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Multiactor Dynamics in Domestic Wastewater Governance within the Framework of Water Governance: Case Study at Sewon WWTP

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Abstract

Wastewater management is important component in sanitation that has direct affect on the quality of clean water sources. This study analyses the implementation of domestic wastewater governance by focusing on two key aspects: government performance and community involvement. Adopting a case study approach, the study was conducted at the Sewon Wastewater Treatment Plant (WWTP), which is the only regional WWTP in the Special Region of Yogyakarta (Daerah Istimewa Yogyakarta/DIY) serving Sleman regency, Yogyakarta city, and Bantul regency. Data were collected through interviews, document analysis, and field observation. The analysis is grounded in a water governance framework, assessing three key dimensions: content, institutional arrangements, and relational dynamics. The results reveal significant gaps in policy implementation, limited coordination among government actors, and minimal public participation. These challenges have negatively impacted the effectiveness and sustainability of domestic wastewater management. Therefore, the study underlines the urgent need for more integrated coordination among governmental bodies and stronger efforts to empower communities. Greater public literacy, involvement in decision-making processes, and inclusive governance practices are essential to improve the performance of domestic wastewater management and ensure long-term environmental sustainability.

Keywords: *Water governance; wastewater management; Sewon WWTP*

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Domestic Wastewater Management Issues

The domestic wastewater management at the Sewon Wastewater Treatment Plant (WWTP) involves multiple stakeholders, each with distinct roles, interests, and capacities. The local government, which includes collaborations among related districts, cities, agencies, and the community, participates in various stages of the management process. However, the collaboration in practice lacks full synergy. Field data shows ongoing challenges such as limited public awareness, power imbalances among actors, and insufficient budget allocations for the optimisation of the Sewon WWTP. This shows that the problems in domestic wastewater governance are not only technical in nature but also rooted in complex social and institutional challenges. Therefore, an analytical framework is needed to describe the relationship between these actors. Using a water governance approach and the three-layer model, this article analyses the multi-actor dynamics of domestic wastewater governance at the Sewon WWTP, focusing on the legitimacy, capacity, and collaboration of each actor, and how these factors influence the effectiveness of wastewater management.

Domestic wastewater management and sanitation are fundamental human needs, serving to separate waste from human settlements to prevent the spread of disease (Flores et al., 2009). In Indonesia, wastewater management is a regional responsibility as stipulated in Law No. 23/2014. However, it cannot be managed in isolation, as wastewater often flows across administrative boundaries. For example, in this study, waste originating

from Sleman regency affects the downstream environment in Bantul regency if not managed properly. This situation illustrates that wastewater management at the Sewon WWTP is a manifestation of inter-regional cooperation.

Effective domestic wastewater management requires an integrated, effective, and efficient approach to planning, financing, and implementation (Yudo & Said, 2018). Despite this, on-the-ground implementation often faces significant obstacles, such as limited community participation—reflected in low levels of engagement and compliance—and inadequate treatment capacity. Faced with declining water quality due to untreated domestic waste, Indonesia must address the pressing challenge of improving wastewater treatment infrastructure, especially in rapidly urbanising areas. Legislative frameworks such as Law No. 17/2019 on Water Resources and Presidential Regulation No. 1/2017 on water resources management underscore the importance of integrated and sustainability-based water governance.

The selection of the Sewon WWTP as a case study is well justified due to its pipeline network spanning across district and city boundaries, involving a wide range of stakeholders. This setting presents an unique opportunity to see the dynamics and interrelationships between actors. Additionally, Sewon WWTP serves as a reference point for other regions, such as Central Java province, which also planning the development of regional WWTPs. As such, the national relevance of this study may contribute to enhancing inter-regional collaboration, especially in sustainable

sanitation management (DPRD Provinsi Jawa Tengah, 2023). Moreover, Sewon WWTP exemplifies a cross-regional governance model, a critical issue in Indonesia's water resources policy, as emphasised in both the 2020–2024 National Medium-Term Development Plan (Rencana Pembangunan Jangka Menengah Nasional/RPJMN) and Indonesia's National Action Plan for the SDGs. Therefore, research at Sewon WWTP holds both local significance and national value, contributing to Indonesia's efforts to achieve Sustainable

