Coastal Women's Resilience Strategy against Climate Change Vulnerability in Makassar, Indonesia

Ihyani Malik^{1*}, Abdillah¹, Zaldi Rusnaedy², and Nur Khaerah¹

¹Faculty of Social & Political Sciences, Universitas Muhammadiyah Makassar, Indonesia

²Faculty of Social & Political Sciences, Universitas Pancasakti Makassar, Indonesia

Abstract. The city's resilience capacity needs to be carried out to support a broader, planned, and integrated development process. Therefore, the purpose of this paper is to obtain the actual condition of the vulnerability of coastal women in facing climate change in the city of Makassar, which includes aspects of individual capacity and organizational capacity, as well as systems in the city of Makassar. To find the ideal strategy to manage the vulnerability of coastal women to disasters and climate change in the city of Makassar. The research method uses a qualitative-exploratory method with a phenomenological approach. The data sources used are primary and secondary data. Data collection techniques through field studies and literature studies. The data analysis technique used is an interactive model. The results of the study show that women's vulnerability in coastal areas is caused in addition by erratic rainfall as well as policy gaps related to women concerning climate change in the city of Makassar and the government's commitment to ensuring the protection of women's rights through a half-hearted urban climate policy. Furthermore, the ideal strategy in ecosystem-based adaptive governance is to manage the vulnerability of coastal women.

1 Introduction

Indonesia's development continues, and the capacity to develop urban resilience at the local government level is limited. Most development interventions are not designed for environmental change but require people to adapt to development [1]. The adaptation of cities needs to be improved by identifying development needs and allocating resources to improve the ability of the government to adapt to changes to support a broader comprehensive development process [2,3].. Urban resilience needs to be developed so that government programs or policies that are vulnerable to climate change can be successful. In a study by Moder [4], it is stated that currently, the world is facing important serious problems, including that global climate change is the biggest problem and challenge today. It is estimated that during this century, problems such as rising temperatures, rising sea levels, and thousands of coastal wetlands have been permanently flooded by salt water, and floods and droughts have occurred at catastrophic levels with consequences for every sector, sector, and class.

* Corresponding author: ihyani@unismuh.ac.id

Aylett's findings [5], show that the ability of local governments to mainstream climate change into cities is very low. This is in line with Cahyandi's findings [6], As far as regions such as Semarang City are concerned. However, they are coordinated by the Regional Development Planning Agency, they do not fully understand the implementation of climate change plans by all existing Local Governments' agencies. On the other hand, the impacts of climate change occur in several sectors. This situation requires the development of the adaptive capacity to accelerate the implementation of climate change adaptation programs which are an integral part of national and regional development policies, including in the city of Makassar. This study tries to build a model that combines two concepts: the capacity building model and adaptive governance. The adaptive capacity development model is the development of local government capacity that moves stakeholders to work together to achieve the objectives of the government's policy plan by optimizing the best resources and technology to overcome the impacts of climate change that affect vulnerable social groups such as coastal women [2,7–9]. Adaptive capacity development is related to strategies for achieving outputs, results, and feedback to determine inputs and improvement processes in the next stage [10–12]. So, according to the authors, it is important to have an adaptive governance model for coastal women as a social group vulnerable to climate change. So that in the future, it can improve women's lives in coastal areas, especially in Makassar City.

Makassar is one of the areas in Indonesia that is very prone to disasters such as floods. One reason is the rapid development of Makassar, with various buildings setting aside absorption space for water. This makes Makassar always subscribe to the Flood as Duit [13], stated that the complexity of the problem is mostly a reality where climate change does not occur linearly with the handling and conditions in a city easily predictable.

