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COVERING LETTER

**POLITICAL AND ECONOMIC ASPECTS OF INTEGRATED URBAN WATER
RESOURCES MANAGEMENT (IUWRM) IN SEMARANG CITY INDONESIA**

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POLITICAL AND ECONOMIC ASPECTS OF INTEGRATED URBAN WATER RESOURCES MANAGEMENT (IUWRM) IN SEMARANG CITY INDONESIA

ABSTRACT

Purpose: This study aims to find out the aspects of politics and economics of integrated urban water resources management in Semarang City and their impact on the practices of qualities of water resources management.

Methods: This research used the qualitative method and field research approach. The focus data are the regulation and the implementation of water resources management in Semarang City Indonesia. The data was drawn from documents and interview with some resource persons.

Results and Conclusion: The study found that the city government, which should carry out the function of conserving water resources, actually polluted the Kaligarang River through one of its institutions: Local Water Drinking Company, “*Tirta Moedal*”. This company disposes of waste sludge containing aluminum metal directly into the river without any treatment processes that impacted in pollution in the river and causing siltation of the river downstream.

Research implications: the enactment of the comprehensive and integrated water resources management will has a positive impact on the practices of water resources management in Semarang specifically and Indonesia and even world countries generally. The implementation of comprehensive and integrated water resources management will also support the achievement of the sustainable development Goal.

Originality/value: Semarang City government must be supported to arrange a comprehensive and integrated water resources management (WRM) policy. There must be a clear legal law for the water resources management.

Keywords:

Politics, Economics, Water Resources Management, Urban Area, Semarang City

1. INTRODUCTION

The potential for water availability from time to time decreases while the demand is increasing due to the population growth and urbanization. Urbanization causes urban areas to be inhabited by around 64% of the 9.7 billion world population. Water is a vital resource for life and livelihood as well as a key factor for the achievement of several sustainable development goals (SDGs). One of them is SDG No. 6, namely "ensuring the availability and sustainability of water and sanitation for all" (Global Water Partnership, 2013; Guppy & Anderson, 2017). Water demand will continue to increase and lead to an escalation of the extraction of water resources between 18 - 50% in 2025 when compared to the conditions in 2012 (Environmental Assessment Agency, 2012; UNESCO World Water Assessment Programme, 2022). On the other hand, increased development and industrial activities have led to a decrease in water quantity and quality, as well as damage to ecosystems. It is estimated that globally there will be a reduction in water supply by up to 40% in 2030. Urban areas face multi-stress problems due to: (i) decreasing water quantity and quality; (ii) increased demand due to population growth,



urbanization, and development activities; (iii) climate change; and (iv) overuse.

All regions in the world are exposed to climate change, but developing countries will experience the greatest impact, where urban infrastructure, political, social, and cultural awareness have not been oriented towards the sustainability of water resources (Bichai & Flamini, 2018; Guppy & Anderson, 2017). Water is not only seen as a commodity-based on its economic and social value but is treated as a scarce resource that must be protected. Given that water is a resource with limited quantity, quality, and access, and 60% of surface water comes from river basins, river conservation is a necessity to ensure the sustainability of water supply in urban areas (Guppy & Anderson, 2017).

In the Semarang City - Indonesia, the reality that happened was unusual and unique. The Semarang city government, which is supposed to protect the sustainability of the river, has become a polluter through one of its institutions, the Local Company for Drinking Water "*Tirta Moedal*". This local company for drinking water discharges its waste sludge into the Kaligarang River without being treated first. The river becomes polluted with aluminium (Al) which is one of the dangerous and poisonous material, and experiences silting due to sedimentation. Semarang city government policy allowed or "do nothing" to the practice that impacted to water pollution done by the company. The other data shows that Semarang City has no comprehensive and integrated water resources management (WRM) policy. Policies related to water resources are sectoral, partial, and partisan. The absence of a WRM policy in Semarang City is related to another fact, that there was legal uncertainty in the WRM due to the annulment of Law No. 7/2004 concerning water resources) by the Constitutional Court in 2013. The purpose of this study was to analyze the political and economic conditions in integrated urban water resources management (IUWRM) in Semarang City. These questions are based on the assumptions that in formulating a comprehensive and integrated policy there are political and economic considerations that determine the process of enactment of the policy.

2. LITERATUR REVIEW

Integrated Urban Water Resources Management

Integrated Urban Water Resources Management (IUWRM) has gained significant attention in recent years due to the growing challenges posed by urbanization and climate change. The concept of IUWRM involves a holistic and sustainable approach to managing water resources in urban areas, encompassing various aspects such as water supply, demand management, wastewater treatment, and stormwater management (Burn et al., 2012; Li et al., 2017; Pataki et al., 2011; van de Meene et al., 2011; Worku, 2017). This approach is particularly crucial in the face of rapid urbanization, which has led to increased water demand and environmental stress (Adams & Smiley, 2018; Laminu et al., 2021; Vo, 2007; Zhou et al., 2022). IUWRM emphasizes the integration of natural and engineered water systems, aiming to enhance resilience, reduce vulnerabilities, and address environmental injustices while maintaining critical ecological services (Li et al., 2017; Pataki et al., 2011).

Furthermore, IUWRM involves the incorporation of governance and policy frameworks that promote sustainability and resilience in urban water management (Rouillard et al., 2016). It also emphasizes the need for innovative and decentralized solutions to address the complex challenges associated with urban water management (Burn et al., 2012; Peña-Guzmán et al., 2017). The implementation of IUWRM requires a shift from traditional, centralized water



management approaches to more adaptive, integrated, and participatory strategies (Burn et al., 2012; Worku, 2017). In addition, IUWRM encompasses various strategies such as water-sensitive urban design, green infrastructure, and sustainable urban drainage systems, which play a crucial role in mitigating the impacts of urbanization on water resources (Ali, 2018; Hurlimann & Wilson, 2018). These strategies promote the efficient use of water, the protection of water sources, and the sustainable exploitation, distribution, and consumption of water (Jiang et al., 2010). Moreover, IUWRM emphasizes the importance of community engagement and participation in urban water management, aiming to improve transparency, communication, and operational efficiency (Renouf & Kenway, 2017).

In conclusion, the concept of IUWRM offers a comprehensive and integrated approach to address the complex challenges associated with urban water management. By incorporating principles of sustainability, resilience, and community participation, IUWRM provides a framework for managing urban water resources in a holistic and adaptive manner, thereby contributing to the long-term sustainability of urban water systems.

Natural Resource Management in Semarang

Natural resource management in Semarang is a complex and multifaceted issue that requires a comprehensive and sustainable approach. The city faces various challenges related to the management of its natural resources, including water availability, plastic waste handling, coastal dynamics, groundwater conservation, and disaster management. These challenges necessitate the development of sustainable management strategies that consider the interactions between stakeholders, the conservation of ecosystem services, and the sustainable utilization of resources. The analysis of meteorological water availability and water demand in Semarang Regency highlights the need for resolving the problem of inequality in water demand and availability through proper water resource management (Herdiansyah et al., 2022). Additionally, the preliminary study on plastic waste handling in Semarang City emphasizes the necessity of environmentally sound management of plastic waste due to increasing generation and associated environmental pollution (Pertiwi et al., 2018). Furthermore, the study on sustainability strategy for small-scale fisheries management underscores the multifaceted challenges in achieving sustainable fisheries management in Semarang City (Malik & Kristiana, 2021). These references collectively emphasize the importance of sustainable management practices to address specific resource-related challenges in Semarang.

Moreover, the stakeholder interactions model of groundwater management in Semarang City emphasizes the significance of developing a model for effective stakeholder engagement in groundwater management (Susanto, 2018). Additionally, the mapping and valuing of ecosystem services approach highlights the need to consider multiple objectives and unintended consequences in conservation and natural resource management (Tallis & Polasky, 2009). These references underscore the importance of stakeholder engagement and holistic approaches in managing natural resources in Semarang. Furthermore, the coastal dynamic and shoreline mapping study emphasizes the impact of both natural and man-made factors on the shoreline dynamic in Semarang coastal area (Marfai et al., 2008). This highlights the need for integrated management approaches that consider both natural and anthropogenic influences on coastal dynamics. Additionally, the policy of community-based disaster management



underscores the importance of disaster management regulations and their implications for environmental damage and human livelihoods (Susanti & Setiajid, 2020). In conclusion, the management of natural resources in Semarang requires a holistic and sustainable approach that considers the interactions between stakeholders, the conservation of ecosystem services, and the sustainable utilization of resources. Addressing the challenges related to water availability, plastic waste handling, coastal dynamics, groundwater conservation, and disaster management necessitates the development and implementation of comprehensive and integrated management strategies.

Political and Economic Aspects of City Government Policy

The political and economic aspects of city government policy in water management are crucial for addressing the challenges posed by climate change and ensuring sustainable development. The city manager form of government has been noted to insulate governance from political pressures, which can influence the adoption and implementation of climate change mitigation policies (Sharp et al., 2011). Water governance involves the integration of political, administrative, social, and economic aspects to effectively manage water challenges (Yasin et al., 2021). Additionally, the international promotion of a city's water management policy can serve as a case of policy boosterism, demonstrating a social practice of legitimation enacted by the city government at both local and global scales (Martinez, 2023).

Comprehensive vision for the management of water resources is essential for overall development, economic growth, and national security, highlighting the economic significance of water resources management within a city (Tortajada, & Joshi, 2013). The influence of political and economic forces on communities' reliance on specific policy instruments varies based on the form of government, such as mayor-council and council-manager cities (Feiock et al., 2003). The political dimension of multi-scalar water, energy, and food systems introduces complexity to nexus management, emphasizing the intricate interplay of political and economic factors in water management (Artioli et al., 2017). The roles of city managers in policy-making are integral, and their involvement is influenced by the changing landscape of local governments and the complex nature of policy issues, reflecting the intersection of political and administrative aspects of government (Demir & Reddick, 2012). City governments can signal leadership in policy entrepreneurship through their memberships in city networks, underscoring the political and economic dimensions of city policies (Acuto & Leffel, 2021). In conclusion, the synthesis of these references underscores the intricate interplay of political and economic aspects in city government policy related to water management. The integration of these aspects is essential for addressing climate change, ensuring sustainable development, and effectively managing water challenges within cities.

3. MATERIALS AND METHODS

This study focuses on the analysis of political and economic conditions on Integrated urban water resources management (IUWRM) in Semarang City. Semarang City is one of the big cities in Indonesia and the capital of Central Java Province. The location of the Semarang City can be seen in Figure 1. The selection of the Semarang City based on the problem of management of water resources in the city. Environmental disaster such as flooding that occur in the Semarang City almost every year



and pollution of the Kaligarang River showed the problems. Kaligarang River was polluted because the city government did not respond appropriately toward the actions of the Local Company for Drinking Water “*Tirta-Moedal*” which dumps its sewage sludge into the Kaligarang river without without any treatment. Problems related to water resources in the Semarang City will be continued once the management of water resources is not implemented properly. The important role of city government policies is one of the fundamental factors to be improved in order to realize Integrated urban water resources management (IUWRM) in Semarang City.

Figure 1. Map of Location Semarang City in Indonesia



This study is qualitative research that investigates the phenomenon of the formulation and implementation of urban water resources management policies in Indonesia, particularly in the Semarang City. Water is a vital resource in the water-food-energy chain, where the interconnection and interaction between humans and water resources forms a socio-ecological system. Humans as actors determine the forms and patterns of their relationships with water resources that are subjective, relative, and unique, but can be constructed into objectives and social realities. In this regard, the process of investigation in this study used the constructivism paradigm and case study strategy (Creswell, 2014; Denzin & Lincoln, 2009; Lincoln & Guba, 1985; Yin, 2003).

Data from this research were taken from primary data and secondary data. Primary data includes data obtained from various policies regarding water resources management that have



been established by the Semarang City government as well as interview. Interviews were conducted using a list of questions to five respondents and free questions to five informants who were representatives of institutions related to water resources management in the city of Semarang. The results of the interview are presented in table form below. Secondary data consisted of the documents related to the water resources management. All the data was analyzed applying the parameter of integrated water resources management

4. RESULT AND DISCUSSION

The Political Aspects of Policy on Water Resources Management

The results of the study found that in the political domain there are 3 focus conditions. The first WRM policy is partial, sectoral, partisan, short or medium term, and is not oriented towards SDGs, giving rise to 3D phenomena (disorientation, disconnection, and disharmony) with central and provincial government policies. Second, policy formulation does not follow the policy cycle because it is based on the political interests of policy makers and local content. Third, Urban Water Resources Policy has not been integrated with collaborative institutions across sectors and administrative areas.

In the economic domain, the first 3 points are the application of the Dublin principle partially and incorrectly, where water resources are only seen as a market commodity. Second, the utilization of economic and social values of natural resources and watersheds is based on the principle of "market economy" which has an impact on reducing the quality and carrying capacity of the environment. Third, the opportunity to explore new sources of funding through environmental taxes with the principles of "user pays principles" and "polluters pay principles".

Table 1. Politics and Social Conditions in IUWRM Semarang City

No.	DOMAIN	Resume of Interviews Transcript
1	Politics	<ul style="list-style-type: none"> - The WRM policy is partial, sectoral, partisan, short or medium term, and is not oriented towards SDGs, giving rise to a 3D phenomenon (disorientation, disconnection, and disharmony) with central and provincial government policies. - Policy formulation does not follow the policy cycle because it is based on the political interests of policymakers and local content. - Urban PSDA policies have not been integrated with collaborative agencies across sectors and administrative areas.
2	Economics	<ul style="list-style-type: none"> - Partial and improper application of the Dublin Principles, whereby water resources are only seen as a market commodity. - The exploitation of the economic and social values of natural resources and watersheds is based on the principle of "market economy" which has an impact on reducing the quality and carrying capacity of the environment. - There is an opportunity to explore new sources of funding through environmental taxes with the principles of "user pays principles" and "polluter pays principles".
Source: Primary Data		



Political factors play a dominant role in the process of formulating and implementing WRM policies in Indonesia, including in the Semarang City. Most of the informants stated that the socio-political order in Indonesia after the government of the authoritarian regime of the New Order was still looking for an established direction and form in line, and was still in a transitional stage in line with the processes of democratization and decentralization which are still ongoing today. The phenomenon that appears is frequent changes in policies, regulations, and planning based on short term situational changes. If there is no policy change in the long term, it does not mean that the policy has been good or established, but rather because of uncertainty or there is no basis for updating it so that it continues to be used as usual (business as usual).