Figure 1. Main Pool Sewon WWTP

Source: Author's documentation, 2024

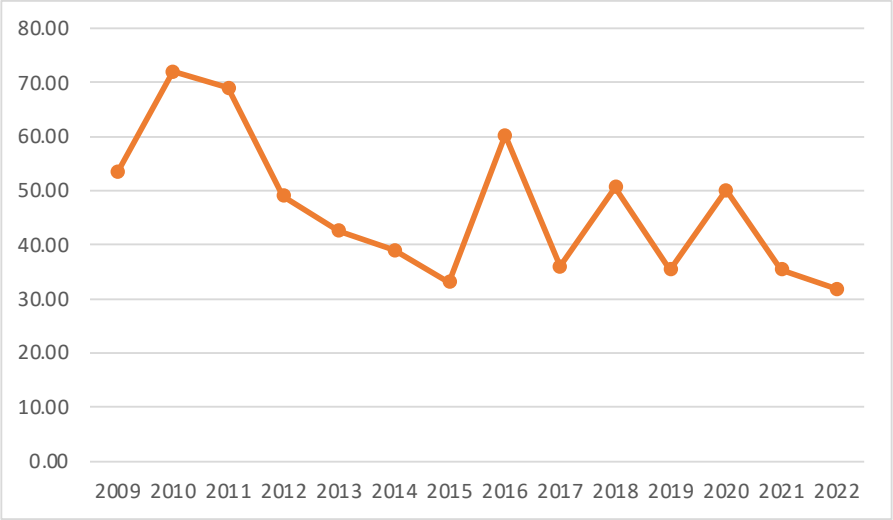
Development Goal 6 (clean water and proper sanitation) and Goal 11 (sustainable cities and settlements).

The selection of actors in this study was based on their direct involvement and roles in the management of domestic wastewater at the Sewon WWTP. The selected actors included the provincial government, the relevant district and city governments, Urban Wastewater and Drinking Infrastructure Management Agency (Balai Pengelola Infrastruktur Air Limbah dan Air Minum Perkotaan/Balai PIALAM) as the technical implementation unit (Unit Pelaksana Teknis/ UPT) responsible for Sewon WWTP, and representatives from the community who utilise its service. The selection ensured a comprehensive perspective across different levels of management.

The coding process followed a thematic approach using a combination of inductive and deductive methods. Interview transcripts and documentary data were analysed through the stages of data familiarisation, initial coding, code grouping into themes, and thematic interpretation, guided by the three-layer model of water governance (Braun & Clarke, 2006). This approach enabled the systematic and holistic identification of patterns and key themes while maintaining alignment with theoretical framework (Miles et al., 2014; Creswell & Poth, 2023). The coding began with an in-depth reading of interview data to extract meaning, followed by categorisation into representative codes that were used to construct an analytical narrative describing the dynamics of domestic wastewater governance.

The urgency of domestic wastewater management in the Special Region of Yogyakarta (Daerah Istimewa Yogyakarta/ DIY) is further underscored by population growth. According to BPS data from 2010 to 2019, the population increased by 121.27 people per km^2. This growth drives a corresponding rise in demand for clean water, housing, and adequate sanitation services.

Figure 2. Water Quality Index DIY 2009-2022



Source: Environmental and Forestry Agency of the Special Region of Yogyakarta, 2023

Based on the graph above, it can be observed that water pollution in DIY has shows fluctuating data but has tended to decrease in recent years. Many factors contribute to water pollution, one of which is the improper disposal of household

waste. Domestic wastewater management is a key effort to help reduce water pollution in DIY.

In the Sewon WWTP system, the number of household connection *(sambungan rumah/SR)* surged up to the end of 2021, reaching 26,050 SR, with an average incoming water volume of 19,605 m^2 per day. The Regional Settlement Infrastructure Office optimised the Sewon WWTP in 2021, increasing its capacity from 25,000 SRs to 75,000 SRs due to overload. However, despite the optimisation, the number of household connections did not increase significantly. Data from 2024 shows that utilisation of household connections only reaches 36.27 percent or around 27,205 connections—comprising 19,831 in Yogyakarta city, 3,868 in Sleman regency, and 3,506 in Bantul regency (Ria, 2024).

This household connection network requires a large budget, with each network costing around IDR 10-12 million. Therefore, many residents remain reluctant to connect independently. Meanwhile, the district and city government, which hold the authority to build these networks, are also constrained by limited local government funding.

In addition, problems also arise in the community level. Public understanding and participation in managing wastewater pipeline infrastructure remain limited. According to Deni Purwana Nugaraha, Head of the Operational Division of Balai PIALAM,

> *"There are still people who put garbage other than wastewater into the leading pipe network that passes through their house, which can clog the system and potentially*

damage the infrastructure." (Deni Purwana Nugaraha, Head of the Operational Division of Balai PIALAM, 1 February 2024).

The provincial government, Kartamantul[2] Joint Secretariat (Sekber Kartamantul), district/city governments, and the community are all involved in managing the Sewon WWTP. The water governance framework emphasises collaboration, cooperation, and participation. This research examines the dynamics among these actors in managing domestic wastewater at the Sewon WWTP.

