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## **INTEGRATION OF ENGINEERING AND POLITICS IN WATER MANAGEMENT: A HOLISTIC APPROACH TO ENHANCING PUBLIC POLICY**

### **INTEGRASI TEKNIK DAN POLITIK DALAM PENGELOLAAN AIR: PENDEKATAN HOLISTIK DALAM MENINGKATKAN KEBIJAKAN PUBLIK**

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#### **Abstract**

This article explores the evolving concept of water governance across various nations, serving as a reference for effective and sustainable water management. Aligned with Sustainable Development Goal (SDG) No. 6, which focuses on Clean Water and Sanitation, Indonesia faces unique challenges due to its dual climate patterns of rainy and dry seasons. These climatic variations necessitate sound water resource management to address water shortages during droughts, prevent drought-related disasters and mitigate flood risks during the rainy season. Utilizing a literature review methodology, this research aims to comprehend the development of knowledge in the water governance concept, incorporating both technical and political dimensions in policy formulation. The findings underscore the significance of collaboration, cooperation, and participation among the government, community, and private sector in implementing effective water governance. Embracing the governance paradigm, the key takeaway is the need for collective efforts to establish robust water resource management, thereby ensuring the success of the clean water and sanitation program nationwide by 2030. However, it is crucial to acknowledge that not all variants of water governance models can be universally applied, considering the diverse institutional contexts and political cultures across different regions in Indonesia. Despite these challenges, this research underscores the importance of a holistic approach that integrates both technical and political aspects in water management policies, providing a foundation for achieving sustainable water access and sanitation goals.

**Keywords:** Water governance Model, Water Management, Public Policy, Sustainable Development Goals, Holistic Approach

#### **Abstrak**

Artikel ini mengkaji konsep perkembangan tata kelola air yang tersebar di berbagai negara, menjadi acuan untuk pengelolaan air yang efektif dan berkelanjutan. Sejalan dengan Tujuan Pembangunan Berkelanjutan (Sustainable Development Goals/SDGs) No. 6 yang menitikberatkan pada Akses Air Bersih dan Sanitasi, Indonesia menghadapi tantangan khusus akibat dua iklim yang dimilikinya, yakni musim hujan dan kemarau. Variasi iklim ini menuntut manajemen sumber daya air yang baik untuk mengatasi kekurangan air saat kemarau, mencegah bencana kekeringan, dan mengurangi risiko banjir saat musim hujan. Penelitian ini menggunakan metode studi pustaka dengan tujuan memahami



perkembangan konsep tata kelola air dalam pendekatan teknik dan politik dalam penyusunan kebijakan. Temuan penelitian menekankan pentingnya kolaborasi, kerjasama, dan partisipasi dari pemerintah, masyarakat, dan sektor swasta dalam menerapkan tata kelola air yang efektif. Mengadopsi paradigma tata kelola, kesimpulan utama adalah perlunya upaya bersama untuk membentuk manajemen sumber daya air yang kuat, guna menjamin kesuksesan program air bersih dan sanitasi di seluruh Indonesia hingga tahun 2030. Namun, penting untuk diakui bahwa tidak semua varian model tata kelola air dapat diterapkan secara universal, mengingat konteks institusional dan budaya politik yang beragam di setiap daerah di Indonesia. Meskipun demikian, penelitian ini menegaskan pentingnya pendekatan holistik yang mengintegrasikan aspek teknik dan politik dalam kebijakan pengelolaan air, memberikan dasar untuk mencapai tujuan akses air bersih dan sanitasi yang berkelanjutan.

**Kata Kunci:** Model *Water governance*, Pengelolaan Air, Kebijakan Publik, Sustainable Development Goals, Pendekatan Holistik.