One empirical pieces of evidence is that there is no integrated WRM policy in the Semarang City even though there is a technical implementing agency, namely the PSDA & ESDM Agency. This is due to two factors: (i) there is no legal basis for making policies since Water Resource Act No. 7/2004 and all of its derivative regulations Government regulation No. 42/28 concerning PSDA, and Presidential Regulation No. 33/2011 was cancelled by the Constitutional Court in 2013; (ii) the substance of the WRM policy has been fragmented into the duties and functions of the relevant agencies for example, irrigation, drainage and flood control by the Public Works Agency, pollution control by the Environment Agency (DLH), drinking water supply by Local Company for Drinking Water “*Tirta-Moedal*”, and other functions by the Department of PSDA & ESDM.

There are at least two substantial changes to legal regulations relating to water resources management by the state, as shown in the Table 1.



Table 1. The Changes of Legal Norms in Integrated Water Resource Management (IWRM)

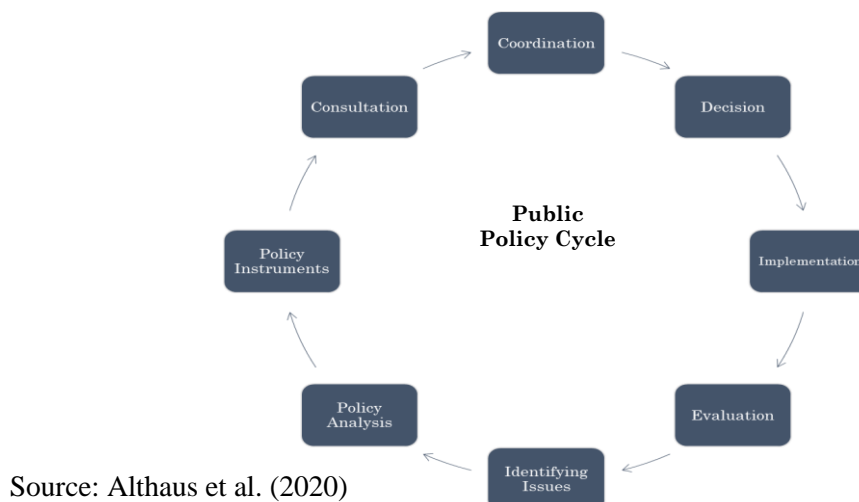
Laws	Context	Change
UU No. 7/2004	Water resource	Canceled
PP No. 42/2008	Water Resource Management (WRM)	Canceled
Presidential Decree (Perpres) No. 33/2011	National WRM Policy	Canceled
UUSDA No. 17/2019	Water resource	New Replacement of UU No. 7/2004
UU No. 32/2004	Local Governance	New Replacement of UU No. 22/1999
UU No. 23/2014	Local Governance	New Replacement of UU No. 32/2004
PEPU No. 2/2014	Local Governance	The first change of UU No. 23/2014
UU No. 2/2015	Local Governance	The second change UU No. 23/2014

Source: Primary data

Frequent changes in legal norms create political, economic, and social uncertainty so that the formulation of public policies is more influenced by short-term issues or situational factors such as floods, natural disasters, economic crises, and so on which are uncertain. A new water resources law has been made, namely Act No. 17/2019 concerning water resources, but the implementing regulations in the form of Government Regulations have not been made yet so that they cannot be implemented effectively. The formulation and implementation of water resources management policies are still subject to uncertainty.

This resulted in the response of policymakers focused on efforts to anticipate uncertainty. It is rare for a public policy to be properly designed following the stages in the policy cycle as described by Althaus et al. (2020):

Figure 2. Public Policy Cycle



Source: Althaus et al. (2020)

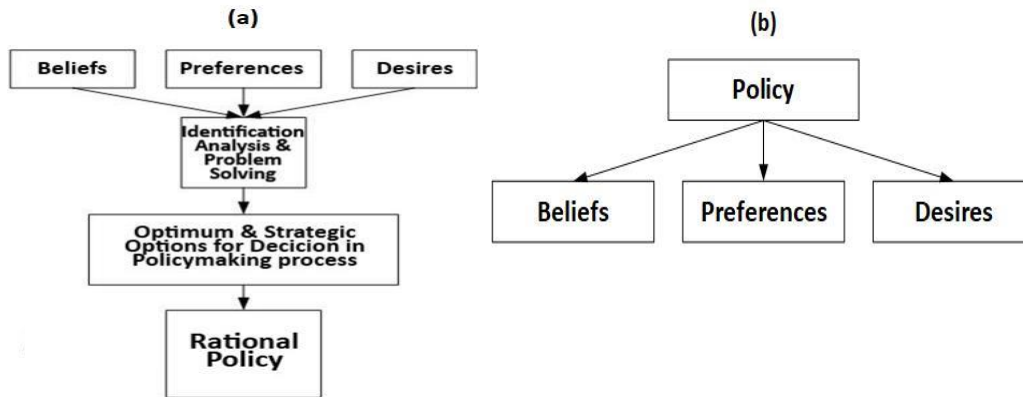
The results of the analysis of the informants' opinions show that the situational factors which led to the Semarang mayor's policy of allowing the disposal of waste sludge to the Kaligarang watershed include: (i) the Kaligarang watershed has not shown signs of degradation and a significant reduction in carrying capacity; (ii) The investment to build a Wastewater Treatment Plant (WWTP) is expensive, and the budget is not yet available; (iii) The priority is to meet the needs of clean water for the community to 100%; and (iv) WWTP construction can be carried out by a substitute mayor in the future. The opinion of the informants reflects a reality that the PSDA policy making in the Semarang City is not based on empirical facts in the field. The fact that the Kaligarang watershed has been polluted with Aluminium (Al) metal has been side-lined, to implement the priority of policies to fulfil the basic needs of the community and contribute to Local income.

The neglection phenomenon of the Kaligarang watershed pollution and the absence of an integrated WRM policy in the Semarang City is a form of "inaction", is a condition in which policymakers do nothing about ongoing public issues, in this case, waste disposal of Local Company for Drinking Water "Tirta-Moedal" to the Kaligarang watershed. Referring to McConnell & 't Hart (2019), the practice of neglecting pollution in the Kaligarang watershed is referred to as "government inaction". The Semarang city government is unmoved "to do nothing", to avoid uncertainty by continuing to practice business as usual (McConnell & 't Hart, 2019). Judging from the provisions of Article 24 paragraph (3) Act No. 17/2019 concerning water resources, the Semarang municipal government has the obligation and authority to "control pollution" of water resources. This obligation is not carried out because the polluter is the institution itself, namely the Local Company for Drinking Water "Tirta-Moedal". Furthermore, the practice of omission can be rationalized on the grounds of (i) development priorities to meet community needs for clean water or drinking water; and (ii) there has been no sign of degradation and a significant reduction in carrying capacity.

Rationalization means that policymaking is not based on the rational dimensions of decision making, namely empirical facts and problem analysis, but is based on the irrational dimension, namely the instincts, desires, or beliefs of policymakers about "what is considered

and felt right". A belief that is formed through repeated practice over a long period so that it is believed to be a rational truth. The difference between rational policy and policy rationalization is described by Cushman (2020) like a Figure 3.

Figure 3. The Difference between Rational Policy and Policy Rationalization
(a) Rational Policy & (b) Policy Rationalization



Source: Cushman (2020)

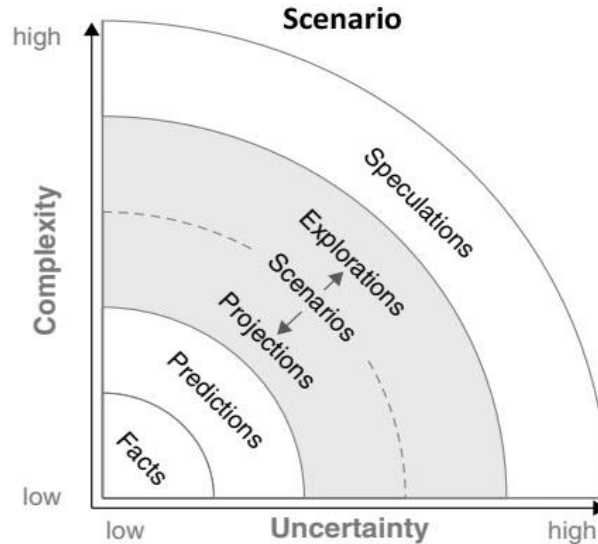
(a) is a rational policy-making process, in which the irrational dimensions of policymakers (beliefs, preferences, and desires) are included in the rational dimensions (identification, analysis, and problem-solving), to obtain the most optimal and strategic options, and then made a basis for making policies. There is an evidence-based process and knowledge management so that policies are made to be rational, objective, logical, and consistent through the application of knowledge management. (b) is policy rationalization, where direct policies are made based solely on the beliefs, preferences, and desires of policymakers without going through rational processes and knowledge management.

In essence, policies resulting from the rationalization process are irrational, but over time it is believed to be rational after going through repeated practices. The justification reasons used to rationalize "not prohibiting pollution and allowing Local Company for Drinking Water to dispose of its waste sludge into the Kaligarang watershed" are: (i) meeting the basic needs of the community for clean water; (ii) cost efficiency; and (iii) there are no signs and symptoms of degradation and a significant decrease in carrying capacity. The effect of rationalization is the emergence of "moral hazard" in the form of permissiveness, neglect or neglect, and so on which leads to abuse of authority and opportunistic behaviour of policy-making actors (Henricks, 2016). The result of the rationalization process in policymaking is "irrational, partial, sectoral, partisan and unsustainable policies" so that it can never achieve sustainable development goals.

Policymakers are always faced with changes in the external and internal environment that are increasingly complex with unclear boundaries, so they cannot be predicted or ascertained. A fundamental understanding of the complexity and uncertainty of change is

needed to make policy rationally. Zurek & Henrichs (2007) describe the relationship between complexity and uncertainty and scenarios to anticipate it as follows at the Figure 4:

Figure 4. The Scenario to Anticipate Complexity and Uncertainty of Change



Source: Zurek & Henrichs (2007)

The dark shaded areas are scenario areas where complexity and uncertainty are moderate. At the lowest level, what happens is facts, and then predictions or estimates as complexity and uncertainty increase. Prediction is rational because it is based on facts and logical reasoning. Predictions are often stuck at the risk of simplifying the problem because the facts are so clear that the implied substance fails to be revealed. At the highest level, speculation occurs because the rational method of reasoning is deadlocked. At the medium level of complexity and uncertainty, a "scenario" is needed which consists of two components, namely: (i) Exploration of various uncertainties in the future, particularly regarding (a) how much uncertainty is the driving factors of future development, and (b) how much the size of the complexity of the changes and how the causal relationship; and (ii) Projection of various possibilities using knowledge management, methods, and tools for policymaking (Jordan & Turnpenny, 2015).

Policy-making scenarios require understanding (Datta et al., 2016). Some aspects of policy making that must be considered include:

a. Working Dimension of Policy

1) Non-Discretionary Dimension

Policies are made based on applicable legal regulations, Standard Operating Procedures (SPO), administration, accountability, and public ethics. This dimension is used to formulate short, medium, and long-term policies following the stages of the public policy cycle.

2) Discretionary Dimension



Policies are made purely based on the considerations and decisions of policymakers based on the inherent authority, within the limits permitted by law. Discretionary policies are made for situational conditions where there is no legal norm but require immediate or emergency intervention. For example, emergency response to floods, natural disasters, drought, and others.

b. Basic Knowledge

Policymaking requires an adequate knowledge base which includes knowledge of:

- 1) Administrative statistics and data
- 2) Research results and expert/expert advice
- 3) Perceptions, aspirations, and experiences of the community/public

The reasons and benefits regarding the importance of the knowledge that comes from research results and expert/expert advice are: (i) providing context to the actual issue or problem; (ii) formulating policies and strategies, and (iii) give the policy professional legitimacy, and convince stakeholders or the public.

Economical Aspects of Water Resources Management

The opinion of respondents and informants regarding water resources management based on their economic and social values are as follows:

Table 2. Economic Implications of Water Resource Management (WRM)

Economic Implications	Questioner n = 96	Resume of Interview Transcripts (n = 14)
Fulfilling the basic needs of the community	Yes (100%)	Implementation of the function of water supply and sanitation (SDG No. 6)
The function of contributing to local revenue	Yes (100%)	Reasons for easy and cheap practice in disposing of waste
Performance orientation on profitability	Yes (68,2%)	The reasons for neglecting the conservation function of the Kaligarang watershed and allowing pollution practices
Cost-benefit efficiency pressures	Yes (64,3%)	The cause of the easy and cheap practice of disposing of waste
WWTP investment costs are relatively expensive	Yes (77,2%)	The reason for not building a Wastewater Treatment Plant
Does not take into account the cost of restoration of watershed damage	Yes	Reasons for not doing a cost-benefit analysis
Source: Primary Data; WWTP = Wastewater Treatment Plant		

The opinions of 72% of the 145 stakeholders interviewed about water resources management practices in the Semarang City are as follows:

"The determination of economic factors for water resources management is the greatest compared to other factors. The function of public services to meet community needs for clean water and sanitation (SDG no. 6) is privatized from a business perspective. Semarang city



government has established a Local Company for Drinking Water “*Tirta-Moedal*”, which is owned by Semarang municipal government. The legal basis for the privatization of water resources was Act No. 7/2004 concerning water resources, Government Regulation No. 42/2008 concerning water resource management (WRM), and Presidential Decree No. 33/2011 concerning National water resource management (WRM) policy, which were annulled by the Constitutional Court in 2013. The pressure of privatization caused the local drinking water company Local Company for Drinking Water “*Tirta-Moedal*” to truly emerge as a company that applies market principles and instruments such as market efficiency, pricing, efficiency in use, and production efficiency.

