Journal of Governance
Volume 6, Issue 2, December 2021 (244-258)
(P-ISSN 2528-276X) (E-ISSN 2598-6465)
http://dx.doi.org/10.31506/jog.v6i2.12384

Adaptive Climate Change Governance in Makassar, Indonesia

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Recieved: July 14, 2021; Revised: October 19, 2021; Accepted: November 28, 2021

Abstract*: Over the past few years, historical records show that floods and strong winds are climatic phenomena that always cause damage and loss to cities. To climate vulnerability and disasters, the geographical character of the city causes the types of vulnerability and the impact of disasters to vary widely. Due to the unpredictable nature of climate change, there is a need for intervention from government agencies through policies and governance to reduce risks from the impacts of climate change. Therefore, this study aims to analyze how the Makassar City Government carries out governance to adapt to climate change. The research method used is a qualitative method with data collection techniques through interviews and document review. This research shows that the Makassar government is to formulate seven strategies to reduce the impact of climate change, form a Climate Change Adaptation Working Group and make priority village programs. Priority village program policies will make it easier to map areas with high to low levels of exposure. So with this policy, Makassar will become a city that is more adaptive to climate change. We propose increasing adaptability and decreasing sensitivity to exposure so that Makassar residents will be more resilient in the face of future climate change. In addition, adaptation action does not only rely on the government. However, it involves the community and the private sector so that collective action is created in the context of adapting to climate change.*
Keywords: *climate change; governance; adaptive.*

Introduction

The emergence of the Anthropocene means that human activity has become a significant driver of environmental change, including climate change and biodiversity (Folke, 2010). Urban areas are a crucial area in unprecedented change; cities are both the cause for this process and the result of the outcome. Regions act as engines of change by transforming and exploiting energy ecosystems and natural resources within and outside their geographic areas. Simultaneously, the region is affected by the changes. Cities also face the challenge of providing safe and adequate space and infrastructure in the context of limited resources (Boyd & Juhola, 2015).

The increase in greenhouse gases that trigger climate change has become a global concern in recent times. It is interesting because climate change has potential negative impacts on various sectors that can threaten human survival (Barnett & Webber, 2010; Wilby et al., 2009). However, it must be understood that the impact of climate change is not felt by all countries globally. The United Nations Framework Convention on Climate Change in its report states that developing countries have a greater vulnerability to the impacts of climate change due to lower adaptation capacities (social, technological, and financial) (UNFCCC, 2006).

Although measuring the contribution of greenhouse gas emissions to environmental change is a complex issue and the role of cities in this regard is still under discussion (Kennedy et al., 2010), the World Bank estimates that cities now consume more than two-thirds of the world's energy and produce more than two-thirds of the world's energy of 70% of greenhouse gas emissions (World Bank, 2010). The impacts of climate change are likely to be felt in cities as well. UN-HABITAT estimates that more than half of the world's population now lives within 60 km of the sea, while about three-quarters of all major cities are located on the coast (UN-Habitat, 2012). The phenomenon is of concern in terms of sea-level rise caused by climate change. The urban area consists of households, environment, green space, drainage and infrastructure, and transportation systems. Its specific characteristics, such as location, structure, and density, can make residents and assets vulnerable to climate change (Gasper et al., 2011).

Adaptation is urgently needed as an effort to deal with uncertain and unpredictable situations (Sagala & Simbolon, 2014). Government institutions become part of existing institutions at the level of policymaking and implementation (Termeer et al., 2011). In facing the uncertainty of climate change, the government is expected to adapt to the complexities of climate change by becoming an adaptive institution (Termeer et al., 2011). Of the various uncertainties and ambiguities that exist in the context of climate change, the government, as one of the important actors, will face challenges to develop and realize strategies and increase the community's adaptive capacity through policies made (Jordan et al., 2010).