## INTRODUCTION

From 2011 to 2014, the Community-Based Urban Sanitation Program (SPBM), part of the Millennium Development Goals (MDGs), laid the foundation for the ongoing Sustainable Development Goals (SDGs). This program aims to improve sanitation infrastructure through community participation. SPBM engaged various stakeholders at the central, provincial, and local levels, making it a comprehensive community-based program (Kusumastuti et al., 2015; Rumihin et al., 2020). The program received support from the Urban Sanitation and Rural Infrastructure (USRI) Support for PNPM Mandiri, a continuation of RIS PNPM-2, which covers urban sanitation activities. Asian Development Bank (ADB) Loan No. 2768-INO funded the program over four years, from 2011 to 2014, with the aim of enhancing sanitation services through Community Direct Assistance Funds (BLM) (Dewi, 2024; Rumihin et al., 2024). The program distributed these funds to 1,350 urban communities, each ward receiving Rp. 350 million to enhance community-based sanitation services. Hence, SPBM was a concrete step in achieving MDG targets and laid the groundwork for ongoing sustainable development goals through the SDGs (Wicaksono et al., 2024).

The program was implemented to address discrepancies between achievements and goals due to various issues in the drinking water and sanitation sectors. Several obstacles stand in the way of achieving the Millennium Development Goals (MDGs) in sanitation. 1) Low access to sanitation and poor management quality, particularly regarding open defecation, have reached a governance level of 30 for water management in Indonesia. 2) Inadequate and ineffective institutions, along with the incompleteness of relevant legislation, contribute to the situation. 3) There are limited alternative funding options for development activities. 4) Minimal community and private sector involvement in supporting sanitation targets (Suyeno et al., 2024).

In 2018, data from the Central Statistics Agency (BPS) showed that access to safe drinking water was at 88%, while access to adequate sanitation was only at 75%. This data revealed that 32 million people still lacked access to safe drinking water, and 67 million people lacked adequate sanitation services (Akbar et al., 2023; Annahar et al., 2023). This highlights significant challenges in this sector. By the end of 2019, the Ministry of National Development Planning/Bappenas, together with the National Housing, Settlement, Drinking Water, and Sanitation Working Group (PPAS) and development partners in the sanitation and drinking water sectors, held the National Sanitation and Drinking Water Conference (KSAN) in Jakarta. Established in 2007, KSAN serves as a biennial forum that fosters commitment and participation from various stakeholders, such as central and local governments, donor agencies, NGOs, the private sector, educational institutions, communities, media, and the public, with the goal of promoting access to sanitation and drinking water that aligns with the



Sustainable Development Goals (SDGs) by 2030 (Sahide et al., 2023). KSAN formed a collective spirit to achieve safe, innovative, and sustainable sanitation and drinking water for all.

The sixth goal outlines a set of targets and milestones aimed for achievement by 2030. Each target addresses critical aspects of creating positive change in the drinking water and sanitation sectors. Firstly, this goal aims to achieve universal and affordable access to drinking water by 2030, emphasizing the importance of providing safe and decent water for all individuals. Secondly, the target focuses on adequate sanitation and hygiene access, with particular emphasis on ending open defecation and addressing the specific needs of women, girls, and vulnerable populations (Pambudi & Kusumanto, 2023; Rahmani et al., 2023). Additionally, the goal targets improving water quality through concrete measures such as reducing pollution, eliminating waste, decreasing the disposal of hazardous chemicals, and managing wastewater more effectively. Furthermore, it focuses on water use efficiency across all sectors to address water scarcity and emphasizes the importance of integrated water resource management through cross-border cooperation. The sixth goal also includes aspects of protecting and restoring water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes. Alongside this, the goal underscores the need for expanded cooperation and capacity-building support for developing countries in various activities and programs related to clean water and sanitation (Pradipta et al., 2023). Ultimately, the sixth goal highlights the importance of supporting and enhancing local community participation in improving water and sanitation management. All these targets create a comprehensive framework for achieving positive and sustainable change in the drinking water and sanitation sectors by 2030.