The reason for market efficiency has caused the Semarang municipal government to apply double standards in controlling river pollution. If the polluter is a community, sanctions will be applied, but if the polluter is Local Company for Drinking Water “*Tirta-Moedal*”, there will be no sanction. Also, there is an even more erroneous and even misleading assumption, that in the name of economic and social development, environmental damage is acceptable, and is a price to be paid by future generations because they enjoy the results of what is being built at this time." Market efficiency is understood as "spending the lowest possible cost to get the maximum benefit". This misunderstanding is what underlies the practice of disposing of waste sludge into the Kaligarang watershed because it costs nothing at all. Net income will be greater and the contribution to original local revenue will increase. The assumption that discharging sewage sludge into the river at no cost is wrong because the sludge will cause sedimentation and silting downstream (downstream). The Public Works Office always has operational costs incurred to dredge sediment every time there is silting in the upstream part. Kaligarang watershed must always be maintained because of its strategic function as a flood control channel in the west part of Semarang city.

There will be a portion of the local revenue contribution from Local Company for Drinking Water “*Tirta-Moedal*” that will be absorbed by the DPU for dredging operational costs. The question is: why not allocate a budget to build a wastewater treatment plant (WWTP) so that it does not always dredge rivers? The cost of restoring rivers is not only for dredging, but there are also costs for restoring the decline in river water quality due to chemical pollution. The cost of restoring environmental damage is not taken into account at all because the Kaligarang watershed is "considered" not yet showing symptoms or signs of decreasing carrying capacity.

This fact indicates that in managing water resources, environmental sustainability is always put aside, and only considered when symptoms or signs of damage or disaster have occurred. The valuation of water resources occurs in an unbalanced manner, where the economic and social values take precedence over the value of the ecosystem. The valuation of water resources includes economic, social, and environmental values, where water resources must be seen as an integral part of the ecosystem that is interwoven in a hydrological entity. The interaction between humans and water resources forms a dynamic socio-ecological system, where the level of resilience of the system always changes depending on the context of the interaction. If the water resource ecosystem is overexploited until it exceeds its critical



threshold value, then the balance will shift towards degradation and decreased environmental carrying capacity, and vice versa (Janssen & Anderies, 2007; Mulyanti et al., 2024).

Referring to one of the principles in the Dublin Principles which was declared by UNO at the international conference on water resources in Dublin in 1992, it is stated that water resources are seen as an economic commodity that can be used as development assets. This has triggered the emergence of political issues and pressures to schedule the making of water resources management policies based on their economic and social values, to fulfil basic needs, and to implement development as a whole. Water resources immediately enter the market not only as public goods (public goods) but also as consumer goods or traded production raw materials. As a consequence, the paradigm of “market efficiency” applies the law of supply-demand balance, and market instruments such as pricing, cost-benefit ratios, the efficiency of use, and productivity (Berbel et al., 2017).

If it is consistent with the principle of market efficiency, every polluter should have to pay the cost of environmental damage due to pollution. This principle has been adopted in environmental law and is applied to the community in the form of fines for polluters. The agency who implementing the function of conservation and pollution control is the Environmental Service (DLH). DLH does not exercise its authority to impose sanctions on Local Company for Drinking Waters for being fellow Local Apparatus Organizations (OPDs) from the Semarang municipal government. Institutional conflicts arose among fellow OPDs stemming from the Semarang mayor's policy of "doing nothing" on the practice of river pollution by Local Company for Drinking Water. The solution to this conflict is: Local Company For Drinking Water builds a Waste Water Treatment Plant (WWTP) so as not to pollute the river. Wastewater is treated first before being discharged into the river, or if possible, it is recycled for reuse as raw material. The reason there is no budget to build WWTP which is expensive can be circumvented by applying the 'polluter pays principle', where every polluter including Local Company for Drinking Water “*Tirta-Moedal*” allocates a fee for each litter of waste it discharges. The costs collected during a certain period can be used to finance the construction of the WWTP.

The definition of the polluter pays principle is "that individuals or companies that pollute the environment must pay the cost of restoring environmental damage that occurs as a result of pollution". This principal stems from the codex of European law and was adopted by developing countries. Several developing countries that have implemented this principle include Malaysia, Taiwan, South Africa, Kenya, Chile, and Ecuador. Experience from several countries shows that this principle can be used as an effective control instrument. The problem lies in inconsistency in law enforcement practices (Lindhout & Van den Broek, 2014; Luppi et al., 2012).

Policy is a crucial aspect in Urban Water Resources Management. Policy formulation does not only focus on the power of policy makers, in this case the government (Suwadi et al., 2024; Zhang et al., 2023). Given the shape of the river that passes through many areas, Urban Water Resources Management must be developed in an integrated manner. The concept of developing integrated Urban Water Resources Management is referred to as Integrated Urban Water Resources Management (IUWRM) to ensure security, resistance to pressure, and



preservation of urban water resources. Apart from that, ideally every development should support environmental sustainability, so to formulate a development policy, it must refer to the success of sustainable development goals (Griggs et al., 2014; Handrian & Andry, 2020). Based on these conditions, the development of IUWRM should ideally also be oriented towards the successful achievement of sustainable development goals (SDGs). IUWRM policies must also be able to accommodate external issues such as the Global Water Partnership, Green New Deal, Green Growth, Green Economy, and Sustainable development, so that in preparing programs/activities in IUWRM in the Semarang City it can also address these external issues. The implementation of the IUWRM policy is also not an easy thing because it involves many stakeholders, so that the implementation must be carried out through the stages of the public policy cycle in making WRM policies in the Semarang City. The implementation of an integrated policy must also apply an evidence-based policy model, so that the IUWRM development process in Semarang City must also apply an evidence-based model in policy making. for non-discretionary and discretionary dimensions.

IUWRM development in Semarang City must also be able to balance economic values, social values, and environmental values in accordance with the concept of sustainable development (Biermann & Kanie, 2017; Ristianti, 2016; Setianingtyas et al., 2019). Economically, the development of integrated policies must also consider the efficiency of economic values, even though the expected results are very large and have an impact on the future, if you do not consider economic efficiency, the sustainability of development policies will also stop at any time (Frochot, 2005; Smith et al., 2010; Wang et al., 2020). Reflecting on this, the development of IUWRM also needs to implement market efficiency balanced by calculating and allocating costs for restoring environmental damage, as well as conducting a cost-benefit analysis in the management and/or utilization of water resources. This is done to achieve efficiency in economic management in the development of IUWRM considering that IUWRM policies are not policies that are carried out once in a while. Reward and punishment is also an aspect that needs attention in implementing policies (Smith et al., 2010). Implementing pollutant payments as an instrument for pollution control and management of water resources. Apart from that, to support environmental sustainability economically, it is also necessary to build a wastewater treatment plant (WWTP) to prevent and control pollution of water resources. In terms of financing, considering that the funds owned by the Local government for the development of IUWRM are limited, it is necessary to have financing from non-government sources. Financial resources need to be developed through collaboration with industry and the private sector to jointly provide financial financing so that development can have optimal results (Head & Alford, 2015; Iza & Nurhaeni, 2021). Based on these conditions, in the development of IUWRM in Semarang City, it is necessary to explore the financial sources both from conventional (APBN/APBD) and non-conventional (outside APBN/APBD) financing sources to finance WWTP development.

The development process is influenced by macro factors including political, economic, and social, technological, legal, and environmental or abbreviated as PEST or PESTLE (Cox, 2021; De Groote, 2022; Gupta, 2013; Kolios & Read, 2013; Koumparoulis, 2013; Shahid et al., 2012; Shilei & Yong, 2009; Zahari & Romli, 2019; Zalengera et al., 2014). The research showed that the problems in integrated water resources management in the Semarang City are



heavily influenced by the policies of the city government itself. WRM policy is relative because it depends on the political interests of policy makers. The formulation of the policy itself is very dependent on the political and economic conditions encountered, so that in this study the authors focus on the analysis of the political and economic situation in reviewing the integrated water resources management in the Semarang City.

5. CONCLUSION

The results of this study showed that to support the development of Integrated Urban Water Resources Management (IUWRM) there must be a policy that ensure security, resistance to pressure, and preservation of urban water resources. IUWRM policies also need to be encouraged to be oriented towards sustainable development goals (SDGs). Internalization of external issues such as the Global Water Partnership, Green New Deal, Green Growth, Green Economy, and Sustainable development is the WRM policy agenda in Semarang City. In carrying out the stages of the public policy cycle in making WRM policies in the Semarang City. There is a need to apply an evidence-based model in the IUWRM policy-making process. In addition, it is also necessary to apply knowledge management in the process of making IUWRM policies for both non-discretionary and discretionary dimensions.

In the economic domain, this research showed that: in the development of IUWRM it is necessary to have a valuation of water resources that must balance the economic, social, as well as the environmental value. The need of the application of market efficiency is balanced by calculating and allocating the cost of restoring environmental damage, as well as carrying out cost-benefit analysis in the management and/or utilization of water resources. The need of implementing the polluter pays as an instrument for pollution control and management of water resources. Building a wastewater treatment plant (WWTP) to prevent and control the pollution of water resources also crucial. The need of exploring conventional (State/Local Revenue and Expenditure Budget) and non-conventional (outside of State/Local Revenue and Expenditure Budget) financing sources to finance WWTP development.

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Conflict of Interest

The authors declare there is no conflict of interest.

REFERENCES

- Acuto, M., & Leffel, B. (2021). Understanding the global ecosystem of city networks. *Urban Studies*, 58(9), 1758–1774. <https://doi.org/10.1177/0042098020929261>
- Adams, E. A., & Smiley, S. L. (2018). Urban-rural water access inequalities in Malawi: implications for monitoring the Sustainable Development Goals. *Natural Resources Forum*, 42(4), 217–226. <https://doi.org/10.1111/1477-8947.12150>
- Ali, F. (2018). Initiative urban water studies at depok, peri-urban city - toward the implementation of



- water sensitive city concept. *International Journal of GEOMATE*, 14(44).
<https://doi.org/10.21660/2018.44.3729>
- Althaus, C., Bridgman, P., & Davis, G. (2020). *The Australian Policy Handbook*. Routledge.
<https://doi.org/10.4324/9781003117940>
- Artioli, F., Acuto, M., & McArthur, J. (2017). The water-energy-food nexus: An integration agenda and implications for urban governance. *Political Geography*, 61, 215–223.
<https://doi.org/10.1016/j.polgeo.2017.08.009>
- Berbel, J., Gutiérrez-Martín, C., & Martín-Ortega, J. (2017). Water Economics and Policy. *Water*, 9(10), 801. <https://doi.org/10.3390/w9100801>
- Bichai, F., & Flamini, A. C. (2018). The Water-Sensitive City: Implications of an urban water management paradigm and its globalization. *WIREs Water*, 5(3).
<https://doi.org/10.1002/wat2.1276>
- Biermann, F., & Kanie, N. (2017). Conclusion: Key challenges for global governance through goals. In *Governing through Goals* (pp. 295–310). The MIT Press.
<https://doi.org/10.7551/mitpress/9780262035620.003.0013>
- Burn, S., Maheepala, S., & Sharma, A. (2012). Utilising integrated urban water management to assess the viability of decentralised water solutions. *Water Science and Technology*, 66(1), 113–121.
<https://doi.org/10.2166/wst.2012.071>
- Cox, J. (2021). The higher education environment driving academic library strategy: A political, economic, social and technological (PEST) analysis. *Journal of Academic Librarianship*, 47(1), 102219. <https://doi.org/10.1016/j.acalib.2020.102219>
- Creswell, J. W. (2014). *Research Design: Qualitatives, Quantitative, and Mixed Methods Approaches*. Sage Publication Inc.
- Cushman, F. (2020). Rationalization is rational. *Behavioral and Brain Sciences*, 43, e28.
<https://doi.org/10.1017/S0140525X19001730>
- Datta, A., Hendytio, M. K., Perkasa, V., & Basuki, T. (2016). *The Acquisition of Research Knowledge by National-Level Decision Makers in Indonesia*. Ksi-Indonesia.Org. <https://www.ksi-indonesia.org/id/pengetahuan/detail/287-working-paper-the-acquisition-of-research-knowledge-by-national-level-decision-makers-in-indonesia>
- De Groote, H. (2022). Economic analysis of pest problems in agriculture and food chains in Africa. *Current Opinion in Insect Science*, 54, 100969. <https://doi.org/10.1016/j.cois.2022.100969>
- Demir, T., & Reddick, C. G. (2012). Understanding shared roles in policy and administration: An empirical study of council-manager relations. *Public Administration Review*, 72(4), 526–535.
<https://doi.org/10.1111/j.1540-6210.2011.02551.x>
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2009). *Handbook of Qualitatif Reseserch* (Dariyatno, Trans.). Penerbit Pustaka Pelajar.
- Feiock, R. C., Jeong, M., & Kim, J. (2003). Credible commitment and council-manager government: Implications for policy instrument choices. *Public Administration Review*, 63(5), 616–625.
<https://doi.org/10.1111/1540-6210.00324>
- Frochot, I. (2005). A benefit segmentation of tourists in rural areas: A Scottish perspective. *Tourism Management*, 26(3), 335–346. <https://doi.org/10.1016/j.tourman.2003.11.016>
- Global Water Partnership. (2013). *Policy Brief IUWM - Integrated Urban Water Management (IUWM): Toward Diversification and Sustainability*.
<https://www.gwp.org/globalassets/global/toolbox/publications/policy-briefs/13-integrated-urban-water-management-iuwm.-toward-diversification-and-sustainability.pdf>
- Griggs, D., Stafford Smith, M., Rockström, J., Öhman, M. C., Gaffney, O., Glaser, G., Kanie, N., Noble, I., Steffen, W., & Shyamsundar, P. (2014). An integrated framework for sustainable