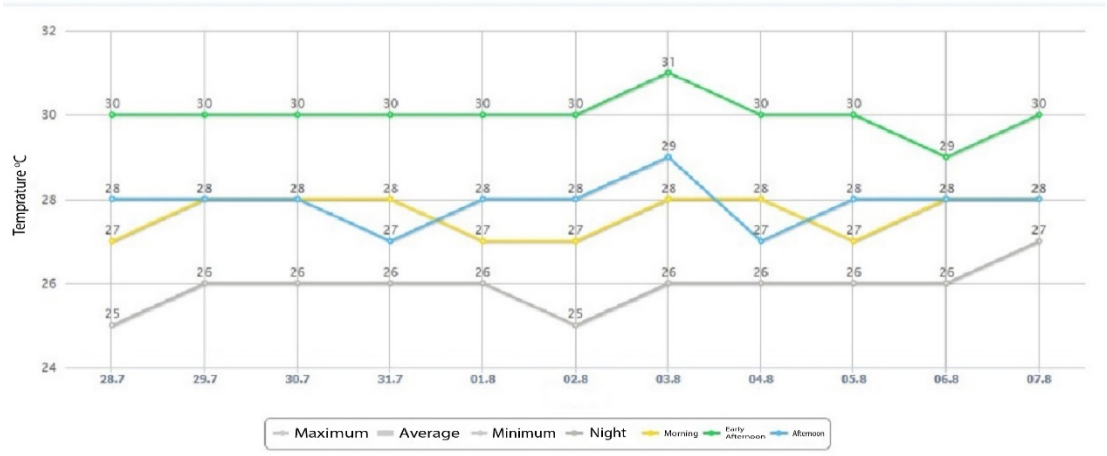
Law number 23 of 2014 concerning Regional Government has provided space for regions to regulate and manage, including making their policies. It means that local governments have the authority to implement policies and adopt attitudes toward climate change (Hermawan, 2016; Sagala & Simbolon, 2014; Setiadi & Nadhiroh, 2021). Therefore, knowledge of institutional aspects including (policies, laws, procedures, both formal and informal) and including processes and mechanisms of planning, decision making, coordination, and negotiation) in dealing with climate change (Svendsen et al., 2005).

Makassar is a lowland area that is directly adjacent to the sea. One of the characteristics of the area bordering the sea is high-temperature conditions. The difference in air temperature during the day and night (diurnal variation) is not too significant. The average air temperature in Makassar is around 28-30, with the daily

maximum temperature reaching 36. The area around the coast has a relatively higher temperature than the area in the middle and eastern part of Makassar City. To climate vulnerabilities and disasters, the geographical characteristics of cities cause the types of vulnerabilities and impacts of disasters to vary. In addition, urban growth factors or urbanization also contribute to increasing urban vulnerability, such as increasing pressure on groups exposed to higher vulnerabilities, such as the poor, women, children and the elderly, and people with disabilities in adapting to climate change (UNDP, 2015). Due to the unpredictable nature of climate change, there is a need for intervention from government agencies through policies and programs to reduce the risk of climate change impacts.

The annual mean temperature data in Makassar since 1981 shows an increase of 0.27°C per decade. The phenomenon equates to a 0.3°C increase in the average temperature in Indonesia and globally in the 20th century. Analysis of rainfall data since 1950 shows no change in the wet season, but during the dry season, there is a downward trend of around 36% - relative to the long-term average. Rainfall also varies from year to year (Pabalik et al., 2015; Rosliana et al., 2017).

Figure 1. Annual Temperature in Makassar



The Regional Action Plan for Climate Change Adaptation and Disaster Risk Reduction (RAD API-PRB) Makassar City has a vision of "A Comfortable Makassar City through Vulnerability Reduction and Climate Change Adaptation." Comfortable city conditions, defined as a relational condition between urban space and society. Conditions that ensure the safety and comfort of the community by prioritizing inclusiveness and equal relations between city development stakeholders. A city that has resilience covers a broad spectrum, starting from the ability to understand the risks of climate disasters that are faced, how to prevent them, to how to respond if they occur so that they do not have an impact on damaging aspects of the city life (RPJMD, 2014).

Scholars have carried out several studies on adaptive climate change governance. The government needs to take an active role in formulating and implementing climate change policies (Fröhlich & Knieling, 2013; Hurlbert &

Gupta, 2016; Wulandari, 2021). Other researchers also recommend the need for collaborative multi-level governance efforts to deal with complex climate change issues, starting with international, national, and local organizations (Bauer & Steurer, 2014; Di Gregorio et al., 2019; Fuhr et al., 2018; Hickmann & Stehle, 2019). All entities at different levels collaborate to create adaptive climate change governance.