This initiative is noteworthy as it reflects the growing awareness among the government, private sector, and community that universal access and fulfillment of clean water needs are a shared responsibility. This phenomenon indicates that the governance paradigm is evolving in Indonesia, particularly in achieving Sustainable Development Goal (SDG) number 6, which is Access to Clean Water and Sanitation. As this development progresses, research on water management shifts towards the concept of water governance. However, the concept of water governance in many studies tends to be case-specific. The most critical water governance issues occur in developing countries that frequently face hydrological problems such as floods and droughts, high uncertainty about water sources, dependence on agriculture and irrigation, rapid population growth, increasing water demand, and low prioritization of water management infrastructure coupled with weak public institutions managing water resources, faced with greater uncertainty due to climate change (Yan, 2023; Yasmin et al., 2023).

As a result, there is greater insecurity regarding water resources and deeper conflicts, especially in poor countries (Camargo et al., 2023; Widiarto et al., 2023). As stated by Camargo et al. (2023) and Widiarto et al. (2023), the concept of water governance has not yet experienced significant development in terms of substance, theory, and methodology, resulting in minimal impact on policy improvement. Araral and Yu then proposed three types of analytical frameworks for water governance research, namely: public sector economic perspective, institutional economic perspective, and public administration perspective. These three frameworks were created from studies by Camargo et al. (2023) and Widiarto et al. (2023) that looked at common issues in Asian countries when it comes to water governance. These issues included the responsibility of water sector managers, pricing policies, the connection between legal bases and water management policies, managing finances and investments, managers' functional abilities, regulatory mechanisms, and managers' responsibility.

The research results indicate that government management often faces various obstacles, particularly in aspects of regulation, accountability, and the functional capacity of managers. These weaknesses contribute to the public's mistrust of government involvement in public sector administration. Therefore, this study aims to explore the concept of water governance to formulate a



water management model in Indonesia. Currently, clean water sources are increasingly scarce, and changing community habits regarding the use and utilization of clean water is a challenging task. We hope to implement the concept of water governance to establish a common foundation that the government, private sector, and community can use, particularly in designing government policies that seriously consider environmental sustainability as an integral part of their governance.

## **METHODS**

The methodology used in this research is a literature review method aimed at understanding the development of the concept of water governance in technical and political approaches to policy formulation (Bryman, 2016). The research steps entail identifying and analyzing water governance-related literature, with a focus on the development of the water governance concept and its application in technical and political aspects.

We first conducted literature searches through academic sources, scientific journals, and official publications related to water governance. The literature was chosen based on its relevance to the research objective of exploring the concept's development. We then performed an in-depth analysis of the collected literature. The analysis focused on the integration of technical and political aspects into the water governance concept, aiming to gain a comprehensive understanding of the roles of both aspects in water management policy formulation.

We used the results of the literature analysis as a foundation to synthesize knowledge and identify emerging trends, challenges, and opportunities in the development of the water governance concept. This literature review method provides deep insights into the latest developments in technical and political approaches in water management and lays the groundwork for further research.

## **RESULTS AND DISCUSSION**

### **Results**

With the shift from government to governance, the most significant change is that the state is no longer the sole dominant actor in public policy-making. In the governance paradigm, actors and institutions play vital roles in the decision-making or policy process, involving all elements of national life: the state or government, the private sector, and society (Wyborn et al., 2023). Gemede et al. (2024) explain that governance is a more inclusive concept than the previous one, government. Governance not only encompasses the relationship between society and the government, but it also involves mediating behavior through values, norms, and, in some cases, law. The concept of governance includes elements such as laws, regulations, and institutions, but it also refers to government policies and actions, domestic activities, and influence networks involving international market forces, the private sector, and civil society. All these elements collectively create dynamics that influence the political system in which the concept of governance operates (Wei et al., 2023).

Mostly used in complex processes where participation involves multiple parties beyond national boundaries, governance has evolved into an umbrella concept. Decision-making not only involves community institutions but also the private sector, civil society, and the general public. A good governance framework emphasizes new processes and methods where the actions of all involved parties must be transparent and accountable. This includes the relationship between the government and society, involving laws, regulations, institutions, and formal and informal interactions that influence how the governmental system functions. This framework highlights the importance of involving broader voices, responsibility, transparency, and accountability of both formal and informal organizations in every process (Abbas et al., 2023).