- development goals. *Ecology and Society*, 19(4), art49. <https://doi.org/10.5751/ES-07082-190449>
- Guppy, L., & Anderson, K. (2017). *Global water crisis: The facts*. Institute for Water, Environment and Health, UNU-INWEH.
- Gupta, A. (2013). Environment & PEST analysis: an approach to external business environment. *International Journal of Modern Social Sciences*, 2(1), 34–43. <https://modernscientificpress.com/Journals/ViewArticle.aspx?YTDXIp8pwb35qABc+2BV/1WJUQnMuLGNSj0NcUX/H4nrYH2pOUyBFV904kXBzuJV>
- Handrian, E., & Andry, H. (2020). Sustainable development goals: Tinjauan percepatan pencapaian di Provinsi Riau. *Publika: Jurnal Ilmu Administrasi Publik*, 6(1), 77–87. [https://doi.org/10.25299/jiap.2020.vol6\(1\).4995](https://doi.org/10.25299/jiap.2020.vol6(1).4995)
- Head, B. W., & Alford, J. (2015). Wicked problems: Implications for public policy and management. *Administration & Society*, 47(6), 711–739. <https://doi.org/10.1177/0095399713481601>
- Henricks, T. S. (2016). Reason and rationalization: A theory of modern play. *American Journal of Play*, 8(3), 287–324.
- Herdiansyah, A. R., Zahra, R. A., Masjoyo, Y. M., Muhammad, A. F., Saputra, M. R., Firdauzi, L. B., Hafizha, K. P., & Nurjani, E. (2022). Analysis of meteorological water availability and water demand in Semarang Regency. *IOP Conference Series: Earth and Environmental Science*, 1039(1), 012011. <https://doi.org/10.1088/1755-1315/1039/1/012011>
- Hurlimann, A., & Wilson, E. (2018). Sustainable urban water management under a changing climate: The role of spatial planning. *Water*, 10(5), 546. <https://doi.org/10.3390/w10050546>
- Iza, S. M., & Nurhaeni, I. D. A. (2021). Proses Kolaborasi dalam Penanganan Kemiskinan: Studi Kasus pada Program Gandeng Gendong di Yogyakarta. *Wacana Publik*, 1(2), 365–379. <https://doi.org/10.20961/wp.v1i2.54600>
- Janssen, M. A., & Anderies, J. M. (2007). Robustness Trade-offs in Social-Ecological Systems. *International Journal of the Commons*, 1(1), 43–65.
- Jiang, Y., Chen, Y., Younos, T., Huang, H., & He, J. (2010). Urban water resources quota management: The core strategy for water demand management in China. *AMBIO*, 39(7), 467–475. <https://doi.org/10.1007/s13280-010-0080-x>
- Jordan, A. J., & Turnpenny, J. R. (Eds.). (2015). *The Tools of Policy Formulation*. Edward Elgar Publishing. <https://doi.org/10.4337/9781783477043>
- Kolios, A., & Read, G. (2013). A political, economic, social, technology, legal and environmental (PESTLE) approach for risk identification of the Tidal Industry in the United Kingdom. *Energies*, 6(10), 5023–5045. <https://doi.org/10.3390/en6105023>
- Koumparoulis, D. N. (2013). PEST analysis: The case of e-shop. *International Journal of Economy, Management and Social Sciences*, 2(2), 31–36.
- Laminu, M.-D., Ahadzie, D. K., & Okrah, M. (2021). Domestic end-users' participation in managing urban water supply in emerging cities: Evidence from Wa, Ghana. *Ghana Journal of Development Studies*, 18(1), 1–24. <https://doi.org/10.4314/gjds.v18i1.1>
- Li, H., Ding, L., Ren, M., Li, C., & Wang, H. (2017). Sponge city construction in China: A survey of the challenges and opportunities. *Water*, 9(9), 594. <https://doi.org/10.3390/w9090594>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. SAGE Publication Inc.
- Lindhout, P. E., & Van den Broek, B. (2014). The polluter pays principle: Guidelines for cost recovery and burden sharing in the case law of the European Court of Justice. *Utrecht Law Review*, 10(2), 46. <https://doi.org/10.18352/ulr.268>
- Luppi, B., Parisi, F., & Rajagopalan, S. (2012). The rise and fall of the polluter-pays principle in developing countries. *International Review of Law and Economics*, 32(1), 135–144.



<https://doi.org/10.1016/j.irl.2011.10.002>

- Malik, J., & Kristiana, H. (2021). Sustainability strategy for small-scale fisheries management: Case study in Semarang city coastal, Indonesia. *Journal of Tropical Fisheries Management*, 5(2), 83–90. <https://doi.org/10.29244/jppt.v5i2.34761>
- Marfai, M. A., Almohammad, H., Dey, S., Susanto, B., & King, L. (2008). Coastal dynamic and shoreline mapping: Multi-sources spatial data analysis in Semarang Indonesia. *Environmental Monitoring and Assessment*, 142(1–3), 297–308. <https://doi.org/10.1007/s10661-007-9929-2>
- Martinez, R. (2023). Urban water governance as policy boosterism: Seoul’s legitimation at the local and global scale. *Urban Studies*, 60(2), 325–342. <https://doi.org/10.1177/00420980221097500>
- McConnell, A., & Hart, P. (2019). Inaction and public policy: understanding why policymakers ‘do nothing’. *Policy Sciences*, 52(4), 645–661. <https://doi.org/10.1007/s11077-019-09362-2>
- Mulyanti, D., Perwira, I., Muttaqin, Z., & Sugiharti, D. K. (2024). The legal policy role of groundwater tax on water resources conservation in Indonesia. *Journal of Law and Sustainable Development*, 12(2), e1673. <https://doi.org/10.55908/sdgs.v12i2.1673>
- OECD. (2012). *OECD Environmental Outlook to 2050: The Consequences of Inaction*. OECD Publishing. <https://doi.org/10.1787/9789264122246-en>
- Pataki, D. E., Boone, C. G., Hogue, T. S., Jenerette, G. D., McFadden, J. P., & Pincetl, S. (2011). Socio-ecohydrology and the urban water challenge. *Ecohydrology*, 4(2), 341–347. <https://doi.org/10.1002/eco.209>
- Peña-Guzmán, C., Melgarejo, J., Lopez-Ortiz, I., & Mesa, D. (2017). Simulation of infrastructure options for urban water management in two urban catchments in Bogotá, Colombia. *Water*, 9(11), 858. <https://doi.org/10.3390/w9110858>
- Pertiwi, A., Kiky, S. M. P., Wiwik, B., Ratna, P., Budi, P. S., & Arya, R. (2018). Preliminary study on plastic waste handling in Semarang City - Indonesia: Estimated generation and existing management. *E3S Web of Conferences*, 73, 07008. <https://doi.org/10.1051/e3sconf/20187307008>
- Renouf, M. A., & Kenway, S. J. (2017). Evaluation approaches for advancing urban water goals. *Journal of Industrial Ecology*, 21(4), 995–1009. <https://doi.org/10.1111/jiec.12456>
- Risianti, N. S. (2016). S.M.A.R.T. Eco-village for hazardous coastal area in Bedono Village, Demak Regency. *Procedia - Social and Behavioral Sciences*, 227(November 2015), 593–600. <https://doi.org/10.1016/j.sbspro.2016.06.120>
- Rouillard, J., Vidaurre, R., Brouwer, S., Damman, S., Ponce, A., Gerner, N., Riegels, N., & Termes, M. (2016). Governance regime factors conducive to innovation uptake in urban water management: Experiences from Europe. *Water*, 8(10), 477. <https://doi.org/10.3390/w8100477>
- Setianingtias, R., Baiquni, M., & Kurniawan, A. (2019). Pemodelan indikator tujuan pembangunan berkelanjutan di Indonesia. *Jurnal Ekonomi Pembangunan*, 27(2), 61–74. <https://doi.org/10.14203/JEP.27.2.2019.61-74>
- Shahid, H., Shafique, O., Shokat, A., Bodla, O. H., & Arshad, S. (2012). PEST analysis of engro fertilizers, Pakistan. *Journal of Biology, Agriculture and Healthcare*, 2(10), 1–5. <http://www.iiste.org/Journals/index.php/JBAH/article/view/3269>
- Sharp, E. B., Daley, D. M., & Lynch, M. S. (2011). Understanding local adoption and implementation of climate change mitigation policy. *Urban Affairs Review*, 47(3), 433–457. <https://doi.org/10.1177/1078087410392348>
- Shilei, L., & Yong, W. (2009). Target-oriented obstacle analysis by PESTEL modeling of energy efficiency retrofit for existing residential buildings in China’s northern heating region. *Energy Policy*, 37(6), 2098–2101. <https://doi.org/10.1016/j.enpol.2008.11.039>
- Smith, L. C., Smith, M., & Ashcroft, P. (2010). Analysis of environmental and economic damages



- from British Petroleum's Deepwater Horizon Oil Spill. *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.1653078>
- Susanti, M., & Setiadjid, S. (2020). The policy of community-based disaster management in disaster-resistant village at Semarang City. *Proceedings of the Proceedings of the 2nd International Conference on Social Sciences, ICSS 2019, 5-6 November 2019, Jakarta, Indonesia*.
<https://doi.org/10.4108/eai.5-11-2019.2292505>
- Susanto, N. (2018). Stakeholder interactions model of groundwater management in Semarang City/Indonesia. *International Journal of GEOMATE*, 15(47).
<https://doi.org/10.21660/2018.47.73578>
- Suwadi, P., Sofyan, A. C., & Ramdhani, R. S. (2024). Legal comparison between national collective management institutions in Indonesia and United States. *Revista de Gestão Social e Ambiental*, 18(4), e04572. <https://doi.org/10.24857/rgsa.v18n4-015>
- Tallis, H., & Polasky, S. (2009). Mapping and valuing ecosystem services as an approach for conservation and natural-resource management. *Annals of the New York Academy of Sciences*, 1162(1), 265–283. <https://doi.org/10.1111/j.1749-6632.2009.04152.x>
- Tortajada, C., & Joshi, Y. K. (2013). Water resources management and governance as part of an overall framework for growth and development. *International Journal of Water Governance*, 1(3), 285–306. <https://doi.org/10.7564/13-IJWG16>
- United Nations - UN Water. (2022). *UN World Water Development Report 2022 - Groundwater: Making the invisible visible*. <https://www.unwater.org/publications/un-world-water-development-report-2022>
- van de Meene, S. J., Brown, R. R., & Farrelly, M. A. (2011). Towards understanding governance for sustainable urban water management. *Global Environmental Change*, 21(3), 1117–1127.
<https://doi.org/10.1016/j.gloenvcha.2011.04.003>
- Vo, P. Le. (2007). Urbanization and water management in Ho Chi Minh City, Vietnam-issues, challenges and perspectives. *GeoJournal*, 70(1), 75–89. <https://doi.org/10.1007/s10708-008-9115-2>
- Wang, Y., Lu, Y., He, G., Wang, C., Yuan, J., & Cao, X. (2020). Spatial variability of sustainable development goals in China: A provincial level evaluation. *Environmental Development*, 35, 100483. <https://doi.org/10.1016/j.envdev.2019.100483>
- Worku, H. (2017). Rethinking urban water management in Addis Ababa in the face of climate change: An urgent need to transform from traditional to sustainable system. *Environmental Quality Management*, 27(1), 103–119. <https://doi.org/10.1002/tqem.21512>
- Yasin, H. Q., Breadsell, J., & Tahir, M. N. (2021). Climate-water governance: a systematic analysis of the water sector resilience and adaptation to combat climate change in Pakistan. *Water Policy*, 23(1), 1–35. <https://doi.org/10.2166/wp.2020.113>
- Yin, R. K. (2003). *Case study research: Design and methods* (3rd Ed.). SAGE Publications Inc.
- Zahari, A. R., & Romli, F. I. (2019). Analysis of suborbital flight operation using PESTLE. *Journal of Atmospheric and Solar-Terrestrial Physics*, 192, 104901.
<https://doi.org/10.1016/j.jastp.2018.08.006>
- Zalengera, C., Blanchard, R. E., Eames, P. C., Juma, A. M., Chitawo, M. L., & Gondwe, K. T. (2014). Overview of the Malawi energy situation and a PESTLE analysis for sustainable development of renewable energy. *Renewable and Sustainable Energy Reviews*, 38, 335–347.
<https://doi.org/10.1016/j.rser.2014.05.050>
- Zhang, L., Song, Y., Zhang, M., & Wu, W. (2023). Evolutionary game analysis of strategic interaction of environmental regulation among local governments. *Environmental Development*, 45, 100793. <https://doi.org/10.1016/j.envdev.2022.100793>



Zhou, J., Li, Y., Lei, Q., Feng, Q., Luo, J., & Lindsey, S. (2022). Asynchrony between urban expansion and water environmental protection reshapes the spatial patterns of nitrogen and phosphorus concentrations and N:P stoichiometry in inland small water bodies in Changsha, China. *Frontiers in Environmental Science*, *10*. <https://doi.org/10.3389/fenvs.2022.1018408>

Zurek, M. B., & Henrichs, T. (2007). Linking scenarios across geographical scales in international environmental assessments. *Technological Forecasting and Social Change*, *74*(8), 1282–1295. <https://doi.org/10.1016/j.techfore.2006.11.005>



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POLITICAL AND ECONOMIC ASPECTS OF INTEGRATED URBAN WATER RESOURCES MANAGEMENT (IUWRM) IN SEMARANG CITY INDONESIA

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ABSTRACT

Purpose: This study aims to find out the aspects of politics and economics of integrated urban water resources management in Semarang City and their impact on the practices of qualities of water resources management.

Methods: This research used the qualitative method and field research approach. The focus data are the regulation and the implementation of water resources management in Semarang City Indonesia. The data was drawn from documents and interview with some resource persons.

Results and Conclusion: The study found that the city government, which should carry out the function of conserving water resources, actually polluted the Kaligarang River through one of its institutions: Local Water Drinking Company, “Tirta Moedal”. This company disposes of waste sludge containing aluminum metal directly into the river without any treatment processes that impacted in pollution in the river and causing siltation of the river downstream.

Research implications: the enactment of the comprehensive and integrated water resources management will has a positive impact on the practices of water resources management in Semarang specifically and Indonesia and even world countries generally. The implementation of comprehensive and integrated water resources management will also support the achievement of the sustainable development Goal.

Originality/value: Semarang City government must be supported to arrange a comprehensive and integrated water resources management (WRM) policy. There must be a clear legal law for the water resources management.

Keywords: politics, economics, water resources management, urban area, Semarang city.

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ASPECTOS POLÍTICOS E ECONÔMICOS DA GESTÃO INTEGRADA DOS RECURSOS HÍDRICOS URBANOS (IUWRM) EM SEMARANG CITY INDONÉSIA

RESUMO

Propósito: Este estudo visa descobrir os aspectos políticos e econômicos da gestão integrada dos recursos hídricos urbanos na cidade de Semarang e seu impacto nas práticas de qualidade da gestão dos recursos hídricos.

Métodos: Esta pesquisa usou o método qualitativo e abordagem de pesquisa de campo. Os dados de foco são a regulamentação e a implementação da gestão de recursos hídricos na cidade de Semarang, na Indonésia. Os dados foram extraídos de documentos e entrevistas com algumas pessoas de recursos.

