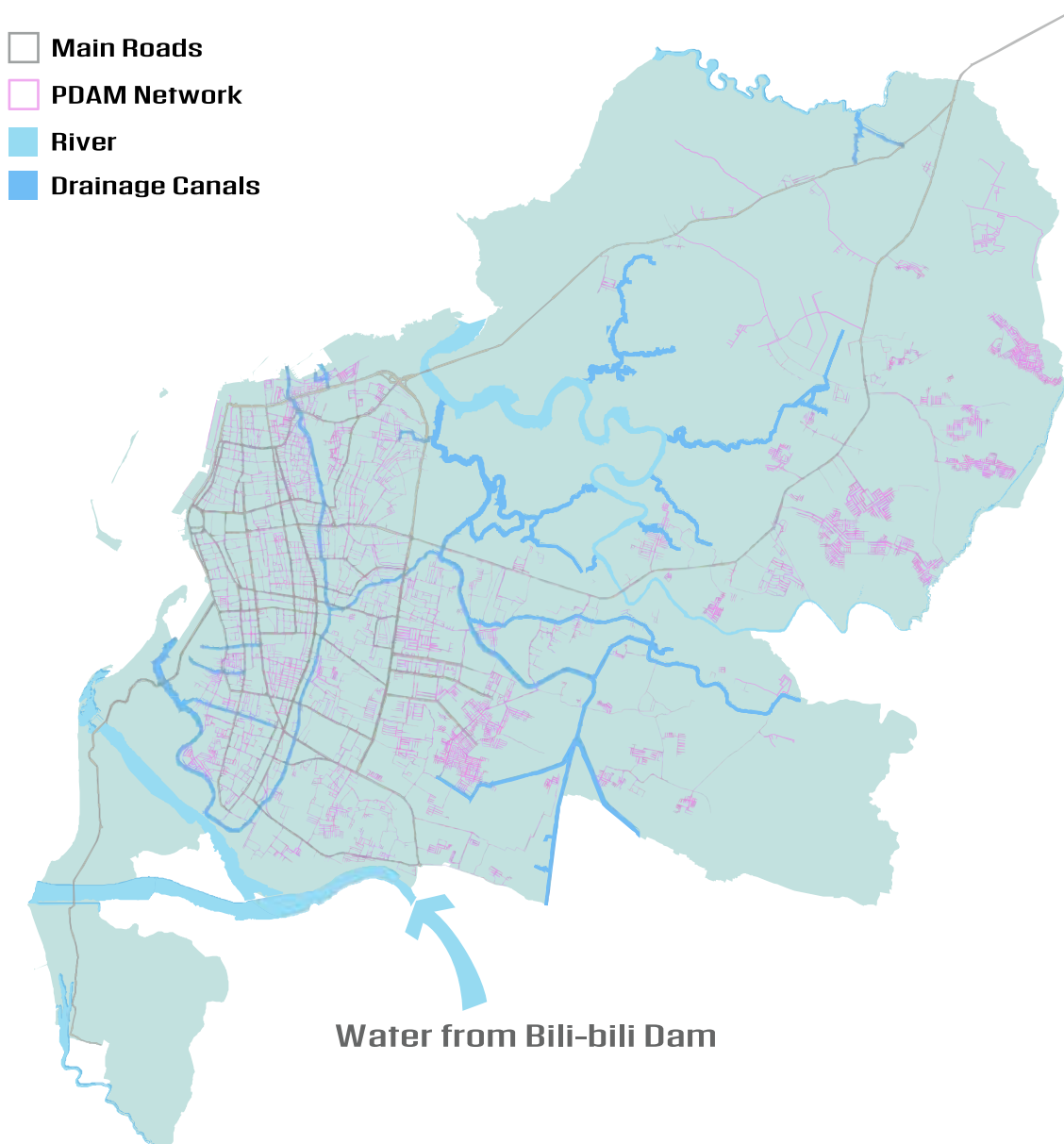
SOUTH SULAWESI REGIONAL NETWORK

Considered the gateway to east Indonesia, the port in Makassar is an important commercial hub and economic generator for South Sulawesi and the region.

Basic urban information about the city is required to create an overview or profile of the city. This information can be found in the city's annual 'Dalam Angka' publication, this is a publically accessible document that provides a standardized set of information about the city's characteristics every year.

PUBLIC SERVICE DELIVERY

Public services are services that the government provides to city residents. These include: Water, Energy and Electricity, Transportation and Access, Health, and Sanitation. Extending public services to the population is an important way of improving lives, reducing climate change vulnerability, and creating opportunities and prosperity. The RUA should demonstrate gaps in services, which can be seen as opportunities to extend service, and also a way to identify which parts of the city are vulnerable. If a community doesn't have water, sanitation or electricity, it is much more likely to struggle to recover from flooding, or other climate event, as its health and safety are more likely to be seriously impaired. Particular attention should be given to identify fast-growing, poorer communities, which rarely have full services.



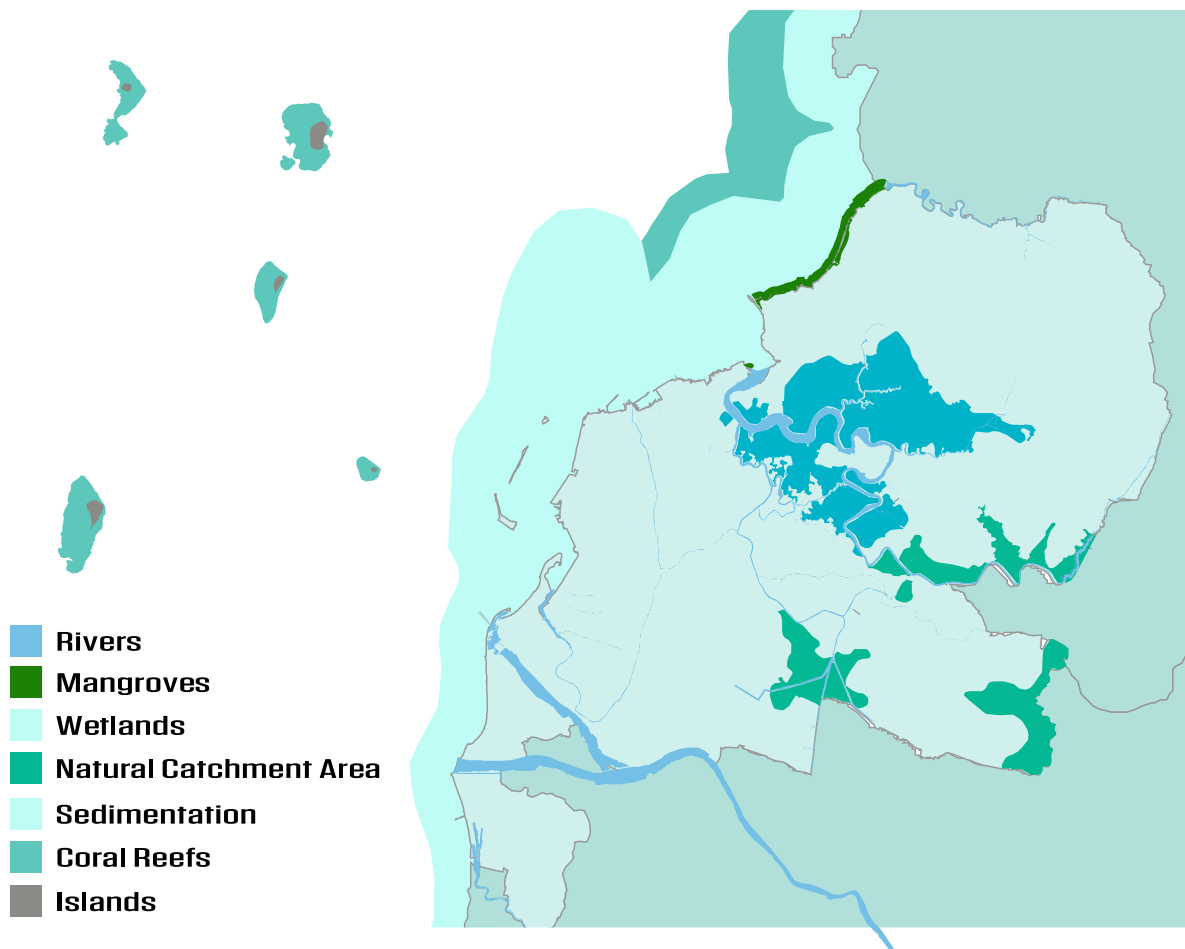
The map above shows the City of Makassar and a variety of different public service networks: main roads, drainage canals and the waters supply network. Understanding the extent of public service networks helps to build an understanding of where gaps in service delivery may exist. If you can overlap maps of service coverage with different layers of information, such as population density, population growth and population numbers, this will allow you to identify areas of the city that lack services and infrastructure and that would be vulnerable to changing climate conditions. Other public services that could be mapped would be education (the location of schools) and health (the location of hospitals and health centers).

ECOSYSTEMS

Climate change is drastically changing ecosystems. This does not just affect rural areas. Cities rely heavily on the services ecosystems provide. For example, rivers provide drinking water, while mangroves protect the coastline from dangerous winds and erosion which can damage homes. Ecosystems are threatened by many human activities. Developing on erosion-prone coastlines or riverbanks, or dumping waste-water in rivers, are two common examples.

Given the importance of ecosystems to provide for urban residents, it is important to identify which ecosystems provide most for a city, and which communities rely most on these ecosystems by mapping where they are. What services does each ecosystem provide? What activities may harm an ecosystem, and how can that activity change? Has climate change already affected any ecosystems? What changes has the community observed?

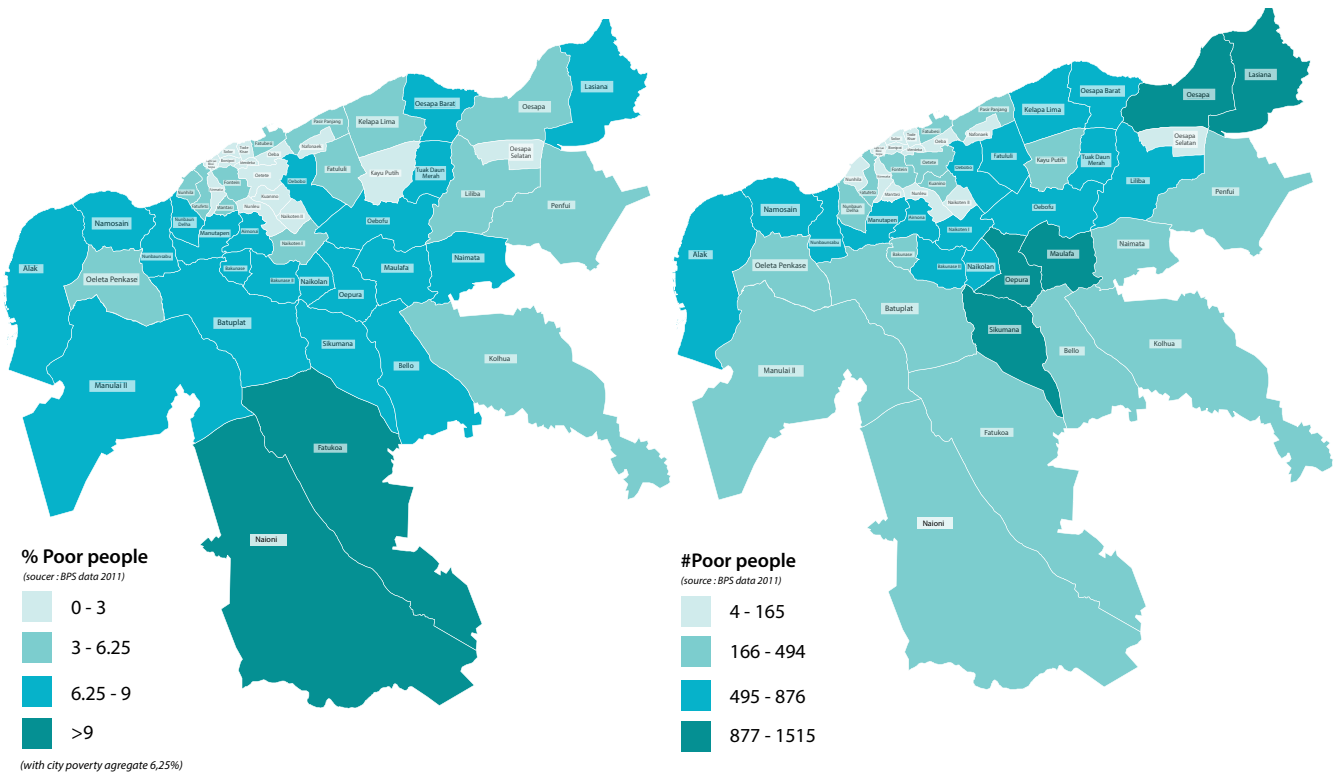
Identifying a city's critical ecosystems, and mapping where they are, who relies on them, and what ecosystem hazards or changes have already been observed, is critical information for later stages of the CCVA process.



