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Exploring Stakeholder Collaboration in Addressing Watershed Degradation

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ABSTRACT

The degradation of the Tallo watershed has become an urgent environmental issue in South Sulawesi, especially due to urbanization pressures, domestic waste pollution, and declining quality of aquatic ecosystems. This research aims to explore the collaboration of stakeholders in addressing watershed degradation by emphasizing the role, interaction, and synergy between local governments, local communities, civil society organizations, and academia. The research uses a descriptive qualitative approach with a case study design on the Tallo watershed. The data was obtained through in-depth interviews with eight key informants consisting of government representatives, community leaders, environmental activists, and academic experts, and was complemented by field observations and analysis of policy documents. Data analysis was carried out using thematic analysis techniques and stakeholder mapping to identify patterns of collaboration and institutional dynamics. The results show that collaboration efforts are still partial, dominated by government programs, while the participation of the community and the private sector is relatively limited. However, effective multi-stakeholder coordination practices are found in river boundary rehabilitation activities and community-based pollution control initiatives. This study concludes that strengthening collaborative governance, community capacity building, and integration of cross-sectoral roles are important strategies in sustainable watershed management. Theoretically, this study enriches the study of environmental governance and multi-stakeholder collaboration, while practically providing policy recommendations to improve the effectiveness of the management of the Tallo watershed in an inclusive and participatory manner.

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INTRODUCTION

Watersheds (DAS) have a vital role in maintaining ecosystem balance, providing clean water, controlling flooding, and sustaining people's livelihoods (Chakraborty, 2021). However, globally watersheds face increasing pressures due to urbanization, deforestation, and climate change that are accelerating

environmental degradation (Kumar et al., 2022). Deteriorating watershed quality not only impacts local ecosystems, but also affects regional and global ecological stability, including declining biodiversity and increasing vulnerability of communities to hydrometeorological disasters (David Raj & David Raj, 2025). Therefore, adaptive and collaborative watershed management is an increasingly urgent issue in the discourse on sustainable development.

The critical condition of watersheds is also evident in Indonesia. The Ministry of Environment and Forestry reported that in 2020 there were 108 watersheds with critical status with a critical land area of more than 12 million hectares, which continues to increase until 2024 (Rendrarpoetri et al., 2024). Pressure on watersheds is caused by land conversion, uncontrolled resource exploitation, and weak inter-agency coordination in environmental management (Sáez-Ardura et al., 2025). Urban watersheds are one of the vulnerable points because they have to bear the burden of domestic and industrial pollution, as well as high population density. (Montazeri et al., 2024). This phenomenon shows that watershed conservation efforts in Indonesia cannot be solved by one actor alone, but requires cross-sectoral involvement.

In South Sulawesi, the Tallo watershed is one of the watersheds that experiences the highest environmental pressure (Hendra et al., 2024). The Tallo River that flows through Makassar City faces degradation due to household waste pollution, industrial activities, and uncontrolled land-use changes. This condition causes a decrease in water quality, sedimentation, and the threat of flooding that is detrimental to the community around the riverbanks. Although various programs have been implemented by the local government, the participation of the community and the private sector in watershed rehabilitation and management is still not optimal. This emphasizes the need for research that specifically examines the dynamics of collaboration between stakeholders in the Tallo watershed.

Collaboration between stakeholders in environmental management is believed to be one of the effective approaches to dealing with the complexity of watershed problems. The concept of collaborative governance emphasizes the importance of interaction and synergy between the government, society, civil society organizations, and academia in formulating joint solutions. In the context of watershed management, collaboration allows for the creation of participation-based mechanisms that not only strengthen policy legitimacy, but also improve compliance and effectiveness of program implementation on the ground (Hui & Smith, 2022). Therefore, strengthening collaborative governance is an urgent need for watersheds located in urban areas such as Tallo.

A number of studies in Indonesia have examined watershed management through a collaborative approach. For example, Abdillah and colleagues (2024) highlight a collaboration strategy based on the Quintuple Helix model in the Citarum watershed. The study confirms the importance of multi-stakeholder collaboration in reducing environmental degradation (Abdillah et al., 2024). Similarly, Petrina and Andriyani (2021) examined the role of stakeholders in the upstream conservation of the Bedadung watershed (Petrina & Andriyani, 2021). However, these studies focus more on watersheds in Java and less on urban watersheds outside Java, including South Sulawesi. This gap shows the need to examine the case of the Tallo watershed, which has different socio-ecological characteristics from watersheds in other regions.