Methods

Adaptive climate change is needed to reduce vulnerability and increase resilience to disasters caused by climate change. Therefore, government intervention through adaptive climate change governance policies is required. This study uses qualitative-exploratory research by focusing on urban climate governance issues that are adaptive to the threat of climate change. The location of this research is Makassar which consists of several government agencies: Regional Development Planning Agency, Environmental Service, Regional Disaster Management Agency. The data collected are in the form of Regional Action Plans for Climate Change Adaptation – Disaster Risk Reduction (RAD API-PRB), Regional Medium-Term Development Plans (RPJMD), and other supporting documents. The data contained in the Regional Action Plan for Climate Change Adaptation – Disaster Risk Reduction to see issues and programs for climate change adaptation and handling. The Regional Medium-Term Development Plan is needed to analyze the Makassar City Government's program to deal with climate change. This study's data analysis techniques are 1) reduction, 2) data display, and 3) conclusion drawing/verification.

Result and Discussion

Governance and Services

The Makassar City Government seeks to reduce vulnerability and strengthen adaptive capacity in a comfortable and resilient manner. A comfortable city means a city that is able to withstand threats and recover from disasters. Meanwhile, resilience means the ability to understand the risks of climate disasters that are faced, how to prevent them, and how to respond if they occur so that they do not have an impact on damaging aspects of city life. Therefore, to realize these two things, the Makassar City Government implements seven leading strategies:

1. Improvement and addition of green open space.

   Makassar City has obstacles in meeting the availability of green open space up to 30% of the city area. Makassar City sees that this fulfillment will be challenging to realize given the very minimal availability of land. For this reason, focusing on fulfilling 10% of green open space in the housing sector is an authentic thing for the next five-year target in Makassar City. The current condition is that the green open space in Makassar City is 1,098.7 hectares, including urban forests, green lines, fields, parks, cemeteries, mangroves, and borders. This area is only about 6.25% of the total area of Makassar City (RPJMD, 2014).
2. Improving the quality of infrastructure and public services.

   The suburban area is rapidly developing into a residential area due

to the relatively cheaper land price factor compared to the downtown area. The outermost sub-district in Makassar City grew by 3.01%, while the area in the middle of the city experienced negative growth at -0.2%. Some of the impacts of this trend are converting rice fields into housing and urban development areas. Another impact is the lack of supporting facilities in development areas because they lack public services and infrastructure to reach these areas.

3. Improved economic and social welfare.
   The number of poor people in Makassar City in 2011 was 71,700 families or 6.24% of the total number of household heads in Makassar City, decreasing to 69,200 families in 2012. The poverty rate decreased by about 3.61% during 2011 – 2012.
4. Public capacity building.
   A sound city governance system should include various interest groups in promoting the improvement of life in the city. Weak public participation is often also related to access to information, thereby weakening the participatory capacity of city residents.
5. Capacity building for government institutions, NGOs and CSOs.
   The authority of government institutions is still limited. One of the weak points in regional autonomy is the increasingly complicated process of coordination between regions, thus limiting the authority of institutions dealing with sector-based and cross-regional issues.
6. Conservation and improvement of environmental quality.
   Between 1991 and 2010, there was a 279% increase in the area of the Jenebarang River Basin surrounding Makassar City. The city's growth is considered very rapid and seems to have moved eastward along the Maros and Jeneberang Rivers, as well as along the coast, as seen massively in Losari and Tallo. This condition also increases the danger of environmental degradation, reduces water infiltration sources in the Jeneberang watershed, or accelerates water flow into the sea. Faster water flow can increase the chance of flooding.
7. Strengthening and enforcing regulations and laws.
   Enforcement aspects include giving strict sanctions for violations or rewards for those who obey and follow the rules correctly and consistently. Another weak aspect is the condition of the community that tends to lack knowledge about technical issues such as planning and regulation. The tendency results in violations in urban development.

The seven priority programs for climate change adaptation above rest on the government. It means that community involvement in climate change adaptation actions is still very minimal. The aspect that is breathless in climate change adaptation actions involves the whole community in all aspects of activities. The community is the main actor who is directly involved in the adaptation action. Community-based adaptation actions are carried out to manage climate change by putting environmental understanding as the main thing. Government synergy through climate change adaptation governance policies with public

awareness of the threats and dangers caused by climate change will create Makassar City resilient and adaptive to climate change.

What happened in Makassar confirms Adger (2016) thesis that actions often show that the public and government sectors are far ahead of other sectors. Climate change adaptation programs should rely on the government and involve multiple sectors such as individuals, communities, and the private sector. How is private action, in some circumstances, a synergistic public sector response. So the social process of adaptation needs to consider individual agency, collective action, private sector action, and other forms of response strategies.

