

# Environmental Governance in Handling Flood Problems in Makassar City

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**Abstract.** *Environmental management or Environmental Governance is a comprehensive approach that involves various stakeholders in decision-making, policy formulation, and implementation of strategies to address environmental problems. In the context of Makassar City, this approach is crucial in managing the increasing risk of flooding due to climate change, changes in land use, and population growth. This study highlights the effectiveness of flood management policies based on community participation, information transparency, and coordination between institutions. The survey results show that the majority of the community feels that flood management policies are not yet effective, with low levels of participation. In addition, the lack of transparency and coordination between institutions are major obstacles in the implementation of flood mitigation policies. This study recommends improving the participatory and collaborative approach in Environmental Governance, by integrating ecosystem-based policies, strengthening the role of the community, and increasing the use of sustainable infrastructure to create city resilience to future flood disasters.*

**Keywords:** *Environmental Governance, Management Flood, Makassar City, Participation Society, Change Climate*

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## INTRODUCTION

According to Yuliansa (2024), environmental governance, in essence, relates to the complex decision-making framework, procedures, and mechanisms through which various stakeholder interests, including government agencies, civil society organizations, and local communities, engage in collaborative efforts to design, implement, and enforce environmental management policies and regulations (Bridge & Perreault, 2009). This concept recognizes the fact that environmental challenges often transcend political boundaries and require a comprehensive and integrated approach to problem-solving (Syahputra, 2024). The design of Environmental Governance places great emphasis on the important aspects of participation, transparency, accountability, and equitable allocation of benefits and burdens for environmental life (Ulum & Ngindana, 2017). This concept encompasses various aspects, such as regulatory frameworks, institutional arrangements, stakeholder interest engagement, and utilization of scientific knowledge and skills (Nasution, 2020).

A comprehensive understanding of this concept is essential in evaluating the effectiveness of Environmental Governance in addressing flooding problems in the context of Makassar City in particular, as well as in identifying potential avenues for improving flood management strategies (Said & Anita, 2023; Hardi, 2020). Within the framework of this study, the study of Environmental Governance will produce significant perspectives on the formulation and implementation of policies and actions for flood control and mitigation processes in urban environments. According

to Surya (2020), Environmental Governance is a complex and dynamic concept that plays an important role in managing and resolving environmental problems, including flooding in the urban area of Makassar City (Firdaus et al., 2022)

Align with research from Gutberlet (2017), this concept marks a significant change from the conventional hierarchical and authoritarian approach to environmental management, towards a more comprehensive, participatory, and cooperative methodology that recognizes the interdependence of social, economic, and environmental systems. An important component of Environmental Governance lies in the recognition that environmental problems in life often transcend political boundaries and require a comprehensive and integrated approach to resolve them (Newell, 2008). Flooding events such as flash floods are not limited to a particular city area or jurisdiction (Andriyanto, 2019). This phenomenon has the potential to impact a very large geographic area and the population within it (Arjana, 2027).

For this reason, collaboration and synchronization are needed between various levels of government, both local, regional, and national, so that the risks associated with flooding can be handled properly (Dewanti, 2018). In the context of Makassar City, as a Coastal City in Indonesia, Environmental Governance must facilitate collaboration between the city and regional and national authorities (Schreider et al., 2000). Collaboration This is needed in order to effectively address the impacts of flooding that are not only local, but also have a wider impact at the regional and national levels (Yuliastanty et al., 2024). Environmental Governance is a concept that has many aspects and continues to develop and has an important meaning in managing environmental challenges, such as flooding problems in urban areas such as Makassar City (Ioppolo et al., 2016).

This process includes various stakeholder interests, by combining the principles of participation, transparency, equality, and reliance on scientific knowledge (Aini, 2024). Especially in Makassar City, these factors will be very important in formulating efficient flood management strategies and policies that can effectively address the various challenges posed by flooding in urban coastal areas. Through the application and strengthening of the principles and mechanisms of Environmental Governance, Makassar City can strive towards unique sustainability and resilience in the future, even amidst increasing risks in environmental life.