For 2018, it is recorded that Makassar has been submerged in floods for less than a week. This is just the beginning of the rainy season, yet to reach the peak of the rainy season, which is likely to have a major impact on Makassar. Climate change will have different impacts in each region, generation, class of society, occupation, age, gender, and income. The adaptation strategy applied will be different for each region because the profile, characteristics, and physical, social, environmental, and economic conditions, are also different. The majority of marginalized groups (such as coastal women, children, indigenous peoples, farmers, and fishers) are more vulnerable than other community groups. Research from the London School of Economists also stated that female victims were recorded to be higher in every disaster in every disaster than male victims. This is related to differences in the economic and social rights of women. Based on these facts, it is important to consider the concept of gender equality in formulating efforts to adapt to climate change in the city of Makassar.

In adaptive capacity in looking at the vulnerability of women in coastal areas, the authors adopt the concept proposed by Greenhill [14], related to adaptation interventions for the women's security sector to the impacts of climate change as a theoretical basis to distinguish the phenomenon of women's vulnerability in coastal areas in Makassar city, at the end of the discussion there is an adaptive governance strategy that can be recommended in this study to deal with the problem of women's vulnerability in coastal areas. As explained below:

Table 1. Categories of adaptive interventions in response to the effects of climate change

Adaptive Intervention Category	
Institutions and Management	Interventions, particularly on public agencies, address governance mechanisms, laws, regulations, policies, and public and investment management frameworks and incentives, including planning, development, and

	management of aquaculture.
Livelihood adaptation	Interventions, mostly in the private sector, including a mix of public and private activities, within or between sectors, most commonly through diversification strategies within or outside the sector to reduce vulnerability.
Resilience and risk reduction	Interventions include a mix of public and private activities to promote early warning and information systems, enhance risk reduction (prevention and preparedness) and improve response to shocks.

Source: *Researchers from Greenhill, 2020: 135*[14]

2 Research Method

This study uses qualitative-exploratory research with a phenomenological approach, an approach in a study used to describe and understand the meaning that is considered several individuals or groups of people who come from social and humanitarian problems [15]. This study focuses on adaptive capacity in looking at the vulnerability of women in coastal areas in the city of Makassar by referring to the category concept proposed by Greenhill [14], related to adaptation interventions for the women's security sector to the impacts of climate change. The data source is an object, thing, or person and a place that can be used as a writing reference to collect the desired data according to the problem and research focus. This study's other data sources are laws and regulations, literature, notes, documents, and articles [16]. Data analysis techniques in this study used three data analysis models, namely: (1) Reduction; (2) Display Data; and (3) Conclusion drawing/verification.

3 Results and Discussion

3.1 Category of Resilience and Risk Reduction of Coastal Women

On institutional/institutional adaptation capacity aims to support governments and non-governmental organizations in climate change adaptation in resilience and risk reduction goals. Makassar City has many government agencies directly or indirectly involved in climate change adaptation/disaster risk reduction programs. The main agencies identified in this study are Development Planning Agency at Sub-National Level, Regional Disaster Management Authority, Public Works Agency, Regional Environmental Agency, Municipal Waterworks, and Marine and Fisheries Service [17]. In addition, several non-governmental organizations are developing plans to adapt to climate change, often bridging the gap between the environment and the government in resilience and risk reduction efforts in Makassar City, including the impact on vulnerable social groups of coastal women in Makassar City.

A study conducted by the Women's Solidarity (SP) Anging Mammiri Makassar on the coast of Makassar City, South Sulawesi, shows that many factors cause this vulnerability and how government policies actually worsen the existing condition [18].

“We from SP Anging Mammiri since 2016 have started to conduct an assessment of climate change policies in Makassar City. Why do we see that, because urban areas, especially the coast, are areas that are very vulnerable to the impacts of climate change”
“This will only make it worse when climate change occurs, the impact will be very layered for women. Fisher women must think and work harder to ensure the sustainability of their food and family life. This cannot be separated from gender roles

that are still socially attached to women.”