Climate Change Adaptation Working Group

The Makassar City Government in implementing climate change policies has established a Climate Change Adaptation Working Group (Pokja API), which has the task of 1) facilitating coordination between government agencies and non-government groups (academics, NGOs, and community representatives); 2) synergize with various inter-agency activities; and (3) monitoring and evaluation of program implementation: assessing program achievements and impacts in a measurable and structured manner. The Working Group consists of three sub-groups: 1) mitigation, 2) emergency and disaster situations, 3) data and monitoring. This Working Group was formed as a result of the workshop on Regional Action Plans for Climate Change Adaptation – Disaster Risk Reduction (RAD API-PRB) organized by the Makassar City Regional Development Planning Agency.

The Working Group on Climate Change Adaptation is supervised directly by the mayor as the person in charge who coordinates several agencies:

1. Regional Disaster Management Agency (BPBD) as Head of Disaster Mitigation and Management, responsible for coordinating related mitigation programs and activities. The mitigation sub-group also involves the Department of the Environment, the Department of Public Works and Public Housing, the Office of Spatial Planning and Building, the Department of Marine Affairs and Fisheries of DKP, and the Department of Marine Fisheries, Agriculture, Animal Husbandry.
2. The Office of Social Affairs and the Regional Disaster Management Agency are responsible for coordinating emergency and post-disaster management programs and activities. The emergency and post-disaster response sub-groups also involve the Community Empowerment Agency, Search and Rescue (SAR), the Health Service, and NGOs.
3. The Central Statistics Agency and the Regional Planning and Development Agency are responsible for coordinating the processing and monitoring of program data. The data and monitoring sub-group also involves the Meteorology, Climatology and Geophysics Agency, the Environment Agency, and NGOs.

The working group was formed as a commitment of the Makassar City Government to deal with climate change.

Climate change is a very complex matter, so its handling must also involve many stakeholders. Government institutions involved in the Working Group coordinate with each other and carry out their respective priority programs. Some scholars have argued that government working groups offer the opportunity to regulate not one but several government agencies, with each of these units being able to exercise independent authority to make and enforce rules within a particular area (Olson, 2012; Ostrom, 2010; Rusnaedy & Haris, 2021).

The role of the Regional Development Planning Agency is crucial because it is the agency that receives the mandate for development coordination in local governments: coordination of environmental management, poverty reduction, livelihood creation, because all of them are related to the issue of disaster risk reduction and climate change governance at the local level (Djalante & Thomalla, 2012). In our opinion, Development Planning Agency at Sub-National Level should be given more coordination power through an appropriate legal framework to increase its awareness and capacity. The starting point is closer coordination between the sub-structures of National Development Planning Agency and Development Planning Agency at Sub-National Level, as they are the coordinating agency for all planning activities related to development.

Finally, effective communication and exchange of information between various stakeholders must occur through the National Platform for Disaster Risk Reduction. CCA activities should leverage these existing channels rather than create new ones. Through this mechanism, knowledge, experience, and guidance on disaster risk reduction from the government can complement the knowledge and experience of NGOs, and CBOs and vertical mismatches of competence, awareness, and knowledge can be avoided.

Table 1. Impact of Climate Change Threats

The threat of climate change	Biophysical Impact	Primary impact	Secondary impact
Sea level rise	Inundation in the beach area	• Damage to coastal ecosystems causes migration and economic problems for fishing communities • Seawater intrusion in coastal water sources reduces the availability of clean water for poor communities in coastal areas • The gradual loss of coastal land due to abrasion on islands and low-lying coastal areas	• Disruption of economic activities, settlements, ports, and tourism activities - economic losses • Disruption of the road and transportation systems resulting in economic losses

		• Damage to the physical infrastructure built by coastal communities • Impoverishment and forced displacement of communities in affected coastal areas	
Increased rainfall/flood	• Septic tanks and wells overflow • Stagnant water in areas without drainage • Contaminated clean water	• Diseases caused by water and carried by mosquitoes • Damage to settlements and infrastructure, especially in low-lying areas • Contamination of wells with e-coli bacteria from the surroundings • Damage to agricultural products in rural and suburban areas	• Declining profits from agricultural production • Declining local food supply, rising prices which have an impact on poor households • Declining availability of clean water, rising prices, impacting poor households • Economic disruption caused by a partial disruption in city movement
Hurricane and waves	Damage to local buildings and infrastructure	• Damage to business and household activities causes high costs and economic losses • Impoverishment of communities in coastal areas that have lost assets and houses • Displacement of coastal communities results in migration • Decreased catch for small vessels	• The fishing industry is affected by the limited number of marine catches • Decreased seafood exports lead to reduced people's income
Hot temperaturs and dryness	Damage to agricultural produce	• Continued migration of workers from rural to urban areas • Hot airstrikes affect children and the elderly, increase risk of death, local food supply declines, price increases impact poor households • Availability of clean water decreases, prices rise, impacting poor households	• An increase in energy consumption for air conditioning or pumped water has an impact on the incomes of the poor • New migrants from rural to urban areas settle in risky locations, exacerbating urban vulnerability