The issue of domestic wastewater management is a government priority, as it directly impacts public sanitation. Based on the previous challenges, this research focuses on domestic wastewater governance within framework of water governance, with particular emphasis on the role government as a key actor in providing environmental sanitation services. Additionally, the dynamics between actors involved in governance will be an important focus of the study.

Complexity in Wastewater Governance

The Global Water Partnership (GWP) defines water governance as the political, social, economic, and administrative systems that exist to manage and develop water resources and provide water services to society (Jiménez et al., 2020). This definition explains that water governance encompasses both formal institutional structures and the informal processes of day-to-day negotiation, contestation, and conciliation among involved actors, which collectively influence the management and

2 Kartamantul refers to the Greater Yogyakarta metropolitan area, encompassing the city of Yogyakarta and the surrounding districts of Sleman and Bantul. It's an informal term, essentially an acronym formed from the names of the three administrative areas.

distribution of water. Therefore, water governance also involves the political power dynamics among stakeholders. In looking further into water governance, a framework is needed to map the actors involved.

Several models exist for examining water governance. One notable example is the socio-hydrological framework of Garimella & Prakash (Prakash et al., 2025), which discusses adaptive governance—emphasising the dynamic interaction between social and hydrological systems. This framework offers a new approach to designing more inclusive and climate-responsive water governance strategies. It focuses on the interplay between social decisions, water management policies, and the hydrological cycle, considering how changes in one system affect the other. This approach is particularly oriented towards resilience and adaptation to climate change, incorporating social, economic and cultural factors into water management.

Another widely adopted approach is the Organisation for Economic Co-operation and Development (OECD) Gap Analysis, which centres on evaluating water governance policies and identifying gaps in sustainable policy implementation. This model assesses whether existing policies meet the standards of good water governance and identify areas for improvement, whether regulatory, implementation, or policy. It is particularly useful for strengthening the effectiveness of existing policy framework (OECD, 2024).

A third model, the three-layer model by Maarten Hosfra (Water Governance Centre), conceptualises water governance through three interrelated and

inseparable layers. The content layer focuses on knowledge of the water system and its problems. The experience and skills of the managing actors will be needed to solve various problems, both technical and non-technical. Adequate organisation coupled with the legal instruments needed to create a more integrated water resources management structure is included in the institutional layer. In addition, persistent problems must be resolved through what is called the relational layer. Key elements of the multiple stakeholders involved in water resources management must communicate and cooperate to build transparency and trust (Hofstra, 2013).

This study adopts the three-layer model due to its emphasis on structured, multi-level water resource management, involving actors from operational to policy levels. This framework helps to see the extent of government-led wastewater governance and identifying the roles and interests of various actors involved. While typically applied to clean water provision, the model is here adapted to examine domestic wastewater management at Sewon WWTP.

This framework helps to see the extent of wastewater governance by the government, map the participating actors, and assess their respective roles and interests. The analysis categorises and codes actor behaviours and statements across the three indicators: content, institutional, and relational. In the content indicator, data is classified based on the knowledge, understanding, and policy formulation. The institutional indicator focuses on organisational structure, coordination mechanisms, budgetary constraints, and task distribution. Relational

indicators examine interactions, participation levels, and communication strategies. Qualitative data were validated using source and method triangulation, involving various actors including the provincial and district/city governments, as well as community members utilising the service. Data source included interviews, policy documents, and field observations, all cross-verified and interpreted through crisis reflection and alignment with the theoretical framework to ensure credibility and validity.

Beyond water governance, this study also supported by the theory of inter-regional cooperation to evaluate the inter-regional relations of the Sewon WWTP. Given Indonesia's decentralised governance structure, inter-governmental cooperation is often required to address issues that transcend territorial boundaries. Successful collaboration relies on trust, common goals, and mutual dependence. Angranoff & McGuire (2003) emphasise the importance of both horizontal and vertical collaboration, supported by intensive communication in various policy domains. Effective regional cooperation can mitigate disparities between regions, preventing "winners and losers" scenarios often associated with decentralisation. As Utomo (2006) notes, better-managed regions tend to attract more resources, accelerating their development. In addition, Rhodes (1981) and Stoker (1995) observe that bureaucrats may prioritise expanding their own departmental budgets and programmes, potentially sidelining broader public interest. The losers in this case will be the majority who are not included in the system and just sit idly by on public funding to support service expansion (Stoker, 1995).

By integrating water governance and inter-regional cooperation, this research aims to unpack the complexities of domestic wastewater management at Sewon WWTP. The study explores actor involvement, the interplay of interests, and how these dynamics influence governance outcomes.