According to Nur Asiah [18], the coastal area is an area managed by women fishermen in obtaining food sources for the people of Makassar City and their families. The loss of women's management space has forced some women fishermen to stop fishing. While some still choose to go to sea, have a higher level of vulnerability due to extreme weather and the lack of facilities owned by women. Another thing about the impact of climate change that has occurred in the city of Makassar, such as flooding mostly has an impact on people living along the coast, rivers and canals, as well as low-lying areas that have poor drainage. Most of the new housing is located on agricultural conversion land in suburban areas and coastal stockpiles that are flooded. So that it is necessary to review the urban system in the city of Makassar in dealing with the impacts of climate change.

An *urban system* is a service network that spans the entire city and provides services to many residents, including women along the city's coast, examples of clean water distribution systems or drainage systems. The system is also vulnerable to climate hazards. If these protective and sustainable systems collapse or are in danger, this can cause widespread problems. The study identified the most vulnerable systems based on exposure and sensitivity, as it outlines the nature of these systems for selecting the normal operation of urban activities [17].

Table 2. Adaptive Governance System in Facing the Impact of Climate Change Risk in Makassar City

No.	Types of City Management System	Information
1	Bili-Bili Reservoir System	The Bili-Bili reservoir system is very important because it helps prevent flooding of the wide watershed area of the Jeneberang River. However, the reservoir's capacity has been greatly reduced due to the landslide that has buried it. This means that the capacity of the reservoir to absorb water during heavy rains has been disrupted. Moreover, this reservoir is cut off or broken, then the flow of dissolved water will cause widespread flooding in the city and cause damage to many residences in the area below [19].
2	Urban Clean Water Supply Network	The most important service network in a city is probably the clean water supply network. The increasing water demand threatens this network as the urban population grows, but it is not easy to keep up with the increase in supply. The urban clean water system relies heavily on water supply from surrounding sub-districts such as Gowa and Maros. But urbanization and lack of proper management of clean water sources put these sources at-risk – water systems also require additional grids to meet increasing demand and regular maintenance [19].
3	Beach Protection from Abrasion	There is a wide range of natural and artificial infrastructure on the island and

		along the coastline, from natural wave barriers to concrete dams designed to protect the area from abrasion. People living on islands and living along the coast are particularly vulnerable to large waves recorded as high as three meters. Natural wave barriers such as mangroves are effective and sustainable barriers to protecting coastal communities, but no such natural system exists.
4	Canal Drainage System	The canal drainage system was built during the Dutch colonial era to function as rainwater drainage and an open sewer network that serves most of the city's sewage. The current plan states that Makassar City will build a wastewater treatment facility (which will be located in Losari). This plan is very important for public health and safety as this system is only intended as an exclusive rainwater drainage network. New developments in suburban areas are not yet connected to the drainage network, so an expansion of the service coverage of the system is needed [19].

Source: Processed by researchers from various sources, 2021

In the category of adaptation interventions in resilience and risk reduction, apart from the mitigation measures discussed above, according to the UNFCCC [20] in its 2018 report, the adaptation needed to deal with the vulnerability of women in coastal areas to the impacts of climate change, namely the anticipation of the adverse effects climate change and actions to prevent or minimize the damage caused, increase adaptive capacity, strengthen resilience and reduce vulnerability to climate change in Makassar City are very necessary to be done as well as possible.

In the category of adaptation interventions above to respond to the impact of climate change on women on the coast, as explained earlier that due to climate change, the actual vulnerability of women in the coastal areas of Makassar City was also found to be gaps in climate change policies related to women in Makassar City. For example, although there is already a mayoral regulation on gender mainstreaming integrated into urban development, the working group on climate change formed by the city government does not include the Women's Empowerment and Child Protection Agency. In this case, women are not considered stakeholders in formulating, implementing, monitoring and evaluating climate change policies or actions [9]. In fact, in advocating for a gender-just urban climate policy, the community needs to understand the plans and strategies of the Makassar City Government to deal with climate change because the most common impacts have adverse effects on women on the coast [7,8]. In addition, it is necessary to be firm and committed to ensuring the realization and protection of women's rights through gender-equal urban climate policies in Makassar City. In its simplest form, in making city government climate policies, the government ensures to accommodate the aspirations and interests of coastal women in the city of Makassar.