Source: (RAD Makassar, 2020)

Climate Change and Potential Disasters

BPBD Makassar City has conducted a Disaster Risk Study using data from the Indonesian Disaster Data and Information (DIBI) in 1815-2015. Based on the BPBD Disaster Study Document, Makassar City has experienced various disasters since 1815-2015. The most frequent natural disasters in Makassar City are floods, with a total of 9 incidents. Floods occur because Makassar City has an area in the lowlands which is directly adjacent to the sea. This disaster has an impact on humans and buildings such as houses and land damage. Other hit disasters include droughts, technological failures, epidemics, disease outbreaks, and extreme weather.

Areas that have experienced certain disaster events are likely to experience the same disaster in the future without any preventive measures taken. The history of disaster events states that five disasters have occurred in Makassar City. According to the Disaster Risk Study conducted by BPBD Makassar, Makassar City has eight potential disasters in Makassar City. Other disasters that have the potential in Makassar City include extreme waves and abrasion, earthquakes, and tsunamis.

Table 2. Potential Disasters in Makassar

Disaster type	Number of events	Deaths	Wounds	Evacuations	Heavy damaged house	Lightly damaged house	Land damage
Flood	9	4	-	150	26	26	85
Technology failure	1	10	1	-	-	-	-
Drought	1	9	-	-	-	-	20
Epidemics and disease outbreaks	1	-	805	-	-	-	-
Extreme weather	1	9	3	-	32	-	-
Total	17	25	809	150	58	26	105

Source: BPBD Makassar, 2019

There are four types of climate-related disasters recorded in the Indonesian Disaster Data and Information (DIBI) in Makassar in 2010-2019: floods, droughts, cyclones, and landslides. Each disaster has a different level of impact on people, homes, infrastructure, roads, and land use. DIBI data shows that the most impacting disaster in Makassar is flooding. A flood is a disaster that causes the most significant impact on human victims compared to tornadoes and landslides that occurred in Makassar.

Climate change can be described as a complex and protracted hazard. Climate change is a multifaceted (from drought to flood) and multidimensional (from local to global) hazard with short, medium, and long-term aspects and unknown outcomes. Climate change is intensifying hazards affecting human livelihoods, settlements, and infrastructure. It also increases the resilience of livelihood systems in the face of increasing uncertainty and frequent disasters (O'Brien et al., 2021). Disasters due to climate change in Makassar, such as floods,

droughts, and extreme weather, became a real threat to survival, resulting in death, loss of housing, job loss, and other threats.

If climate change adaptation tends to intersect with disaster management efforts due to climate change, climate change mitigation is identical to efforts to reduce greenhouse gas emissions. The most prominent emission contributor in urban areas, in general, is CO2 gas produced by motor vehicles. Therefore, emission reductions in urban areas that are pretty effective are diverting private vehicles to public transportation and creating mixed-use urban space utilization patterns. As a result, this method may reduce the mobility of people who use motorized vehicles because their activities can be fulfilled by walking or cycling (Handayani, 2020). The Makassar City Government currently has not paid attention to climate change adaptation policies by diverting the use of private vehicles to public transportation. Facilities for pedestrians are also not a concern due to the lack of facilities provided by the government (Wunas & Veronica, 2015).

Efforts are needed to increase the quantity and quality of public transportation facilities combined with parking management. This policy is widespread, especially in some big cities, assuming that the implementation of this policy is part of the response to climate change by the Regional Adaptation Plan (RAD) (Hermawan, 2016; Setiadi & Nadhiroh, 2021). The reduction of greenhouse gas emissions is the main benefit of the policy (Maizlish et al., 2013; Pongthanaisawan & Sorapipatana, 2013; Stanley et al., 2011). The Makassar City Government should maximize the improvement of public transportation and other supporting facilities. People will reduce the mobility of using private transportation to reduce greenhouse gas emissions.