The above map demonstrates the different ecosystems that make up the city of Makassar. These ecosystems are dispersed throughout the city, some are along the coastline and around islands off shore, such as mangroves and coral reefs and, while others may run through the city, such as rivers and wetlands. These ecosystems play a vital role in providing the city with water, drainage after rainfall, and protecting communities from sea-level rise; they should be noted and their value in ensuring resilience appreciated.

POVERTY

Urbanization and climate change greatly increase the suffering of people living in poverty in Indonesian cities. Comparing maps showing where the poorest communities are with maps of climate hazards can identify which communities are most vulnerable. This information can be used with higher levels of government to advocate for increased protection from these hazards, or more services, like clean water, health, and education, which can improve poverty rates and longterm community sustainability.

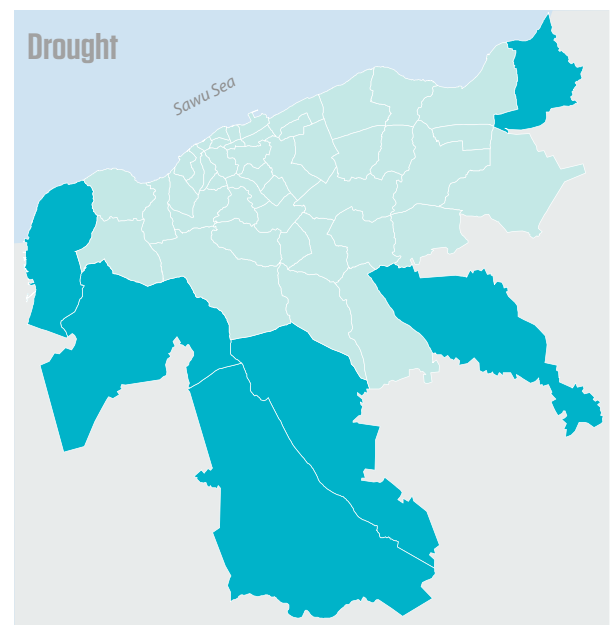
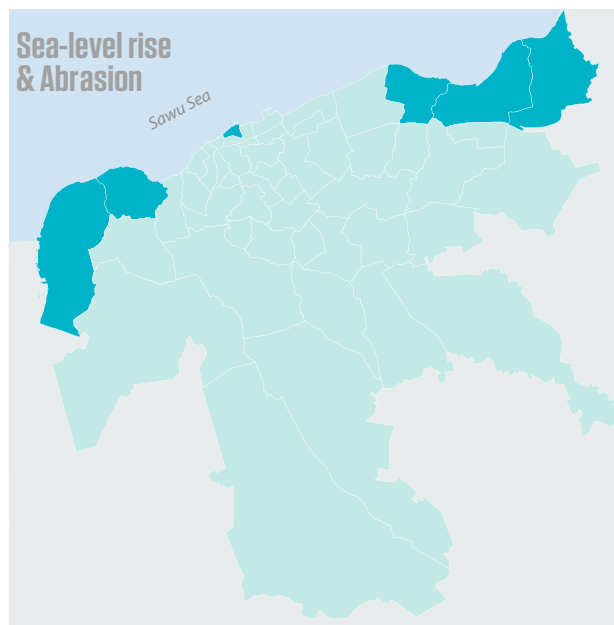
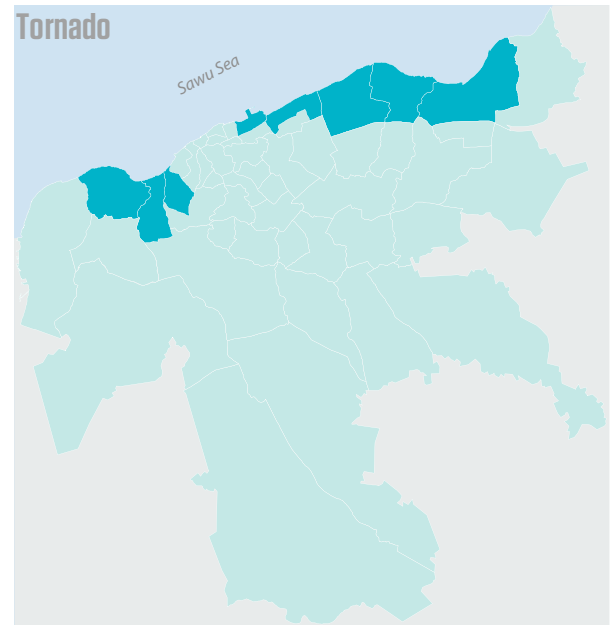
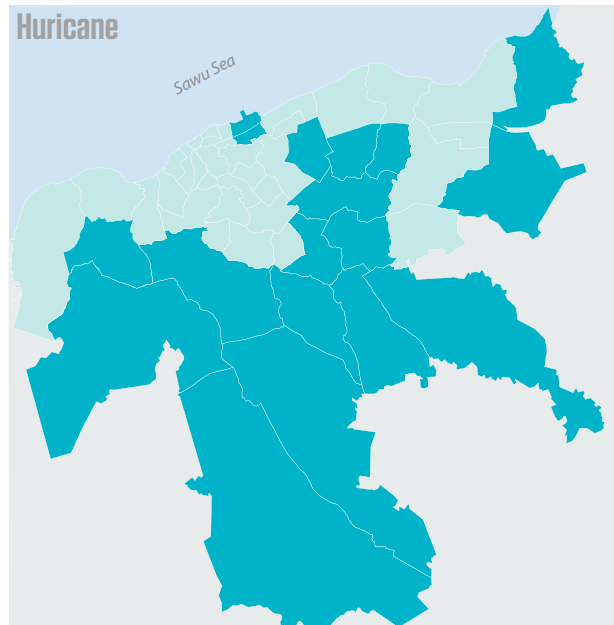


The above maps demonstrates two ways of indicating the distribution of poverty across the city. The map on the left demonstrates the percentage of poor people as a proportion of the total population of each neighborhood. This is a good way to see the intensity, or concentration, of poverty in each of the neighborhoods. The neighborhoods in the western and souther periphery of the city concentrate high levels of poverty, way above the average poverty rate of 6.25%. The map on the right demonstrates the total number of poor people in each neighborhood. This indicates that per neighborhood there are high numbers of poor in neighborhoods to the east of the city.

DISASTERS

Natural disasters have affected cities throughout Indonesia in many different ways; these may include flooding, high winds, and landslides. Unless there are interventions to make locations safer climate change is likely to happen in areas that have already suffered natural disasters. Previous sites of disasters are often already mapped, making it easier to identify areas of vulnerability.

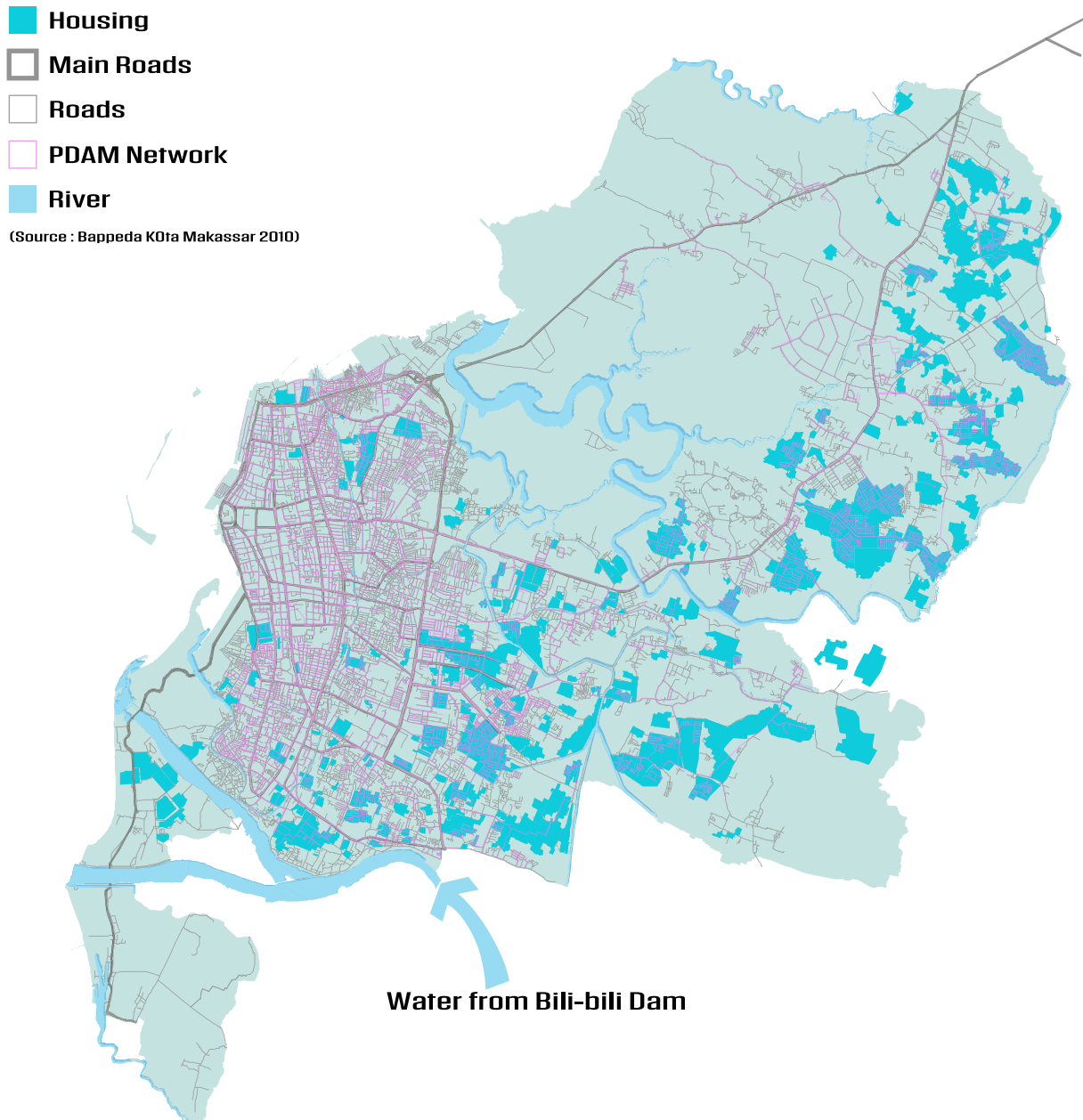
Area prone to disaster



The above four maps show where specific disasters, hurricanes, drought, sea-level rise or abrasion, and tornados, affect certain areas of the city. The data was collected from participants during the City Context Workshop. Participants noted on a table which climate hazards and disasters affected which neighborhoods, this information was then visualized on individual maps. The four maps help indicate how different areas of the city are affected differently according to the type of hazard.

INFRASTRUCTURE AND URBAN SYSTEMS

Infrastructure refers to large physical structures and facilities (such as roads, bridges, and ports) that provide essential services to a city. There are different scales of infrastructure, small-scale and large-scale infrastructure. Small-scale affects households or a particular community, while large-scale affects the whole city. We are most interested in large, often critical infrastructure and systems that are needed to support essential functions for the whole city. They include: the port, the airport, roads, trash collection, sanitation, water supply, and electricity.



