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OECD Water Governance Approach to Optimizing Drainage System in Semarang

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Abstract

Effective drainage systems are crucial for managing stormwater, preventing flooding, and promoting urban sustainability. However, rapid urbanization and climate change exacerbate drainage challenges in cities like Semarang, where poor infrastructure often struggles with heavy rainfall and tidal floods. Despite proactive efforts, such as participation in the Water as Leverage program, the city's drainage system faces significant challenges, including financial limitations and poor coordination between stakeholders. This study applies the Organization for Economic Co-operation and Development (OECD) Water Governance Principles to analyze the governance framework of Tenggang drainage system, identifying gaps and proposing improvements. A qualitative, descriptive approach was used, collecting primary data through interviews with government and community stakeholders, alongside secondary data from literature and document analysis. The results highlight the need for clearer roles and responsibilities, better coordination across government levels, and enhanced public participation. It was also found that integrating policies across sectors and fostering innovation could significantly improve the system's efficiency and sustainability. Additionally, strengthening transparency, trust, and community engagement is essential for achieving more inclusive governance. This study concludes that aligning Semarang's drainage management with the OECD principles can lead to a more resilient, efficient, and sustainable system that addresses both current challenges and future water management needs.

Keywords: *Drainage System; Water Governance; OECD Principles*

INTRODUCTION

A drainage system plays a critical role in urban infrastructure, serving as the primary mechanism for managing stormwater and preventing flooding. An effective drainage system not only ensures the safety and functionality of urban areas but also contributes to environmental sustainability and public health. However, as cities expand and face the impacts of climate change, maintaining efficient drainage systems becomes increasingly challenging (Nugroho & Handayani, 2021).

The increasing challenges of urban drainage management have become a pressing issue for many cities worldwide, including Semarang. Rapid urbanization, land subsidence, and climate change have exacerbated the risks of flooding and waterlogging in urban areas . In Semarang, poor drainage infrastructure often struggles to accommodate heavy rainfall and tidal floods (commonly known as rob), leading to significant economic, environmental, and social impacts (Wahyudi et al., 2019). According to BNPB data, the percentage of flood incidents in Semarang City was 22.5% in 2018, 14.7% in 2019, and increased to 16.3% in 2020 (Permanahadi &

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Widowati, 2022). These recurring problems highlight the urgency of optimizing the city's drainage system.

Semarang, located on the northern coast of Java, is a city recognized for its proactive measures in addressing climate change and water management challenges. As a participant in initiatives like the Water as Leverage (WaL) program, Semarang demonstrates its commitment to sustainable urban water governance (Handayani et al., 2023). However, achieving an efficient and resilient drainage system requires not only advanced technical solutions but also effective governance. Previous studies have highlighted similar findings regarding the challenges in managing Semarang's drainage system. These studies concluded that the existing institutional framework, dominated by government-led management, faces significant issues, particularly financial limitations in the operation and maintenance of drainage systems. The research also emphasized the need for an improved institutional model that integrates greater community participation to overcome these persistent problems and enhance the overall effectiveness of the drainage management system (Adi & Wahyudi, 2015).

The OECD (Organisation for Economic Co-operation and Development) Water Governance Principles offer a comprehensive framework to evaluate and improve water management systems (OECD, 2018). The principles were developed by the OECD Water Governance Initiative, a multi-stakeholder platform of over 100 delegates from public, private and non-profit sectors, to support collective action to scale up governance responses to water challenges (Neto et al., 2018). The 12 principles are presented in figure 1. Applying these principles to the drainage system in Semarang could provide strategic insights to enhance its functionality and resilience.

The principles are grouped into three core dimensions (OECD, 2018) :

1. Effectiveness focuses on how governance supports the establishment of clear and sustainable water policy goals and objectives across various levels of government, ensuring their implementation and the achievement of desired outcomes.
2. Efficiency emphasizes the role of governance in optimizing the benefits of sustainable water management and welfare while minimizing societal costs.
3. Trust and Engagement highlight governance's role in fostering public confidence and inclusivity by promoting democratic legitimacy and fairness for all stakeholders.