International research also shows the relevance of cross-stakeholder collaborative studies in watershed management. A study by Bajongprasert (2021) identified that collaboration between actors in Europe strengthens the capacity of watershed management adaptation to climate change (Banjongprasert, 2022). On the other hand, research by Baah and colleagues (2022) found that the success of collaboration is greatly influenced by clarity of roles, transparency, and trust between stakeholders (Baah et al., 2022). However, the international literature still scantly discusses urban contexts in developing countries, so there is a gap to understand how collaboration works in Indonesia's urban watersheds facing urbanization and high pollution pressures.

Based on the background and gaps of the research, the purpose of this study is to explore the collaboration of stakeholders in overcoming the degradation of the Tallo watershed. The analysis is focused on identifying the roles of each stakeholder, the forms of interaction and synergy formed, and the obstacles faced in the collaboration process. Thus, this study seeks to produce a comprehensive understanding of the dynamics of sustainable and inclusive urban watershed governance.

The contribution of this research is theoretical and practical. Theoretically, this study enriches the literature on environmental governance, multi-stakeholder collaboration, and watershed management in urban contexts in developing countries. Practically, the results of the study are expected to provide policy recommendations for local governments, civil society organizations, and local communities in Makassar to strengthen participatory mechanisms and build trust between actors in the management of the Tallo watershed. Thus, this research not only provides academic contributions but also supports the implementation of more effective and sustainable environmental management strategies.

RESEARCH METHOD

Types and approaches of research

This study uses a qualitative approach with a descriptive design of a case study focusing on the Tallo River Watershed in Makassar City (Upright & Forsythe, 2021). This approach was chosen because it is able to provide a deep understanding of the dynamics of collaboration between stakeholders in overcoming environmental degradation. The case study is considered relevant because it allows a thorough exploration of the specific phenomenon, namely multi-stakeholder interactions and synergies in watershed management, in complex socio-ecological contexts.

Population and sampling techniques

The research population includes actors who have direct and indirect involvement in the management of the Tallo watershed, including representatives of local governments, local communities, civil society organizations, and academics. The sampling technique used is non-probability with a purposive sampling approach, namely the selection of informants based on their role, experience, and relevance to the issue of watershed degradation. A total of eight key informants were interviewed in this study, consisting of two representatives of local governments (Environment Agency and River Area Agency), three people from local communities (community leaders, fishermen's groups, or riverbank residents), two people from civil society organizations/NGOs (environmental activists or river care communities), and one academic/expert (lecturer or researcher related to watersheds). The number of informants is determined by considering the principle of data saturation, which is when the information obtained has been repeated and no longer provides new findings (Mwita, 2022).

Data collection techniques

Data was collected through three main techniques, namely in-depth interviews, field observations, and analysis of policy documents. In-depth interviews were conducted with semi-structured guidance to explore the roles, perceptions, and forms of interaction between stakeholders. Field observations focused on river border rehabilitation activities, community-based pollution control programs, and inter-sector coordination practices. Document analysis was carried out on regulations, official local government reports, and environmental policy documents related to the Tallo watershed. To ensure credibility, the validity of the data is tested through triangulation of methods and triangulation of sources, as well as member checking by confirming the interpretation of the results of the interview to the informant (Donkoh & Mensah, 2023).

Research procedure

The research procedure is carried out through several stages. First, the preparation stage includes the preparation of interview guidelines and the identification of key informants. Second, the data collection stage was carried out through interviews, direct observation, and documentation during the research period. Third, the data reduction stage is carried out by selecting relevant information and compiling field records systematically. Fourth, the data analysis stage is carried out simultaneously with the data collection process through initial coding, category identification, and theme development. Fifth, the verification stage is carried out through triangulation and discussion of provisional results with informants and experts. The last stage is the preparation of research reports by emphasizing empirical findings and theoretical and practical implications.

Data analysis techniques

Data analysis is carried out using thematic analysis techniques that allow the identification of patterns, themes, and dynamics of collaboration between stakeholders. The analysis process includes interview transcription, coding, category grouping, and theme development according to the collaborative governance framework (Qaissi, 2024). To strengthen the analysis, stakeholder mapping was used which describes the roles, interests, and relationships between actors in the management of the Tallo watershed. This mapping helps identify dominant actors, supporting actors, and potential conflicts and synergies. All analysis is assisted by NVivo 12 software to facilitate qualitative data management and visualization of relationships between themes (Allsop et al., 2022).