The map above shows the City of Makassar and a variety of different public service networks: main roads, drainage canals and the water supply network. Understanding the extent of public service networks helps to build an understanding of where gaps in service delivery may exist. If you can overlap maps of service coverage with different layers of information, such as population density, population growth and population numbers, this will allow you to identify areas of the city that lack services and infrastructure and that would be vulnerable to changing climate conditions. Other public services that could be mapped would be education (the location of schools) and health (the location of hospitals and health centers).

SOME ANALYTICAL METHODS

There are a number of analytical methods that can be used to better understand the data and maps – these can help provide insights for the RUA.

- **Compare different layers of information together:** When reviewing mapped information, for example about poverty, demography, and public services, try to compare them. If there are areas of high population and high poverty there may be a correlation that can help identify an area of the city that is more economically vulnerable than others.
- **Comparison of data in time:** Another comparative method is to look at how the city has changed in time, for example population numbers, or population density, if you compare this year with ten years ago. You can calculate the rate of population growth, or the rate of change of poverty, and this can indicate how much a place has changed. This information is valuable for understanding trends.
- **Comparing maps to aerial maps:** Another way to use the data is to compare the data layers to aerial images and try to understand why differences occur. Often there are clues such as the existence of certain natural features (such as ravines or uninhabited areas). Your conclusions can prompt further investigation on the ground, through site visits, to learn more about the city.

CRITICAL ISSUES AND URBAN

Cities are constantly changing and evolving. What is happening today may change and be different tomorrow. While the above information gives us a snapshot of what is happening in the city today, it is important to make sure the RUA considers how emerging trends will affect the city in the future. Identifying urban trends can come from the analysis but also from discussing the trends and context with workshop participants. Decisions made now about these trends will have an impact upon reducing vulnerability in the future, so it is important to perceive them early and not wait until it is too late to react to them.

In the next chapter, we will discuss ways to apply these methods of analyzing problems. Applying these methods can be thought of as “measuring vulnerability” to several key factors: Exposure, Sensitivity, and Adaptive Capacity. Chapter 5 will explain what these factors mean, and how to apply them in the next step of the CCVA process.

EXERCISE: THE CITY CONTEXT WORKSHOP

The City Context Workshop is the first opportunity for stakeholder participation in the CCVA process, and will help to verify the findings of the RUA. The objective of the workshop is to gather knowledge and gain understanding about the primary climate hazards, and the existing context, of the city. The City Context Workshop lays the necessary foundations for the rest of the CCVA process, and brings stakeholders together for the first time, allowing them to meet, learning about climate change, and contribute to the CCVA process from the very beginning. Thus it is important not just for building understanding, but also for building an identity, and an agenda, around the need for climate change resilience.

The City Context Workshop should be held once a baseline of data about the city has been assembled. The role of the facilitators should be to generate discussion, solicit feedback and additional information about the city. They should ask what additional information is available (not all information is easy to access publicly), which climate hazards are most common, what neighborhoods are most susceptible to disasters and should be studied, and what kinds of groups most vulnerable. The Workshop should last for one day and bring together a diverse group of stakeholders from different government agencies, civil society organizations and local universities.

PROCESS

- 1. Assemble baseline information about the city:** Gather basic information about the city to understand general city profile such as demography, poverty, economic condition and public services through secondary data (Dalam Angka BPS, RTRW, some government publication such as Pembangunan Manusia Berbasis Gender, published by MOWE and BPS, as well as Profil Gender dan Anak published by local government .
- 2. Prepare base maps as tools to generate discussion:** Mapping will be a powerful tool to understand where the concentration of people in the city, where public services are distributed, the environmental characteristics of the city, and what trends the city is experiencing. If sex-disaggregated data is available, it should be displayed accordingly on the map. Also, it may be helpful to ask men and women stakeholders for feedback on maps; men and women may interpret maps differently. Using certain colors, graphics, and visual displays often register differently for men and women, so it is important to take their perspectives into account to optimize maps and discussion.
- 3. Invite stakeholders to the workshop:** Invites both local government institutions includes Bappeda, BPBD, BLHD, BMKG, PDAM, Office of Women's Empowerment, and other related institution and non-government institutions such as local NGO, Women's Organizations, and representatives of civil society to contributes in the workshop.
- 4. Present preliminary findings to stakeholders:** The City Context Workshop may start with presentation of preliminary finding gathered using the maps that we already prepared. We commonly use our method 'gallery walk', so people can absorb the provided information easily. Women and men should both facilitate discussions, and lead gallery walks to illicit different perspectives.
- 5. Facilitate discussion amongst participants:** Inputs from the stakeholders related to the preliminary findings will be very significant to better understand the situation, like why such location have higher poverty level, or why there is no public service in specific area. Make sure that questions focus on these issues for women specifically, such as specific constraints women and other marginalized groups (children, elderly, people with disabilities) face accessing public services.
- 6. Conduct focus group discussions on specific themes:** Discussion on specific theme is needed to deepen our understanding about the important aspect of the city like poverty and socio-economic profile of the city, infrastructure and public service delivery, the primary ecosystem, climate profile, climate hazards and general vulnerability profile in the city. Promoting women leaders in group discussion and presentations is, again, an important mechanism for increasing participation and relaying marginalized perspectives.
- 7. Gather additional information:** Additional information will be needed for the next step of work, in particular you will need to identify the indicators use will use to assess vulnerability. You should identify the proposed indicators together with the stakeholders during the workshop. Read through the following chapter (Ch. 3) to understand what indicators are needed (exposure, sensitivity and adaptive capacity) and present options to workshop participants about possible indicators for each.
- 8. Consolidate the results:** The final result of the City Context Workshop is a draft of the city profile, complete with maps and an understanding of hazards, hotspots of vulnerability, the identification of the city's primary ecosystems, trends and critical issues. You should also have identified the vulnerability indicators that will be used to conduct the quantitative analysis of the city.





CHAPTER 3

EXPOSURE, SENSITIVITY, AND ADAPTIVE CAPACITY

3.1 Assessing Vulnerability by Measuring Exposure, Sensitivity, and Adaptive Capacity

3.2 Exposure

3.3 Sensitivity

3.4 Adaptive Capacity

The objective of the CCVA is to identify what are the most vulnerable areas, people and systems in the city to climate change. This document will enable stakeholders in the city to discuss and decide which actions are necessary to build resilience and reduce vulnerability in the future. To be able to be continuously monitor and evaluate the changing vulnerability of the city, since it may move and change as the city evolves, and because efforts to reduce it may be successful, requires using indicators that can be easily accessed and used regularly. In this chapter, we will explain how exposure, sensitivity, and adaptive capacity are indicators to measure vulnerability. Quantifying these indicators can help guide and target policies and interventions to reduce vulnerability, as well as make future assessments easier to repeat.

3.1 ASSESSING VULNERABILITY BY MEASURING EXPOSURE, SENSITIVITY, AND ADAPTIVE CAPACITY

The three concepts we use to measure vulnerability are exposure, sensitivity, and adaptive capacity. These come together in the following equation, which is the standard formula that UNDP and other UN agencies use to define vulnerability:

$$\text{VULNERABILITY} = \frac{\text{EXPOSURE} + \text{SENSITIVITY}}{\text{ADAPTIVE CAPACITY}}$$

Each concept is explained below as well as examples of indicators that can be used to measure them. Since each city will have different physical and socio-economic characteristics, different kinds of data available, and different kinds of vulnerability, there is no one standard set of measurement criteria. This manual presents a number of options.

It is important for the facilitators to allow the stakeholders to decide themselves which indicators to use to measure and assess exposure, sensitivity, adaptive capacity and ultimately, vulnerability. Since the CCVA process is designed to be as participatory as possible it gives the choice of indicators to participants, building more ownership of the process, and tailoring it to local settings. Not only is it possible for participants to choose what indicators to use, they can also choose how to give different weights to each, so that the formula reflects the importance of certain indicators over others.

This section defines each of the three components of vulnerability and demonstrates examples of which indicators can be chosen (although the selection is essentially up to them). The section then describes the process for using the indicators in step-by-step detail to enable the facilitator to guide the technical team and workshop participants through the process.

3.2 EXPOSURE

Topics Covered:

- Exposure
- What hazards affect communities most
- How to map exposure
- How hazards affect cities as a whole

Exposure refers to The degree of climate stress upon a particular unit of analysis (i.e. neighborhood, sector), and may be characterized by long-term change in climate conditions, or changes in climatic variability including the magnitude and frequency of extreme events in the urban context (IPCC 2007). Exposure may vary for men and women. For example, women may live in an area more exposed to flooding, while men may spend most of their time working near the ocean, and are more strongly affected by winds. Our level of “vulnerability” to these risks is related to our exposure to climate hazards. Depending on the type of hazard, and In order to better understand the ways in which we are vulnerable, we will describe where, what, and how these hazards might affect us. We will also describe how these hazards might affect men and women differently.

SOURCES AND UNITS OF INDICATORS TO ASSESS EXPOSURE

Type of Hazard	Source of Data	Indicator of Sensitivity	Impact on Women
Sea-level rise	Identified by workshop participants - crosschecked by BPBD official data.	Those kelurahan located in low-lying coastal areas with number of cases of flood and tidal floods	Floods increase domestic burden for women, such as clearing their homes. Women traders in coastal communities also suffer when markets flood, because they cannot sell their goods.
High winds	Identified by workshop participants - crosschecked by BPBD official data.	Kelurahan with high number of cases of high winds	Among fisheries communities, women play important role on producing food from fish and selling fish in the market. During this season, men and women fishers lose their sources of income. markets flood, because they cannot sell their goods.
Increased temperatures	Existence of cases of drought - identified by workshop participants and confirmed by BBPD officials	Kelurahan which are prone to drought	Women responsible for collecting water for their family. During drought, they have to spend several hours each day to line up for free water, or allocating much of their income to buy clean water. This can
Unpredictable seasons and heavy rainfall	Workshop participants	Kelurahan with high number of cases of landslides during the rainy season	Flood and landslides increase domestic burden for women, such as clearing their house, or even loosing their homes. Flooded markets also prohibits women traders from selling their goods.

MAPPING EXPOSURE ACROSS THE CITY

Now that we've discussed the most frequent hazards, we can visualize how these hazards impact the city as a whole. To do this, we consolidate these indicators into one metric, which we call "exposure." We created this measure by creating a points system which adds the different kinds of climate hazard that occur in each neighborhood. Through this mechanism, we are able to show which neighborhoods area exposed to many different climate hazards.

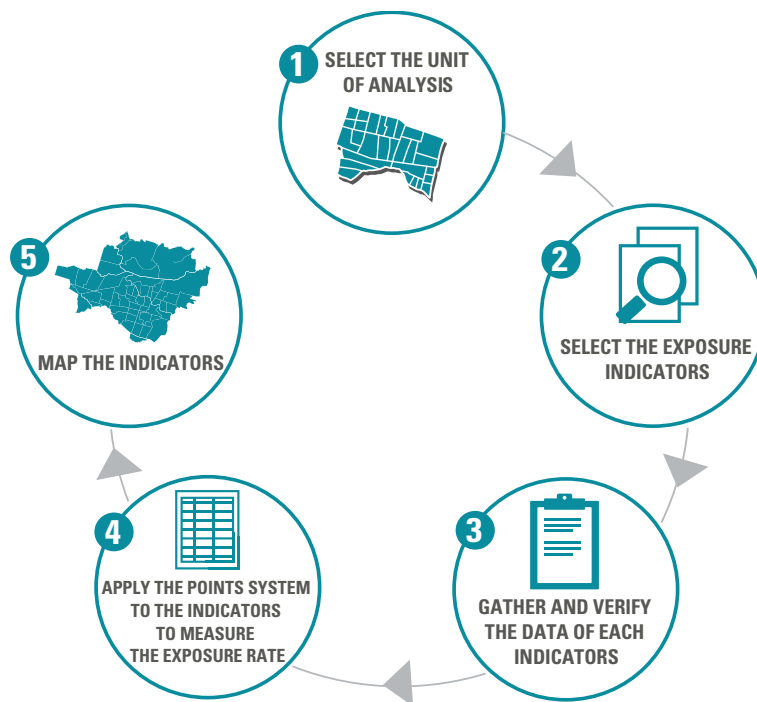
Different kinds of points system could possibly be applied. It depends on how detail do we want assessment to be and the most affecting factor, the availability of data. We have used 2 kinds of points system in the CCVA.

