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Stakeholder Power, Conflict Dynamics, and Sustainable Urban Spring Governance in the Framework of the Sustainable Development Goals

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Abstract: Urbanization pressures and land conversion in Probolinggo City in recent years have increased the risk of discharge reduction and degradation of recharge zones at three main springs: Senthong, Grinting/Sumber Wetan, and Umbul/Ganesha. This study aims to analyze the distribution of power, interests, and conflicts in urban spring conservation. The approach used is a qualitative case study through in-depth interviews, focus group discussions (FGDs), and policy document analysis. The analysis is grounded in Stakeholder Theory using a power–interest matrix instrument to map actor configurations and their relational dynamics. The findings indicate that local government and the water distribution operator (PDAM) occupy dominant positions (high power), while business actors fall into the category of powerful beneficiaries. In contrast, local communities have high interests but low power. This pattern produces pseudo-collaboration practices, in which communities are only involved at the socialization or ceremonial stage, with no role in determining tariff policies, distribution allocation, or conservation priorities. This imbalance triggers latent conflict between exploitation-oriented interests and ecosystem protection agendas. The study concludes that spring conservation requires a governance design that corrects power asymmetry through the establishment of formally legalized cross-actor collaborative forums and the granting of community-based management rights over recharge areas as a mechanism for strengthening substantive participation.

Keywords: Collaborative governance; Stakeholder power; Urban springs; Water governance; Water resource conservation

Introduction

The availability and sustainability of urban water resources is a strategic issue receiving increasing attention in global environmental governance studies, particularly in developing countries. Rapid urbanization, increasing domestic and economic water needs, and land use changes have placed urban springs in conditions increasingly vulnerable to degradation and over-exploitation (Bakker & Morinville, 2013; Yang et al., 2021).

Land use changes, especially the conversion of forests to settlements and economic activities, have been proven to reduce the hydrological carrying capacity of watersheds, thereby increasing pressure on the sustainability of water sources utilized by urban areas (Amini et al., 2025). Experience in natural resource-based conservation shows that conflicts between ecosystem protection and economic utilization are not solely triggered by ecological pressures, but by weak institutional dimensions and unclear actor roles in management (Komala et al., 2025; Mamesah et al., 2024). In the urban context, springs not only function as supply sources, but also as important elements of city resilience against environmental crises, so that water governance failure is a governance problem, not merely a technical or ecological issue (Djohar & Junita, 2025).

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Springs not only function as water supply sources, but also have important ecological, social, and cultural values for city sustainability (Hermawan, 2024). Findings by Ninasafitri et al. (2023) show that water resource conservation, including groundwater and springs, cannot be approached technically alone, but requires integration of continuous monitoring, public education, utilization management, and mitigation of economic activity impacts such as tourism, with active involvement of communities and government as prerequisites.

In the water resource governance framework, spring management cannot be separated from the dynamics of relationships among stakeholders who have different interests and levels of power. Several studies show that power and interest imbalances among government actors, business actors, and local communities often produce policies and management practices biased toward short-term economic interests, while conservation aspects and social justice are marginalized (Brisbois & de Loë, 2016).

Research on land conservation shows that the success of resource protection efforts is greatly determined by community norms and perceptions, where the state has zoning authority, but the level of compliance and conservation effectiveness depends on local actor practices and interests (Anggana et al., 2024). This imbalance becomes a key factor explaining the failure of sustainable water resource management in urban areas.

Conflict between conservation interests and water exploitation is a consequence of these different interests. Water is treated paradoxically as a source of life that must be protected while simultaneously as a commodity exploited to meet domestic, industrial, and commercial activity needs (Moore et al., 2014). Edelenbos et al. (2015) and Megdal et al. (2017) affirm that water use conflicts often emerge when management policies are not accompanied by fair, participatory, and transparent regulatory mechanisms, and when the state's role as regulator and protector of public resources weakens.

These conditions are also reflected in the context of urban spring management in Indonesia. The lack of specific technical policies, weak supervision, and low local government concern for spring conservation cause water utilization to proceed without adequate control and potentially trigger conflicts among users.

In Probolinggo City, urban springs such as Senthong Spring, Grinting/Sumber Wetan, and Umbul/Ganesha play important roles in meeting community water needs and supporting local economic activities. However, the existence of these springs faces serious pressure due to increasing water needs, land use conversion in recharge areas, and weak regulation and supervision of utilization. Existing management practices show power relationship imbalances among stakeholders, conflicts of interest between conservation and water exploitation, and limited community participation mechanisms and effective conflict resolution.

The availability of clean water remains a significant issue in Probolinggo Regency. Several areas still experience limited access to clean water sources, leaving communities heavily dependent on local springs. The regional government has even encouraged the utilization of spring potential in villages as a solution to address water crises that frequently occur, particularly during the dry season (Antaranews, 2023).

This condition indicates that the existence of springs plays a strategic role in meeting the community's water needs. In reality, however, the distribution and availability of clean water across the Probolinggo region remains uneven. In Probolinggo City, for instance, only around 39% of the population has access to piped clean water services, while the remaining approximately 60% still rely on groundwater as their primary source for daily water needs (Radar Bromo, 2024).

Beyond limited access to clean water services, several areas in Probolinggo Regency also experience fairly serious water shortages, particularly during the dry season. The regional government, through the Regional Disaster Management Agency (BPBD), has even had to distribute clean water assistance to communities facing difficulties in obtaining water for their basic daily needs (Antaranews, 2025).