Given the diverse actors involved—each with differing interests, capacities, and roles—effective governance of domestic wastewater at Sewon WWTP requires collaborative approaches. Multi-actor models are shown to enhance the sustainability and effectiveness of water management. This is because collaboration frameworks can balance stakeholder roles and improve communication (Di Vaio et al., 2021). Similarly, a multi-actor approach in water governance also improve the effectiveness of decisions taken as outlined by Megens & Warner (2025) which emphasises the importance of collaborative and decentralised systems in water resources management.

A 2023 OECD report on water governance also found that applying principles of participation, accountability and transparency can improve water management efficiency and effectiveness at the local level. This aligns with findings from Saint-Bois et al. (2024), who argue that multi-sectoral cooperation in managing the food, energy, and water nexus leads to more responsive and locally tailored policies.

Finally, understanding the power dynamics between actors is essential. McIlwain et al., (2023) suggest that recognising and actively managing these dynamics enables more effective collaboration and responsive problem-solving. Therefore,

attention to power relations is critical for fostering meaningful actor collaboration in the governance of wastewater at Sewon WWTP.

Multi-actor-based Water Governance

Multi-actor-based water governance and multi-level governance have received more attention in recent years, especially in the Asian region, which is currently facing challenges in sustainable water resources management. Research Jiangmin & Ghengzi (2024) conducted a study of transnational water governance in the Shenzhen river, which involved collaboration between local governments, the Hong Kong government, and the Chinese central government. The study highlighted the importance of cooperation between actors in managing flooding challenges and water resource management in transboundary areas. Linh et al. (2025) applied the OECD framework to assess water governance in the Mekong delta, Vietnam, which highlighted the implementation of sound water governance principles and the importance of a multi-actor approach to water resources management. In addition, the Global Water Partnership (2025) states the importance of water diplomacy in maintaining and strengthening ASEAN regional water security, focusing on managing shared aquifers and trans-boundary cooperation mechanisms.

Another study conducted by Marks & Baird (2025) in Phnom Penh, Cambodia, highlighted how the government's power structure and policies will affect its vulnerability to flood disasters. This shows that the need for a multi-actor approach in mitigating disaster risk. On the theoretical side, Prakash et al. (2025)

propose a socio-hydrological framework for adaptive governance that focuses on the dynamic interaction between social and hydrological systems. This framework offers a new approach to designing water governance strategies that are more inclusive and responsive to climate change.

These studies reinforce the importance of multi-actor and multi-level governance in addressing the complexity of water-related challenges in Asia. They also provide a more robust theoretical foundation for the implementation of adaptive and collaborative policies across the region. By adopting such an approach, water resource management can become more responsive to the pressures of urbanisation and climate change, while also being more inclusive of the diverse actors involved in the governance process.

Identification of Actors and Their Involvement in Sewon WWTP Management

Analysis through the water governance framework requires mapping between actors involved to see the extent of their participation in domestic wastewater management at the Sewon WWTP. This actor mapping also reveals the various problems faced by each actor. The following outlines the roles, interests, and challenges encountered by different actors involved in managing domestic wastewater at the Sewon WWTP.

The provincial government, through the Public Works, Housing, and Energy and Mineral Resources Agency (Dinas Pekerjaan Umum, Perumahan dan Energi Sumber Daya Mineral/ DPUP ESDM), is responsible for overseeing wastewater management. The technical

operations are delegated to one of its implementation units, Balai PIALAM. Although operational and maintenance budgets are shared with the regency/city governments that utilise the Sewon WWTP, overall budget planning remains under the authority of the PUP ESDM DIY. Wastewater management remains a priority, with development targets focusing on increasing house connections to reach the current maximum capacity of 75,000 SRs. According to Gunawan Sri Subekti, Sub-Coordinator of the Programme Substance Group, achieving these targets remains a challenge for district/city governments. The provincial government's authority is largely limited to operational management of the WWTP itself and maintenance of the main pipeline network that crosses regency/city boundaries.

In addition to the DPUP ESDM DIY, the Regional Development Planning Agency (Badan Perencanaan Pembangunan Daerah/Bappeda) of the DIY also involved in this management. Bappeda acts as a monitor and evaluator for the programmes developed by the provincial PUP ESDM. It coordinates with Bappeda at the regency/city level to improve house connection coverage. Furthermore, Bappeda DIY defines key indicators aligned with the five- and twenty-year development plans (RPJMD and RPJPD), which guide the allocation of annual development budgets.

To facilitate cooperation between the three districts/cities involved—Sleman regency, Yogyakarta city, and Bantul regency—a joint body known as the Sekber Kartamantul acts as a facilitator, mediator, and coordinator. Its primary function is to manage shared

infrastructure and services, including the Sewon WWTP. Sekber Kartamantul ensures that facilities and infrastructure issues are addressed collaboratively through discussion and coordination forums, where each region can voice concerns and propose sollutions. As Agranoff & McGuire (2003) argue, successful inter-regional collaboration depends on intensive communication, trust, and common goals. The secretariat's function is important to minimise conflicts and manage competing interests across administrative boundaries.