## **METHODS**

The method used in this study is mixed-method, combining both qualitative and quantitative approaches. The quantitative aspect is reflected in the use of structured surveys to collect numerical data on public perceptions, levels of involvement, satisfaction with information access, and historical rainfall and flood records, which are analyzed statistically to identify patterns and correlations. Meanwhile, the qualitative approach is evident in the analysis of interview data from key stakeholders such as government officials, community members, and NGO representatives, which provides deeper insights into the challenges, perceptions, and effectiveness of flood management policies. This combination allows for a more comprehensive understanding of both the measurable impacts and the contextual, human-centered factors influencing environmental governance in flood management in Makassar City.

## **RESULTS AND DISCUSSION**

### **The Role of Environmental Governance in Handling problem flood in Makassar City Effectiveness Policy Management Flood**

The graph below This show results survey about perception public to policy management flood, involvement they in management floods, and levels satisfaction to access information public.

Table 1. Results of the Environmental Governance Survey in Mitigation Flood

Aspect	Very Ineffective / Never Involved / Not Easy Accessed (%)	Enough Effective / Ever Involved / Sufficient Easy Accessed (%)	Very Effective / Engaging / Very Easy Accessed (%)	Don't know (%)
Perception to effectiveness policy management flood	45%	30%	15%	10%
Involvement public in management flood	55%	25%	20%	0%
Satisfaction level to information public	50%	35%	15%	0%

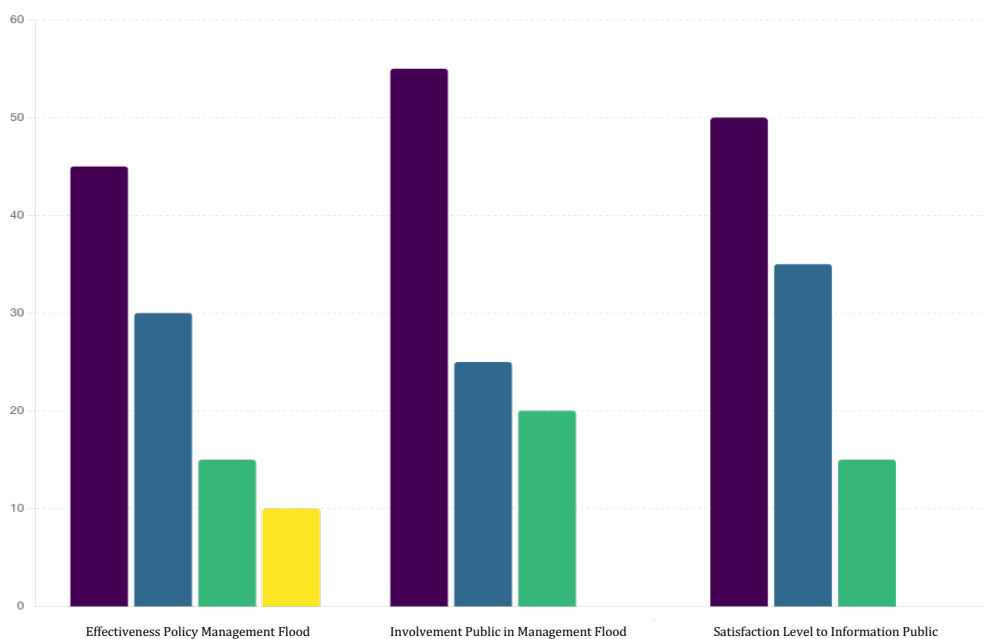


Figure 1. Results of Environmental Governance Survey in Mitigation Flood

Survey results show that 45% of respondents evaluate policy management flood in makassar no effective. This is show significant dissatisfaction among public to effort government in manage and reduce risk flood. Dissatisfaction this possible caused by several factors, including lack of results real from existing policies, slow response government moment happen floods, and lack of maintenance infrastructure countermeasures flood like channel drainage and embankments (Wahyuni, 2021). As many as 30% of respondents feel policy management flood enough effective. This shows that there is part the people who see existence efforts and steps taken by the government, but they possible feel that steps this not yet enough for fully overcome problem flood. The community in category this possible see existence potential repair but feel that implementation policy must more improved (virgiawan & kusmayadi, 2024).