This condition demonstrates that local water sources, including urban springs, have become critically important in maintaining domestic water supply. Consequently, the degradation or poor management of these springs has the potential to directly affect the security of urban water supply in Probolinggo.

The conflict between conservation and exploitation in urban spring management is not singular in nature, but rather manifests across several forms of social relations. In Probolinggo City, emerging conflicts tend to take the form of vertical conflicts between local communities and the government or water distribution operators, concerning access, transparency in decision-making, and priorities in water source utilization. In addition, there is a diagonal conflict dimension between communities and business actors who utilize water for commercial purposes, particularly when the intensity of water extraction is perceived as threatening the sustainability of spring discharge. To a certain degree, the potential for horizontal conflict among residents may also arise in situations of scarcity or uneven distribution, although this does not always escalate into open conflict. Accordingly, conflict in this study is understood as structural tension resulting from differing interests in the utilization and protection of springs,

shaped by the distribution of power among actors within the local governance system. Affirming this conflict typology is important to highlight the social complexity that contextualizes the analysis of power and interest relations in this study.

Research on urban spring conservation has long been dominated by technical and biophysical approaches, such as water quality measurement and pollution level assessment (Abdel-Fattah, 2020; Jo, 2022; Rodrigues, 2020), spatial mapping of priority conservation areas (Tadros, 2020) and evaluation of spring ecological conditions (Collier, 2016; Kurzweil, 2021). These approaches provide important insights into environmental conditions and sources of ecological pressure, yet have not been fully capable of explaining variations in conservation outcomes across locations with relatively similar biophysical characteristics. In recent years, attention has begun to shift toward governance dimensions, including the institutional capacity of local governments (Souza, 2020) the effectiveness of community-based management (Caro-Borrero, 2024), and the role of governance capacity in maintaining the sustainability of spring-based water supply systems (Pokhrel, 2025).

Nevertheless, these studies still tend to be partial and have not yet systematically integrated the analysis of power imbalances among actors, interest configurations, and conflict dynamics in explaining the success or failure of conservation at the site level, particularly in medium-sized cities in developing countries (Brisbois & de Loë, 2016).

In the collaborative governance literature, not all schemes that formally involve multiple actors can be categorized as substantive collaboration. Several investigations highlight the phenomenon of pseudo-collaboration, a condition in which governance policies or forums appear procedurally participatory and inclusive, yet in practice remain dominated by actors with greater resources and formal authority. Brisbois et al. (2016) assert that power relations in water governance are often concealed behind collaborative mechanisms that are normatively regarded as egalitarian. Similarly, Edelenbos et al. (2015) demonstrate that connective capacity and the distribution of influence determine whether collaboration produces the integration of interests or instead becomes a legitimation of certain actors' dominance. In this case, collaboration that is not accompanied by corrective mechanisms against power asymmetry has the potential to create spaces of tokenistic participation, leaving actors with high interests but low power in a persistently marginal position. This framework is important for explaining how urban spring governance that formally involves various stakeholders can nonetheless produce structural exclusion, as found in this study.

The urgency of this research is further reinforced by the fact that urban spring degradation is not only driven by biophysical pressures, but also by institutional problems such as institutional fragmentation, overlapping authority, and resource utilization conflicts. A number of studies indicate that technical approaches, including water quality monitoring, are effective in identifying pollution sources (Burnet, 2019; Buss, 2022), yet often fail to produce sustainable conservation policies due to weak inter-agency coordination. On the other hand, the existence of formal regulations does not automatically guarantee spring protection without adequate implementation capacity and social legitimacy (Chauhan, 2023; Souza, 2020) Community-based management also has the potential to advance conservation practices, but remains at risk of failure without strong policy support and institutional integration (Perevochtchikova, 2020). Findings by Pokhrel (2025) affirm that governance capacity and the effectiveness of inter-actor coordination are the primary prerequisites for the sustainability of spring-based water systems.

Based on these gaps, this study offers conceptual novelty by positioning stakeholder power relations, interest configurations, and conflict dynamics as key elements in the analysis of urban spring conservation. This novelty is reinforced through a multi-site comparative design within a single municipal governance context, thereby enabling the identification of structural governance patterns across locations, rather than merely the dynamics of individual cases. By situating Probolinggo City as the case study, this research also broadens the geographic scope of the urban spring conservation literature, which has thus far been predominantly dominated by studies from Latin America and Europe (Antunes, 2019; Giupponi, 2022), while simultaneously offering an analytical framework with the potential to be replicated in other developing city contexts.

In developing urban contexts, these challenges become more complex due to accelerated urbanization, land use changes, and authority dynamics in decentralized government systems (Feizizadeh et al., 2021; Hung, 2020). Without comprehensive understanding of power structures and conflict dynamics among stakeholders, conservation interventions have potential not only to fail in achieving ecological goals, but also to strengthen access imbalances and trigger new social conflicts. Therefore, this research contributes strategically in formulating adaptive, inclusive, and conflict-sensitive urban spring conservation governance approaches, while bridging the gap between environmental scientific knowledge and policy practices which has been a main challenge in urban water resource management (Alafifi, 2020;

Neumann, 2021). This limitation shows an important research gap to be filled through governance approaches and stakeholder analysis.

Based on this gap, this research aims to analyze the distribution of power and interests among stakeholders in urban spring utilization, identify forms of conflict between conservation and water exploitation, and examine the role of policy and government concern in managing Senthong Spring, Grinting/Sumber Wetan, and Umbul/Ganesha in Probolinggo City.