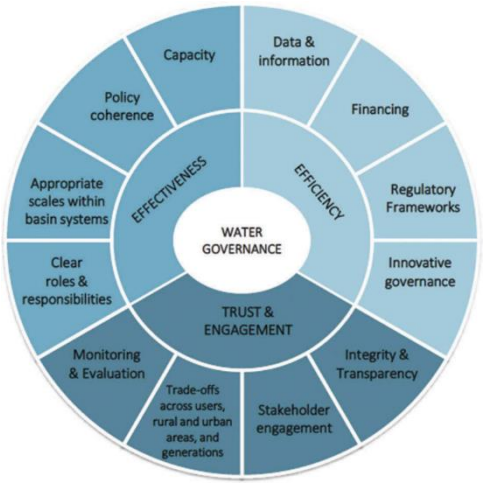

Figure 1. OECD Principles on Water Governance (OECD, 2018)

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The OECD Water Governance Principles have been widely recognized and applied in various countries, with several studies assessing their implementation through the OECD Water Governance Indicator Framework. These assessments reveal which principles are under-applied and provide recommendations for improving water governance, particularly in drainage systems. Previous research has shown several gaps in the application of the OECD principles. Neto et al. (2018) evaluated whether the water governance laws and policies in six countries align with the OECD principles, but only used a Likert scale for four criteria without applying the Water Governance Indicator Framework. O'Riordan et al. (2021) assessed Ireland's water governance using the framework, but did not differentiate the three indicators (what, who, how) or present the level of consensus. Velasco et al. (2023) used the OECD framework to evaluate local water governance in Argentina, but failed to display the consensus level in their assessment. Adi and Wahyudi (2015) studied the drainage system governance in Semarang but did not link it to the OECD principles (Adi & Wahyudi, 2015; Neto et al., 2018; O'Riordan et al., 2021; Velasco et al., 2023).

This study aims to analyze the drainage governance system in Semarang using the OECD Water Governance framework. By identifying gaps and opportunities, the study seeks to propose recommendations that align with sustainable urban water management and address the city's pressing drainage challenges. Furthermore, limited studies on the application of OECD Water Governance principles in Indonesia provide an opportunity for this research to contribute new insights into the implementation of these principles in the Indonesian context.

METHOD

This research employs a qualitative descriptive method with a case study approach in Tenggang drainage system. Primary data were gathered through direct observation and in-depth interviews with stakeholders and local communities within the study area. Meanwhile, secondary data were collected through document analysis and a review of relevant literature.

Respondents & Instruments

This study involved a total of ten respondents comprising both government and community representatives. The government respondents include local authorities, represented by the Public Works Department (DPU) of Semarang City, and central government representatives, represented by BBWS Pemali Juana. Community respondents were selected based on their in-depth knowledge of the Tenggang drainage system. Data were gathered through semi-structured interviews, with the questions formulated in accordance with the principles of the OECD Water Governance framework.

Procedures & Data analysis

The research began with a literature review to provide an overview of Semarang's drainage system and the OECD principles. Following this, primary data were collected through face-to-face interviews with respondents. Descriptive analysis was conducted by drawing on insights from existing literature and relevant regulations to contextualize and interpret the findings. The analysis focused on three key dimensions of the OECD Water Governance framework, effectiveness, efficiency, and trust & engagement, to evaluate the governance aspects of the Tenggang drainage system.

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RESULTS AND DISCUSSION

Dimension Effectiveness

Effectiveness in water governance emphasizes the importance of establishing clear and sustainable water management goals across various levels of government, ensuring that these objectives are implemented successfully to achieve desired outcomes. This requires a comprehensive approach that includes clear delineation of roles and responsibilities, effective policy integration, strengthened coordination, and continuous capacity building at all levels.