The regency/city governments which covers the Sleman, Yogyakarta, and Bantul have direct authority over the service network and house connection infrastructure. Their involvement is especially crucial in the current phase, which prioritises the optimisation of the Sewon WWTP's expanded capacity. However, there are technical and budgetary limitations. For instance, Sleman regency has the highest target, around 30,000 SRs—but progress is hindered by a lack of main pipeline coverage in certain areas, which falls under the authority of Balai PIALAM. Budget constraints also persist, as Sleman's focus remains on developing its own Depok WWTP, diverting resources from Sewon-related connection. Budget constraints also persist, as Sleman's focus remains on developing its own Depok WWTP, diverting resources from Sewon-related connections.

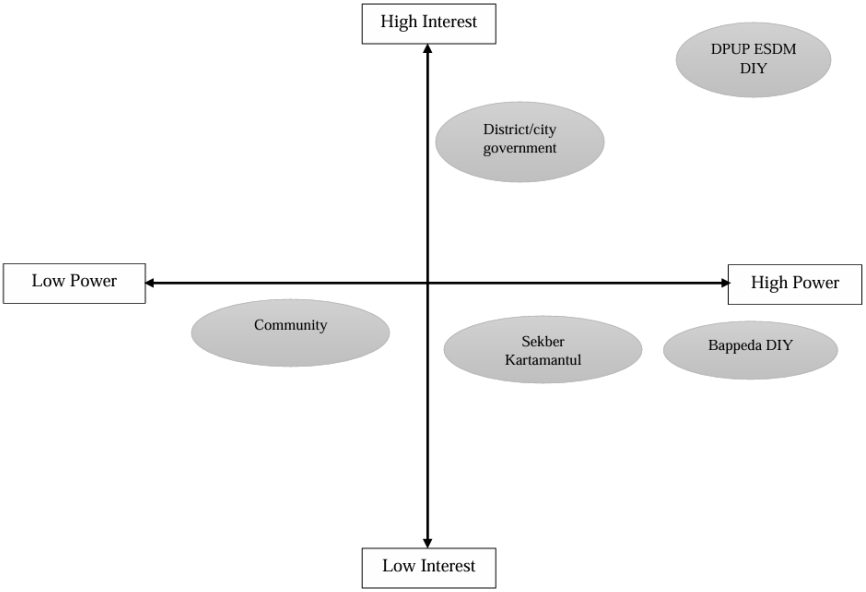
In contrast, Yogyakarta city has made more progress, having received central government funding to build around 600 SRs by 2024. Most areas in Yogyakarta city are already connected to the Sewon

WWTP, largely because the city lacks its own regional WWTP and thus relies entirely on the Sewon facility.

Bantul regency, where the Sewon WWTP is located, presents a unique case. Despite housing the plant, only the northern parts of Bantul can be served, due to technical constraints in extending service coverage throughout the regency.

The community also constitutes an important stakeholder group, as outlined in Regional Regulation No. 2/2013 of DIY. However, in practice, community involvement has been minimal. Public understanding of piped domestic wastewater systems remains low, leading to resistance against the construction of new SRs in some areas. The multi-actor and collaborative approach proposed by Jiménez et al. (2020) emphasises the importance of community empowerment as a critical component for sustaining the Sewon WWTP management system.

Figure 3. Actors Mapping



Source: Author's analysis

Based on actor mapping designed by Freeman (1984), stakeholder mapping can be used to see more clearly the influence and impact of actors involved in domestic wastewater governance at the Sewon WWTP. The high interest-high power category is filled by DPUP ESDM DIY, Balai PIALAM, and the regency/city government, which have a high level of importance and influence. Their collaboration is critical and their roles are pivotal in determining decision-making processes in Sewon WWTP management. The high power-low interest group comprises the Sekber Kartamantul and Bappeda DIY,

who hold considerable influence but have a more peripheral engagement in day-to-day governance. Conversely, the low power-high interest category is occupied by the community, whose stake in domestic wastewater governance is substantial, given that they are the primary beneficiaries of the service. However, their role remains marginalised due to limited engagement, low awareness, and weak inclusion in decision-making processes related to the Sewon WWTP.

The behaviour of these actors cumulatively reflects horizontal fragmentation, stemming from inter-regional interactions, and vertical fragmentation, stemming from interactions between levels of government. The absence of a shared vision and weak inter-agency communication lead to gaps in house connection development, weak coordination, and low community participation.