Method

This study employs a qualitative approach with a case study design to gain an in-depth understanding of the dynamics of power, interests, and conflicts among stakeholders in urban spring management. The case study approach was chosen because it enables comprehensive contextual exploration of the complex water resource governance phenomenon involving social and institutional relationships (Yin, 2018). The research sites are focused on three main springs in Probolinggo City, namely Senthong Spring, Grinting/Sumber Wetan Spring, and Umbul/Ganesha Spring, each of which has distinct utilization characteristics and interest pressures.

Data collection was conducted through in-depth interviews with key informants, focus group discussions (FGDs), field observations, and analysis of policy documents related to water resource management. Informant selection was carried out using purposive sampling, choosing parties considered to possess knowledge, roles, or direct influence in spring management. The informant selection criteria include: (1) actors with formal authority in water resource governance, such as local government and water management institutions; (2) actors involved in the economic utilization of water resources, such as business operators; and (3) representatives of local communities and water user groups with a direct connection to spring sustainability. In some cases, snowball sampling was also employed to identify additional informants recommended by initial informants.

Focus group discussions (FGDs) were conducted to capture the collective perceptions of stakeholders regarding their roles, interests, and potential conflicts in spring management. The FGDs involved representatives from local government, water managers, business operators, community figures, and water user groups. Participant composition was designed to be heterogeneous in order to obtain diverse perspectives on the dynamics of local-level water resource governance. The discussion process was facilitated using a semi-structured guide focused on actor identification, forms of power relations, and spring utilization and conservation practices.

Data analysis was conducted using an interactive analysis model comprising three main stages: data reduction, data presentation, and conclusion drawing (Creswell & Poth, 2016). In the data reduction stage, information from interviews, FGDs, and observations was selected and grouped according to key themes related to actor roles, levels of interest, and influence in spring management. The data presentation stage involved organizing information into stakeholder categories to facilitate the interpretation and comparison process across actors. Subsequently, conclusion drawing was carried out by identifying patterns of power relations, interests, and potential conflicts emerging in spring governance practices.

Based on the results of this analysis, stakeholder mapping was conducted using the Power–Interest Matrix to identify the relative position of each actor within the governance system (Bryson, 2004). The level of power was assessed based on indicators such as formal authority, influence in decision-making, and control over resources and water management operations. Meanwhile, the level of interest was assessed based on the degree of dependence on water resources, concern for spring sustainability, and involvement in utilization and conservation activities. This mapping was used to classify stakeholders into categories of dominant actors, influential actors, potential actors, and marginal actors in urban spring governance.

To ensure data validity, this study applied source and method triangulation techniques. Information obtained from interviews was cross-checked against field observation results, focus group discussions, and policy documents related to water resource management in Probolinggo City. This triangulation process was carried out to ensure information consistency and to enhance the credibility of the research findings.

To clarify the analytical stages employed in this study, the data analysis process flow is presented in Figure 1. Figure 1 illustrates the data analysis stages in this study, beginning with the identification of research sites and stakeholders, followed by the data collection process through interviews, FGDs, observations, and document analysis. The data obtained were then analyzed through the processes of data reduction, data presentation, and stakeholder role analysis to identify the power and interest levels of each actor. The analysis results were subsequently used to map stakeholders using the Power–Interest Matrix, enabling an understanding of power dynamics, interests, and potential conflicts in urban spring management.

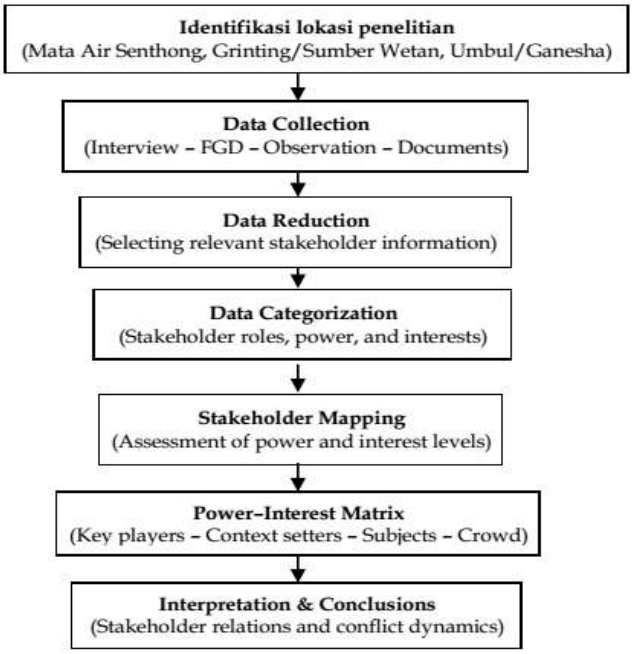

Figure 1. Data analysis and stakeholder mapping process flow

Result and Discussion

Collaborative Stakeholder Mapping and Power Distribution

Stakeholder analysis in the management of Senthong Spring, Grinting/Sumber Wetan, and Umbul/Ganesha in Probolinggo City shows that the spring management process involves several main actor groups, namely local government, managers and economic actors, and local communities. Although normatively water resource management encourages inter-actor collaboration, research findings show that collaborative relationships formed are still characterized by imbalances in power and interest distribution, so collaborative stakeholder practices have not proceeded equitably.

Stakeholder mapping shows power and interest distribution imbalances in spring source governance in Probolinggo City. The local government holds the role of a key actor with high power and strong structural interests in spring governance. Although operational priorities often emphasize service stability and administrative compliance, the government retains formal responsibility for environmental protection, regulatory enforcement, and the implementation of the Sustainable Development Goals (SDGs). Accordingly, its institutional mandate justifies classification as a high-interest actor within the power-interest matrix framework.