- 0 - 1 point system. Identify the existence of cases. If specific locations have the cases of climate hazards, we give score 1, while if there is no cases, we gave score 0. Applied if we doesn't have much data about number of cases.
- 0 - 3 point system. If we have specific data about the number of cases we can do more detail point system in which higher score reflected higher number of cases. This is relevant to distinguish location with high number of cases with those who only have small number of case.

The following table shows the example on how we do the scoring for Exposure (Kupang). Note that the weighting system was developed together with, and in agreement by, stakeholders.

Type of Hazard	Source of Data	Indicator of Sensitivity
Sea-level rise	Low-lying coastal areas; The number of cases of flooding and tidal floods using BPBD data, at the neighborhoods (kelurahan) level.	0 - Those neighborhood with no access to the coast and no cases of flooding 1 - Those located in coastal areas but with no cases 2 - Those areas located in coastal area with 1-10 cases 3 - Those located in coastal area with more than 10 cases.
High winds	Number of cases of high winds (tornadoes and coastal winds), using BPBD data.	0 - Kelurahan with no cases 1 - Kelurahan with 1-2 cases 2 - Kelurahan with 3-9 case 3 - Kelurahan with more than 9 cases in a year .
Increased temperatures	Existence of cases of drought - identified by workshop participants - crosschecked by BPBD official data.	1 - Kelurahan which exposed to increased temperature 3 - Kelurahan with cases of drought (Source: BPBD) .
Unpredictable seasons and heavy rainfall	Areas with ravines, and agricultural areas which have high number of cases of landslides during the rainy season .	Kelurahan with high number of cases of landslides during the rainy season

EXERCISE: USING THE INDICATORS TO CREATE A CITY MAP OF EXPOSURE



1 Select the unit of analysis

The unit of analysis is important to scope the range of our analysis. We recommend using the neighborhood (kelurahan) as your unit of analysis, since the data is generally available easily and it covers the entire extent of the city. While it is not very precise in terms of specific locations, it is available and demonstrates variation across the city.

2 Select the exposure indicators

For exposure, select the types of climate hazard that are most common in your city. To measure exposure, select a specific indicator for each type of hazard. For example: for high winds you can use the number of cases of tornadoes and coastal winds as indicators units, or for sea-level rise, you can simply indicate whether kelurahans are relocated in low-lying coastal areas (exposed to sea-level rise) or not. Select the indicators together with stakeholders during the City Context Workshop, and agree upon them with all the participants.

3 Gather and verify the data of each indicators

Data may already be available in publications created by the city government, or it can be gathered the City Context Workshop – participants have a wide range of knowledge of the city. Make sure you verify the data that you collect with stakeholders. If necessary you may have to collect official data following the City Context Workshop from the government [eg. Bappeda, BPS, Office of Women Empowerment or BPBD].

4 Apply the points system to the indicators to measure the exposure rate

To create the exposure map, you will need to create a points system for each indicator. Each kelurahan should be scored accordingly. You can use 0-1 point system, or a more advance scoring depending on the type of data available. After you have scored each kelurahan, sum the total scores, this becomes the cumulative exposure rate for each kelurahan.

5 Map the indicators

Once we have the total exposure score for each kelurahan, the next step will be to map them. We usually use Arc-GIS to make this map. All you need to make the map is the total score, and the GIS Shapefile of kelurahan boundaries, which you can get from BAPPEDA (City Planning Department). You just need to input the score into the attribute table of the GIS Shapefile, and the software will do the rest.

HOW DOES EXPOSURE TO HAZARDS AFFECT THE CITY

Climate hazards have a direct (primary) impact, as well as indirect (secondary) impacts. In general, primary impacts are physical, such as damage to ecosystems or to property and infrastructure. Because of these impacts they can lead to secondary impacts, where livelihood, health, and safety are affected.

The way that these hazards impact the city depends largely on the socio-economic context of the household or community, but also on what are called non-climate stressors, or things like the economy, ecosystems, the development of the city, and access to basic services. These will influence the degree to which places, people, or systems, are susceptible, or sensitive to climate hazards.

EXERCISE: UNDERSTANDING PRIMARY AND SECONDARY IMPACTS

Draw a table with three columns, the one on the left indicates the climate hazards experienced by the city. The second column refers to the short-term, or immediate, impacts of those hazards. These might be for example, physical damage to homes from flooding, or lost crops and income from a failed harvest due to drought. In the third column, entitled secondary impacts, list the medium- to long-term impacts of the hazard. For example, if the primary impact of flooding is damage to homes and assets, a secondary impact could be reduced income from businesses and poverty.

Climate change hazard	Bio-Physical Effects	Primary Impacts	Secondary Impacts
Sea-level rise	Flooding of coastal areas	<ul style="list-style-type: none"> • Destruction of coastal ecosystem such as mangroves • Abrasion and loss of coastal land • Damage to physical infrastructure and property of coastal communities 	<ul style="list-style-type: none"> • Economic disruption to settlements, port, tourism activities • Disruption to road system leading to economic losses. • Poverty
High winds	Damage to buildings and coastal infrastructure	<ul style="list-style-type: none"> • Damage to businesses and households leading to economic losses • Coastal communities lose homes. • Displacement of communities. • Decreased catch for fishermen 	<ul style="list-style-type: none"> • Impact upon fishing industry and local markets • Increase in cost of living
Unpredictable seasons and heavy rainfall	<ul style="list-style-type: none"> • Flooding of wells and septic tanks • Stagnant water no drainage • Contamination of water • Damage to crops 	<ul style="list-style-type: none"> • Illness from water and mosquito-borne disease • Damage to property and infrastructure • Heat strokes to elderly • Damage to crops • Decrease in local food supply • Decline in availability of water 	<ul style="list-style-type: none"> • Decline in yield of crops • Decline in local food supply and impact upon the poor • Decline of availability of water, increasing prices. • Economic disruption • Migration of newcomers from rural areas.

3.3. SENSITIVITY

Topics Covered:

- Sensitivity
- Sensitivity indicators
- How to map sensitivity

Sensitivity means “the degree to which different systems and sectors of the population are affected by climate related hazards” (IPCC 2007). Understanding sensitivity to climate change requires us to think not only about the geography of a place but also to consider its socio-economic context – the level of poverty, the unemployment, or the access to basic services. Such non-climate related factors can influence a city’s vulnerability. They make it more difficult for people to recover from a disaster, avoid it, or respond to it effectively, and this results in them being more vulnerable to its damaging effects. These characteristics vary widely across different neighborhoods, different administrative divisions, and local economies – this means that sensitivity to climate change can be very different depending on where you are in the city.

SOURCES AND UNITS OF INDICATORS TO ASSESS SENSITIVITY

Type of Sensitivity	Source of Data	Indicator of Sensitivity	Impact on Women
Poverty	BPS	Have high poverty rates	Poverty may cost lower level for food intake for women and children, which determines their health and well being. It may also lead them to life in hazard-prone areas, which increase women and children’s sensitivity since they spend more times in their homes than adult men.
Settlements in Coastal Areas	Identified by workshop participants - Crosschecked by BPBD maps	Settlements located along the coast	Floods destroy homes and markets, which increases women’s burdens to maintain their families’ “security of wellbeing,” or shelter and income.
Receive Migrants	Workshop	Receive high levels of migrants	Living in area experiencing overcrowding and lack of basic services may affect women in many ways, such as lower health level due to lack of basic services such as clean water. Migrants often live in hazard-prone areas since it is less expensive lead to relocating their families to be closer to sources.
Access to Water	BPS	Have limited access to water	Women are responsible person for water in the family. Lack of access of water means increased burden for women (for lining up for water), or impacting on their health (since budget reallocation for buying water)
Education	BPS	Have low level of education attainment	Women’s lower education level may affect their access to relevant information related to climate. It also affects their livelihoods, such as facing with constraints to entering labour force.

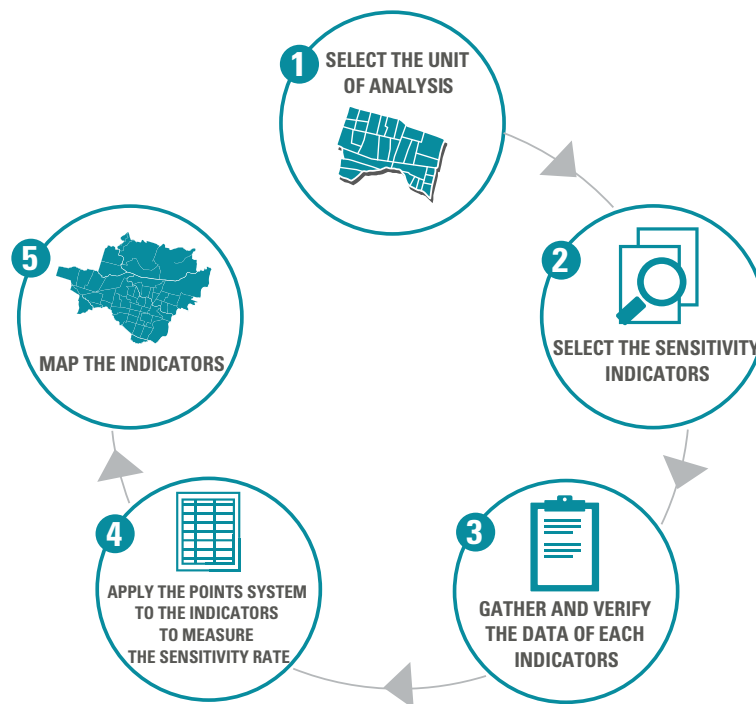
MAPPING EXPOSURE ACROSS THE CITY

In order to look at sensitivity as a whole we will condense these indicators in a map. Just as we did before, we add their values together to create a composite. Thus if a neighborhood has higher than average levels of poverty and also poor education, its sensitivity value is higher than for those with higher than average poverty alone. Through this mechanism, we are able to show which neighborhoods are most sensitive to climate hazards.

The following table gives an example how to score Sensitivity at the city scale (Kupang). Note that the weighting system was developed together with, and in agreement by, stakeholders.

Type of Sensitivity	Indicators	Indicator of Sensitivity
Poverty	Percentages of poverty rates	1 - Kelurahan with the percentage of poor people less than 27% (the city average), 2 - If 27% to 49% of the kelurahan is poor , 3 - If 49% to 71% of the kelurahan is poor.
Settlements in Coastal Areas	Settlements located along the coast	Using settlement maps from BPBD, 0 - Kelurahan which were not located in coastal areas, 1 - Kelurahan located in coastal area but there is no settlement, 2 - Kelurahan located in coastal areas and there is settlement along the coast.
Receive Migrants	Receive high levels of migrants	Using BPS data : 1 - If the kelurahan has migrants less than 5.8%, 2 - If migrants make up 5.8% to 22.5% of the population, 3 - If migrants make up 22.5% to 39% of the population.
Access to Water	Have low level of education attainment	Using data 'percentage of illiterate people' (by BPS), we scored: 1 - If they have percentage of illiterate people less than 3.6%, 2 - If they have percentage of illiterate people form 3.6% - 7%, 3 - If it is between 7% - 11%.

EXERCISE: USING THE INDICATORS TO CREATE A CITY MAP OF SENSITIVITY



1 Select the unit of analysis

The unit of analysis you should be using (from the previous exposure section) is the kelurahan level. This should be the same for all the indicators (sensitivity, adaptive capacity and vulnerability).

2 Select the sensitivity indicators

For sensitivity, the indicators should be the factors that make the impact of climate hazards greater. Such indicators could be: the poverty rate, the existence of settlements in coastal areas, the existence of settlements near rivers that flood, whether there is limited access to water, or other factors. Select which indicators to use together with

3 Gather and verify the data of each indicators

You can gather the data during the City Context Workshop, or if necessary gather official data from the government (for example from Bappeda, BPS, Office of Women Empowerment, or BPBD) depending on what indicators you have selected. Make sure to verify the information gathered during the next workshop.