While existing regulations for water management, particularly in urban drainage, provide a foundation for clear roles and responsibilities, the implementation of these regulations requires further refinement. This includes clarifying each stakeholder's role and enhancing communication and coordination between different parties involved in drainage management. Furthermore, the enforcement of regulations must be bolstered with stricter penalties for violations to ensure accountability and effective achievement of policy goals.

Water management at the river basin scale, specifically for the Tenggang River under the BBWS Pemali Juana, has shown positive outcomes. However, there is room for improvement in strengthening multi-level coordination among central and local governments. Establishing such coordination forums will improve the alignment of government programs, facilitating more effective and efficient implementation. Additionally, these forums can provide opportunities for training, technical support, and capacity building, enabling local governments to independently manage drainage systems and improve overall governance.

The integration of policies across various sectors, especially between spatial planning and water management, is essential for addressing challenges like flooding caused by incompatible land-use decisions. Misalignments between spatial planning and drainage management can exacerbate water-related issues. A more cohesive approach that involves close coordination among sectors such as spatial planning, environmental management, infrastructure, and water management will foster comprehensive decision-making. This alignment will not only reduce conflicts of interest but also ensure more sustainable use of resources, contributing to the long-term success of water management initiatives.

In parallel, enhancing human resource capacity in water management is critical. Expanding the scope and frequency of training programs for water management professionals is vital for building a well-equipped workforce. Localized training materials, coupled with ongoing evaluations and certifications, will ensure that professionals remain up-to-date with current practices. Additionally, incorporating practical case studies into training and establishing networks for knowledge sharing will strengthen practical skills, ensuring that the workforce can effectively address challenges in water management. This multi-faceted approach will foster greater expertise and sustainability in water governance.

Dimension Efficiency

Efficiency in water governance is crucial for optimizing the benefits of sustainable water management while minimizing societal costs. To achieve this, a combination of advanced data management, innovative financing models, effective regulatory frameworks, and a focus on technological innovation must be implemented. By leveraging these strategies, water governance can ensure the effective use of resources, long-term sustainability, and resilience.

One of the key areas to focus on is optimizing the use of data in water management. Establishing an integrated data management system, incorporating advanced technologies, is essential for identifying, collecting, and analyzing relevant data. In addition to creating this system, it is crucial to train staff and formalize data management policies to maintain consistency and ensure high-quality data. Strengthening inter-agency collaboration through forums or

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working groups will enhance the overall effectiveness of data management efforts. Regular monitoring and evaluation will ensure that the data remains relevant, supporting informed decision-making and maximizing efficiency in water management.

Financing water management continues to be a critical challenge, as public budgets alone are insufficient to meet the increasing demands for infrastructure and services. Therefore, exploring alternative financing mechanisms, such as Public-Private Partnerships (PPP), is necessary to provide additional resources and improve project efficiency. Furthermore, encouraging community involvement in the planning, implementation, and maintenance of water management systems fosters a sense of ownership, which is key for the long-term sustainability of projects. This approach reduces reliance on public funding and enhances long-term efficiency by ensuring that communities remain actively engaged in maintaining their local water systems.

Effective regulatory frameworks are fundamental for maintaining accountability in water management. Regular evaluations of existing regulations should assess their effectiveness, identify areas for improvement, and ensure that regulations are enforced with clear and consistent sanctions for non-compliance. Transparent communication of regulatory measures will help align the efforts of all stakeholders, ultimately improving governance outcomes and enhancing the overall efficiency of water management.

Finally, fostering innovation is essential to addressing the evolving challenges in water management. Promoting the use of advanced information technologies can streamline processes and enhance flood management strategies. Collaborating with external organizations, such as those in the Netherlands, can bring valuable expertise and innovative solutions tailored to local needs. Additionally, as part of innovative drainage governance, it is recommended to establish community-based groups similar to the Badan Polder Banger Sima (BPP SIMA) in Polder Banger. BPP SIMA serves a vital role as a local organization and a platform for community participation, established through collaboration between the government, academic experts, businesses, and private stakeholders (Adi & Wahyudi, 2018). These groups should focus on empowering local communities to actively participate in the planning and maintenance of local drainage systems. This approach enhances the efficiency of drainage management, fosters a sense of ownership, and ensures long-term sustainability by addressing specific local needs. Through these combined efforts, water governance can achieve greater efficiency, resilience, and sustainability in the long term.