This condition aligns with research findings by Pambudi et al. (2023) showing that water management policies at the regional level still tend to be administrative and not yet fully integrated with ecosystem conservation principles operationally.

Water managers or distribution operators appear as dominant actors in spring source utilization practices because they have a combination of both high power and interest. This dominance makes management orientation tend toward technocratic and operational efficiency becomes the main focus, such as supply sustainability and distribution optimization. A similar pattern was also found in research by Prayoga et al. (2023) stating that technical water management institutions tend to emphasize distribution and service aspects, while ecological sustainability dimensions are often in secondary positions. This technical actor dominance shows that formed collaboration is more oriented toward operational efficiency than integration of social and ecological dimensions, so long-term sustainability goals are potentially neglected (Pioh & Pinatik, 2025).

Business parties and the commercial sector are categorized as powerful stakeholders with moderate power and high interest. Although they exert economic influence through investment and water use intensity, they lack formal regulatory authority or direct control over permit issuance and policy formation. Their power therefore remains structurally limited in comparison to the local government and water operators. This classification aligns with stakeholder theory, which distinguishes between economic influence and institutional decision-making authority.

This position shows that the business sector obtains significant benefits from water resources without always being proportionally involved in conservation responsibilities. This condition aligns with findings by Salsabila et al. (2025) showing that the economic sector tends to position itself as a benefit user, not as an active partner in water resource sustainability management. This position affirms an imbalance between water resource utilization levels and contributions to conservation efforts, which potentially creates ecological pressure on spring sustainability in the long term (Sarjani et al., 2023).

Local communities as direct spring users are actually in the structurally weakest position. With low power level but high interest, this group is classified as marginalized stakeholder. They have great interest in water access, spring sustainability, and social-cultural values, but limitations in access to decision-making processes make their aspirations less accommodated. Renaldi et al. (2024) affirm that local communities often have important ecological knowledge, but it has not been formally integrated into natural resource management decision-making systems. This marginalization condition shows that decision-making mechanisms are still top-down, so local knowledge that potentially supports conservation has not been utilized

optimally in spring management policies (Prihantini, 2023).

Meanwhile, civil society groups and local figures have potential as connecting actors in multi-party collaboration. Although their power is still low to medium, high interest levels in spring protection place them as strategic potential collaborators. However, their role not yet being institutionalized causes contributions to advocacy, social supervision, and local-based conservation to not yet be optimal. In this case, the importance of community institutional strengthening so civil society roles can function effectively in collaborative-based water resource governance. Water resource management policies at the regional level are still dominated by administrative and sectoral approaches, with main focus on clean water service fulfillment and regulatory compliance, while ecosystem conservation integration and community participation have not run optimally (Azmin, 2025).

Overall, the stakeholder mapping reveals a structural power imbalance in urban spring governance, whereby formal and technical actors dominate the decision-making process while community actors with high interests remain marginalized. This imbalance limits the effectiveness of collaborative governance and risks reinforcing pseudo-collaborative practices rather than genuine power-sharing arrangements.

Findings regarding power relation imbalances among stakeholders in the management of Senthong, Grinting/Sumber Wetan, and Umbul/Ganesha springs show that collaborative governance practices at the local level still face significant structural challenges. This condition has direct implications for achieving Sustainable Development Goals (SDGs), particularly SDG 6 on Clean Water and Sanitation and target 6.b which emphasizes the importance of local community participation in water resource management. Low inclusivity in water governance causes resulting policies to be less responsive to ecological and social needs of communities around water sources (Fatristya et al., 2025; Permata et al., 2024). Thus, the actor role imbalance found in this research strengthens the argument that SDG achievement not only depends on infrastructure availability, but also on inclusive and collaborative governance quality. These findings indicate that collaborative governance strengthening becomes a key factor in ensuring water resource sustainability and benefit distribution justice for all stakeholders (Safitri & Sofiana, 2024).

The dominance of local government and water distribution operators oriented toward service stability and technical efficiency reflects a management approach that is still administrative and sectoral. This pattern is not yet fully aligned with Integrated Water Resources Management (IWRM) principles which are SDG 6.5 targets, which demand integration of social, ecological, and institutional aspects in water management. Annaifah (2024) and Suseno et al. (2025) show that water governance that overly emphasizes distribution technical aspects tends to ignore ecosystem conservation dimensions and community participation, thus potentially reducing spring source carrying capacity in the long term. These findings are relevant to conditions in Probolinggo City, where conservation agendas are still not a main priority in water source management practices.

Meanwhile, the business sector's position as powerful beneficiary shows an imbalance between water resource utilization and responsibility for sustainability. This condition relates to SDG 12 on Responsible Consumption and Production, which demands economic sector involvement in sustainable natural resource utilization practices. The commercial sector often plays a role as benefit user without significant contribution to conservation efforts (Capah et al., 2023). In this context, strengthening partnership mechanisms between government, operators, and business sectors becomes important so water utilization is not only oriented toward economic profit, but also supports resource sustainability.

On the other hand, the weak position of local communities in decision-making structures shows challenges in achieving SDG 16.7 which emphasizes inclusive, participatory, and representative decision-making. Local communities have high interest in spring sustainability and relevant ecological knowledge, but limitations in access to policy forums cause these contributions to not yet be optimally accommodated. Harjanta et al. (2023) affirm that integration of local knowledge in natural resource governance can increase conservation effectiveness and strengthen policy legitimacy. Therefore, community empowerment and community institutional strengthening become important strategies to encourage a shift from hierarchical management models toward more equal collaborative governance.