Only 15% of respondents think policy this is very effective. Group this possibility consists of from individuals living in areas that have been get benefit direct from policy management floods, such as development infrastructure new or effective mitigation programs. However, a small percentage this show that efforts that have been made done not yet enough spread or felt by some big makassar society. As many as 10% of respondents no own opinion or no know about policy management flood. This figure show that there is segment underprivileged society

information or not enough involved in issue management flood. This may be due to lack of communication from government or lack of access public to relevant information (Burhan, 2018).

In addition, the results survey show that 55% of respondents no once involved in the management program flood. This figure show that majority public no involved in a way active in effort mitigation flood. Non-involvement this can due to lack of initiative from party government and ngos to involving public in existing programs. Lack participation this also reflects the need for a more strategic strategy inclusive and collaborative for ensure that public feel have and be responsible answer to effort management flood. As many as 25% of respondents once involved in mutual cooperation cleaning activities water channels. Mutual cooperation is one of the form participation very important society in mitigation flood, because clean water channel can prevent blocked drainage which often becomes reason main flood (Sulistyo et al., 2022). Although number participation this enough significant, still there is room for improvement to be more lots community involved in activity similar.

As many as 20% of respondents involved in activity education environment organized by the government or ngo. Participation in education environment is very important for increase awareness public about ways prevent and manage flood (Hilmy & Sya'ban, 2023). However, the percentage this show that activity education still need expanded and more lots involving public. About information public, 50% of respondents feel information related management flood no easy accessed. Align with research from Beni (2021), this shows that half from public feel difficulty in get the information they have need for understand and participate in effort management flood. Inability for access information can hinder participation active society and reduce effectiveness effort mitigation flood (Arnangngi et al., 2024).

As many as 35% of respondents state information the enough easy accessed, while only 15% found it very easy access information this shows that that although there is a number of effort for spread information, still much is needed done for increase transparency and accessibility information. Government need ensure that information related policies, programs and actions management flood can with easy accessible to all layer societ, good through digital, print and electronic media through socialization directly in the community (Amir et al., 2024). In an interview with head of public works department of makassar city, said that challenge main in handling flood is lack of coordination between various department government and lack of source power for carry out projects big.

*"We are facing challenge big in matter coordination between department. In addition, the limited budget make it difficult for us for operate project infrastructure the required size for reduce risk flood."*

Interview results this show that effectiveness handling floods are greatly influenced by coordination between department government and availability source power. Lack of coordination cause inefficiency in implementation policy, while limitations budget hinder realization projects crucial infrastructure for mitigation flood. For increase effectiveness management flood, required repair in coordination cross sector as well as improvement allocation budget for projects sustainable infrastructure (Lestari et al., 2022).

### **Community Involvement in Management Flood**

Survey results in table 1 show that 55% of respondents state they no once involved in the program or activity management flood. As many as 25% of respondents report that they once involved in mutual cooperation cleaning activities water channels, while the other 20% involved in activity education environment organized by the government or ngo. Findings this indicates that majority public no active participate in effort management flood. Lack of involvement this show the need a more approach inclusive and collaborative from government and ngos to push participation public in the management program floods which can covers more lots mutual cooperation initiatives and more educational programs wide. The head of bpbdd makassar

emphasized importance participation public in mitigation flood and stated that effort education and socialization currently improved.

*"We continue make an effort increase awareness and participation society. Without participation active from citizens, business mitigation flood no will effective."*

Interview results this highlight that participation public is element key in success effort mitigation flood. Although bpbd makassar has try for increase awareness and participation through education and socialization, level participation low society show that the existing strategy need reinforced. Improvement participation active from inhabitant will increase effectiveness of mitigation programs flood, reduce risks and impacts flood (Sriyono et al., 2024). Therefore that's important for develop more educational programs focused and involving public in a way direct in the management process flood. In addition, a residents living in the area vulnerable flood in kelurahan the panakkukang complain about lack of help and support from government during incident floods. They also highlighted that channel drainage often clogged and not well maintained with good.