RESULT AND DISCUSSION

The Role of Stakeholders in the Management of the Tallo Watershed

The results of the study show that the management of the Tallo watershed still tends to be dominated by the role of local governments. The two informants from the Environment Agency and the River Region Center emphasized that the main focus of their agencies is the preparation of regulations, the implementation of river border rehabilitation programs, and pollution control. The government performs its main function as a policy maker and program controller, but this approach moves more top-down so that the space for the participation of other actors is not fully optimal. One government representative stated, *"We already have an annual program for riverbank repairs, but the community often only gets involved if they are officially invited. Awareness of participation still needs to be increased"* (PD-1, Interview June 10, 2025).

Local communities have a closer role to the day-to-day dynamics of the river, but their involvement is limited to incidental activities. Informants from community groups said that activities such as river waste cleaning, mutual cooperation, and planting vegetation are more often carried out when there is direct encouragement from the government or when environmental problems such as floods occur. A resident of the riverbank said, "*If there is a new flood, it is important to clean the river. We usually do community service, but after that it is not routinely done*" (ML-2, Interview June 14, 2025). This shows that community participation is still reactive, not proactive.

The role of civil society organizations and river care communities can be seen in advocacy activities, environmental awareness campaigns, and public education. However, the scope of their activities is still limited to certain communities and has not been able to reach all watershed areas. One of the activists said, "*We try to educate residents about reducing plastic waste and the importance of protecting rivers, but our activities are often hampered by the lack of strong logistical or policy support*" (MS-1, Interview June 16, 2025). This view shows the limitations of the role of CSOs which are more voluntary and community-based.

Academics play a role as providers of data, analysis, and policy recommendations, for example through research on water quality, potential pollution, or watershed rehabilitation models. However, the results of the research prepared have not been fully utilized by the government as a basis for decision-making. An academic said, "*Our research has provided an overview of the condition of the river, but it is often not used as the main reference because the government is more in line with the agenda that has been set*" (AK-1, Interview June 21, 2025). This role of academics is important, but it is still limited to the provision of information without strong integration in practical policy.

Overall, the role of stakeholders in the Tallo watershed can be mapped as follows: local governments are in a dominant position as decision-makers, local communities as implementers in the field with a direct interest in river conditions, civil society organizations as drivers of public awareness, and academics as knowledge providers. However, there is no balance of roles that allows the formation of strong collaborative governance.

Forms of Interaction and Synergy Between Actors

The form of interaction between stakeholders in the management of the Tallo watershed takes place in two main patterns, namely formal coordination forums and community-based initiatives. Formal coordination forums are usually initiated by local governments through cross-agency meetings or public consultation activities. However, the interaction in this forum is still ceremonial

and has not resulted in a sustainable collaboration mechanism. A government official revealed, "*We do routinely invite various parties to coordination forums, but after the forum is over, the follow-up often stops*" (PD-2, Interview June 12, 2025).

Outside of formal mechanisms, there are more spontaneous interactions based on community initiatives. Mutual cooperation activities to clean up river waste, household waste sorting programs, or the creation of biopore holes are examples of how residents try to contribute directly. A community leader said, "*We make routine activities with fishermen groups, such as planting trees on the banks. But the number of participants often decreases because there is no outside support*" (ML-1, Interview 15 June 2025). This activity shows the potential for synergy from below, although the scale is still small and the sustainability is limited.

Civil society organizations play the role of a liaison between local communities and a wider network, both at the city and provincial levels. Through collaboration with academics, they organize educational programs in schools and communities. However, this collaboration often stalls after the project is completed due to resource constraints. One of the activists said, "*We once worked with researchers to create conservation training, but after the project ended, the activities did not continue*" (MS-2, Interview June 18, 2025).

A relatively successful form of synergy can be seen in river border rehabilitation programs involving the government, communities, and CSOs. This program has a real impact in the form of reduced erosion at several critical points on the riverbank. One of the residents said, "*After there was a tree planting with the government and the community, the riverbank area was stronger in retaining water. But this kind of activity is rarely carried out*" (ML-3, Interview 20 June 2025). These findings show that collaboration can be successful if there is a clear integration of roles and direct benefits to society.

However, in general, interaction between actors is still partial and inconsistent. Many programs run in the form of short-term, non-continuous projects. This results in weak continuity of cooperation and low sense of common ownership. With this condition, strengthening synergy between stakeholders in the Tallo watershed is an urgent need so that environmental management does not only depend on government initiatives, but is truly based on equal and sustainable collaboration.