Overall, this research results show that SDG target achievement in water resource management in Probolinggo City still faces challenges in governance aspects, particularly related to power distribution and collaboration inclusivity. To strengthen spring management contributions toward SDG 6, SDG 12, SDG 16, and SDG 17 (Partnerships for the Goals), strengthening more balanced multi-party collaboration mechanisms is needed, integration of conservation agendas in regional policies, and increasing local community and civil group roles in decision-making processes. Thus, built collaboration is not only operational and administrative, but also capable of

encouraging ecological sustainability, social justice, and long-term water resource resilience.

The classification of stakeholder power and interest levels was carried out through triangulation of interview data, policy document analysis, and validation through focus group discussions (FGDs). Power levels were evaluated based on formal authority, regulatory control, and operational influence, while interest levels were assessed based on expressed dependence on the sustainability of natural resources and involvement in conservation initiatives. Classification into high, moderate, or low categories was conducted using an interpretive analytical approach consistent with stakeholder mapping methodology.

Table 1. Power Distribution in Spring Source Management in Probolinggo City

Stakeholder group	Main role	Power level	Interest level	Dominant interest form	Position in collaborative stakeholder
Local government (related agencies for natural resources, environment, licensing)	Regulator, licensing provider, formal supervisor	High	Medium	Water service stability, administrative compliance	Key player but conservation not yet a priority
Water manager / distribution operator	Extraction, distribution, technical management	High	High	Supply sustainability & operational efficiency	Dominant actor in utilization practices
Business actors / commercial	Water utilization for economic activities	Medium–high	High	Economic profit, water access continuity	Powerful beneficiary
Local community (domestic users, communities around springs)	Direct users & informal spring guardians	Low	High	Water access, spring sustainability, social values	Marginalized stakeholder
Community groups / local figures	Advocacy, social control, local-based conservation	Low–medium	High	Spring protection & community interests	Potential collaborators, not yet institutionalized

Table 1 illustrates the distribution of power and interests among stakeholders in spring management in Probolinggo City. The local government holds the primary role as regulator and permit provider, with high power but only moderate conservation interest. The water management operator emerges as the dominant actor, possessing both high power and high interest in maintaining supply sustainability and operational efficiency. Business operators hold moderate to high influence with a focus on economic gain and continuity of water access. On the other hand, local communities and advocacy groups have high interest in spring sustainability, yet their power remains low, leaving their position marginal despite their potential as collaborators. This condition reveals a power imbalance among stakeholders, underscoring the need for collaborative strategies to integrate conservation and water utilization interests in a sustainable manner.

Figure 2 illustrates that local governments and water operators/managers have the highest level of influence in urban spring management. This indicates that formal authority, regulatory power, and operational control over the water distribution system are the main factors in determining decision-making capacity. Business actors show a relatively high level of power due to their economic contribution and potential investment in the utilization of water resources.

Conversely, local communities and community groups have a lower level of power. This condition reflects their limited formal authority, even though they are the parties directly affected by and dependent on the sustainability of the spring. This pattern indicates that the governance structure remains institution-centric, where power is more concentrated in government actors and technical operators. This unequal distribution of power has implications for the need for more inclusive participatory mechanisms to avoid the dominance of certain actors in the decision-making process.

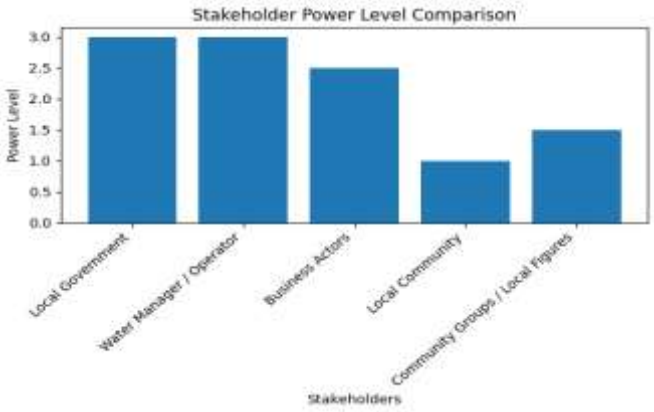

Figure 2. Graph of stakeholder power level comparison in urban spring management

Figure 3 shows that the majority of stakeholders have a high level of interest in the management and conservation of springs. Water operators, business actors, local communities, and community leaders demonstrate a high level of interest due to their direct

connection to the sustainability of water sources, whether economically, socially, or ecologically.

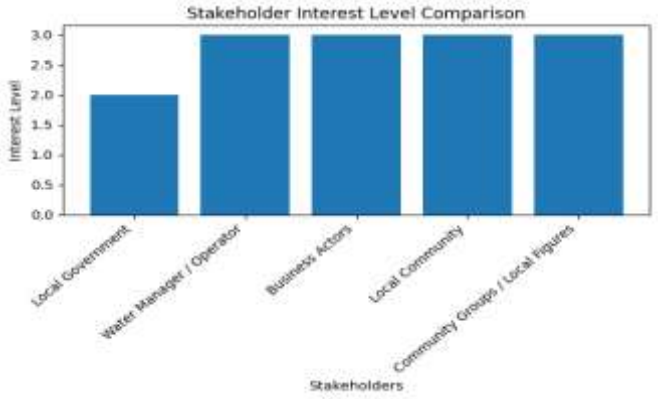

Figure 3. Graph of stakeholder interest level comparison in urban spring management

Local government shows a moderate level of interest, which can be understood because the government's responsibilities encompass various development sectors besides water management. The high level of interest from various stakeholder groups indicates a strong potential for collaboration in water resource governance. However, the discrepancy between the levels of power and interest reveals an imbalance of influence, thus management strategies need to be directed toward increasing the participation of groups with high interest but low power.