4 Apply the points system to the indicators to measure the sensitivity rate

To create the sensitivity map, you will need to create a points system for each indicators (to quantify each kelurahan) in order to measure sensitivity. You can use 0-1 point system, or a more advance scoring system, depending on type of data available and level of precision you need. After you have the scored each kelurahan, sum the total scores which represent the exposure rate of each kelurahan.

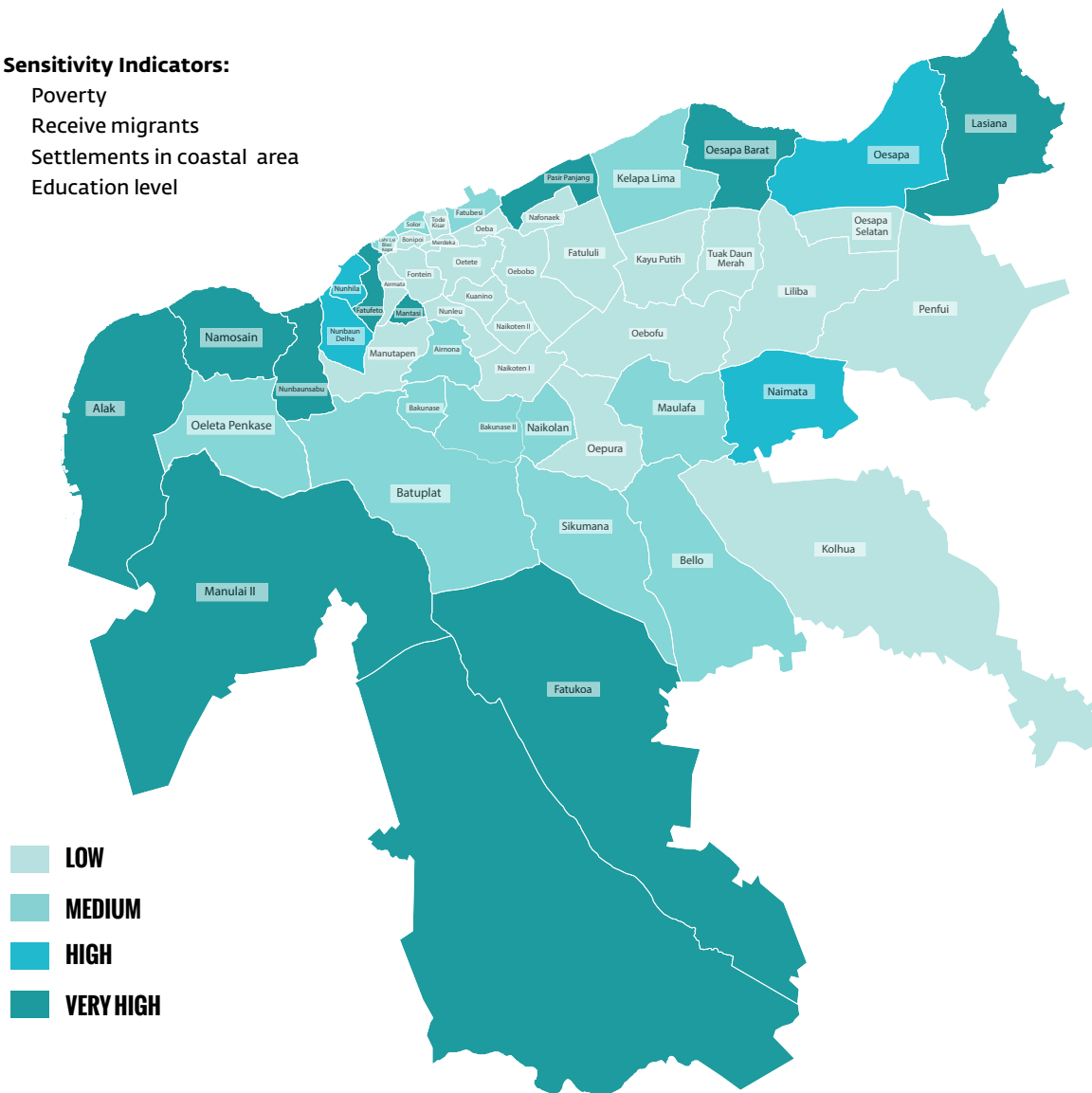
5 Map the indicators

Similar with the previous process for exposure, once you have the total sensitivity score for each kelurahan, the next step will be to map them. All you need to make the map is the total score, and the GIS Shapefile of kelurahan boundaries (you can get this from BAPPEDA (City Planning Department)). Input the score into the attribute table of the GIS Shapefile, and the software will do the rest.

CUMULATIVE SENSITIVITY MAP

4 Sensitivity Indicators:

- Poverty
- Receive migrants
- Settlements in coastal area
- Education level



From the consolidated map, demonstrating the 4 different indicators together, we see that the neighborhoods situated along the coast, and in the rural periphery are most sensitive to climate hazards.

3.4 ADAPTIVE CAPACITY

Topics Covered:

- Adaptive Capacity
- Existing institutional adaptive capacity mechanisms
- How to map adaptive capacity

Adaptive Capacity refers to “the ability of a system to adjust to climate change so as to moderate potential damage, take advantage of opportunities, or help cope with consequences” (IPCC 2007).

There are three different scales at which adaptive capacity exists:

- **Autonomous:** Autonomous adaptive capacity refers to actions taken at individual or households level to protect livelihoods and assets from potential climate related hazards. Autonomous adaptation is usually small scale and effective for low intensity disasters. Adaptation is triggered by ecological changes in natural systems and by market or welfare changes in human systems.
- **Collective:** Collective adaptive capacity refers to the capacity of or actions taken by groups. These are generally community initiatives aimed at reducing exposure or minimizing sensitivity, the efforts and benefits of which are sought after by a wider group than just individual households. Collective adaptation is geographically larger than autonomous adaptation and usually requires more resources and coordination.
- **Institutional:** Institutional adaptive capacity refers to the capacity of organizational systems. These might be programs, policies, regulations, human resources and technological expertise of government at the local, regional or national levels, as well as civil society groups.

We are most interested in the ways in which governments and civil society organizations can institute adaptive capacity to help build gender-responsive and participatory resilience strategies. Most adaptive capacity strategies at the institutional scale are policies, programs, and measures like enhanced coordination – they are not small-scale initiatives, such as household-level or community-level initiatives. Improving institutional capacity of governments and non-government organizations can spread wide benefits that build adaptation to climate change.

EXAMPLES OF EXISTING INSTITUTIONAL ADAPTIVE CAPACITY MECHANISMS

There are likely to be a number of existing adaptive capacity mechanisms in the city. These can indicate varying degrees of adaptive capacity because they are likely not to be evenly applied throughout the city.

- **Social welfare or safety net programs:** The government may already have social welfare programs in place that help to protect the poorest and most vulnerable citizens. Such policies indicate that the city government is aware of their social needs and has institutional mechanisms in place to provide support.
- **Safety regulations for hazardous areas:** To protect citizens from dangerous areas, such as landslides in settlements with ravines, city governments may have instituted policies to prevent building. These might include regulations, signage, barriers and even retaining walls. The existence of such measures demonstrates a proactive attitude and adaptive capacity – the government is aware and is responding to prevent further damage or casualties.
- **Local infrastructure investment programs:** Some city governments have instituted neighborhood-level development programs which encourage citizens to be involved in decisions about local infrastructure needs. Such policies demonstrate adaptive capacity because they allow citizens to resolve needs themselves, they are empowered to do so by neighborhood-level government resources from city government.

- **Neighborhood-level disaster preparedness committees:** In anticipation of natural disasters some neighborhoods have assembled and trained citizens to form disaster-preparedness committees. These citizens groups can prevent injuries, provide assistance to victims, and also guide people to evacuation routes. They are a very good example of institutional adaptive capacity, an example of which is the 'KelompokPengelolaSumberDaya'.
- **Early warning mechanisms:** Early warning mechanisms help provide advanced notice in the event of a natural disaster or climate event how to respond; for example how to prepare, or where evacuation routes are. Some local governments have implemented such mechanisms already, meaning that they have raised awareness and have established means of sharing information – both indicating institutional adaptive capacity.
- **Campaigns to raise awareness:** Public information campaigns to raise awareness are an important indicator of adaptive capacity – they demonstrate the degree to which a city or neighborhood-level government, or even a civil society organization, has prepared the community for natural disasters or climate hazards.
- **Existence of networked public infrastructure:** Networked public infrastructure allows public institution to distribute services across a large area, either through networks of pipes, supply lines, or even health centers and schools. It is important that there is not simply infrastructure, but also institutional and organizational resources to make the network work; for example, doctors and teachers who staff the health clinics and schools. Networked public infrastructure demonstrates adaptive capacity because it shows where the government operates; but the functioning of these networks varies across the city.

Examples of Institutional Adaptive Capacity in Indonesian Cities

Social Welfare programs that are targeted at supporting the poor can serve as safety nets in the event of climate disaster or the threat of climate hazards.

- RASKIN (an acronym for “BerasuntukKeluargaMiskin” or “Rice for the Poor”). RASKIN is a national program that distributes a food subsidy for the very poor. This program was started in 1998 following the economic crisis and provides each poor household around 20kg of rice every month.
- JAMKESMAS (an acronym for “JaminanKesehatanMasyarakat” or “guaranteed Health for Society”): JAMKESMAS is a national health insurance program

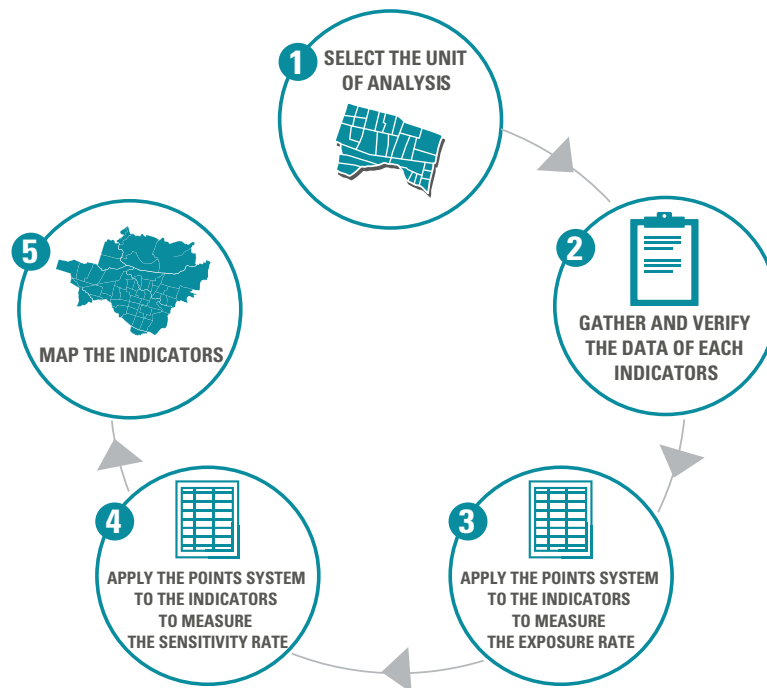
SOURCES AND UNITS OF INDICATORS TO ASSESS ADAPTIVE CAPACITY

Type of Adaptive Capacity	Indicators	Unit
Neighborhood-level disaster preparedness committee organizations	DKP - Identified by workshop participants	A presence of community organization
Local infrastructure investment programs	BPS / RPJMD / Bappeda	Good level of public spending
Early warning mechanisms	BPBD - Identified by workshop participants	The existence of an early warning mechanism
Early warning mechanisms	PLN (Electricity)	<ul style="list-style-type: none"> • High level of public services such as electricity, water, education • Average ratio of households to number of health centers or Puskesmas • Number of women group/ network such as Posyandu in each village

MAPPING ADAPTIVE CAPACITY ACROSS THE CITY

Type of Adaptive Capacity	Indicators	How we do the scoring
Neighborhood-level disaster preparedness committee organizations	A presence of community organization using DKP data	0 - Kelurahan with no groups present, 1 - Kelurahan which have a group.
Networked public services	Average ratio of households to number of health centers or Puskesmas	1 – Ratio 1 : 2.053 (city average), 2 – Ratio 1 : 2.053 to 1 : 10.775, 3 – Ratio 1 : 10.775 to 1 : 19.498.