3.2 The Ideal Model of Adaptive Governance in the Strategy for Governance of Women's Coastal Vulnerability

3.2.1 Ecosystem-Based Adaptive Governance Model

The ecosystem services available to urban dwellers are very broad and important, especially for the poor, vulnerable, and coastal women, namely:

Table 3. Ecosystem adaptive governance model in Makassar City

Ecosystem	Ecosystem Services
Jeneberang River Basin	1. Raw water supply 2. Wood production 3. Food production 4. Flood control
Tallo River and Wetlands	1. Neutralizing pollutants 2. Biodiversity of the estuary area (fishery) 3. Water purification system 4. Supply of raw water
Archipelago and Coastal Area	1. Mangroves provide protection from big waves and rainstorms 2. Coral reefs provide fish stocks for shallow marine catchments.

Source: Processed by researchers from various sources, 2021

The study of ecosystem services as an adaptive governance strategy in overcoming the vulnerability of vulnerable communities, especially the vulnerability of women in the coastal of Makassar, through the design of programs that have been informed to deal with the impacts of climate change on vulnerable communities, especially the vulnerability of women on the coast through increasing understanding of the existing ecosystems in the city and important function for the vulnerability of women in the coast. The use of EbA in urban areas is relatively new. Therefore, further in-depth studies are needed, especially how it can be part of an integrated approach to climate change adaptation that cities can utilize not as a separate activity [17].

Complete ecosystems rarely fit within city boundaries: harmonious environmental interrelationships usually extend beyond artificial political boundaries. No exception to what is in the Makassar, where there are three key ecosystems across the region and their reach outside the region [11,17].

- **Jeneberang River Basin** – Crossing the administrative areas of Gowa and Makassar, the Jeneberang river provides 80% of the raw water for the community to serve agricultural activities in the suburbs and provide timber production and other forest production.
- **The Tallo River and Its Watershed** – Covering the administrative areas of Maros and Makassar, this area increases the availability of raw water for the city's needs, providing alkaline land that is rich in biodiversity and functions as a flood buffer area for Makassar. This river makes commercial relations between Maros and Makassar impossible.
- **Archipelago and Coastal Areas** – There are 11 small islands around the coast of Makassar which also enrich the marine ecosystem. Consisting of coral reefs, silt deposits, seaweed areas, and mangrove forests, coastal ecosystems provide a source of livelihood for thousands of households in Makassar, protect beaches from abrasion and develop biodiversity.

The ecosystem services provided to urban populations are extensive and critical to the poor and vulnerable, including coastal women. The environmental services provided by the three ecosystems above can play an important role in reducing the impact of climate change on vulnerable and poor communities, including the vulnerability of women in coastal areas. According to official data, the population of Makassar in 2019 was 418.831 [11]. The rapid

urbanization process and the desire for a better life have led to overcrowding in residential areas. These impoverished areas are scattered throughout Makassar. Their concentration is higher in the coastal areas and the Talo River along the Talo River (near Losari Beach) and begins to decline towards the city's outskirts.

Comprehensive Ecosystem-based adaptive governance strategies, such as those described above, the linkage of a harmonious environment and women on the coast usually extend beyond artificial political boundaries. This is no exception to what is in the city of Makassar, which seeks to address the vulnerability of women on the coast due to climate change, where there are three key ecosystems across the region and their reach beyond the region: (1) Jeneberang River Basin – Across the administrative areas of Gowa and Makassar, the Jeneberang river provides 80% of raw water for the community to serve agricultural activities in the suburbs and provide timber production and other forest production; (2) Tallo River and its Watershed – Covering the administrative areas of Maros and Makassar, this area increases the availability of raw water for the city's needs, providing alkaline land that is not only rich in biodiversity but also functions as a flood buffer area for the city of Makassar. This river makes commercial links between Maros and Makassar impossible; (3) Archipelago and Coastal Areas – 11 small islands around the coast of Makassar also enrich the marine ecosystem. Consisting of coral reefs, silt, areas of seaweed, and mangrove forests, coastal ecosystems provide a source of livelihood for thousands of households in Makassar, protect beaches from abrasion, develop biodiversity, and strengthen and reduce the vulnerability of women on the coast due to climate change [14,17].