The comparison between the levels of power and interest reveals a governance asymmetry in urban spring management. Local governments and water operators have a high level of influence in the decision-making process due to their formal legitimacy and control over resources, while several other groups, particularly local communities and community groups which demonstrate a high level of interest yet possess relatively limited influence.

From the perspective of stakeholder theory, an unbalanced distribution of power can influence the direction of policy and resource management priorities, as actors with high power tend to be more decisive in strategic decisions. This imbalance has the potential to create a gap in the representation of interests, especially if groups with high interest do not obtain adequate space for participation.

Bryson (2004) emphasizes that stakeholder mapping aims to identify key actors and determine appropriate engagement strategies based on their levels of power and interest. In this context, groups with high interest but low power should be a priority in empowerment strategies and increasing participation in order to create more inclusive governance.

Further, Reed et al. (2009) state that in natural resource management, stakeholder analysis serves to reduce the potential for conflict and increase policy effectiveness through the integration of the interests of various parties. Therefore, the mapping results in this study indicate the need for a collaborative approach that not only focuses on dominant actors, but also strengthens the role of the community as key stakeholders in the sustainability of water resources.

A comparative analysis of the three spring sites — Senthong, Grinting/Sumber Wetan, and Umbul/Ganesha — reveals that stakeholder dynamics are not uniform, but rather shaped by the distinct social, economic, and institutional contexts of each location. At Senthong Spring, the management structure exhibits stronger technocratic dominance by water operators and government institutions, resulting in relatively limited involvement of local communities in strategic decision-making. The management orientation at this site places greater emphasis on distribution stability and operational efficiency of the water supply system. In contrast, at Umbul/Ganesha, local community involvement is more pronounced due to stronger socio-cultural attachment to the spring. This condition enables community figures and groups to play a more active role in source water protection activities and social oversight of water utilization.

Meanwhile, at Grinting/Sumber Wetan, governance dynamics are more strongly influenced by economic utilization pressures, as reflected in the relatively more prominent role of business actors in water use practices. The dominance of economic interests at this site risks amplifying pressure on spring sustainability if not counterbalanced by adequate conservation mechanisms. These differing configurations indicate that collaboration patterns in spring management are contextual and shaped by the local characteristics of each area, thereby reinforcing the relevance of the multi-site approach in this study for understanding variations in water source governance across urban areas.

The collaboration pattern identified in this study can be categorized as pseudo-collaboration, a situation in which various actors are formally involved in the governance process, yet decision-making authority remains concentrated among high-power stakeholders. Such a configuration creates the appearance of participation without being accompanied by substantive redistribution of power, thereby limiting the achievement of more inclusive and equitable governance transformation.

Figure 4 presents field observation documentation at one of the spring sites in Probolinggo City. The image shows the physical environmental conditions surrounding the spring, including vegetation cover, surface water flow, and land use patterns in the recharge area. The presence of the research team and community

members during the observation activities reflects a field verification process aimed at understanding environmental pressures and the dynamics of stakeholder interactions around the water source. Vegetation cover surrounding the spring indicates the presence of an ecological buffer function; however, the proximity of human activities to the spring source also signals potential vulnerability to land use change and anthropogenic disturbance. These findings reinforce the interview results, which affirm the need for strengthened conservation policies and clearer governance arrangements to maintain spring sustainability in urban areas.

Figure 4. Field documentation of spring source conditions in Probolinggo City

Figure 5. Focus group discussion (FGD) on the importance of springs in efforts to mitigate the impacts of climate change

Figure 4 illustrates field observations at spring source sites in Probolinggo City, demonstrating the spatial manifestation of stakeholder power asymmetries. Figure 5 depicts the implementation of a Focus Group Discussion organized by the Probolinggo City Environmental Agency as a multi-stakeholder dialogue forum to discuss spring conservation as part of efforts to address climate change in Probolinggo City, Indonesia. This activity reflects the interaction among stakeholders, demonstrating the distribution of power, interests, and potential conflicts in urban water resource management. It represents a deliberative process used to negotiate the interests of environmental conservation with the need for sustainable water resource utilization, while simultaneously showing how power relations influence the direction of policies and the implementation of spring conservation at the local level.

Local Government: High Power – Medium Interest

Local government has a very strategic role in water resource governance through regulatory, planning, implementation, and supervision authority over water use in its region. This authority is regulated in the regional autonomy framework, where district/city governments are given responsibility to manage local affairs including formulating water resource management policies based on local area needs and characteristics (Wulandari & Ilyas, 2019). Thus, local government not only acts as formal regulator, but also as main planner establishing local water resource management patterns and protected water areas within river basins that are its administrative responsibility (Rasidi & Boediningsih, 2023).

This authority gives local government high power in determining spring management direction. This aligns with just and sustainable water resource management principles as contained in the Water Resources Law, which places the state and government as regulators and guardians of people's rights to water access, including through planning and designation of water source conservation areas for public interests (Kirana, 2021). In practice, local government can establish regional regulations supporting water resource conservation implementation, including protection, preservation, and water pollution control through systematic management mechanisms.