*"We often feel abandoned moment flood come. Channel drainage here always clogged and not there is effort serious from government for fix it."*

Interview results this disclose dissatisfaction public to response government in handling floods, especially related maintenance infrastructure like channel drainage. Complaints about channel clogged and unclogged drainage well maintained show existence problem serious in maintenance infrastructure the essential basics for mitigation flood. Lack of support and action fast from government moment incident flood add burden for affected residents. For increase effectiveness management flood, government need repair system drainage and ensure its maintenance in a way routine, and provide more help and support responsive during incident flood.

### **Satisfaction Level to Public Information**

Survey results in table 1 show that 50% of respondents feel information related management flood no easy accessed, while 35% of respondents state information the enough easy accessible, and only 15% found it very easy access information the findings this indicates that part big public face difficulty in get required information about policies and actions management flood. Lack of accessibility information this can hinder participation and response public to effort mitigation flood (Rimbawan, 2023). For increase involvement and awareness society, government need increase transparency and provide more information easy accessed, for example through digital platforms, publications regular, and discussion forums public. The coordinator of walhi south sulawesi criticized government on lack of transparency and accountability in projects management flood. They also stated that approach government too focus on infrastructure physical and less notice solution based on ecosystem.

*"Approach government that is too focus on infrastructure often ignored solution based on a more ecosystem sustainable. Transparency and accountability are also still become problem big."*

Interview results this highlight a number of problem fundamental in approach government to management flood. Criticism of lack of transparency and accountability show that lots project management flood possible no done in a way efficient or responsible answer, which can damage trust society. In addition, the approach is too focus on infrastructure physique ignore solution based on ecosystem that can give benefit term longer length sustainable. This shows the need for a more strategic strategy balanced that combines infrastructure physique with approach based on ecosystem, as well as improvement transparency and accountability in all project management flood for ensure success and sustainability term long (Amsari et al., 2024).

## Historical Data Analysis and Modeling Statistics

Table 2. Historical Data on Rainfall and Floods in Makassar (2013-2023)

Year	Average Annual Rainfall (mm)	Amount the Great Flood
2013	2000	2
2014	2100	2
2015	2200	2
2016	2300	2
2017	2400	3
2018	2500	3
2019	2600	4
2020	2700	4
2021	2800	4
2022	2900	4