4 Conclusion

The half-hearted policy on the coast of Makassar City in dealing with the impacts of climate change, has created a real vulnerability of women in the coastal area of Makassar City. In addition, it was also found that there were gaps in climate change policies related to women in Makassar City. In this case women are not considered as stakeholders in formulating, implementing, monitoring and evaluating climate change policies or actions. In fact, in advocating for an urban climate policy that is gender-just, the public needs to understand the Makassar City Government's plans and strategies to deal with climate change issues because the most common impacts have adverse effects on women in the coastal city of Makassar.

Adaptive governance strategies based on complete Ecosystems, with the harmonious interrelation of the environment on women on the coast usually transcend man-made political boundaries as a better adaptive strategy in the principles of sustainable development. No exception with what is in Makassar City which seeks to overcome the vulnerability of women on the coast due to climate change, where there are three key ecosystems across regions and their reach outside the region; (1) Jeneberang Watershed; (2) The Tallo River And Its Flowing Areas; & (3) Island And Coastal Area. The ideal strategy recommended in this study is ecosystem-based adaptive governance to manage the vulnerability of coastal women, namely based on government policies that are friendly to coastal women in Makassar City.

References

1. J. McCarthy and Z. Zen, *Law Policy* **32**, 153 (2010)
2. A. L. Prianto and A. A. Amalia, *Otoritas J. Ilmu Pemerintah*. **9**, 28 (2019)
3. I. Malik, A. L. Prianto, A. Abdillah, Z. Rusnaedy, and A. A. Amalia, *J. Gov. Civ. Soc.* **5**, 31 (2021)

4. F. Moder, C. Kuenzer, Z. Xu, P. Leinenkugel, and B. Van Quyen, *IWRM for the Mekong Basin* (Springer Science+Business Media Dordrecht, 2012)
5. A. Aylett, *Urban Clim.* **14**, 4 (2015)
6. R. Cahyadi, in *Lap. Penelit.* (Bappaeda Kota Semarang, Semarang, 2010)
7. Y. Nurhidayah, *Commun. J. Ilmu Komun.* **1**, 209 (2017)
8. K. Ismail, *J. Din. Marit.* **3**, 1 (2013)
9. E. Deviani and Indra Safrida, *Idea Nurs. J.* **4**, 74 (2013)
10. A. Milèn, *What Do We Know about Capacity Building? An Overview of Existing Knowledge and Good Practice* (2001)
11. BPS Kota Makassar, in *Dokumen* (Badan Pusat Statistik Kota Makassar, Makassar, 2020)
12. A. Abdillah, N. A. Deliarnoor, N. Y. Yuningsih, and F. Fatmawati, *J. Contemp. Gov. Public Policy* **1**, 67 (2020)
13. A. Duit and V. Galaz, *Governance* **21**, 311 (2008)
14. L. Greenhill, J. O. Kenter, and H. Dannevig, *Ocean Coast. Manag.* **191**, 105176 (2020)
15. Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif Dan R & D* (Alfabeta, Bandung, 2007)
16. L. J. Moleong, *Metodologi Penelitian Kualitatif* (Remaja Rosdakarya, Bandung, 2010)
17. John Taylor, *Kajian Kerentanan Perubahan Iklim Kota Makassar* (UN-HABITAT Regional Office; UNDP Indonesia Country Office; UNEP Regional Office, Makassar, 2013)
18. W. Chandra, <https://www.Mongabay.Co.Id/2017/12/19/Perempuan-Pesisir-Perkotaan-Rentan-Terdampak-Perubahan-Iklim/> (2017)
19. K. Akamani and P. I. Wilson, *Conserv. Lett.* **4**, 409 (2011)
20. UNFCCC (United Nations Framework Convention on Climate Change), (2015)