Dimension Trust and Engagement

Trust and engagement are fundamental in ensuring effective water governance by fostering public confidence, inclusivity, and fairness for all stakeholders. A key aspect of this is ensuring integrity and transparency in water management. Although legal and institutional frameworks for integrity and transparency exist, their implementation should be further strengthened. The Integrity Zone program should be reinforced with continuous oversight to prevent corruption and misuse of authority. Expanding risk management systems and increasing public participation through surveys and independent audits will help bridge the gap between policy and practice, ensuring that governance actions align with the public's expectations and needs.

In addition to promoting integrity, it is essential to enhance stakeholder engagement in water management. Public involvement plays a crucial role in monitoring and evaluating drainage conditions. To improve this, community oversight teams, representing diverse groups, should be established to ensure that all voices are heard in the governance process. Regular stakeholder forums and integrated reporting platforms can further enhance transparency and accountability. Public awareness campaigns will also foster collaboration and encourage active participation, making the governance process more inclusive and responsive to community concerns.

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Equity among water users, both in rural and urban areas, as well as across generations, is another key component of building trust. Strengthening mediation mechanisms for resolving water-related disputes is critical to ensuring that all parties have access to water resources in a fair and equitable manner. Establishing an independent and transparent mediation body will ensure that decision-making processes are impartial and inclusive. Additionally, decision-making should prioritize sustainability and consider the long-term impacts on future generations, fostering innovation that balances current needs with the broader, long-term goals of water management.

Finally, improving monitoring and evaluation processes is essential for promoting transparency and accountability in water governance. Increasing the frequency of monitoring activities and expanding community involvement in these activities will help ensure that governance remains responsive to local needs. Public feedback mechanisms, such as public forums and surveys, should be enhanced to ensure that community concerns are integrated into decision-making. By strengthening public participation, trust and engagement will be reinforced, ensuring that water management remains effective, inclusive, and transparent. These recommendations aim to address the challenges in the Tenggang River drainage system and create a more resilient and sustainable water management approach in line with the OECD Water Governance Principles.

CONCLUSION

This study concludes that the governance of the Tenggang River drainage system presents both challenges and opportunities for improvement across the three dimensions of the OECD Water Governance Framework: effectiveness, efficiency, and trust & engagement. In terms of effectiveness, the findings indicate that while regulatory frameworks for water governance in Semarang provide a foundation for clear roles and responsibilities, their implementation remains fragmented. Strengthening policy integration, inter-agency coordination, and capacity building across all government levels is essential to ensure that water management objectives are effectively achieved and lead to more resilient and sustainable outcomes. For the efficiency dimension, improving the governance of the Tenggang River drainage system requires addressing fragmented data management, limited technology use, and dependence on public funding. Establishing integrated data systems, supported by staff training and inter-agency collaboration, is vital for informed decision making.

Exploring alternative financing such as Public Private Partnerships (PPP) and involving communities in system maintenance can enhance sustainability and local ownership. Strengthening regulatory enforcement and promoting innovation, through technology and community based models like Badan Polder Banger Sima (BPP SIMA), will further improve efficiency and support a more resilient and sustainable water management system. Last one, the trust and engagement dimension, strengthening water governance in the Tenggang River drainage system requires improved implementation of integrity and transparency frameworks, along with greater public involvement. While legal structures exist, their effectiveness depends on consistent oversight, risk management, and community participation. Establishing inclusive oversight teams, enhancing feedback mechanisms, and promoting equitable access to water, both across regions and generations, are essential for building trust. These efforts will help ensure that water governance is fair, transparent, and responsive to public needs.

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