Wastewater management in Sewon WWTP is fairly complex, multi-layered system, in which actors across administrative boundaries and governance levels interact dynamically. Inter-regional collaboration and active community participation, as emphasised in Agranoff & McGuire (2003) theory of cooperation, are key to the success of this governance. By understanding the power dynamics and interests of each actor, Sewon WWTP's wastewater governance can be improved in terms of effectiveness and sustainability by the principles of good water governance.

Problems and Challenges in Sewon WWTP Management

The actors involved in domestic wastewater management experience several problems, stemming from both

government through power imbalances between actors and community-level dynamics. From the data analysis, three problems have been identified: limited public awareness, power imbalance between actors, and budgetary constraints in optimising the Sewon WWTP.

One of the key challenges lies in the community's limited awareness and understanding of piped wastewater systems. Some communities object to the installation of pipelines because they do not really believe in pipeline treatment. This condition happens a lot in Bantul regency, as stated by Department of Public Works, Housing, and Settlement Areas (Dinas Pekerjaan Umum Perumahan dan Kawasan Permukiman/DPUPKP). These objections are mostly due to the idea that the pipe system may disrupt their existing water infrastructure. Whereas the piped network system is more efficient and can help the community to maintain water quality as it minimises leakage. Others fear that pipeline installation will involve dismantling parts of their homes or incur costs they cannot afford without government subsidies.

> *"People who did not want to install the pipeline also argued that they did not want to dismantle the tiles in their houses and that they would have financial problems if they did not receive funding from the government program." (Interview with Satria Agung Nugroho, Staff of Human Settlements Division DPUPKP Bantul , 5 February 2024).*

These objections highlight the lack of technical literacy regarding the environmental and health benefits of domestic wastewater treatment. The system is arguably still new to the community so they still do

not know about the impacts that may arise from using old system wastewater treatment. On the other hand, they also feel that the need for wastewater management is not a priority and do not see the urgency to carry out such treatment. The community often lacks access to education on domestic wastewater management. So far, socialisation from the government has only been limited to the disposal of waste or garbage that has the potential to pollute the environment.

> *"Education to the community has never touched on domestic wastewater management in the piping system. In fact, this can be said to be new knowledge for the community." (Interview with Kuncoro, Sewon WWTP user residents, 21 March 2024).*

> *"The emergence of cons from the community is because they do not know the benefits of management with a pipeline system. One of them is because they have the idea that pipes under the ground will produce murky or polluted water. Whereas this system is actually beneficial for the community." (Interview with Sarwiyono, Sewon WWTP user residents, 29 February 2024).*

Due to the lack of knowledge on domestic wastewater management, people assume that wastewater management is the responsibility of the government. Such thinking is strongly reflected in their behaviour towards involvement in domestic wastewater management. Wastewater is often perceived as a secondary issue, with residents prioritising more immediate needs such as

clean water access. However, when it comes to waste, the community has yet to see that it is an obligation for them as well.

> *"The community is often unable to see the link between the water they use and the waste they discharge. In fact, as water users, we share responsibility to ensure that waste is treated in a manner that does not pollute the environment." (Interview with Mifta, Assistant for Programme and Technical Sekber Kartamantul, 1 March 2024).*

One tangible form of the community's lack of literacy regarding domestic wastewater management is the continued practice of disposing of solid waste into wastewater network pipes, which has the potential to block the passage of water. This habit of the community is also exacerbated by the fact that many pipelines have been built since the Dutch colonial era and are therefore susceptible to damage. Therefore, incidents of wastewater overflow have occurred in the Keraton area.

Power asymmetries is also experienced by government actors in collaborative efforts. Bantul regency has expressed concerns regarding inequalities in the budget-sharing scheme for Sewon WWTP. Under current arrangements, operation costs are shared with a composition of 30% covered by the district/citie governments and 70% by provincial government. The former being distributed according to the number of SRs.

Bantul regency, however, has raised objections to this model, as most of its connections come from low-tariff households. In contrast, Sleman regency and Yogyakarta city benefit from a

higher number of connections to hotels and other commercial entities, which are charged significantly higher tariffs.

> *"Therefore, there is an imbalance in budget contribution. In Yogyakarta city and Sleman regency, there are many hotels so that the amount of contribution will also be different. At this time, the payment from the district/ city government budget sharing is only based on the number of SRs, not actual usage." (Interview with Satria Agung Nugroho, Staff of Human Settlements Division DPUPKP Bantul, 5 February 2024).*

Adding to this inequality, the Bantul regency government has raised the issue of compensation due to the location of the Sewon WWTP within Bantul. The community's complaints have yet to be formally addressed through the Kartamantul coordination forum, as the matter is still under review.