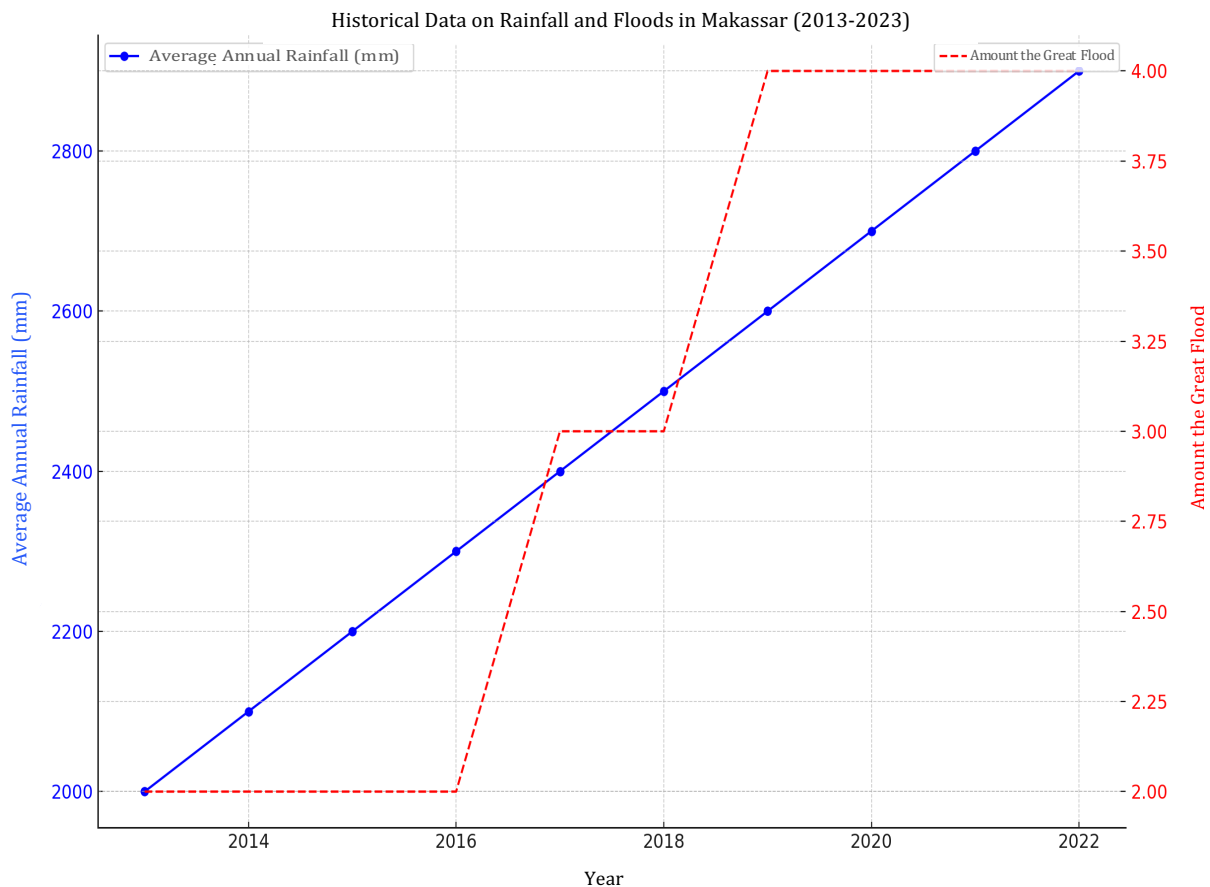


Figure 2. Historical Data on Rainfall and Floods in Makassar

Chart show that rainfall rain annual increase in makassar city in a way consistent from 2000 mm in 2013 to 2900 mm in 2022, indicating change climate that has an impact on increasing intensity rainfall rain. Increase this no only significant in a way statistics but also has implications great practical for management flooding in the area. Increase rainfall consistent rain means that system drainage and infrastructure existing water management must capable handle large volumes of water more big than previously. This is create pressure addition to source power and ability government local for manage water runoff effective. In addition, the increase rainfall rain this correlated with improvement amount incident flood large per year, which reaches the peak with four events per year from 2019 to 2022. Correlation this show that rainfall more rain tall



direct contribute to the improvement frequency and intensity flood big in makassar city. Changes climate, which causes improvement rainfall rain this, becomes factor the main thing that improves risk floods, worsening vulnerability of the area to incident more floods often and more severe. This is emphasize urgency for adapt and improve infrastructure management flood, adopt approach based on ecosystem, and improve awareness as well as participation public in effort mitigation and adaptation to change climate.

Table 3. Effects Variables to Risk Floods in Makassar

Variables	Effect to Risk Flood (%)
Rainfall	20%
Change Land Use	30%
Density Resident	15%