Resultados e Conclusão: O estudo descobriu que o governo da cidade, que deveria desempenhar a função de conservação dos recursos hídricos, na verdade poluiu o rio Kaligarang através de uma de suas instituições: Empresa Local de Consumo de Água, "Tirta Moedal". A empresa despeja diretamente no rio resíduos de lama contendo alumínio metálico sem qualquer tratamento que tenha impacto na poluição do rio e provoque assoreamento do rio rio rio abaixo.

Implicações da investigação: a promulgação da gestão abrangente e integrada dos recursos hídricos terá um impacto positivo nas práticas de gestão dos recursos hídricos em Semarang especificamente e na Indonésia e mesmo em países em geral. A implementação de uma gestão global e integrada dos recursos hídricos apoiará igualmente a realização do objetivo de desenvolvimento sustentável.

Originalidade/valor: o governo da cidade de Semarang deve ser apoiado para organizar uma política abrangente e integrada de gestão de recursos hídricos (WRM). Tem de haver uma lei clara para a gestão dos recursos hídricos.

Palavras-chave: política, economia, gestão de recursos hídricos, área urbana, cidade de Semarang.

ASPECTOS POLÍTICOS Y ECONÓMICOS DE LA GESTIÓN INTEGRADA DE LOS RECURSOS HÍDRICOS URBANOS (IUWRM) EN LA CIUDAD DE SEMARANG, INDONESIA

RESUMEN

Propósito: Este estudio tiene como objetivo averiguar los aspectos de la política y la economía de la gestión integrada de los recursos hídricos urbanos en la ciudad de Semarang y su impacto en las prácticas de las cualidades de la gestión de los recursos hídricos.

Métodos: Esta investigación utilizó el método cualitativo y el enfoque de investigación de campo. Los datos de enfoque son la regulación y la implementación de la gestión de los recursos hídricos en la ciudad de Semarang, Indonesia. Los datos se obtuvieron de documentos y entrevistas con algunos especialistas.

Resultados y Conclusión: El estudio encontró que el gobierno de la ciudad, que debería llevar a cabo la función de conservar los recursos hídricos, en realidad contaminó el río Kaligarang a través de una de sus instituciones: la Compañía Local de Agua Potable, "Tirta Moedal". Esta empresa elimina los lodos residuales que contienen metal de aluminio directamente en el río sin ningún proceso de tratamiento que haya impactado en la contaminación del río y que cause sedimentación del río río río abajo.

Repercusiones en la investigación: la promulgación de una gestión integral e integrada de los recursos hídricos tendrá un impacto positivo en las prácticas de gestión de los recursos hídricos en Semarang, específicamente en Indonesia, e incluso en los países del mundo en general. La



aplicación de una gestión integral e integrada de los recursos hídricos también contribuirá al logro del Objetivo de Desarrollo Sostenible.

Originalidad/valor: El gobierno de la ciudad de Semarang debe recibir apoyo para organizar una política integral e integrada de gestión de recursos hídricos (WRM). Debe existir una ley legal clara para la gestión de los recursos hídricos.

Palabras clave: política, economía, gestión de recursos hídricos, área urbana, ciudad de Semarang.

1 INTRODUCTION

The potential for water availability from time to time decreases while the demand is increasing due to the population growth and urbanization. Urbanization causes urban areas to be inhabited by around 64% of the 9.7 billion world population. Water is a vital resource for life and livelihood as well as a key factor for the achievement of several sustainable development goals (SDGs). One of them is SDG No. 6, namely "ensuring the availability and sustainability of water and sanitation for all" (Global Water Partnership, 2013; Guppy & Anderson, 2017). Water demand will continue to increase and lead to an escalation of the extraction of water resources between 18 - 50% in 2025 when compared to the conditions in 2012 (Environmental Assessment Agency, 2012; UNESCO World Water Assessment Programme, 2022). On the other hand, increased development and industrial activities have led to a decrease in water quantity and quality, as well as damage to ecosystems. It is estimated that globally there will be a reduction in water supply by up to 40% in 2030. Urban areas face multi-stress problems due to: (i) decreasing water quantity and quality; (ii) increased demand due to population growth, urbanization, and development activities; (iii) climate change; and (iv) overuse.

All regions in the world are exposed to climate change, but developing countries will experience the greatest impact, where urban infrastructure, political, social, and cultural awareness have not been oriented towards the sustainability of water resources (Bichai & Flamini, 2018; Guppy & Anderson, 2017). Water is not only seen as a commodity-based on its economic and social value but is treated as a scarce resource that must be protected. Given that water is a resource with limited quantity, quality, and access, and 60% of surface water comes from river basins, river conservation is a necessity to ensure the sustainability of water supply in urban areas (Guppy & Anderson, 2017).

In the Semarang City - Indonesia, the reality that happened was unusual and unique. The Semarang city government, which is supposed to protect the sustainability of the river, has become a polluter through one of its institutions, the Local Company for Drinking Water "Tirta Moedal". This local company for drinking water discharges its waste sludge into the Kaligarang River without being treated first. The river becomes polluted with aluminium (Al) which is one of the dangerous and poisonous material, and experiences silting due to sedimentation. Semarang city government policy allowed or "do nothing" to the practice that impacted to water pollution done by the company. The other data shows that Semarang City has no comprehensive and integrated water resources management (WRM) policy. Policies related to water resources are sectoral, partial, and partisan. The absence of a WRM policy in Semarang City is related to another fact, that there was legal uncertainty in the WRM due to the annulment of Law No. 7/2004 concerning water resources) by the Constitutional Court in



2013. The purpose of this study was to analyze the political and economic conditions in integrated urban water resources management (IUWRM) in Semarang City. These questions are based on the assumptions that in formulating a comprehensive and integrated policy there are political and economic considerations that determine the process of enactment of the policy.

2 LITERATUR REVIEW

2.1 INTEGRATED URBAN WATER RESOURCES MANAGEMENT

Integrated Urban Water Resources Management (IUWRM) has gained significant attention in recent years due to the growing challenges posed by urbanization and climate change. The concept of IUWRM involves a holistic and sustainable approach to managing water resources in urban areas, encompassing various aspects such as water supply, demand management, wastewater treatment, and stormwater management (Burn et al., 2012; Li et al., 2017; Pataki et al., 2011; van de Meene et al., 2011; Worku, 2017). This approach is particularly crucial in the face of rapid urbanization, which has led to increased water demand and environmental stress (Adams & Smiley, 2018; Laminu et al., 2021; Vo, 2007; Zhou et al., 2022). IUWRM emphasizes the integration of natural and engineered water systems, aiming to enhance resilience, reduce vulnerabilities, and address environmental injustices while maintaining critical ecological services (Li et al., 2017; Pataki et al., 2011).

Furthermore, IUWRM involves the incorporation of governance and policy frameworks that promote sustainability and resilience in urban water management (Rouillard et al., 2016). It also emphasizes the need for innovative and decentralized solutions to address the complex challenges associated with urban water management (Burn et al., 2012; Peña-Guzmán et al., 2017). The implementation of IUWRM requires a shift from traditional, centralized water management approaches to more adaptive, integrated, and participatory strategies (Burn et al., 2012; Worku, 2017). In addition, IUWRM encompasses various strategies such as water-sensitive urban design, green infrastructure, and sustainable urban drainage systems, which play a crucial role in mitigating the impacts of urbanization on water resources (Ali, 2018; Hurlimann & Wilson, 2018). These strategies promote the efficient use of water, the protection of water sources, and the sustainable exploitation, distribution, and consumption of water (Jiang et al., 2010). Moreover, IUWRM emphasizes the importance of community engagement and participation in urban water management, aiming to improve transparency, communication, and operational efficiency (Renouf & Kenway, 2017).

In conclusion, the concept of IUWRM offers a comprehensive and integrated approach to address the complex challenges associated with urban water management. By incorporating



principles of sustainability, resilience, and community participation, IUWRM provides a framework for managing urban water resources in a holistic and adaptive manner, thereby contributing to the long-term sustainability of urban water systems.

2.2 NATURAL RESOURCE MANAGEMENT IN SEMARANG

Natural resource management in Semarang is a complex and multifaceted issue that requires a comprehensive and sustainable approach. The city faces various challenges related to the management of its natural resources, including water availability, plastic waste handling, coastal dynamics, groundwater conservation, and disaster management. These challenges necessitate the development of sustainable management strategies that consider the interactions between stakeholders, the conservation of ecosystem services, and the sustainable utilization of resources. The analysis of meteorological water availability and water demand in Semarang Regency highlights the need for resolving the problem of inequality in water demand and availability through proper water resource management (Herdiansyah et al., 2022). Additionally, the preliminary study on plastic waste handling in Semarang City emphasizes the necessity of environmentally sound management of plastic waste due to increasing generation and associated environmental pollution (Pertiwi et al., 2018). Furthermore, the study on sustainability strategy for small-scale fisheries management underscores the multifaceted challenges in achieving sustainable fisheries management in Semarang City (Malik & Kristiana, 2021). These references collectively emphasize the importance of sustainable management practices to address specific resource-related challenges in Semarang.

Moreover, the stakeholder interactions model of groundwater management in Semarang City emphasizes the significance of developing a model for effective stakeholder engagement in groundwater management (Susanto, 2018). Additionally, the mapping and valuing of ecosystem services approach highlights the need to consider multiple objectives and unintended consequences in conservation and natural resource management (Tallis & Polasky, 2009). These references underscore the importance of stakeholder engagement and holistic approaches in managing natural resources in Semarang. Furthermore, the coastal dynamic and shoreline mapping study emphasizes the impact of both natural and man-made factors on the shoreline dynamic in Semarang coastal area (Marfai et al., 2008). This highlights the need for integrated management approaches that consider both natural and anthropogenic influences on coastal dynamics. Additionally, the policy of community-based disaster management underscores the importance of disaster management regulations and their implications for



environmental damage and human livelihoods (Susanti & Setiajid, 2020). In conclusion, the management of natural resources in Semarang requires a holistic and sustainable approach that considers the interactions between stakeholders, the conservation of ecosystem services, and the sustainable utilization of resources. Addressing the challenges related to water availability, plastic waste handling, coastal dynamics, groundwater conservation, and disaster management necessitates the development and implementation of comprehensive and integrated management strategies.



2.3 POLITICAL AND ECONOMIC ASPECTS OF CITY GOVERNMENT POLICY

The political and economic aspects of city government policy in water management are crucial for addressing the challenges posed by climate change and ensuring sustainable development. The city manager form of government has been noted to insulate governance from political pressures, which can influence the adoption and implementation of climate change mitigation policies (Sharp et al., 2011). Water governance involves the integration of political, administrative, social, and economic aspects to effectively manage water challenges (Yasin et al., 2021). Additionally, the international promotion of a city's water management policy can serve as a case of policy boosterism, demonstrating a social practice of legitimation enacted by the city government at both local and global scales (Martinez, 2023).

Comprehensive vision for the management of water resources is essential for overall development, economic growth, and national security, highlighting the economic significance of water resources management within a city (Tortajada, & Joshi, 2013). The influence of political and economic forces on communities' reliance on specific policy instruments varies based on the form of government, such as mayor-council and council-manager cities (Feiock et al., 2003). The political dimension of multi-scalar water, energy, and food systems introduces complexity to nexus management, emphasizing the intricate interplay of political and economic factors in water management (Artioli et al., 2017). The roles of city managers in policy-making are integral, and their involvement is influenced by the changing landscape of local governments and the complex nature of policy issues, reflecting the intersection of political and administrative aspects of government (Demir & Reddick, 2012). City governments can signal leadership in policy entrepreneurship through their memberships in city networks, underscoring the political and economic dimensions of city policies (Acuto & Leffel, 2021). In conclusion, the synthesis of these references underscores the intricate interplay of political and economic aspects in city government policy related to water management. The integration of these aspects is essential for addressing climate change, ensuring sustainable development, and effectively managing water challenges within cities.



3 MATERIALS AND METHODS

This study focuses on the analysis of political and economic conditions on Integrated urban water resources management (IUWRM) in Semarang City. Semarang City is one of the big cities in Indonesia and the capital of Central Java Province. The location of the Semarang City can be seen in Figure 1. The selection of the Semarang City based on the problem of management of water resources in the city. Environmental disaster such as flooding that occur in the Semarang City almost every year and pollution of the Kaligarang River showed the problems. Kaligarang River was polluted because the city government did not respond appropriately toward the actions of the Local Company for Drinking Water “*Tirta-Moedal*” which dumps its sewage sludge into the Kaligarang river without without any treatment. Problems related to water resources in the Semarang City will be continued once the management of water resources is not implemented properly. The important role of city government policies is one of the fundamental factors to be improved in order to realize Integrated urban water resources management (IUWRM) in Semarang City.

Figure 1
Map of Location Semarang City in Indonesia



This study is qualitative research that investigates the phenomenon of the formulation and implementation of urban water resources management policies in Indonesia, particularly in the Semarang City. Water is a vital resource in the water-food-energy chain, where the interconnection and interaction between humans and water resources forms a socio-ecological system. Humans as actors determine the forms and patterns of their relationships with water resources that are subjective, relative, and unique, but can be constructed into objectives and social realities. In this regard, the process of investigation in this study used the constructivism paradigm and case study strategy (Creswell, 2014; Denzin & Lincoln, 2009; Lincoln & Guba, 1985; Yin, 2003).

Data from this research were taken from primary data and secondary data. Primary data includes data obtained from various policies regarding water resources management that have been established by the Semarang City government as well as interview. Interviews were conducted using a list of questions to five respondents and free questions to five informants who were representatives of institutions related to water resources management in the city of Semarang. The results of the interview are presented in table form below. Secondary data



consisted of the documents related to the water resources management. All the data was analyzed applying the parameter of integrated water resources management

4 RESULT AND DISCUSSION

4.1 THE POLITICAL ASPECTS OF POLICY ON WATER RESOURCES MANAGEMENT

The results of the study found that in the political domain there are 3 focus conditions. The first WRM policy is partial, sectoral, partisan, short or medium term, and is not oriented towards SDGs, giving rise to 3D phenomena (disorientation, disconnection, and disharmony) with central and provincial government policies. Second, policy formulation does not follow the policy cycle because it is based on the political interests of policy makers and local content. Third, Urban Water Resources Policy has not been integrated with collaborative institutions across sectors and administrative areas.