EXERCISE: USING THE INDICATORS TO CREATE A CITY MAP OF ADAPTIVE CAPACITY



1 Select the unit of analysis

To select adaptive capacity indicators, identify the ways that government, or civil society organizations, may already be organized to reduce the impact of climate change. Such existing policies may range from having neighborhood-level disaster preparedness committees set up, or early warning mechanisms in place, or even networked public services like electricity, or health services. In order to ensure a participatory process select the indicators during the City Context workshop, and ensure that participants agree to them. Also make sure that the indicators that you choose are available.

2 Gather and verify the data of each indicators

You can either gather the data during the City Context Workshop, or through collecting it from government departments directly (for example from Bappeda, BPS, or BPBD). The data should also be verified. This is why we need the next step of data collection to gather official data from the government [could be from Bappeda, BPS, or BPBD, depends on the selected indicators] in purpose to cross check validity of the information gathered during the workshop. The data have to be available in the unit of analysis that we decided to use.

3 Apply the points system to the indicators to measure the exposure rate

To create the adaptive capacity map, you will need to create point system for each indicator on each kelurahan to measure the sensitivity rate. You can use the 0-1 (binary) point system, or a more advance scoring system, depending on type of data available or due to the opinion of stakeholders. After you have scored each kelurahan, sum up the total score to give you the exposure rate of each kelurahan.

4 Apply the points system to the indicators to measure the sensitivity rate

To create the sensitivity map, you will need to create a points system for each indicators (to quantify each kelurahan) in order to measure sensitivity. You can use 0-1 point system, or a more advance scoring system, depending on type of data available and level of precision you need. After you have the scored each kelurahan, sum the total scores which represent the exposure rate of each kelurahan.

5 Map the indicators

Similar with previous process with the Map of Exposure, once you have the total adaptive capacity score for each kelurahan, the next step is mapping. All you need to make the map is the total score, and the GIS Shapefile of the kelurahan boundaries, which you can access from BAPPEDA (the City Planning Department). Input the score into the attribute table of the GIS Shapefile, and the software will do the rest.

Adaptive Capacity Sources Specifically for Women

There are numbers of policies and regulations which directly or indirectly affect women's adaptive capacities in Indonesia. One important regulation is The Presidential Decree No 9/ 2000 on Gender Mainstreaming, which can be used as a basis for ensuring consideration of gender concerns in all development sectors. For disaster management, Law No 24 (2007, as a basis on disaster management in Indonesia, by recognizing and putting the rights of vulnerable groups in disaster preparedness and response). Also, Following this law, in more practical level, Peraturan Kepala BNPB No 13 (2014) integrates gender mainstreaming specifically into disaster management policy, including pre, during and after disaster service delivery and program implementation. It also requires sex-disaggregated data on disaster management to better target women's specific needs.

While the above sources represent more top-down, institutional adaptive capacities, smaller-scale community groups also play a valuable role for women's adaptive capacities towards climate change. Posyandu, a community-based health care, plays an important role in monitoring health status of the community. It has wide coverage which up to the lowest level of government structure. According to Badan Pemberdayaan Masyarakat Kota Kupang, there are 310 posyandu for babies and kids which spread over all villages in Kupang, or in average there are 3-4 posyandu in each village. There are also posyandu for elderly people, which accounted for 98 posyandu, or average 1-2 posyandu for elderly in each village. Because women are so active in Posyandu, they can play a strong role in the CCVA process and raising awareness among women at the community level.

In addition to strengthening existing top-down and community-based capacities, a final source is a community's "transforming capacity." Workshops can help communities reinterpret the roles of existing institutions and community groups to address urgent needs like water scarcity during prolonged draught. For example, Posyandu plays important role not only in the health sector but also in anticipating risk of climate-related disaster and resources. Re-envisioning the role of community groups, laws, and even social structures, is a critical part of adapting to climate change risks. Specific transformative capacities depend on the social dynamics, resources, and active organizations in a vulnerable community.





CHAPTER 4

VULNERABILITY

4.1 Thinking about vulnerability

4.2 Rapid Community-Based
Vulnerability Assessment (RBVCA)

4.3 Identifying Vulnerable Groups
of People

4.4 Vulnerable Systems: Critical
Systems at Risk

4.5 Mapping Vulnerability in the City:
a Quantitative Approach

Now that we understand how to gather our indicators: Exposure, Sensitivity, and Adaptive Capacity, we can discuss how these indicators measure vulnerability. In this chapter, we will cover the Rapid Community-Based Vulnerability Assessment (RCBVA), how to identify vulnerable people and systems, and quantify and communicate these groups and areas by mapping.

4.1 THINKING ABOUT VULNERABILITY

Vulnerability can be understood differently through a number of dimensions. So far, we have challenged you to think about urban climate challenges with gender-sensitivity and participation in mind. In this chapter, we want to push you to expand this framework to include a broader range of perspectives. Considering how women and men of all ages and backgrounds can help you target the most vulnerable people, better prioritize projects and interventions, and design more effective policies. To do so, we will consider vulnerability in terms of:

- What places are most vulnerable
- Who is most vulnerable
- What systems and natural resources are most vulnerable

Since there is not one correct way of identifying vulnerability we encourage an approach where both qualitative and quantitative methods are used. This will help build a well-rounded perspective and build a deeper understanding. There are a number of approaches that we encourage for teams: (i) the Rapid Community-Based Vulnerability Assessment (RBVCA) which examines specific communities in detail, (ii) creating a list of the most vulnerable groups of people, (iii) mapping and identifying the critical systems, which include both urban networked systems as well as ecosystems, and finally (iv) the quantitative city-scale analysis. All of these approaches are useful for assessing vulnerability in your city.

4.2 RAPID COMMUNITY-BASED VULNERABILITY ASSESSMENT (RBVCA)

To gain a more detailed understanding of the way that climate change can affect specific communities it is useful to conduct a Rapid Community-Based Vulnerability Assessment (RBVCA). While the previous analysis has been at the city-scale by focusing on the community scale (at the level of the *kelurahan* or RW) we can see how specific urban trends and climate hazards may affect people in their daily lives. The objective of the RCBVA is to identify how specific places and people are affected by climate hazards, and exactly how.



EXERCISE: CONDUCTING A RAPID COMMUNITY-BASED VULNERABILITY ASSESSMENT

Choose two to three different communities where the impact of the city's different climate hazards are particularly acute. For example, if the hazards the city is most exposed to are high winds, flooding and droughts, choose a neighborhood that might best represent each condition. One might be a hilly area (high winds), another along a river (flooding), and another a peri-urban area (droughts). The choice of community should relate to other similar areas of the city (thus they shouldn't be unique); this helps the reader of the CCVA relate the issues to the scale of the city.



1 Prepare fieldwork materials

For fieldwork the following materials are useful: a notebook, pen, camera, a city map, an aerial image of the community.

2 Visit the site

Visit the site during the day to observe how the community in action – what people do for a living, how they build their homes, what spaces they use. The site visit should last a few hours because you should walk around the whole area and learn as much as possible from interacting with residents.

3 Document the area

During the site visit document the area by taking photos of places of interest. Examples might be areas of risk, practices that are dangerous or unsustainable, and daily activities that characterize the community.

4 Interview residents

The most important way to learn about a community is through its residents. During the site visit interview as many people as possible, and seek diverse perspectives. Make sure subjects are chosen taking gender balance, as well as other socioeconomic factors, into consideration. Your questions can focus on understanding more about how residents face physical vulnerability, adapt to hazards, and the changing context of the environment. Work with gender experts to ensure gender questions are asked sensitively and effectively.

5 Conduct a focus group discussion

Focus group discussions are similar to interviews, but they bring together groups of people. To conduct a focus group discussion you will need to arrange a venue (perhaps a community center or a public space) where people can gather. Explain the objective of the activity and ask questions clearly, involving as many participants as possible.

The RCBVA can be summarized in a short report, this should demonstrate where it is located in the city, the climate hazards that threaten it, as well as some information about the workings of the community. The findings from this report should help give more detailed understanding to exactly how different communities are affected by hazards, which groups within those communities are most vulnerable, and also provide ideas as to how to increase resilience.

Case Study: An Assessment of Two Neighborhoods in Kupang

To identify how certain areas become vulnerable we looked at two different neighborhood typologies that are exposed to some of the most common hazards: drought, sea-level rise, heavy rains. The neighborhoods that were studied in more depth were selected by the City Context workshop participants, they used the following criteria:

- Neighborhoods experienced climate hazards on a regular basis
- Neighborhoods were particularly sensitive; they had higher than average poverty levels, received migrants, and were challenged in accessing basic services.
- Neighborhoods were representative of other areas in the city; allowing lessons learned from them to be applied more generally.

The neighborhood assessment visited micro-regions, or specific areas within neighborhoods, that are vulnerable to climate hazards. The unit of a neighborhood, or *kelurahan*, is actually too big to use, so we focused on those places within them can be very dangerous, or concentrate poverty.

Oesapa

Oesapa is like many communities along the coastline; originally there were mangroves that protected the coastline from waves and wind, serving as a natural barrier. Perhaps at this time there were small-scale farmers living there, but in the past the coastline was much less intensively used.

With the growth of the city, many people move to the coastline to benefit from the fishing industry. They can either be fishermen, those that sell fish like traders, or those that buy fish. With this growth you find more houses, more shops, and communities have cut down some of the mangroves to open access to the sea. The coastal area evolves to be a hub of economic activity where different income groups are making use of the area.

Further urban growth results in even more intense usage of the coastline. The mangroves have been cleared completely to create more access to the sea, and the community has had to create its own barrier, a sea-wall. But the sea-wall is unable to defend the power of waves, and this has been destroyed.

From this sequence we see that the coastal areas along Oesapa have changed a lot over the last 20 years.



Bello

Bello is located in the hilly area of the city on its rapidly growing periphery. As more people move to Kupang more people will be moving to places like this because there is still land available and it is relatively close to markets and connected by roads. What is interesting is that you have agricultural areas, and also ravines, both have different vulnerability issues.

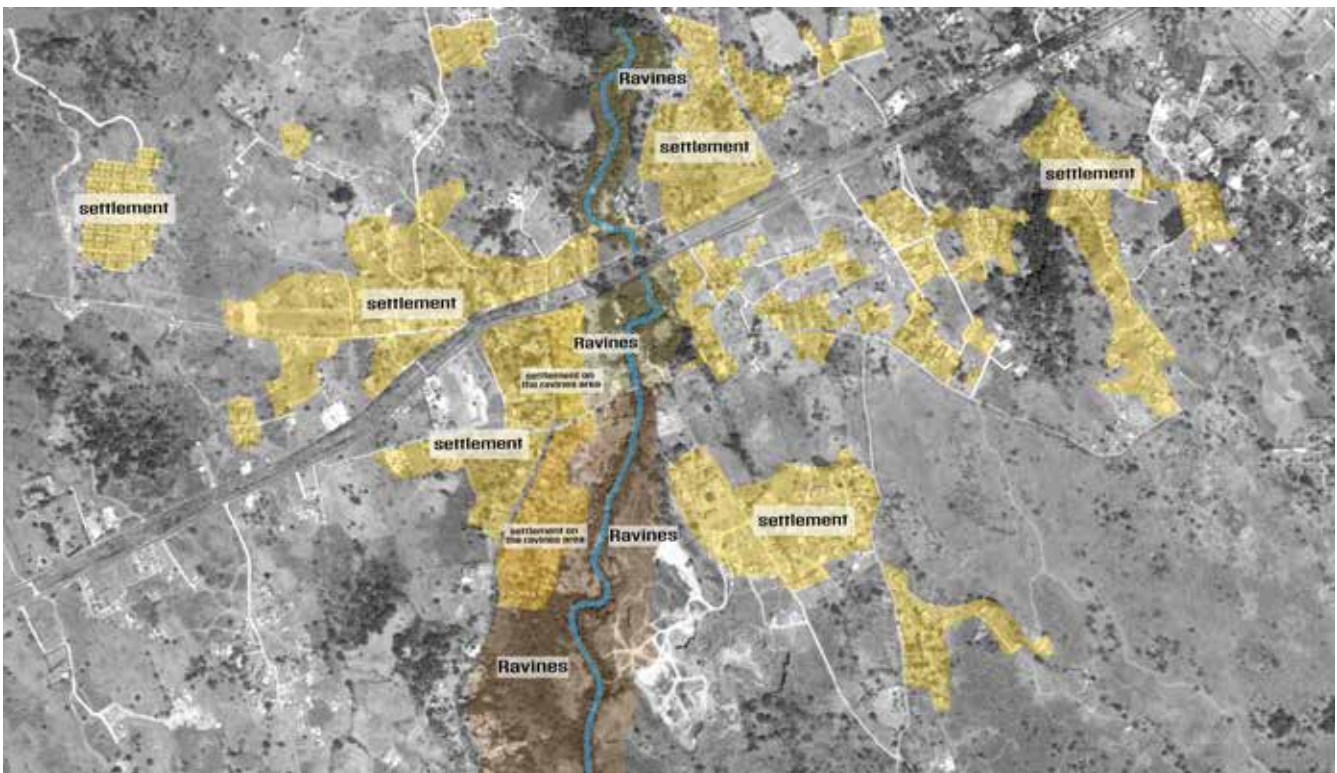
As the city grew roads and housing started to surround the ravines, people might have used the river to gain access to water. Poor people moved there because the land was not occupied, but it was close enough to jobs.