Priority Adaptation Program

The priority of adaptation locations is determined based on the level of urgency and the presence of disaster events. The determination of priority level areas facilitates the government in determining targeted actions. Priority levels I and II are the areas most affected by disasters that occur, even though the disaster events may only be at a deficient level of location urgency. Regions included in priority categories III and IV do not mean they are not a concern of the government. However, these areas can still survive and adapt to the impact of disasters that will occur. The government will maintain priority categories III and IV by implementing actions that follow regional conditions.

The determination of priority programs and the form of adaptation actions carried out must be in accordance with the conditions of the priority villages. The more specific the adaptation action program chosen in the priority village will have implications for the lower level of vulnerability in the village. On the other hand, mistakes in selecting the action program will have implications for the level of village vulnerability not changing or even increasing. The effectiveness and efficiency of financing the action program will depend on the accuracy of the selection of the action program. To determine the appropriate adaptation action program and according to priority village problems, there are four main stages:

1. Identify indicators that have a significant impact on system vulnerabilities. Identify indicators using web diagrams.
2. Identify adaptation options. Identify adaptation options through various means: tagging, literature review, expert judgment, and best practice/local knowledge.
3. Evaluation of the potential impacts of implementing adaptation actions. Evaluation of the potential impact of implementing adaptation actions is assessed based on the ability of these actions to improve the vulnerability of the system/village and its positive impact on various aspects of development carried out in the village.
4. Prioritization of adaptation actions for each priority village. Program prioritization and forms of adaptation action for each priority village are measured based on the program's ability to reduce village vulnerability levels or improve village vulnerability indicators in each priority village.

Table 3. Distribution of Priority Levels

No.	Rating	Number of Villages
1	Priority I	24
2	Priority II	2
3	Priority III	96
4	Priority IV	32

Source: (RAD Makassar, 2020)

From the Makassar regional planning document, a total of 244 programs/actions were further narrowed down to 31 high and very high priority programs/actions. Climate change adaptation programs/actions categorized as high are programs/actions that deal more with development aspects and can impact handling vulnerability and climate change impacts. The results of the priority program proposals have been adjusted to the nomenclature in the Minister of Home Affairs Regulation No. 90 years 2019.

The Makassar Government's policy is to map the distribution of villages by dividing them into 4 clusters. Priority I is a disaster event at a high to a very high level of location urgency. Priority II is the occurrence of a disaster at a very low to moderate level of location urgency. Priority III has been no disaster incident in the last decade at a high to a very high level of location urgency. Lastly, Priority IV has been no disaster event in the last decade at a very low to moderate level of location urgency. Priority village program policies will make it easier to map areas with high to low levels of exposure. So with these policies, Makassar will become a city that is more adaptive to climate change.

The central government will remain the essential player directing national, regional, and local responses to climate change, but its role will need to be complemented by local initiatives. Other factors, including local impacts of climate change, capacity and awareness, and leadership and vision, also contribute to these changes. ACC can become mainstream policy as a priority issue for local governments (Sharma et al., 2014; Williams et al., 2020; Ye et al., 2008).

Conclusion

Until now, climate change has been difficult to avoid, especially in urban areas, as they are both the cause and recipient of its effects. Therefore, it is necessary to have an adaptive governance policy in response to these changes. Makassar has

policies and programs to deal with the challenges of climate change. Makassar City Government policies respond to climate change as a form of adaptation to reduce impacts and increase resilience due to climate change. Disasters caused by climate change such as floods, droughts, and extreme weather are real threats that have been, are, and will happen in the future. Therefore, through the climate change governance policy carried out by the Makassar City Government, it is hoped that it will be adaptive to the conditions that occur.

Makassar has and is still implementing its mitigation and adaptation programs. The seriousness of the Makassar government is to formulate seven strategies to reduce the impact of climate change, form a Climate Change Adaptation Working Group and make priority village programs. Priority village program policies will make it easier to map areas with high to low levels of exposure. So with these policies, Makassar will become a city that is more adaptive to climate change. We propose increasing adaptability and decreasing sensitivity to exposure so that Makassar residents will be more resilient in the face of future climate change. In addition, adaptation action does not only rely on the government. However, it involves the community and the private sector so that collective action is created in the context of adapting to climate change.

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Acknowledgments

The author would like to thank the Ministry of Education, Culture, Research and Technology for providing the Beginner Lecturer Research grant. The funding source for this research is from the Budget Implementation List (DIPA) of the Directorate General of Higher Education, Ministry of Education, Culture, Research and Technology for Fiscal of 2021, Number 1868/E4/AK.04/2021 June 7, 2021.

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