In the economic domain, the first 3 points are the application of the Dublin principle partially and incorrectly, where water resources are only seen as a market commodity. Second, the utilization of economic and social values of natural resources and watersheds is based on the principle of "market economy" which has an impact on reducing the quality and carrying capacity of the environment. Third, the opportunity to explore new sources of funding through environmental taxes with the principles of "user pays principles" and "polluters pay principles".



Table 1
Politics and Social Conditions in IUWRM Semarang City

No.	DOMAIN	Resume of Interviews Transcript
1	Politics	<ul style="list-style-type: none"> - The WRM policy is partial, sectoral, partisan, short or medium term, and is not oriented towards SDGs, giving rise to a 3D phenomenon (disorientation, disconnection, and disharmony) with central and provincial government policies. - Policy formulation does not follow the policy cycle because it is based on the political interests of policymakers and local content. - Urban PSDA policies have not been integrated with collaborative agencies across sectors and administrative areas.
2	Economics	<ul style="list-style-type: none"> - Partial and improper application of the Dublin Principles, whereby water resources are only seen as a market commodity. - The exploitation of the economic and social values of natural resources and watersheds is based on the principle of "market economy" which has an impact on reducing the quality and carrying capacity of the environment. - There is an opportunity to explore new sources of funding through environmental taxes with the principles of "user pays principles" and "polluter pays principles".

Source: Primary Data

Political factors play a dominant role in the process of formulating and implementing WRM policies in Indonesia, including in the Semarang City. Most of the informants stated that the socio-political order in Indonesia after the government of the authoritarian regime of the New Order was still looking for an established direction and form in line, and was still in a transitional stage in line with the processes of democratization and decentralization which are still ongoing today. The phenomenon that appears is frequent changes in policies, regulations, and planning based on short term situational changes. If there is no policy change in the long term, it does not mean that the policy has been good or established, but rather because of uncertainty or there is no basis for updating it so that it continues to be used as usual (business as usual).

One empirical pieces of evidence is that there is no integrated WRM policy in the Semarang City even though there is a technical implementing agency, namely the PSDA & ESDM Agency. This is due to two factors: (i) there is no legal basis for making policies since Water Resource Act No. 7/2004 and all of its derivative regulations Government regulation No. 42/28 concerning PSDA, and Presidential Regulation No. 33/2011 was cancelled by the Constitutional Court in 2013; (ii) the substance of the WRM policy has been fragmented into the duties and functions of the relevant agencies for example, irrigation, drainage and flood control by the Public Works Agency, pollution control by the Environment Agency (DLH), drinking water supply by Local Company for Drinking Water “*Tirta-Moedal*”, and other functions by the Department of PSDA & ESDM.



There are at least two substantial changes to legal regulations relating to water resources management by the state, as shown in the Table 2.

Table 2

The Changes of Legal Norms in Integrated Water Resource Management (IWRM)

Laws	Context	Change
UU No. 7/2004	Water resource	Canceled
PP No. 42/2008	Water Resource Management (WRM)	Canceled
Presidential Decree (Perpres) No. 33/2011	National WRM Policy	Canceled
UUSDA No. 17/2019	Water resource	New Replacement of UU No. 7/2004
UU No. 32/2004	Local Governance	New Replacement of UU No. 22/1999
UU No. 23/2014	Local Governance	New Replacement of UU No. 32/2004
PEPU No. 2/2014	Local Governance	The first change of UU No. 23/2014
UU No. 2/2015	Local Governance	The second change UU No. 23/2014

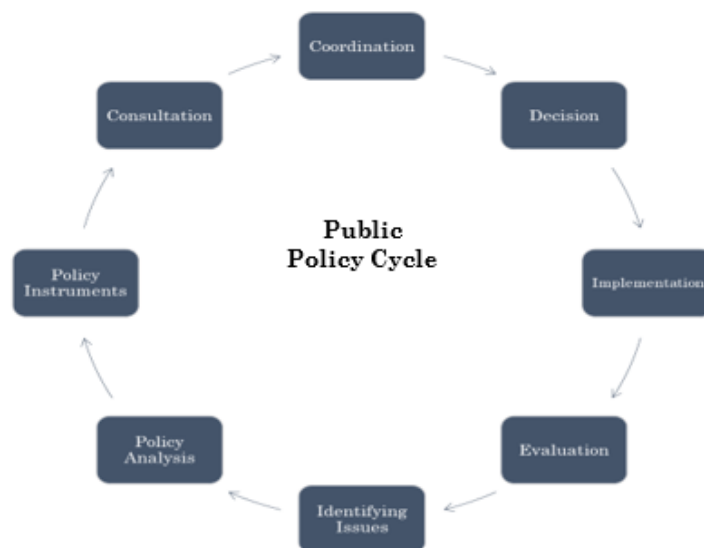
Source: Primary data

Frequent changes in legal norms create political, economic, and social uncertainty so that the formulation of public policies is more influenced by short-term issues or situational factors such as floods, natural disasters, economic crises, and so on which are uncertain. A new water resources law has been made, namely Act No. 17/2019 concerning water resources, but the implementing regulations in the form of Government Regulations have not been made yet so that they cannot be implemented effectively. The formulation and implementation of water resources management policies are still subject to uncertainty.

This resulted in the response of policymakers focused on efforts to anticipate uncertainty. It is rare for a public policy to be properly designed following the stages in the policy cycle as described by Althaus et al. (2020):



Figure 2
Public Policy Cycle



Source: Althaus et al. (2020)

The results of the analysis of the informants' opinions show that the situational factors which led to the Semarang mayor's policy of allowing the disposal of waste sludge to the Kaligarang watershed include: (i) the Kaligarang watershed has not shown signs of degradation and a significant reduction in carrying capacity; (ii) The investment to build a Wastewater Treatment Plant (WWTP) is expensive, and the budget is not yet available; (iii) The priority is to meet the needs of clean water for the community to 100%; and (iv) WWTP construction can be carried out by a substitute mayor in the future. The opinion of the informants reflects a reality that the PSDA policy making in the Semarang City is not based on empirical facts in the field. The fact that the Kaligarang watershed has been polluted with Aluminium (Al) metal has been side-lined, to implement the priority of policies to fulfil the basic needs of the community and contribute to Local income.

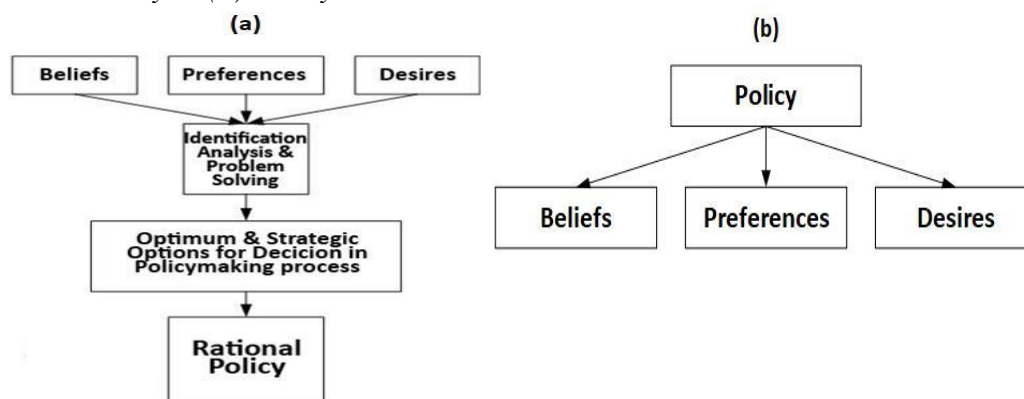
The neglect phenomenon of the Kaligarang watershed pollution and the absence of an integrated WRM policy in the Semarang City is a form of "inaction", is a condition in which policymakers do nothing about ongoing public issues, in this case, waste disposal of Local Company for Drinking Water "Tirta-Moedal" to the Kaligarang watershed. Referring to McConnell & 't Hart (2019), the practice of neglecting pollution in the Kaligarang watershed is referred to as "government inaction". The Semarang city government is unmoved "to do nothing", to avoid uncertainty by continuing to practice business as usual (McConnell & 't Hart, 2019). Judging from the provisions of Article 24 paragraph (3) Act No. 17/2019

concerning water resources, the Semarang municipal government has the obligation and authority to "control pollution" of water resources. This obligation is not carried out because the polluter is the institution itself, namely the Local Company for Drinking Water "Tirta-Moedal". Furthermore, the practice of omission can be rationalized on the grounds of (i) development priorities to meet community needs for clean water or drinking water; and (ii) there has been no sign of degradation and a significant reduction in carrying capacity.

Rationalization means that policymaking is not based on the rational dimensions of decision making, namely empirical facts and problem analysis, but is based on the irrational dimension, namely the instincts, desires, or beliefs of policymakers about "what is considered and felt right". A belief that is formed through repeated practice over a long period so that it is believed to be a rational truth. The difference between rational policy and policy rationalization is described by Cushman (2020) like a Figure 3.

Figure 3

The Difference between Rational Policy and Policy Rationalization
(a) Rational Policy & (b) Policy Rationalization



Source: Cushman (2020)

(a) is a rational policy-making process, in which the irrational dimensions of policymakers (beliefs, preferences, and desires) are included in the rational dimensions (identification, analysis, and problem-solving), to obtain the most optimal and strategic options, and then made a basis for making policies. There is an evidence-based process and knowledge management so that policies are made to be rational, objective, logical, and consistent through the application of knowledge management. (b) is policy rationalization, where direct policies are made based solely on the beliefs, preferences, and desires of policymakers without going through rational processes and knowledge management.

In essence, policies resulting from the rationalization process are irrational, but over time it is believed to be rational after going through repeated practices. The justification reasons

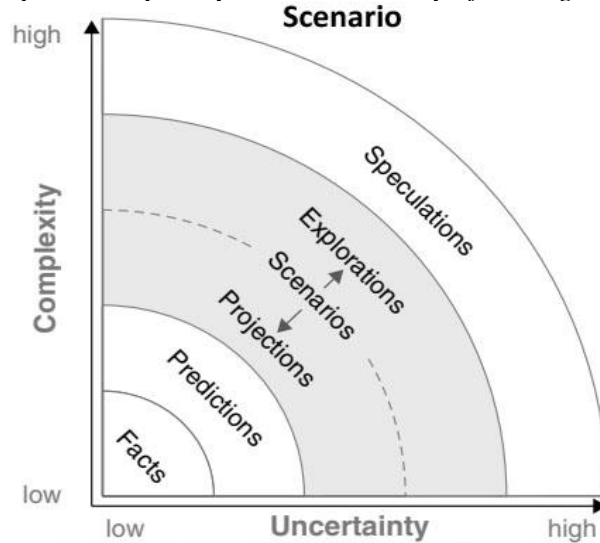


used to rationalize "not prohibiting pollution and allowing Local Company for Drinking Water to dispose of its waste sludge into the Kaligarang watershed" are: (i) meeting the basic needs of the community for clean water; (ii) cost efficiency; and (iii) there are no signs and symptoms of degradation and a significant decrease in carrying capacity. The effect of rationalization is the emergence of "moral hazard" in the form of permissiveness, neglect or neglect, and so on which leads to abuse of authority and opportunistic behaviour of policy-making actors (Henricks, 2016). The result of the rationalization process in policymaking is "irrational, partial, sectoral, partisan and unsustainable policies" so that it can never achieve sustainable development goals.

Policymakers are always faced with changes in the external and internal environment that are increasingly complex with unclear boundaries, so they cannot be predicted or ascertained. A fundamental understanding of the complexity and uncertainty of change is needed to make policy rationally. Zurek & Henrichs (2007) describe the relationship between complexity and uncertainty and scenarios to anticipate it as follows at the Figure 4:



Figure 4
The Scenario to Anticipate Complexity and Uncertainty of Change



Source: Zurek & Henrichs (2007)

The dark shaded areas are scenario areas where complexity and uncertainty are moderate. At the lowest level, what happens is facts, and then predictions or estimates as complexity and uncertainty increase. Prediction is rational because it is based on facts and logical reasoning. Predictions are often stuck at the risk of simplifying the problem because the facts are so clear that the implied substance fails to be revealed. At the highest level, speculation occurs because the rational method of reasoning is deadlocked. At the medium level of complexity and uncertainty, a "scenario" is needed which consists of two components, namely: (i) Exploration of various uncertainties in the future, particularly regarding (a) how much uncertainty is the driving factors of future development, and (b) how much the size of the complexity of the changes and how the causal relationship; and (ii) Projection of various possibilities using knowledge management, methods, and tools for policymaking (Jordan & Turnpenny, 2015).

Policy-making scenarios require understanding (Datta et al., 2016). Some aspects of policy making that must be considered include:



4.1.1 Working Dimension of Policy

4.1.1.1 Non-Discretionary Dimension

Policies are made based on applicable legal regulations, Standard Operating Procedures (SPO), administration, accountability, and public ethics. This dimension is used to formulate short, medium, and long-term policies following the stages of the public policy cycle.

4.1.1.2 Discretionary Dimension

Policies are made purely based on the considerations and decisions of policymakers based on the inherent authority, within the limits permitted by law. Discretionary policies are made for situational conditions where there is no legal norm but require immediate or emergency intervention. For example, emergency response to floods, natural disasters, drought, and others.

4.1.2 Basic Knowledge

Policymaking requires an adequate knowledge base which includes knowledge of:

- 4) Administrative statistics and data;
- 5) Research results and expert/expert advice;
- 6) Perceptions, aspirations, and experiences of the community/public.

The reasons and benefits regarding the importance of the knowledge that comes from research results and expert/expert advice are: (i) providing context to the actual issue or problem; (ii) formulating policies and strategies, and (iii) give the policy professional legitimacy, and convince stakeholders or the public.