However, this high power is not always followed by an equally strong interest level in spring conservation as part of sustainable development strategy. In many regional policy implementations, main focus is still dominantly directed toward fulfilling basic services in the form of clean water availability and supply stability for communities, while ecological protection aspects of springs have not been fully comprehensively integrated into regional development policy priorities. Such situations show a shift in orientation from environmental conservation approaches to short-term technical service perspectives, so conservation policy space tends to occupy a subordinate position compared

to public service agendas (for example SPAM provision and clean water distribution).

This dynamic reflects structural challenges in water governance at the local level, particularly in the framework of achieving Sustainable Development Goals (SDGs). SDG 6 targets emphasize the importance of sustainable clean water management, including ecosystem conservation, increased access to sustainable water sources, and governance systems responsive to demographic pressures and environmental changes. When local government prioritizes service provision aspects more without strong emphasis on spring protection as an ecological function, there is risk that future water resource resilience will experience pressure, especially in areas prone to drought or spring discharge fluctuations.

Local government roles in water resource conservation are also related to institutional capacity and multi-actor coordination. Effective spring management requires collaboration between government, local communities, private sector, and other stakeholders to ensure that policy determination, technical implementation, and monitoring processes are conducted participatively and adaptively. Collaboration models involving central and local government through programs can increase drinking water provision effectiveness and strengthen community roles in water resource conservation at the local level (Nurmasita et al., 2020). Such approaches need to be expanded so government interest orientation toward conservation is not only administrative but also substantive in the sustainable development framework.

Based on SDG framework assumptions emphasizing cross-sectoral integration, spring conservation policies at the local government level must be positioned as key instruments not only for fulfilling SDG 6 indicators, but also for maintaining terrestrial ecosystems (SDG 15), improving quality of life (SDG 3), and supporting sustainable community development (SDG 11). By expanding conservation policy focus as an integral part of regional development plans, local government can optimize its potential contribution toward achieving global and national targets simultaneously.

In theoretical context, this condition shows deviation from collaborative governance principles that position government as collaboration facilitator. Conversely, government still plays a dominant actor role that has not fully encouraged participation and equal role sharing among stakeholders.

Water Managers and Economic Actors: High Power – High Interest

Water manager (distribution operator) groups and economic actors dependent on springs have high power and interest levels because both actors not only control water system technical infrastructure, but also have direct interests in water supply continuity for operations and business activities. Technical control over sources, distribution networks, and operational management gives water managers strategic positions in determining how efficiently and sustainably water supply is available for various sectors. Economically, business actors dependent on water whether for production, tourism, or service delivery are very interested in supply reliability, continuity, and quality, because supply disruptions will directly impact their productivity and income (e.g. industry dependent on water for production processes). In the context of water resource governance in Indonesia, water governance practices emphasize roles of various actors including government, communities, and private sector to create effective, adaptive, and collaborative governance mechanisms in answering challenges of clean water and sanitation access by 2030 according to SDG 6 targets emphasizing access to sustainable water and sanitation for all through integrated and participatory approaches (Nurmasita et al., 2020). The high interest of both actors also shows they have strong incentives to ensure water distribution systems work efficiently, because technical disruptions such as network inefficiency or drought will result in increased operational costs and real economic loss risks for commercial actors.

However, the dominance of actors with high power–high interest has complex governance implications. When water managers and economic actors are largely oriented toward supply continuity and utilization optimization without considering upstream conservation aspects such as spring preservation, there is risk that water systems are pushed to meet short-term needs without maintaining ecological balance. This becomes an important issue because sustainable water availability not only depends on distribution infrastructure, but also on spring and upstream recharge area conditions including aspects that often receive less attention in commercial operational strategies. In practice in Indonesia, economic needs often drive intensive water resource exploitation, while water source conservation as part of ecological harmony has not been optimally conducted in holistic national governance (Rasidi & Boediningsih, 2023). This imbalance also impacts achievement of SDG 6.4 which emphasizes the importance of efficient water use in all sectors and protection of ecosystems supporting water sources.

Water manager and economic actor roles must be aligned with sustainable development agendas to ensure operational priorities do not ignore conservation and sustainability aspects. Institutionalization of water management practices based on Integrated Water

Resources Management (IWRM) principles that integrate technical efficiency, economic interests, and ecological preservation can help reduce interest conflicts between water supply needs and long-term spring protection. The water governance concept in Indonesia emphasizes multi-actor involvement, cross-sectoral coordination, and collaborative practices as a basis for answering challenges of clean water access, environmental quality, and service continuity for communities and economic sectors while comprehensively answering SDG 6 targets.

Thus, the high power–high interest position of water managers and economic actors should become a driver of policy transformation that not only pursues operational efficiency and economic benefits alone, but also includes responsibility for water source conservation through long-term planning, investment in green infrastructure, and incentive mechanisms balancing economic profit and environmental sustainability. Such strategies align with sustainable development goals that position clean water access, environmental conservation, and economic development as part of one integrated system.

Research results show that this group is the most influential actor in spring utilization practices, often even exceeding conservation interests. From a collaborative stakeholder perspective, this actor dominance reflects asymmetric collaboration, where decision-making processes are more influenced by actors with economic and technical capacity, while ecological and social interests become subordinate.

Local Communities: Low Power – High Interest

Local communities living around springs have important roles as direct water resource users, both for domestic needs and social-cultural activities. Their position in spring management structure is characterized by low power level but high interest. This reflects a common phenomenon in natural resource governance in many areas, where local communities are very dependent on water source continuity because springs are not only ecological functions, but also social-cultural and economic functions. Access to springs becomes part of living space identity and community welfare, especially for drinking, bathing, garden irrigation needs, and social function aspects such as traditions or spiritual values attached to springs in certain communities. A study conducted by Ummah et al. (2020) on spring utilization in local communities shows that spring sustainability is closely related to social values maintained by communities as part of their living space, not merely technical resources.