Inequality is also experienced by Sleman regency, which has the most house connection target of 30,000 SRs. The reason for this target is also supported by the region's favourable topography which is higher than Bantul regency and Yogyakarta city so that it is expected to expand the area served by the pipeline network.

> *"This high target is not supported by an adequate main network, which only exist in a few sub-districts. Since the authority of the main network falls under provincial government, the expansion of the service network at the local level is constrained." (Interview with Fitria, Substance Group Wastewater Treatment DLH Sleman, 6 February 2024).*

The problems experienced by the district/city government certainly hinder the goal of optimising the Sewon WWTP. Increasing house connections is indeed the authority of the district/city government but, on the other hand, they are also still constrained by public awareness and lack of mainline infrastructure in several areas. Therefore, the optimisation of the Sewon WWTP potentially lead to a shift in responsibility when the provincial government seems to be hands off on the construction of SRs.

> *"During initial development, most of the budget came from central government grants and programmes. Today, such funding is limited, and the emergence of regional WWTPs in each district/city has further divided available resources. Public willingness to self-finance connections remains low." (Interview with Miftah, Assistant for Programme and Technical, Sekber Kartamantul, 1 March 2024).*

> *"The budget for connecting the service network can reach an average of IDR 10 to 11 million per household without government assistance. This is a major obstacle in the optimisation programme, particularly as programme-based funding remains insufficient to meet community needs." (Interview with Fitri, Substance Group Wastewater Treatment DLH Sleman, 6 February 2024).*

DIY is one of the few regions In Indonesia that receives a privilege fund (dana istimewa/ danais) due to historical and cultural status. To date, this fund has primarily been allocated for cultural and heritage-related purposes. However, the Yogyakarta city government has proposed using danais for

infrastructure revitalisation—particularly in areas such as the Keraton, where pipelines fall within the Sultanate's Land Space Unit (SRS).

> *"The allocation of funds for infrastructure development is also important. The Yogyakarta city government has tried to propose the use of the danais to revitalise the existing pipeline network in the Keraton area, which lies within the Sultanate's SRS. Since danais is not itemised in allocations from the central government, only areas within the SRS can currently be funded through this mechanism." (Interview with Miftah, Assistant for Programme and Technical, Sekber Kartamantul, 1 March 2024).*

Analysis of Domestic Wastewater Governance

In the water governance framework as previously described, three indicators serve as benchmark for evaluating domestic wastewater governance at the Sewon WWTP. These indicators are content, institutional, and relational. These indicators are interrelated with each other to see the role of stakeholders and the agenda they pursue.

a. Content

Domestic wastewater in DIY is regulated under Regional Regulation No 2/2013, which aligns with the region's needs for wastewater management. The regulation outlines responsibilities among government actors, and in practice, each institution largely adheres to its designated duties and authority. However, a significant challenge in policy

implementation stems from limited public awareness, particularly regarding the piped wastewater system. Nonetheless, local regulations have also regulated the planning of non-physical aspects, such as public education on domestic wastewater management. This effort to implement these have not been optimal by the government as the person in charge of educating the community.

This aligns with the three-layer model framework which emphasises the importance of knowledge and experience of managing actors in dealing with both technical and non-technical problems. Although in its implementation there are still some things that need to be addressed, especially regarding the lack of public knowledge regarding domestic wastewater management.

b. Institutionalisation

The division of responsibilities among actors has been stated in the local regulation. However, interview findings reveals that there is still a one-way coordination. The district/city government only follows the direction of the provincial government, particularly concerning the expansion of household connections to the Sewon WWTP. This one-way coordination model has hindered the achievement of targets, largely due to budget constraints at the district level. In addition, there are some biases in the division of tasks and authority, so development is hampered.

Furthermore, fiscal inequality can occur as a result of differences in regional fiscal capacity. Regions with lower fiscal capacity are less able to finance infrastructure development projects without substantial support from the

central government (Sirait & Handra, 2020). Inequality in regional budgets will greatly affect the ability of local governments to provide adequate sanitation services through the Sewon WWTP. Until now, this construction has depended on central government assistance funds. However, since the expansion of Sewon WWTP capacity, such assistance has significantly declined, making it difficult for regency and city governments to meet the provincial targets for SR expansion. Thus, fair and targeted budget allocations from the central government are crucial to ensure more equitable access to sanitation infrastructure across regions.

Institutionalisation is closely related to intergovernmental relations, and the lack of clear, two-way communication among different government level has contributed to coordination failures. The overlapping roles in pipeline maintenance and the lack of cooperative planning reflects a broader issue in governance. The top-down approach has the potential to create inequality in the distribution of resources, as seen in the unequal interactions between district/city governments, which feel that they are being disadvantaged by these interactions.

c. Relational

In line with Scharpf (1997) theory, the top-down relationship results from decision-making processes at the central level that do not adequate consider the capacities or needs of local governments. Such an approach often ignores the local context, resulting in the implementation of policies that are not aligned with local conditions.