4.2 ECONOMICAL ASPECTS OF WATER RESOURCES MANAGEMENT

The opinion of respondents and informants regarding water resources management based on their economic and social values are as follows:

Table 3
Economic Implications of Water Resource Management (WRM)

Economic Implications	Questioner n = 96	Resume of Interview Transcripts (n = 14)
Fulfilling the basic needs of the community	Yes (100%)	Implementation of the function of water supply and sanitation (SDG No. 6)
The function of contributing to local revenue	Yes (100%)	Reasons for easy and cheap practice in disposing of waste
Performance orientation on profitability	Yes (68,2%)	The reasons for neglecting the conservation function of the Kaligarang watershed and allowing pollution practices
Cost-benefit efficiency pressures	Yes (64,3%)	The cause of the easy and cheap practice of disposing of waste
WWTP investment costs are relatively expensive	Yes (77,2%)	The reason for not building a Wastewater Treatment Plant
Does not take into account the cost	Yes	Reasons for not doing a cost-benefit analysis



Economic Implications	Questioner n = 96	Resume of Interview Transcripts (n = 14)
of restoration of watershed damage		
Source: Primary Data; WWTP = Wastewater Treatment Plant		

The opinions of 72% of the 145 stakeholders interviewed about water resources management practices in the Semarang City are as follows:

"The determination of economic factors for water resources management is the greatest compared to other factors. The function of public services to meet community needs for clean water and sanitation (SDG no. 6) is privatized from a business perspective. Semarang city government has established a Local Company for Drinking Water “*Tirta-Moedal*”, which is owned by Semarang municipal government. The legal basis for the privatization of water resources was Act No. 7/2004 concerning water resources, Government Regulation No. 42/2008 concerning water resource management (WRM), and Presidential Decree No. 33/2011 concerning National water resource management (WRM) policy, which were annulled by the Constitutional Court in 2013. The pressure of privatization caused the local drinking water company Local Company for Drinking Water “*Tirta-Moedal*” to truly emerge as a company that applies market principles and instruments such as market efficiency, pricing, efficiency in use, and production efficiency.

The reason for market efficiency has caused the Semarang municipal government to apply double standards in controlling river pollution. If the polluter is a community, sanctions will be applied, but if the polluter is Local Company for Drinking Water “*Tirta-Moedal*”, there will be no sanction. Also, there is an even more erroneous and even misleading assumption, that in the name of economic and social development, environmental damage is acceptable, and is a price to be paid by future generations because they enjoy the results of what is being built at this time." Market efficiency is understood as "spending the lowest possible cost to get the maximum benefit". This misunderstanding is what underlies the practice of disposing of waste sludge into the Kaligarang watershed because it costs nothing at all. Net income will be greater and the contribution to original local revenue will increase. The assumption that discharging sewage sludge into the river at no cost is wrong because the sludge will cause sedimentation and silting downstream (downstream). The Public Works Office always has operational costs incurred to dredge sediment every time there is silting in the upstream part. Kaligarang watershed must always be maintained because of its strategic function as a flood control channel in the west part of Semarang city.

There will be a portion of the local revenue contribution from Local Company for Drinking Water “*Tirta-Moedal*” that will be absorbed by the DPU for dredging operational



costs. The question is: why not allocate a budget to build a wastewater treatment plant (WWTP) so that it does not always dredge rivers? The cost of restoring rivers is not only for dredging, but there are also costs for restoring the decline in river water quality due to chemical pollution. The cost of restoring environmental damage is not taken into account at all because the Kaligarang watershed is "considered" not yet showing symptoms or signs of decreasing carrying capacity.

This fact indicates that in managing water resources, environmental sustainability is always put aside, and only considered when symptoms or signs of damage or disaster have occurred. The valuation of water resources occurs in an unbalanced manner, where the economic and social values take precedence over the value of the ecosystem. The valuation of water resources includes economic, social, and environmental values, where water resources must be seen as an integral part of the ecosystem that is interwoven in a hydrological entity. The interaction between humans and water resources forms a dynamic socio-ecological system, where the level of resilience of the system always changes depending on the context of the interaction. If the water resource ecosystem is overexploited until it exceeds its critical threshold value, then the balance will shift towards degradation and decreased environmental carrying capacity, and vice versa (Janssen & Anderies, 2007; Mulyanti et al., 2024).

Referring to one of the principles in the Dublin Principles which was declared by UNO at the international conference on water resources in Dublin in 1992, it is stated that water resources are seen as an economic commodity that can be used as development assets. This has triggered the emergence of political issues and pressures to schedule the making of water resources management policies based on their economic and social values, to fulfil basic needs, and to implement development as a whole. Water resources immediately enter the market not only as public goods (public goods) but also as consumer goods or traded production raw materials. As a consequence, the paradigm of "market efficiency" applies the law of supply-demand balance, and market instruments such as pricing, cost-benefit ratios, the efficiency of use, and productivity (Berbel et al., 2017).

If it is consistent with the principle of market efficiency, every polluter should have to pay the cost of environmental damage due to pollution. This principle has been adopted in environmental law and is applied to the community in the form of fines for polluters. The agency who implementing the function of conservation and pollution control is the Environmental Service (DLH). DLH does not exercise its authority to impose sanctions on Local Company for Drinking Waters for being fellow Local Apparatus Organizations (OPDs) from the Semarang municipal government. Institutional conflicts arose among fellow OPDs



stemming from the Semarang mayor's policy of "doing nothing" on the practice of river pollution by Local Company for Drinking Water. The solution to this conflict is: Local Company for Drinking Water builds a Waste Water Treatment Plant (WWTP) so as not to pollute the river. Wastewater is treated first before being discharged into the river, or if possible, it is recycled for reuse as raw material. The reason there is no budget to build WWTP which is expensive can be circumvented by applying the 'polluter pays principle', where every polluter including Local Company for Drinking Water "*Tirta-Moedal*" allocates a fee for each litter of waste it discharges. The costs collected during a certain period can be used to finance the construction of the WWTP.

The definition of the polluter pays principle is "that individuals or companies that pollute the environment must pay the cost of restoring environmental damage that occurs as a result of pollution". This principle stems from the codex of European law and was adopted by developing countries. Several developing countries that have implemented this principle include Malaysia, Taiwan, South Africa, Kenya, Chile, and Ecuador. Experience from several countries shows that this principle can be used as an effective control instrument. The problem lies in inconsistency in law enforcement practices (Lindhout & Van den Broek, 2014; Luppi et al., 2012).

Policy is a crucial aspect in Urban Water Resources Management. Policy formulation does not only focus on the power of policy makers, in this case the government (Suwadi et al., 2024; Zhang et al., 2023). Given the shape of the river that passes through many areas, Urban Water Resources Management must be developed in an integrated manner. The concept of developing integrated Urban Water Resources Management is referred to as Integrated Urban Water Resources Management (IUWRM) to ensure security, resistance to pressure, and preservation of urban water resources. Apart from that, ideally every development should support environmental sustainability, so to formulate a development policy, it must refer to the success of sustainable development goals (Griggs et al., 2014; Handrian & Andry, 2020). Based on these conditions, the development of IUWRM should ideally also be oriented towards the successful achievement of sustainable development goals (SDGs). IUWRM policies must also be able to accommodate external issues such as the Global Water Partnership, Green New Deal, Green Growth, Green Economy, and Sustainable development, so that in preparing programs/activities in IUWRM in the Semarang City it can also address these external issues. The implementation of the IUWRM policy is also not an easy thing because it involves many stakeholders, so that the implementation must be carried out through the stages of the public policy cycle in making WRM policies in the Semarang City. The implementation of an



integrated policy must also apply an evidence-based policy model, so that the IUWRM development process in Semarang City must also apply an evidence-based model in policy making. for non-discretionary and discretionary dimensions.

IUWRM development in Semarang City must also be able to balance economic values, social values, and environmental values in accordance with the concept of sustainable development (Biermann & Kanie, 2017; Ristianti, 2016; Setianingtyas et al., 2019). Economically, the development of integrated policies must also consider the efficiency of economic values, even though the expected results are very large and have an impact on the future, if you do not consider economic efficiency, the sustainability of development policies will also stop at any time (Frochot, 2005; Smith et al., 2010; Wang et al., 2020). Reflecting on this, the development of IUWRM also needs to implement market efficiency balanced by calculating and allocating costs for restoring environmental damage, as well as conducting a cost-benefit analysis in the management and/or utilization of water resources. This is done to achieve efficiency in economic management in the development of IUWRM considering that IUWRM policies are not policies that are carried out once in a while. Reward and punishment is also an aspect that needs attention in implementing policies (Smith et al., 2010). Implementing pollutant payments as an instrument for pollution control and management of water resources. Apart from that, to support environmental sustainability economically, it is also necessary to build a wastewater treatment plant (WWTP) to prevent and control pollution of water resources. In terms of financing, considering that the funds owned by the Local government for the development of IUWRM are limited, it is necessary to have financing from non-government sources. Financial resources need to be developed through collaboration with industry and the private sector to jointly provide financial financing so that development can have optimal results (Head & Alford, 2015; Iza & Nurhaeni, 2021). Based on these conditions, in the development of IUWRM in Semarang City, it is necessary to explore the financial sources both from conventional (APBN/APBD) and non-conventional (outside APBN/APBD) financing sources to finance WWTP development.

The development process is influenced by macro factors including political, economic, and social, technological, legal, and environmental or abbreviated as PEST or PESTLE (Cox, 2021; De Groote, 2022; Gupta, 2013; Kolios & Read, 2013; Koumparoulis, 2013; Shahid et al., 2012; Shilei & Yong, 2009; Zahari & Romli, 2019; Zalengera et al., 2014). The research showed that the problems in integrated water resources management in the Semarang City are heavily influenced by the policies of the city government itself. WRM policy is relative because it depends on the political interests of policy makers. The formulation of the policy itself is



very dependent on the political and economic conditions encountered, so that in this study the authors focus on the analysis of the political and economic situation in reviewing the integrated water resources management in the Semarang City.

5 CONCLUSION

The results of this study showed that to support the development of Integrated Urban Water Resources Management (IUWRM) there must be a policy that ensure security, resistance to pressure, and preservation of urban water resources. IUWRM policies also need to be encouraged to be oriented towards sustainable development goals (SDGs). Internalization of external issues such as the Global Water Partnership, Green New Deal, Green Growth, Green Economy, and Sustainable development is the WRM policy agenda in Semarang City. In carrying out the stages of the public policy cycle in making WRM policies in the Semarang City. There is a need to apply an evidence-based model in the IUWRM policy-making process. In addition, it is also necessary to apply knowledge management in the process of making IUWRM policies for both non-discretionary and discretionary dimensions.

In the economic domain, this research showed that: in the development of IUWRM it is necessary to have a valuation of water resources that must balance the economic, social, as well as the environmental value. The need of the application of market efficiency is balanced by calculating and allocating the cost of restoring environmental damage, as well as carrying out cost-benefit analysis in the management and/or utilization of water resources. The need of implementing the polluter pays as an instrument for pollution control and management of water resources. Building a wastewater treatment plant (WWTP) to prevent and control the pollution of water resources also crucial. The need of exploring conventional (State/Local Revenue and Expenditure Budget) and non-conventional (outside of State/Local Revenue and Expenditure Budget) financing sources to finance WWTP development.

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REFERENCES

- Acuto, M., & Leffel, B. (2021). Understanding the global ecosystem of city networks. *Urban Studies*, 58(9), 1758–1774. <https://doi.org/10.1177/0042098020929261>
- Adams, E. A., & Smiley, S. L. (2018). Urban-rural water access inequalities in Malawi: implications for monitoring the Sustainable Development Goals. *Natural Resources Forum*, 42(4), 217–226. <https://doi.org/10.1111/1477-8947.12150>
- Ali, F. (2018). Initiative urban water studies at depok, peri-urban city - toward the implementation of water sensitive city concept. *International Journal of GEOMATE*, 14(44). <https://doi.org/10.21660/2018.44.3729>
- Althaus, C., Bridgman, P., & Davis, G. (2020). *The Australian Policy Handbook*. Routledge. <https://doi.org/10.4324/9781003117940>
- Artioli, F., Acuto, M., & McArthur, J. (2017). The water-energy-food nexus: An integration agenda and implications for urban governance. *Political Geography*, 61, 215–223. <https://doi.org/10.1016/j.polgeo.2017.08.009>
- Berbel, J., Gutiérrez-Martín, C., & Martín-Ortega, J. (2017). Water Economics and Policy. *Water*, 9(10), 801. <https://doi.org/10.3390/w9100801>
- Bichai, F., & Flamini, A. C. (2018). The Water-Sensitive City: Implications of an urban water management paradigm and its globalization. *WIREs Water*, 5(3). <https://doi.org/10.1002/wat2.1276>
- Biermann, F., & Kanie, N. (2017). Conclusion: Key challenges for global governance through goals. In *Governing through Goals* (pp. 295–310). The MIT Press. <https://doi.org/10.7551/mitpress/9780262035620.003.0013>
- Burn, S., Maheepala, S., & Sharma, A. (2012). Utilising integrated urban water management to assess the viability of decentralised water solutions. *Water Science and Technology*, 66(1), 113–121. <https://doi.org/10.2166/wst.2012.071>
- Cox, J. (2021). The higher education environment driving academic library strategy: A political, economic, social and technological (PEST) analysis. *Journal of Academic Librarianship*, 47(1), 102219. <https://doi.org/10.1016/j.acalib.2020.102219>
- Creswell, J. W. (2014). *Research Design: Qualitatives, Quantitative, and Mixed Methods Approaches*. Sage Publication Inc.
- Cushman, F. (2020). Rationalization is rational. *Behavioral and Brain Sciences*, 43, e28. <https://doi.org/10.1017/S0140525X19001730>
- Datta, A., Hendytio, M. K., Perkasa, V., & Basuki, T. (2016). *The Acquisition of Research Knowledge by National-Level Decision Makers in Indonesia*. Ksi-Indonesia.Org. <https://www.ksi-indonesia.org/id/pengetahuan/detail/287-working-paper-the-acquisition-of-research-knowledge-by-national-level-decision-makers-in-indonesia>
- De Groote, H. (2022). Economic analysis of pest problems in agriculture and food chains in Africa. *Current Opinion in Insect Science*, 54, 100969.