Obstacles in the Collaboration Process

This study found that the main obstacles in building collaboration in the management of the Tallo watershed lie in the weak institutional capacity and low participation of the community and the private sector. Many communities view river management as the full responsibility of the government, so their involvement is limited to incidental activities that are reactive. A resident of the

riverbank said, "*We usually participate in community service if there is a flood or an official invitation from the village, but there are no continuous routine activities*" (ML-2, Interview June 14, 2025). This view shows that people's awareness to engage independently is still low, even though they are the most affected by environmental degradation.

Private sector involvement is also still minimal. In fact, this sector has great potential for financial and technical resources to support environmental rehabilitation. One academic explains, "*Many companies around the Tallo watershed have the potential to support environmental management, but without clear regulation, they tend to ignore it*" (AK-1, June 21, 2025 interview). The absence of binding regulations has led the private sector to place environmental issues as a secondary priority rather than economic interests.

Another obstacle that is quite crucial is the overlap of authority between government agencies. An informant from the River Area Center stated, "*Often our programs are not in line with other agencies, so people are confused about whose direction to follow*" (PD-2, Interview June 12, 2025). This institutional fragmentation results in role ambiguity and slows down the decision-making process. Weak inter-agency coordination is the main obstacle to creating an integrative strategy in overcoming the degradation of the Tallo watershed.

Effective Collaboration Practices

Although most collaborations are still partial, the study found that there are several collaborative practices that can be considered effective. The river border rehabilitation program is one of the real examples of successful inter-sector coordination. This activity involves the government as a facilitator, the community as an implementer in the field, and civil society organizations as advocates for advocacy and education. One community leader stated, "*When the government invited us to plant trees on the riverbank, we felt more appreciated and wanted to participate. As a result, the banks are now more strongly water-resistant*" (ML-1, Interview June 15, 2025). The success of this program shows that active community involvement can increase the sense of ownership as well as the effectiveness of results.

In addition, there are community initiatives in community-based pollution control, such as education on plastic waste reduction and the use of biopores. An environmental activist said, "*We made biopore training for residents so that organic waste can be processed. Indeed, the scale is small, but the citizens are more concerned*" (MS-2, Interview June 18, 2025). Practices like this show that local initiatives that directly involve communities are more likely to create sustainable change than fully government-driven programs.

Synergy is also seen in the cooperation between civil society organizations and academics in environmental education programs in schools. An academic emphasized, "*Collaboration with the river care community allows the results of our research to be more easily understood by the public*" (AK-1, Interview June 21, 2025). Although the scale is limited, the program shows that combining academic knowledge with a community approach can strengthen the effectiveness of environmental education.

Stakeholder Mapping and Institutional Dynamics

Stakeholder mapping shows that local governments occupy a dominant position in the management of the Tallo watershed. Their primary role is as policy makers and program controllers, although they are often top-down. Civil society organizations and academics play a supporting role, each through advocacy and knowledge provision. Local communities play a role as implementing actors on the ground with relatively limited influence, while the private sector occupies a marginal position due to low involvement in management programs.

An environmental activist said, "*The government has always been the main decision-maker, but often the voice of the community or our input is not really considered*" (MS-1, Interview June 16, 2025). This shows that there is an inequality in the power relationship between the actors. At the same time, one government official asserted, "*We cannot completely hand over management to the community, because they are not ready in capacity*" (PD-1, Interview June 10, 2025). This view shows that there is a perception that still places the community as a complementary party, not an equal partner.

The institutional dynamics in the Tallo watershed reflect the potential for synergies, but they have not yet developed into sustainable strategic partnerships. Fragmentation between agencies, low private sector participation, and lack of integration of academic research results into policy are major obstacles in creating effective collaborative governance. With these conditions, strengthening institutional capacity, communication consistency, and more inclusive regulatory arrangements are urgent needs to encourage the realization of more equitable, inclusive, and sustainable collaboration.

Discussion

The results of the study show that the management of the Tallo watershed is still dominated by local governments, while local communities, civil society organizations, academics, and the private sector have not been optimally involved. The government's dominance in the drafting of regulations, river border rehabilitation programs, and pollution control confirms the existence of power asymmetry among the actors involved. This is in line with the finding

that collaboration in environmental governance often takes place in a space that is not entirely egalitarian, where powerful actors have a great influence in controlling agendas and processes (Westin & Montgomerie, 2024). In the context of the Tallo watershed, the top-down approach means that community and private sector involvement is still limited, even though the participation of both is essential to create sustainable collaborative governance.