Although their interest is high, local community power levels in spring management structure are relatively low. This is reflected in their involvement which is often limited to the implementation stage of programs or local-scale conservation activities, while strategic decision-making about policies, licensing, or conservation plans is in the hands of actors with formal authority such as local government or water distribution operators. Community participation tends to be symbolic because policy planning procedures are not yet fully inclusive, so local voices and knowledge have not been optimally utilized in policy formulation related to spring protection and management. In many cases, communities are only involved after major decisions are made, or only at the technical activity implementation level such as environmental rehabilitation community work, not in policy dialogue forums affecting resource allocation and strategic decisions.

This low power–high interest condition contains structural risks to spring sustainability if not handled appropriately. Local community dependence on springs makes them very vulnerable to policy changes unresponsive to upstream needs and external pressures such as over-exploitation by economic sectors or land use conversion changes. When community voices are marginal in formal decision-making arenas, resulting policies potentially ignore conservation approaches rooted in local knowledge and adaptive practices passed down through generations. Bere et al. (2023) state that participatory approaches that are only technical-implementative without providing substantive policy space are not sufficient to build sustainable and just water management.

In the context of Sustainable Development Goals (SDGs), the position of local communities who have strong interest but weak power becomes an important concern for achieving several SDG targets, especially SDG 6 (Clean Water and Sanitation) and SDG 16 (Strong Institutions, Participation and Justice). SDG 6 targets emphasize fair access to clean water and sustainable water resource management, which can only be realized if direct users like local communities have meaningful participation space in policy formulation and implementation. Meanwhile, SDG 16 calls for strengthening inclusion and participation in public decision-making, and community empowerment to actively contribute in natural resource governance. When local voices are suppressed and their role is only limited to technical implementation, the power of local knowledge that can enrich conservation strategies is not effectively accommodated, so potential synergy between social values and scientific/technical approaches is not achieved (Bulo et al., 2024).

To overcome this power structure gap and increase local community ability to influence strategic decisions, more substantive empowerment mechanisms are needed. Strengthening community participation in policy formulation stages through structured public

consultation forums, co-management mechanisms, or village institutions with authority in spring governance can improve representation of local interests in policy arenas. Community-based management models that integrate local knowledge in conservation plans have been proven in several areas in Indonesia to be able to increase participation and social responsibility for water source management, in line with SDG principles encouraging multi-actor collaboration and community capacity strengthening. Therefore, the position of local communities as high interest–low power actors need to be repositioned more balancedly through policies that place them not only as technical implementers, but as equal partners in planning, implementation, and evaluation of sustainable spring conservation policies.

Conclusion

This study concludes that the urban spring management in Probolinggo City covering Senthong, Grinting/Sumber Wetan, and Umbul/Ganesha which administratively appears to employ a collaborative framework, as it involves local government, water operators, business actors, and the community. Operationally, however, the governance in practice remains exclusive and asymmetric. Decision-making processes are dominated by high-power actors, particularly the local government and water distribution operators, while local community groups with high conservation interests remain in a marginal position. Consequently, the practice that has formed is not substantive collaboration, but rather administrative collaboration that has yet to fully correct power imbalances. This asymmetry pattern was found consistently across all three study sites, despite differences in physical characteristics and levels of utilization pressure. Senthong exhibits high domestic exploitation pressure, Grinting/Sumber Wetan experiences a combination of domestic and economic pressures, while Umbul/Ganesha has a more diverse range of utilization dimensions. Nevertheless, across all three sites, the pattern of citizen participation marginalization and technocratic actor dominance remains similarly consistent. These findings affirm that the primary issue lies not in the biophysical conditions of each spring, but rather in the governance structure and the relatively homogeneous distribution of power at the city level. Further, this study affirms that business operators constitute "powerful beneficiary" actors who derive significant benefits from water utilization without making proportional conservation contributions. This imbalance between the level of exploitation and ecological responsibility reinforces latent conflict between conservation and economic utilization. Accordingly, regulatory arrangements are needed that oblige the commercial sector to provide financial and/or technical contributions to spring conservation programs as compensation for water use, for instance, through conservation fund schemes, recharge area rehabilitation obligations, or the integration of environmental cost recovery principles into business licensing. Operationally, strengthening collaborative governance in Probolinggo City needs to be realized through the establishment of a Multi-Stakeholder Forum for Probolinggo City Spring Management, with a formal legal mandate to formulate and oversee a City-Level Spring Management Plan. This forum must ensure substantive representation of communities living around the springs, establish mechanisms for water distribution transparency, and provide clear conflict resolution procedures. With an institutional design grounded in regulatory authority and genuine planning powers, collaboration need not stop at symbolic participation, but can instead become an instrument for correcting power imbalances and strengthening the sustainability of urban spring conservation. Overall, this study affirms that the sustainability of urban springs depends not only on the existence of formal collaboration, but on the capacity of the governance system to reduce power asymmetry, internalize the responsibilities of the economic sector, and guarantee the substantive participation of local communities in decision-making.

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Author Contributions

All authors actively participated in discussing the research findings and contributed to the development of the final manuscript. N. was responsible for research ideation, data collection, formal analysis, project administration, and drafting the original manuscript. M.K. contributed to the methodology, investigation, resources, visualization, and manuscript review and editing. M.P.K. served as supervisor and provided contributions in methodology, investigation, resources, and manuscript review and editing. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
The authors declare that there are no competing interests relevant to this study

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