<https://doi.org/10.1016/j.cois.2022.100969>

- Demir, T., & Reddick, C. G. (2012). Understanding shared roles in policy and administration: An empirical study of council-manager relations. *Public Administration Review*, 72(4), 526–535. <https://doi.org/10.1111/j.1540-6210.2011.02551.x>
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2009). *Handbook of Qualitatif Reseserch* (Dariyatno, Trans.). Penerbit Pustaka Pelajar.
- Feiock, R. C., Jeong, M., & Kim, J. (2003). Credible commitment and council-manager government: Implications for policy instrument choices. *Public Administration Review*, 63(5), 616–625. <https://doi.org/10.1111/1540-6210.00324>
- Frochot, I. (2005). A benefit segmentation of tourists in rural areas: A Scottish perspective. *Tourism Management*, 26(3), 335–346. <https://doi.org/10.1016/j.tourman.2003.11.016>
- Global Water Partnership. (2013). *Policy Brief IUWM - Integrated Urban Water Management (IUWM): Toward Diversification and Sustainability*. <https://www.gwp.org/globalassets/global/toolbox/publications/policy-briefs/13-integrated-urban-water-management-iuwm.-toward-diversification-and-sustainability.pdf>
- Griggs, D., Stafford Smith, M., Rockström, J., Öhman, M. C., Gaffney, O., Glaser, G., Kanie, N., Noble, I., Steffen, W., & Shyamsundar, P. (2014). An integrated framework for sustainable development goals. *Ecology and Society*, 19(4), art49. <https://doi.org/10.5751/ES-07082-190449>
- Guppy, L., & Anderson, K. (2017). *Global water crisis: The facts*. Institute for Water, Environment and Health, UNU-INWEH.
- Gupta, A. (2013). Environment & PEST analysis: an approach to external business environment. *International Journal of Modern Social Sciences*, 2(1), 34–43. <https://modernscientificpress.com/Journals/ViewArticle.aspx?YTDXIp8pwb35qABc+2BV/1WJUQnMuLGNSj0NcUX/H4nrYH2pOUyBFV904kXBzuJV>
- Handrian, E., & Andry, H. (2020). Sustainable development goals: Tinjauan percepatan pencapaian di Provinsi Riau. *Publika: Jurnal Ilmu Administrasi Publik*, 6(1), 77–87. [https://doi.org/10.25299/jiap.2020.vol6\(1\).4995](https://doi.org/10.25299/jiap.2020.vol6(1).4995)
- Head, B. W., & Alford, J. (2015). Wicked problems: Implications for public policy and management. *Administration & Society*, 47(6), 711–739. <https://doi.org/10.1177/0095399713481601>
- Henricks, T. S. (2016). Reason and rationalization: A theory of modern play. *American Journal of Play*, 8(3), 287–324.
- Herdiansyah, A. R., Zahra, R. A., Masjoyo, Y. M., Muhammad, A. F., Saputra, M. R., Firdauzi, L. B., Hafizha, K. P., & Nurjani, E. (2022). Analysis of meteorological water availability and water demand in Semarang Regency. *IOP Conference Series: Earth and Environmental Science*, 1039(1), 012011. <https://doi.org/10.1088/1755-1315/1039/1/012011>
- Hurlimann, A., & Wilson, E. (2018). Sustainable urban water management under a changing



- climate: The role of spatial planning. *Water*, 10(5), 546.
<https://doi.org/10.3390/w10050546>
- Iza, S. M., & Nurhaeni, I. D. A. (2021). Proses Kolaborasi dalam Penanganan Kemiskinan: Studi Kasus pada Program Gandeng Gendong di Yogyakarta. *Wacana Publik*, 1(2), 365–379. <https://doi.org/10.20961/wp.v1i2.54600>
- Janssen, M. A., & Anderies, J. M. (2007). Robustness Trade-offs in Social-Ecological Systems. *International Journal of the Commons*, 1(1), 43–65.
- Jiang, Y., Chen, Y., Younos, T., Huang, H., & He, J. (2010). Urban water resources quota management: The core strategy for water demand management in China. *AMBIO*, 39(7), 467–475. <https://doi.org/10.1007/s13280-010-0080-x>
- Jordan, A. J., & Turnpenny, J. R. (Eds.). (2015). *The Tools of Policy Formulation*. Edward Elgar Publishing. <https://doi.org/10.4337/9781783477043>
- Kolios, A., & Read, G. (2013). A political, economic, social, technology, legal and environmental (PESTLE) approach for risk identification of the Tidal Industry in the United Kingdom. *Energies*, 6(10), 5023–5045. <https://doi.org/10.3390/en6105023>
- Koumparoulis, D. N. (2013). PEST analysis: The case of e-shop. *International Journal of Economy, Management and Social Sciences*, 2(2), 31–36.
- Laminu, M.-D., Ahadzie, D. K., & Okrah, M. (2021). Domestic end-users' participation in managing urban water supply in emerging cities: Evidence from Wa, Ghana. *Ghana Journal of Development Studies*, 18(1), 1–24. <https://doi.org/10.4314/gjds.v18i1.1>
- Li, H., Ding, L., Ren, M., Li, C., & Wang, H. (2017). Sponge city construction in China: A survey of the challenges and opportunities. *Water*, 9(9), 594. <https://doi.org/10.3390/w9090594>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. SAGE Publication Inc.
- Lindhout, P. E., & Van den Broek, B. (2014). The polluter pays principle: Guidelines for cost recovery and burden sharing in the case law of the European Court of Justice. *Utrecht Law Review*, 10(2), 46. <https://doi.org/10.18352/ulr.268>
- Luppi, B., Parisi, F., & Rajagopalan, S. (2012). The rise and fall of the polluter-pays principle in developing countries. *International Review of Law and Economics*, 32(1), 135–144. <https://doi.org/10.1016/j.irl.2011.10.002>
- Malik, J., & Kristiana, H. (2021). Sustainability strategy for small-scale fisheries management: Case study in Semarang city coastal, Indonesia. *Journal of Tropical Fisheries Management*, 5(2), 83–90. <https://doi.org/10.29244/jppt.v5i2.34761>
- Marfai, M. A., Almohammad, H., Dey, S., Susanto, B., & King, L. (2008). Coastal dynamic and shoreline mapping: Multi-sources spatial data analysis in Semarang Indonesia. *Environmental Monitoring and Assessment*, 142(1–3), 297–308. <https://doi.org/10.1007/s10661-007-9929-2>
- Martinez, R. (2023). Urban water governance as policy boosterism: Seoul's legitimation at



- the local and global scale. *Urban Studies*, 60(2), 325–342.
<https://doi.org/10.1177/00420980221097500>
- McConnell, A., & 't Hart, P. (2019). Inaction and public policy: understanding why policymakers 'do nothing'. *Policy Sciences*, 52(4), 645–661.
<https://doi.org/10.1007/s11077-019-09362-2>
- Mulyanti, D., Perwira, I., Muttaqin, Z., & Sugiharti, D. K. (2024). The legal policy role of groundwater tax on water resources conservation in Indonesia. *Journal of Law and Sustainable Development*, 12(2), e1673. <https://doi.org/10.55908/sdgs.v12i2.1673>
- OECD. (2012). *OECD Environmental Outlook to 2050: The Consequences of Inaction*. OECD Publishing. <https://doi.org/10.1787/9789264122246-en>
- Pataki, D. E., Boone, C. G., Hogue, T. S., Jenerette, G. D., McFadden, J. P., & Pincetl, S. (2011). Socio-ecohydrology and the urban water challenge. *Ecohydrology*, 4(2), 341–347. <https://doi.org/10.1002/eco.209>
- Peña-Guzmán, C., Melgarejo, J., Lopez-Ortiz, I., & Mesa, D. (2017). Simulation of infrastructure options for urban water management in two urban catchments in Bogotá, Colombia. *Water*, 9(11), 858. <https://doi.org/10.3390/w9110858>
- Pertiwi, A., Kiky, S. M. P., Wiwik, B., Ratna, P., Budi, P. S., & Arya, R. (2018). Preliminary study on plastic waste handling in Semarang City - Indonesia: Estimated generation and existing management. *E3S Web of Conferences*, 73, 07008.
<https://doi.org/10.1051/e3sconf/20187307008>
- Renouf, M. A., & Kenway, S. J. (2017). Evaluation approaches for advancing urban water goals. *Journal of Industrial Ecology*, 21(4), 995–1009. <https://doi.org/10.1111/jiec.12456>
- Risianti, N. S. (2016). S.M.A.R.T. Eco-village for hazardous coastal area in Bedono Village, Demak Regency. *Procedia - Social and Behavioral Sciences*, 227(November 2015), 593–600. <https://doi.org/10.1016/j.sbspro.2016.06.120>
- Rouillard, J., Vidaurre, R., Brouwer, S., Damman, S., Ponce, A., Gerner, N., Riegels, N., & Termes, M. (2016). Governance regime factors conducive to innovation uptake in urban water management: Experiences from Europe. *Water*, 8(10), 477.
<https://doi.org/10.3390/w8100477>
- Setianingtias, R., Baiquni, M., & Kurniawan, A. (2019). Pemodelan indikator tujuan pembangunan berkelanjutan di Indonesia. *Jurnal Ekonomi Pembangunan*, 27(2), 61–74.
<https://doi.org/10.14203/JEP.27.2.2019.61-74>
- Shahid, H., Shafique, O., Shokat, A., Bodla, O. H., & Arshad, S. (2012). PEST analysis of engro fertilizers, Pakistan. *Journal of Biology, Agriculture and Healthcare*, 2(10), 1–5.
<http://www.iiste.org/Journals/index.php/JBAH/article/view/3269>
- Sharp, E. B., Daley, D. M., & Lynch, M. S. (2011). Understanding local adoption and implementation of climate change mitigation policy. *Urban Affairs Review*, 47(3), 433–457. <https://doi.org/10.1177/1078087410392348>
- Shilei, L., & Yong, W. (2009). Target-oriented obstacle analysis by PESTEL modeling of



- energy efficiency retrofit for existing residential buildings in China's northern heating region. *Energy Policy*, 37(6), 2098–2101. <https://doi.org/10.1016/j.enpol.2008.11.039>
- Smith, L. C., Smith, M., & Ashcroft, P. (2010). Analysis of environmental and economic damages from British Petroleum's Deepwater Horizon Oil Spill. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1653078>
- Susanti, M., & Setiajidi, S. (2020). The policy of community-based disaster management in disaster-resistant village at Semarang City. *Proceedings of the Proceedings of the 2nd International Conference on Social Sciences, ICSS 2019, 5-6 November 2019, Jakarta, Indonesia*. <https://doi.org/10.4108/eai.5-11-2019.2292505>
- Susanto, N. (2018). Stakeholder interactions model of groundwater management in Semarang City/Indonesia. *International Journal of GEOMATE*, 15(47). <https://doi.org/10.21660/2018.47.73578>
- Suwadi, P., Sofyan, A. C., & Ramdhani, R. S. (2024). Legal comparison between national collective management institutions in Indonesia and United States. *Revista de Gestão Social e Ambiental*, 18(4), e04572. <https://doi.org/10.24857/rgsa.v18n4-015>
- Tallis, H., & Polasky, S. (2009). Mapping and valuing ecosystem services as an approach for conservation and natural-resource management. *Annals of the New York Academy of Sciences*, 1162(1), 265–283. <https://doi.org/10.1111/j.1749-6632.2009.04152.x>
- Tortajada, C., & Joshi, Y. K. (2013). Water resources management and governance as part of an overall framework for growth and development. *International Journal of Water Governance*, 1(3), 285–306. <https://doi.org/10.7564/13-IJWG16>
- United Nations - UN Water. (2022). *UN World Water Development Report 2022 - Groundwater: Making the invisible visible*. <https://www.unwater.org/publications/un-world-water-development-report-2022>
- van de Meene, S. J., Brown, R. R., & Farrelly, M. A. (2011). Towards understanding governance for sustainable urban water management. *Global Environmental Change*, 21(3), 1117–1127. <https://doi.org/10.1016/j.gloenvcha.2011.04.003>
- Vo, P. Le. (2007). Urbanization and water management in Ho Chi Minh City, Vietnam-issues, challenges and perspectives. *GeoJournal*, 70(1), 75–89. <https://doi.org/10.1007/s10708-008-9115-2>
- Wang, Y., Lu, Y., He, G., Wang, C., Yuan, J., & Cao, X. (2020). Spatial variability of sustainable development goals in China: A provincial level evaluation. *Environmental Development*, 35, 100483. <https://doi.org/10.1016/j.envdev.2019.100483>
- Worku, H. (2017). Rethinking urban water management in Addis Ababa in the face of climate change: An urgent need to transform from traditional to sustainable system. *Environmental Quality Management*, 27(1), 103–119. <https://doi.org/10.1002/tqem.21512>
- Yasin, H. Q., Breadsell, J., & Tahir, M. N. (2021). Climate-water governance: a systematic analysis of the water sector resilience and adaptation to combat climate change in Pakistan. *Water Policy*, 23(1), 1–35. <https://doi.org/10.2166/wp.2020.113>



- Yin, R. K. (2003). *Case study research: Design and methods* (3rd Ed.). SAGE Publications Inc.
- Zahari, A. R., & Romli, F. I. (2019). Analysis of suborbital flight operation using PESTLE. *Journal of Atmospheric and Solar-Terrestrial Physics*, *192*, 104901. <https://doi.org/10.1016/j.jastp.2018.08.006>
- Zalengera, C., Blanchard, R. E., Eames, P. C., Juma, A. M., Chitawo, M. L., & Gondwe, K. T. (2014). Overview of the Malawi energy situation and a PESTLE analysis for sustainable development of renewable energy. *Renewable and Sustainable Energy Reviews*, *38*, 335–347. <https://doi.org/10.1016/j.rser.2014.05.050>
- Zhang, L., Song, Y., Zhang, M., & Wu, W. (2023). Evolutionary game analysis of strategic interaction of environmental regulation among local governments. *Environmental Development*, *45*, 100793. <https://doi.org/10.1016/j.envdev.2022.100793>
- Zhou, J., Li, Y., Lei, Q., Feng, Q., Luo, J., & Lindsey, S. (2022). Asynchrony between urban expansion and water environmental protection reshapes the spatial patterns of nitrogen and phosphorus concentrations and N:P stoichiometry in inland small water bodies in Changsha, China. *Frontiers in Environmental Science*, *10*. <https://doi.org/10.3389/fenvs.2022.1018408>
- Zurek, M. B., & Henrichs, T. (2007). Linking scenarios across geographical scales in international environmental assessments. *Technological Forecasting and Social Change*, *74*(8), 1282–1295. <https://doi.org/10.1016/j.techfore.2006.11.005>