As the governance paradigm evolves and environmental issues escalate, the concept of sustainable development has also adopted the governance paradigm (Handayani et al., 2023; Hellberg, 2023). It is believed that this paradigm facilitates sustainable development by involving various actors who are equally responsible for environmental sustainability. When discussing water management, considered a public issue with human rights, various challenges arise, both in terms of water resources and fair distribution, which can lead to horizontal conflicts (Grigg, 2023). Accordingly, this study uses the paradigm of water governance as a framework for understanding how the government formulates wastewater management policies in Bandung City.

According to the UN definition, water governance encompasses various political, social, economic, and administrative systems applied to develop and manage water resources and provide water services at different societal levels (Tyhotyholo & Ncube, 2023). This concept has become an essential instrument in the new sustainable development framework, adopted and emphasized by various international organizations such as the UN, OECD, and the World Bank. UNDESA provides another definition, describing water governance as a concept involving social, political, organizational, economic, and administrative aspects, including relationships related to water resource development and management. This definition emphasizes how institutions operate and how regulations influence political actions and social concerns through various formal and informal instruments (Bitterman et al., 2023).

Water governance, as a concept, recognizes that public policy is not solely within the realm of the government but also requires involvement and participation from civil society and the private sector. This reflects how public policy in water management must consider the balance between water resources and community needs while maintaining ecosystems and ensuring water resource sustainability (Pouya et al., 2023; Valdovinos & Yañez Soria, 2024). As explained by the UN, participatory mechanisms and accountability will help address disparities in service provision and help policymakers focus on inequalities and underlying causes. We propose a universal approach that not only addresses inequality and sustainability (maintaining intergenerational equity), but also respects human rights to water and sanitation services. Appropriate governance actions, such as regulating and enforcing agreed standards, are essential to ensuring the overall quality of water bodies over time (Bantider et al., 2023). Pollution control will improve water quality in rivers and lakes and support ecosystem functions by reducing organic and mineral substances that can damage oxygen supplies (UN-Water, 2014).

On the other hand, water governance has diverse definitions, according to scientists. For example, Pahl-Wostl defines water governance as "the development and implementation of norms, principles, rules, incentives, informative tools, and infrastructure to promote behavioral change among actors at the global level in water governance" (Babuna et al., 2023). Wilson (2020) mentions several key features of water governance, such as "systemic perspective, governance focus on social actors, transparency discourse to access values and goals, and comprehensive perspective on water resource sustainability." Both approaches emphasize values, norms, principles, and goals in the context of water governance. Hjorth & Madani (2023), on the other hand, present a more political definition using a political sociology approach, viewing water governance as a domain of political struggle. From the various definitions of water governance, we can conclude that this concept involves the complexity of relationships between actors and various aspects, particularly multidimensional dimensions such as economic, social, political, and cultural. Multi-actor involvement, including the government, private sector, and society, is key in water resource management efforts.



## Discussion

Water is an integral element of the entire development process, and the planning and implementation of activities in the water sector depend on the dynamics of the economy and other productive sectors (Shahvi et al., 2021). This context intersects the needs and interests of various parties, including the public, private sector, and community as stakeholders. Therefore, water management is under multidimensional pressure, requiring continuous consideration of changes occurring both internally and externally within the water sector that influence it (Hussein et al., 2020). The policy-making mechanism is the most important aspect of water resource management because it determines all government activities. The 1945 Constitution emphasizes in Article 33, paragraph 3, that the state controls and utilizes Earth, water, and the natural resources contained therein for the greatest prosperity of the people. This indicates that in Indonesia, water management is a significant part of public affairs managed by the government. The regulations and policies implemented in water management reflect the government's seriousness and commitment to ensuring the maximum welfare of the community (Rumihin et al., 2020, 2024).