As people move to the ravines they clear the trees and build homes by themselves. They may also be places where trash is dumped. When trees are cut down the likeliness of landslides increases. With further urban growth and development these areas become more and more dangerous.

There are also large parts of Belo that are undeveloped. They may be still farms or forested wild areas. In these areas droughts and high winds are a concern; they particularly affect more rural areas on the edges of the city, such as the hilly areas to the south.

The peri-urban areas of Belo about 20-30 years ago was largely unpopulated, covered with trees that help absorb rain and contribute to absorption of rain into the river system. As people start moving to the city development pushes outward, areas like this may have farms and some housing. To make way for these activities trees are cut down, roads are built and people move there.

When the city really starts to grow development continues to expand the city outward. Land markets make the peri-urban area locations for big housing development projects or shopping areas. There is a lot of change to the natural systems, trees are cut down and often the rivers are straightened to prevent flooding. This may reduce protection from wind erosion, and cause additional sedimentation of rivers downstream, which contributes to flooding of the city.



4.3 IDENTIFYING VULNERABLE GROUPS OF PEOPLE

Throughout the city groups of people experience climate change and vulnerability in a variety of ways. We've discussed some of the ways climate change and urbanization affect women differently than men. We will now think about other kinds of differences more generally, considering how, age, health, jobs, education and access to services affect people's vulnerability. For example, older people for example suffer much more than younger people from extreme heat. Very young children are vulnerable to flooding because they may not have a way to escape.

Case Study: Vulnerable Groups in Kupang

In Kupang we came across a number of groups of people who are particularly vulnerable to climate change impacts. We've created a composite of these groups and a narrative that can communicate the problem that they face. These four people are not actually real individuals, but their stories are derived from those of real people that we met; they come from areas of high exposure, high sensitivity, and that have already experienced some disasters. The narratives can help demonstrate how climate change affects men and women, and the ways they struggle to reduce vulnerability. They provide context to our discussions and help us understand different perspectives of real people.

EXERCISE: IDENTIFYING WHICH GROUPS ARE MOST VULNERABLE TO CLIMATE CHANGE AND WHY?

Identifying the most vulnerable groups of people in the city to climate change requires matching an understanding of the ways that climate hazards impact communities, economies and households, together with an understanding of the changing environment that climate change, and urbanization, will bring with them.

The identification of vulnerable groups is not a scientific process. It requires that the CCVA team carefully considers the priority climate hazards, and the primary and secondary impacts that they cause (see previous exercise). Then they should review the following lists, considering exactly which groups, or types of people, are most affected by the priority climate hazards.

Economic sectors that are climate sensitive	Urban trends (those made vulnerable)	Commonly marginalized groups
Agriculture (farmers) Fishing (fishermen, families of fishermen)	High migration (poor migrants) Unemployment (urban poor, informal sector workers) Re-development (displaced communities, urban poor)	Urban poor Women Informal traders Children Elderly

This exercise can lead to the identification of a list of groups of people who are most vulnerable to climate change. This list can help add depth to discussions about developing targeted interventions and policies to reduce vulnerability.

4.4 VULNERABLE SYSTEMS: CRITICAL SYSTEMS AT RISK

Vulnerability can also be thought of on a much larger scale, in terms of urban systems, that ensure cities function. Urban systems can be networked services that cover large areas of the city, or even the entire city, like the road system, the drainage or water supply network. They provide essential services for many citizens, like clean water delivery system or the drainage canal system. But if these systems are damaged or fail, they can cause widespread problems for large numbers of the population – that is why they are critical for the city’s population. These systems can be vulnerable to climate hazards.

But critical systems don’t have to be made of infrastructure, they can be natural systems, or ecosystems, too. Ecosystems also provide essential services for the city, even though they may not require as much maintenance. For example, mangroves protect the coastline from abrasion by strong waves, and forested areas of the watershed help provide drinking water. Natural ecosystems are also at risk, both from urbanization and climate change. For example, urbanization may mean that coastal areas are being developed for commercial purposes and mangroves are being destroyed and replaced by housing. Or climate change may cause rivers and water sources to dry up if there are long periods of droughts. Without these ecosystems life in the city would be made much more difficult.

Examples of Critical Systems in Kupang

Water Supply

Perhaps the most critical network for the city is the water supply network. This network is threatened by increasing demand for water from the city’s growing population, and a difficulty to increase supply. Since it is rare that households can access water from their own private, their community’s public, wells, they are forced to rely on the PDAM system or water vendors. Water can be expensive, so buying water from vendors is most exclusionary for the poor. Because women are often tasked with water collection, they often have the biggest burden to provide water for their family. This reduces the time, money, and ability they have to seize other opportunities.

Coastal Defense System

The coastal defense system protects the city from abrasion and flooding. This is not really a single man-made system, because in the past it was partly made up of mangroves. But as the more and more development moves to the coastline, and sea-level rise continues, some structures (man-made or natural) will be needed to protect the coastline.

The Road Network

The road system is the network of roads that connects different parts of the city together and also connects the city to rural areas, to the airport, port, and the national highways. The road network is critical because so many things rely on it, for example medical services, evacuation from a disaster, even the delivery of water supply. If certain roads are damaged, or cut off, then they can cause other problems.

EXERCISE: IDENTIFYING CRITICAL SYSTEMS THAT ARE AT RISK

Identifying critical systems at risk in the city requires blending an understanding of the climate hazards that threaten the city with an understanding of the critical urban systems that make it work. Speculating on ways in which these might interact during a disaster or extreme climate event will allow us to identify the critical systems and how they are at risk.

1. What ways is climate change affecting the city?
2. How does climate change affect women differently than men in your city specifically?
3. What are the city's urban systems, both man-made infrastructure and ecosystems?
4. Which urban systems are most likely to be affected by extreme climate events? Think of how systems failures can be caused and which would be most serious.
5. Describe if there any bottlenecks or 'chokepoints' that would have wide reaching impacts upon the rest of the city.
6. Make a list of the top five critical systems and describe the ways that they would be affected.
7. Create a map to identify where the failure of critical systems would have the greatest impact.



4.5. MAPPING VULNERABILITY IN THE CITY: A QUANTITATIVE APPROACH

Having reflected upon the different ways of thinking about vulnerability we can also use the indicators to show us where vulnerability is concentrated. This we are calling our quantitative approach. We are using the unit of the neighborhood, so this is not a very precise measure in terms of specific locations, but it does help in terms of understanding how vulnerability can be distributed across the basic administrative unit, the kelurahan. This unit may be helpful in indicating ways for vulnerability to be reduced through the city's planning and policymaking mechanisms, which act through this administrative unit.

We use the standard definition used by the Ministry of the Environment and the UN, which states:

$$\text{VULNERABILITY} = \frac{\text{EXPOSURE} + \text{SENSITIVITY}}{\text{ADAPTIVE CAPACITY}}$$

What is important to reflect upon is that evaluating vulnerability does not simply mean identifying the areas most exposed or with highest sensitivity. Because the formula divides these by adaptive capacity, it is important to understand where the city government currently has extended services, or has institutional capacity, to respond to climate hazards and disasters. For example areas with good roads, services, and medical facilities have high adaptive capacity, whereas those areas that are remote often have low adaptive capacity.

EXERCISE: IDENTIFYING CRITICAL SYSTEMS THAT ARE AT RISK

1. Sum up the cumulative scores using the Vulnerability Formula

From the previous exercise, we already have total score for Exposure, Sensitivity, and Adaptive Capacity. We will use these scores to measure vulnerability rates using this simple formula

“Vulnerability = [Exposure x Sensitivity] / Adaptive Capacity”.

2. Create the map

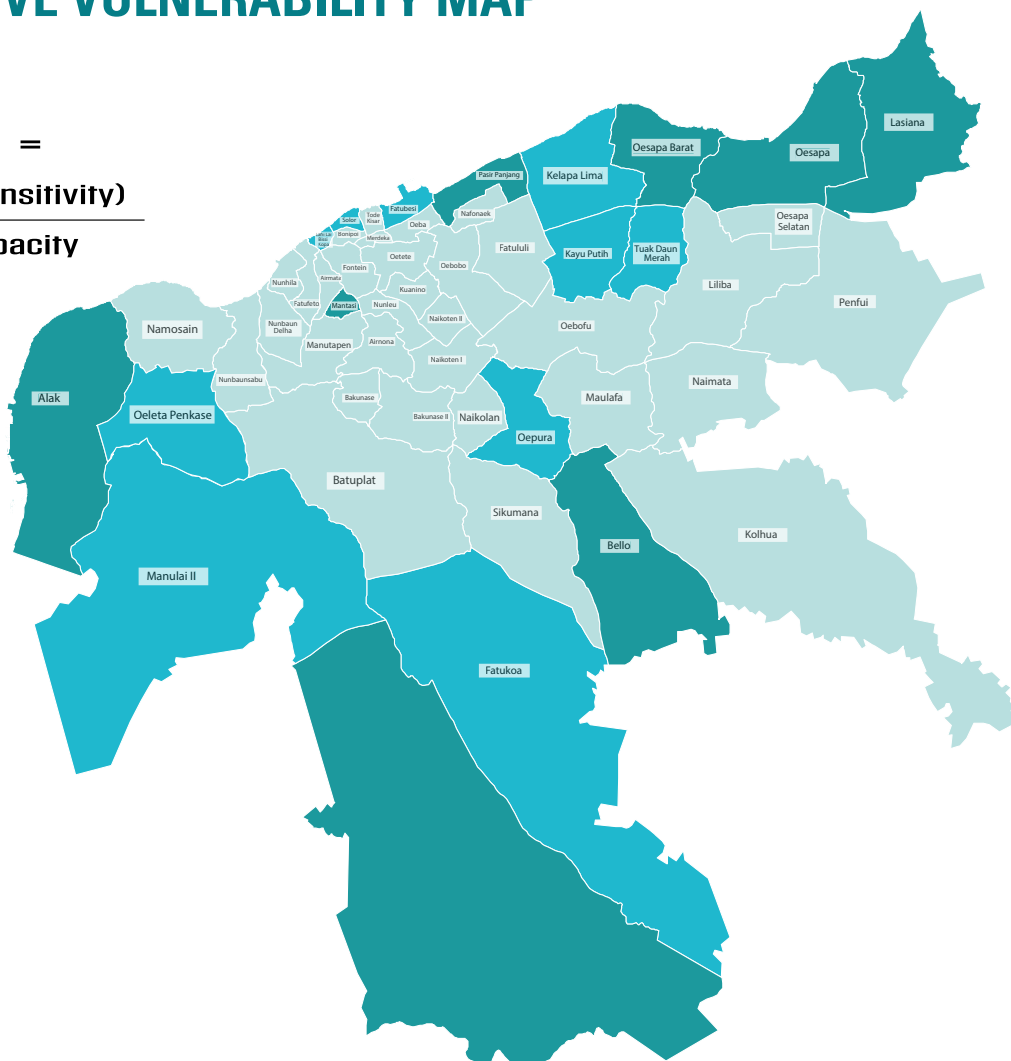
After you have the score, you can re-open your map in Arc-GIS and input the scores into the attribute table of the GIS Shapefile. You can classify the vulnerability rates into 3-4 classes to demonstrate the following categories: very low, low, high and very high.