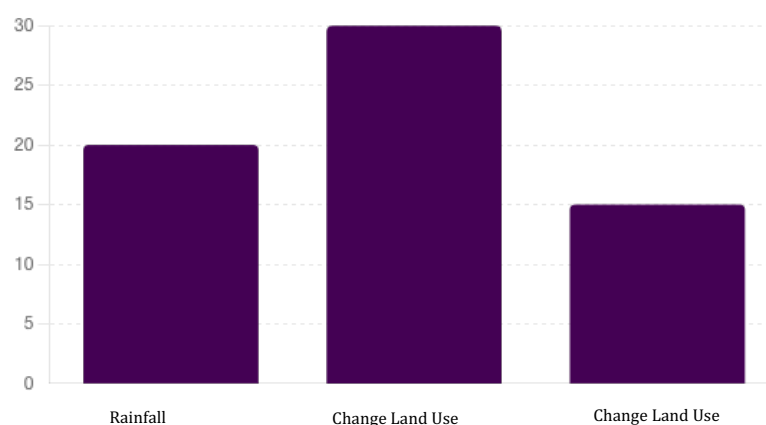


Figure 3. Effects Variables to Risk Floods in Makassar

In the data in table 3 and figure 3, it can be seen that rainfall rain own effect by 20% against risk flood, shows that improvement rainfall rain in a way significant increase possibility the occurrence flood. Increase rainfall rain increase the volume of water that must be managed by the system drainage and infrastructure water management, which if no adequate, will result in flood. More continue, changes use land own effect the largest, namely 30%, shows that conversion land green become a residential area or industry in a way significant increase risk flood. When the land green, which works as area natural water absorption, modified become settlement or area industry, capability land for absorb rainwater reduce drastically, resulting in improvement flow direct surface going to water channels and rivers. This is enlarge possibility the occurrence floods, especially during rain dense.

Density residents also provide contribution to risk flood with effect by 15%. Although its influence no as big as change use land, improvement density resident often associated with with urbanization and development infrastructure that is not friendly environment. Density high population cause improvement surface that is not can absorb water, such as streets and buildings, which worsens condition floods (Istikomah et al., 2014). In addition, areas with density high population tend own infrastructure drainage that has been worn or no adequate for accommodate a larger volume of water large, leading to an increase risk flood. Combined factors this show how the complex problem management flooding in urban areas such as makassar city.

Improvement rainfall rain consequence change climate, change use land that is not controlled, and increased density resident everything each other interact for to worsen risk flood. Therefore that, efforts mitigation flood must covers a holistic and integrated approach, which does not only focus on improvement infrastructure physique but also includes management use wise land use and sustainable urban planning (Firdausy & Alia, 2024). Approach this must supported by policies that encourage development sustainable, protection area water absorption,

and reduction impact change climate. In addition, participation community and collaboration between government, sector private sector, and ngos are very important for reach management effective and sustainable flooding. Ykan director emphasized importance approach holistic in management floods involving all stakeholders interests, including government, society and sectors private.

*"Approach holistic involving all stakeholders very important interest for success management flood. Collaboration between government, society and sectors private must reinforced."*

Interview results this emphasize that success management flood no can achieved by one party only, but need close cooperation between government, society and sectors private. Approach holistic involving various stakeholders interest can ensure that all perspective and expertise utilized optimally (Prakoso & Apriliani, 2024). More collaboration strong can increase coordination, efficiency and effectiveness in implementation of management program flood. This can also increase participation society and responsibility answer together, which in the end will produce more solutions sustainable and resilient to risk flood.

## CONCLUSION

Environmental governance plays role important in management flood in makassar city. Concept this emphasize participation, transparency and accountability in formulation as well as implementation policy management flood. However, the results survey show that majority public feel existing policies not yet effective, with factor main in the form of lack of coordination between institution government, limitations budget, as well as lack of involvement public in effort mitigation. In addition, access to information public still become obstacles, which hinder participation active inhabitant in support policy management flood. Change climate and rapid urbanization also worsen risk flood, demand a more approach holistic and based ecosystem in mitigation and adaptation to disaster this. Therefore therefore, more strategy is needed inclusive and collaborative between government, society, sector private, and organizations environment in handle problem flood. Increase coordination between agency, allocation a more optimal budget, as well as more education and socialization wide to society is very necessary for increase effectiveness policy. In addition, the combination between development infrastructure tough physique and solutions based on ecosystem will become a more approach sustainable in term long. With adopt principles of environmental governance in general more optimally, makassar city can build more resilience good to flood, creating environment more urban safe, and increase welfare society in the middle challenge change climate and growth fast growing city.

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