An interesting development has occurred with the shift from government to governance, resulting in various new governance concepts. One example is the concept of excellent corporate governance, widely used by private companies as a performance indicator. Similarly, waste governance has become a concept in environmentally-based waste management, and water governance encompasses various aspects of water management. In 2014, UN Water formulated indicators of water governance that include several key aspects. First, institutional capacity involves effective water management institutions with rules agreed upon both nationally and internationally. Secondly, it encompasses the capability to develop and execute policies that are based on participation. Third, clear legal instruments and planned implementation strategies are available. Fourth, the benefits felt by all layers of society (UN, 2014).

To meet these indicators, UN Water has set several targets to strengthen water governance while addressing obstacles to implementing the governance paradigm. First, water management policy-making requires active public participation. Second, water distribution and sanitation services must meet community needs. Third, water management must be accountable and sustainable, reflecting a commitment to long-term sustainability. Fourth, we need to build a clear regulatory framework to direct and regulate water management policies. Fifth, it is critical to apply knowledge transfer and technological capability development in water management (Adams et al., 2020; Bayu et al., 2020).

To evaluate the implementation of water governance principles in a regional or national institution, van der Kerk introduced an evaluation method involving core elements of water governance. This approach involves three layers of a framework detailing essential aspects. First, at the content layer, it's crucial to evaluate the existence of clear water management strategies and policies, the sufficiency of relevant information, and the fulfillment of knowledge and skill requirements in water management. Second, at the institutional layer, the evaluation includes questions about the clear division of roles and responsibilities in water management, the availability of supporting facilities, the smooth operation of financial systems, and the relationship of water policies with other policies. Finally, the evaluation at the relational layer inquires about the active involvement of policymakers in water management decision-making, the transparency of the water management process, and the presence of sufficient trust to foster cooperation among related institutions. This approach aids in determining the effectiveness of water governance principles' implementation and establishes the foundation for essential enhancements.

The evaluation points prove to be valuable tools for assessing the implementation of water governance principles and measuring their effectiveness in water management. The evaluation also reveals various obstacles faced by water governance, as highlighted by Pahl-Wostl et al. (2020). These



obstacles include a lack of incentives from the government to cooperate for sustainable development, insufficient funding allocation strategies for priority programs, a lack of understanding among the government and community about environmentally focused sustainable development, low public trust in government operations, inadequate capacity and organizational constraints, and a lack of inclusive access to integrate local wisdom in water management with a sustainable development perspective. By understanding and addressing these obstacles, we can improve the effectiveness of water governance in water management.

It is possible to overcome these obstacles and successfully implement the water governance paradigm in wastewater management. The literature, particularly case studies on water management in California, USA, suggests several measures for enhancing good governance in water management. Firstly, the creation of effective water management policies hinges on the provision of abundant information and the involvement of numerous experts and resources, including facilities and funding. Second, we need to improve integration, coordination, and coherence at every level of government. Third, experts now take over environmental management tasks from the government, aiming to maximize public participation. Fourth, we need to enhance the water management structures and mechanisms to rebuild public trust. Fifth, improving the government's adaptive capacity is another important aspect of responding to the dynamics of water management (Jiménez et al., 2020). Public participation is a critical element in the water governance model. Therefore, multi-stakeholder or multi-actor elements in water management are essential, supported by the clear roles and functions of each actor within a collaborative water management framework. These steps can serve as the foundation for improving water governance effectiveness and achieving sustainable water management.

Essentially, water governance aims to achieve a balance between the supply and demand of water resources, which often leads to conflict, while still considering the sustainability of ecosystems and water resources. The approach taken in water governance includes principles of equitable distribution and ecosystem sustainability, as well as considering human rights to water and sanitation through public participation and management accountability. Water governance is very important in the context of wastewater management, with the main goal of involving wastewater management in the overall water cycle. This includes how to turn wastewater into a new raw water source and manage wastewater effectively to reduce pollution.

The importance of water governance is not only limited to the government's role as a service provider but also to the government's ability as a facilitator, mediator, and regulator, which opens up space for active public participation. We expect the government to act as a manager in wastewater management, ensuring the sustainability of water ecosystems and promoting sustainable development by taking environmental aspects into account. According to Di Vaio et al. (2021), water governance encompasses various political, social, economic, and administrative systems applied to develop and manage water resources and water distribution services at different levels of society. Therefore, this study scrutinizes the political, social, economic, and administrative mechanisms available for water development and management.