The role of local communities who are more involved in incidental activities such as river cleaning or mutual cooperation shows that their participation is still reactive. This shows that community-based management has not fully developed into a sustainable participatory structure. Previous studies have also emphasized that community-based watershed management is only effective when it is based on collective awareness and integration into people's daily activities (Westin & Montgomerie, 2024). The low participation of the community in the Tallo watershed shows that there is a gap between practical needs and institutional strengthening.

Civil society organizations and academics in the Tallo watershed play a role in advocacy, education, and knowledge provision. However, the results show that the reach of civil society organizations is still limited, while academic recommendations are often not integrated into policy. This condition confirms the existence of a gap in the translation of knowledge into public policy, as also found in research on environmental research collaborations in different countries (Mahajan et al., 2022). This gap shows the need for a formal mechanism so that the results of research and advocacy can be used as a basis for program preparation by local governments.

However, there are collaborative practices that have shown positive results, for example in river boundary rehabilitation programs and community initiatives to reduce pollution through waste sorting and biopore use. The success of this program shows that when communities are directly involved and feel tangible benefits, participation can increase. This supports the view that environmental collaboration is more effective if it is focused on tangible activities that can provide direct benefits to the community (Ambrose & Imperial, 2025). Thus, the collaborative practices in the Tallo watershed prove that the bottom-up model can be an effective complement to the dominant government approach.

Stakeholder mapping shows that there is an inequality of roles where the government is in a dominant position, local communities play the role of implementers, civil society organizations and academics as supporters, while the private sector occupies a marginal position. This pattern shows that collaborative governance in the Tallo watershed is still far from the principle of

equality between actors. Similar conditions have been found in watershed governance research in various contexts, where private sector participation is often limited unless there are regulations or incentives that encourage their involvement (Diaz-Kope & Morris, 2022). Thus, the success of collaboration in the Tallo watershed is highly dependent on the government's ability to create inclusive rules of the game, strengthen communication between actors, and provide space for communities and the private sector to contribute equally.

The findings of this study have several important implications. First, if the pattern of government dominance continues without strengthening the capacity of the community and the private sector, then efforts to manage the Tallo watershed risk being unsustainable. Second, the low integration of academic research results and advocacy of non-governmental organizations (NGOs) in policy shows the need for a stronger knowledge translation mechanism so that collaboration can have a real impact. Third, the existence of good practices such as river border rehabilitation shows great potential to develop a more participatory and local needs-based collaboration model.

However, this study has limitations. The relatively small number of informants does not fully reflect the complexity of actors in the Tallo watershed, particularly from the private sector. This research was also carried out in a certain period of time so that it could not capture the long-term dynamics of collaboration between actors. For further research, it is recommended to use a mixed method by combining qualitative and quantitative approaches, for example by measuring the impact of collaboration on environmental indicators such as water quality and sedimentation levels. Longitudinal research is also needed to understand the changes in relationships between actors over time. In addition, comparative studies across watersheds in Indonesia can provide a more comprehensive understanding of the patterns of success and barriers to collaboration in different contexts.

CONCLUSION

This research shows that the degradation of the Tallo watershed is a complex problem that cannot be overcome only through the role of local governments. Although the government still holds a dominant position in the formulation of regulations, the implementation of rehabilitation programs, and pollution control, the involvement of the community, civil society organizations, and academics has proven to be suboptimal. Public participation tends to be limited to sporadic activities, while the private sector is almost absent due to the absence of binding regulations. This condition shows that the collaboration that has been built is still partial and has not been strategically

integrated, so the effectiveness of watershed management in the long term is still low.

On the other hand, the field findings show that there are collaborative practices that can be good examples, such as river border rehabilitation programs and community initiatives in waste control and environment-based pollution. This practice shows that the active involvement of local communities can yield tangible results, such as reduced erosion and increased environmental awareness. Thus, this study emphasizes the importance of strengthening inclusive collaborative governance, increasing community capacity, and encouraging cross-actor synergy including the private sector. Theoretically, the results of this study enrich the literature on environmental governance and multi-stakeholder collaboration in natural resource management. In practical terms, this study provides recommendations for policymakers to design more binding regulations, expand the space for community participation, and integrate the contributions of academics and civil society organizations as part of a sustainable and participatory management strategy for the Tallo watershed.

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