Most of the Sewon WWTP optimisation programmes are still top-down in nature. While proposals from district or city governments are not entirely excluded, the majority of programmes are still initiated and driven by the provincial government. From an interest-mapping perspective, the provincial government is primarily focused on increasing SRs in order to close the capacity-utilisation gap at the Sewon WWTP.

In this domestic wastewater management system, community involvement is an important consideration. Although communities are directly affected by the system, their participation is often limited to receiving assistance during the construction of SRs and paying service fees. The lack of involvement lead to low public awareness, so they tend to be less concerned about the maintenance of domestic wastewater management infrastructure. The situation is compounded by limited public knowledge and literacy regarding domestic wastewater management. According to community interviews, socialisation efforts by the government are often reactive and insufficient, typically taking place only when construction is imminent in a neighbourhood.

To foster greater trust and participation, communities need visible success stories that demonstrate the effectiveness of the system. One example is Padukuhan Pogung Lor, Sinduadi sub-district, Sleman regency.

> *"At the beginning of 2016, few people built house connections due to the pros and cons of the development. However, over time, as domestic wastewater management system was considered*

better and would have a good impact on their groundwater quality, many of them finally began to be interested in making connections independently." (Interview with Kuncoro, Sewon WWTP user residents, 21 March 2024).

The relationship between these actors would contribute to more effective and sustainable governance. Community rejection of house connections and instances of infrastructure damage illustrate the consequences of weak engagement. In addition, efforts to reduce water pollution will remain hampered if communities fail to see domestic wastewater management as a shared responsibility.

Overall, the empirical findings show that although the prevailing policies and regulations align with the needs, their implementation is still constrained by weak coordination, limited budget, and lack of community participation. The success of domestic wastewater management also depends on strong cooperation between the government and the community. Therefore, domestic wastewater management at the Sewon WWTP should focus on theoretical elements that prioritise collaboration among actors and community empowerment to achieve more effective and sustainable results.

The lack of understanding among the public has led to limited active participation in domestic wastewater management. This is also driven by a lack of coordination and transparency among government actors. In good water governance (OECD, 2021), public involvement is considered essential to ensure water management is carried

out efficiently and effectively. However, decision-making, from planning to implementation, remains solely in the hands of the government, without providing the public with a voice. As a result, it is not surprising that the public feels excluded and views themselves only as end-users.

Such conditions are prone to fostering distrust among the public, which is further reinforced by their lack of awareness regarding the importance of domestic wastewater management. If this situation continues, it may lead to increased water pollution caused by poorly managed domestic wastewater.

Conclusion

The findings in this study reinforce the relevance of the water governance framework, which emphasises the importance of content, institutional, and relational dimensions in domestic wastewater management. Barriers such as limited public knowledge and weak coordination between local governments indicate how these three dimensions are interdependent, as explained by Maarten Hofstra. Furthermore, this study identifies imbalances in authority and budget allocation across regions, highlighting the need for a deeper understanding of power and resource dynamics through the lens of intergovernmental relations theory. Budgetary disparities should be a key consideration for the central government in order to ensure fairer and more targeted funding that supports infrastructure development related to sanitation services and helps reduce regional inequalities.

In addition, the lack of public participation challenges the assumption of inclusiveness within multi-actor governance theory, calling for stronger efforts in community education and trust-building. The inadequate response to management issues, such as pipeline damage involving various actors with different authorities, makes an essential contribution to the development of a more adaptive governance theory. This study confirms the need for a governance model that is responsive and flexible to the dynamics on the ground, in order to make domestic wastewater management more effective and sustainable.

Therefore, this study supports the framework of the three-layers model and inter-regional cooperation, offering valuable insights for the development of a more realistic and contextualised governance theory. This is particularly important in addressing institutional challenges, empowering communities, and managing resource imbalance in domestic wastewater management.

However, this study has limitations in its ability to explain domestic wastewater governance more broadly, due to its focus on a single case study of the Sewon WWTP. Thus, further studies are needed to generalise these findings to other regions with differing social and institutional characteristics. It is recommended that future studies employ comparative approach across multiple areas using more comprehensive methodologies, including participatory and longitudinal methods. Such approach would allow for a deeper exploration of collaborative dynamics and the impacts of community involvement in domestic wastewater management. Future research could also

investigate innovative strategies for improving public literacy, enhancing public participation, and integrating information technology to support multi-actor coordination. These efforts are expected to strengthen both the theoretical framework and practical implementation of more inclusive, sustainable and effective domestic wastewater governance.

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