Hussein et al. (2020) provide an analytical framework for water governance consisting of inputs, processes, outputs, and outcomes. Inputs include laws and regulations, as well as existing programs. Processes describe the implementation of laws, regulations, and programs to achieve better environmental conditions. Outputs refer to the results of implementing laws and regulations, as well as several indicators that can measure program success. Outcomes refer to the long-term impacts of inputs, such as water quality. Although this framework primarily focuses on regulatory aspects, this study aims to identify a potential water governance model that is suitable for the supporting and inhibiting factors in Indonesia, taking into account the water governance principles as outlined by the United Nations.



In Indonesia, the implementation of water governance is likely to vary in each region. The empirical conditions of the foundational building of water governance, such as the strength of administration and water management organizations in each region, play a crucial role. Despite the long-standing implementation of regional autonomy, Indonesia continues to experience disparities in the performance and professionalism of local bureaucracies. Where water flow and territorial landscape conditions differ, systemic water laws also become a consideration, challenging the implementation of standard water laws. Financing systems and economic analysis of water management are also important factors, but not all regions have independence and comprehensive capabilities in this regard. Depending on the region's ability and political will, a systemic planning approach is also necessary to meet primary needs in each government program, particularly in achieving universal clean water access. Ultimately, not every Indonesian region has fully embraced stakeholder participation, especially when it comes to the private sector and active community involvement, particularly in urban and rural areas, to varying degrees.

## CONCLUSION

### Conclusion

This article discusses the concept of water governance development in various countries as a reference for effective and sustainable water management. The main focus of the research aligns with Sustainable Development Goal (SDG) No. 6, which emphasizes access to clean water and sanitation in Indonesia. The country faces unique challenges due to climate variations, namely the rainy and dry seasons, requiring adaptive water resource management to cope with changing climatic conditions. The research findings highlight the importance of collaboration, cooperation, and participation from the government, community, and private sector in implementing effective water governance. By adopting the governance paradigm, the main conclusion is the need for collective efforts to establish strong water resource management as the key to the success of clean water and sanitation programs across Indonesia by 2030. Recognizing the variations in institutional contexts and political cultures in each region of Indonesia, we cannot universally apply all water governance models. Nonetheless, this research emphasizes the importance of a holistic approach that integrates technical and political aspects into water management policies. This approach serves as the foundation for achieving sustainable access to clean water and sanitation. Therefore, the integration of technical and political dimensions is crucial to addressing water management challenges in Indonesia. This holistic approach provides a strong foundation for ensuring sustainable efforts towards inclusive access to clean water and sanitation, adapting to climate change, and reducing water-related disaster risks.

### Recommendations

According to the research findings on the integration of technical and political aspects in water management through a holistic approach, several strategic recommendations can strengthen Indonesian public water policies.

First, enhance the capacity of water management institutions at both national and regional levels to ensure effective policy implementation. This involves improving competencies, allocating resources, and clarifying roles for each relevant institution. Second, improve the legal and regulatory framework related to water to create a solid foundation for water resource management. This includes drafting clearer regulations, increasing compliance, and enforcing strict sanctions. Third, foster cross-sector collaboration among the government, community, and private sector with a participatory approach to decision-making and efficient resource allocation.

Fourth, prioritize the implementation of climate-resilient water management strategies, including measures to address droughts and flood risks. Fifth, raise public awareness about the importance of





water management through educational campaigns. Public education can help to change water use behaviors and increase participation in water resource conservation efforts.

Sixth, develop water governance models that fit the local context of each Indonesian region, taking into account the cultural, geographical, and unique needs of each area. Finally, establish sustainable monitoring and evaluation systems to measure the effectiveness of water management policies, which are crucial for identifying weaknesses, adjusting policies, and ensuring the achievement of sustainability goals.

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