3. Interpret the Vulnerability Map

The most important thing once your map is complete is to interpret it. As yourself ‘why do some kelurahans have such high rates of vulnerability, while others are low?’. Understanding this map, will allow you to better understand the needs for government intervention, which parts of the city need most targeted interventions and policy support, and which people are most at risk. The map can help the government target actions that increase resiliency and also monitor progress of their efforts to do so.

CUMULATIVE VULNERABILITY MAP

$$\text{Vulnerability} = \frac{(\text{Exposure} \times \text{Sensitivity})}{\text{Adaptive Capacity}}$$





CHAPTER 5

RECOMMENDATIONS

5.1 Developing a set of recommendations

5.2 Consolidating the CCVA report

5.3 Next Steps: Urban Risk
Management Plan

The previous steps of the CCVA process will have generated a lot of interesting results and conclusions that have helped identify the most vulnerable places, people and systems in your city. Now that stakeholders can better understand these issues it is time to think about ways to respond. The final step in the CCVA process focuses on developing a set of recommendations that orient the city's efforts to build resilience and reduce vulnerability to climate change.

5.1 DEVELOPING A SET OF RECOMMENDATIONS

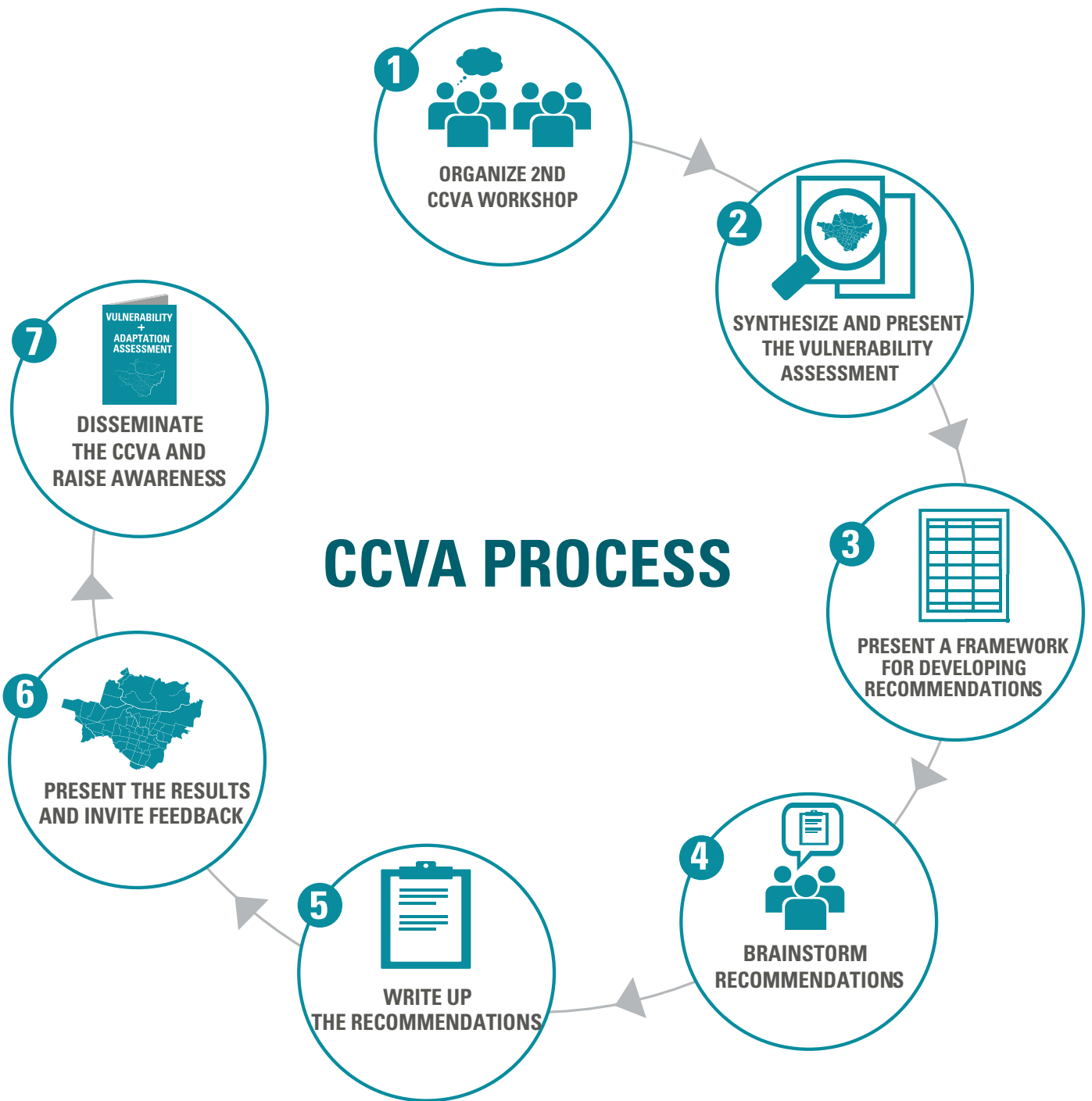
The process of developing recommendations should be participatory and gender inclusive. All the stakeholders involved in the City Context and the 1st CCVA Workshops should be invited to a final workshop in which the results and conclusions of the analysis will be presented, and discussion will be facilitated to develop the recommendations. The outcome of this final session should be a set of priority actions that will be carried forward into a planning exercise to create, what UNDP has given the term, the Urban Risk Management Plan (URMP); others have called it a City Resilience Strategy. Basically, this document will structure the recommendations into a strategic plan so that it can be used to support implementation.

Recommendations should cover a number of different sectors including infrastructure projects, regulations, social policies, institutional coordination, raising social awareness and even leadership. Focusing only on projects or disaster preparedness excludes many other important actions that must be taken to increase resilience. The final list of recommendations should be presented in a way that is easy to understand and present to decision-makers. It will be integrated into the final chapter of the CCVA document.

EXERCISE: BRAINSTORMING RECOMMENDATIONS WITH STAKEHOLDERS

During the 2nd CCVA Workshop, or the concluding workshop of the CCVA process, invite stakeholders to discuss the results of the CCVA analysis and brainstorm a set of recommendations. In order to guide the discussion we suggest splitting the workshop participants in three working groups under the following themes – Regulations and Communications (this will cover necessary regulations as well a how to raise awareness); Capacity and Monitoring (this will involve capacity building of government officials and civil society institutions, as well as monitoring progress towards resilience goals); and finally Policies and Projects (this includes any necessary policies, programs and projects).

Recommendations should consider both short-term and longer-term needs; these will be organized in the following URMP workshop, but all considerations should be noted here first. This session of the workshop should last about 1hr 30 mins to 2 hours, as each group will discuss internally and then present to the other groups. The process can be as follows:



1. Organize the 2nd CCVA Workshop

Convene the same participants as the previous two workshops, to a one-day workshop. The objective of the final CCVA workshop will be to present stakeholders the city profile, analysis and conclusions will be presented, and recommendations for the City Government will developed by those present.

2. Synthesize and present the vulnerability assessment

The workshop should start by presenting a concise version of the city profile and vulnerability assessment analysis, explaining the methods and the results (the presentation should not be more than 30-45 minutes. Explain what you have learned through the process about vulnerability and urbanization and the implications for the future (if no action is taken).

3. Present a framework for developing recommendations

To ensure that the recommendations cover a range of important areas we suggest that the participants should work in groups. Here are possible groupings that recommendations can be discussed under: Group 1 - Regulations and Communications; Group 2 - Capacity and Monitoring; and Group 3 - Policies and Projects. If other groupings work better for you feel free to experiment.

4. Brainstorm recommendations

Divide the workshop participants into separate groups; each group should have a facilitator to guide and the orient discussion. The facilitator should encourage thoughtful reflection and proactive responses to climate hazards and social vulnerability. At the end of the session the groups should present their ideas to the other groups in order to solicit feedback and improve their initial ideas.

5. Write up the recommendations

Recommendations should be written up clearly. There should be also mention of what tasks correspond to which institutions. This helps to ensure that needed actions feasibly have a responsible party to take them forward.

6. Present the results and invite feedback

Once the recommendations are complete circulate them to the stakeholders for comments and inputs in order to verify them one last time.

7. Disseminate the CCVA and raise awareness

When the CCVA is complete disseminate it to a broad array of stakeholders in the city. This will help to build understanding and support for further policies and actions.

5.2 CONSOLIDATING THE CCVA REPORT

CCVA document cannot simply remain as a report it should be consolidated into a readable and accessible document and disseminated. By circulating the document to different kinds of institutions, officials, and individuals, more people will be able to understand the impact of climate change on the city. Growing awareness can help to influence policies, plans, regulations and ultimately the lives of the city and its inhabitants. The possibility of disseminating the report depends upon whether the CCVA is consolidated well, and whether there are follow-up actions to promote its use and circulation.

Consolidating the CCVA report is an important final step to bring together the analysis and recommendations together into one document.

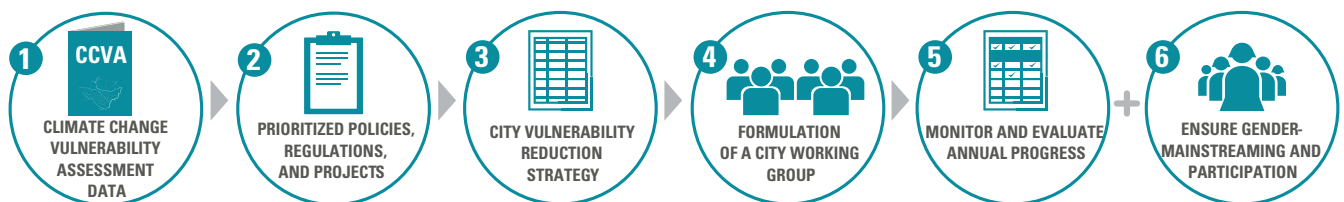
5.3 NEXT STEPS: URBAN RISK MANAGEMENT PLAN

Following the completion of the Climate Change Vulnerability Assessment, the next step that follows is the creation of the Urban Risk Management Plan (URMP). The URMP takes the analysis and recommendations and turns them into policies, regulations and projects that will be prioritized to create a city vulnerability reduction strategy. This document will be the framework of action for the city to implement program and activities to reduce vulnerability to climate change. This will help the city to state a clear vision and strategies on vulnerability reduction, followed by set of targeted program and activities. The URMP will also lead to the formulation of City Working Group which then will be the responsible parties to coordinate and synergize the implementation of program and activities, as well as monitor and evaluate the annual progress.

- Dissemination of the CCVA document
- Creation of a Working Group
- Organization of the URMP workshop

This manual has helped users better understand ways of thinking, organizing, and visualizing how climate change makes people- specifically women and marginalized communities- vulnerable. The exercises are designed to help users design workshops which provide critical, scalable, and specific information about vulnerability. They are also designed to link urban and climate change hazards to issues of gender and participation. Understanding these links is critical to successful planning results. Too often are these concepts discussed without mechanisms for implementing a gender mainstreaming and participatory approach. Hopefully this manual has illustrated ways to link gender to the workshop, data collection, and mapping process.

The next step is to develop an Urban Risk Management Plan (URMP). The next manual will explain how the URMP is developed. In short, the URMP uses the data from the Climate Change Vulnerability Assessment and turns them into policies, regulations, and projects that will be prioritized to create a city vulnerability reduction strategy. This document will be the framework of action for the city to implement program and activities to reduce vulnerability to climate-targeted programs and activities. The URMP will also lead to the formulation of a City Working Group which will be responsible for implementing policies and activities. The City Working Group will also monitor and evaluate annual progress, and ensure that gender-mainstreaming and participation is prioritized.





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