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Assessing Indonesia's Readiness to Integrate Water Accounting into Green Fiscal Policy

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Research aims: This study aims to map the readiness for integrating water accounting into Indonesia's green fiscal governance by developing a conceptual framework that links water accounting data, public fiscal systems, and the effectiveness of environmental expenditure as the foundation for designing an environmental budget tagging model.
Design/Methodology/Approach: The study employs a scoping review approach, synthesizing national and international policy documents related to water management, sustainability reporting, and fiscal governance.
Research findings: The study finds that Indonesia has achieved conceptual, regulatory, fiscal, and institutional readiness to adopt water accounting within its green fiscal governance system. The existing statistical infrastructure aligns with the principles of environmental-economic accounting, while the Climate Budget Tagging mechanism provides a fiscal foundation that can evolve into a comprehensive Environmental Budget Tagging system encompassing water-related expenditures.
Theoretical contribution/Originality: This study extends the literature by explicitly connecting water accounting with fiscal policy mechanisms, integrating perspectives from environmental–economic accounting, climate governance, sustainability reporting, and public sector accounting into a single conceptual framework applicable to policy design.
Practitioner/Policy implication: The findings provide a foundation for policymakers to integrate water-related data into fiscal decision-making, promoting transparent and evidence-based environmental budgeting. Embedding water accounting within fiscal systems can strengthen the efficiency, accountability, and sustainability of public spending, aligning it with national green development goals.
Research Limitation/Implication: The study is conceptual in nature and limited to publicly available documents; future research may conduct empirical assessments to validate fiscal-environmental linkages and measure the effectiveness of implementation.
Keywords: Climate Budget Tagging, Environmental Budget Tagging, Environmental-Economic Accounting, Green Fiscal Governance, Water Accounting

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Introduction

Water is a vital resource that supports all aspects of economic, social, and environmental life. In Indonesia, the availability of clean water is facing increasing pressure due to population growth, urbanization, environmental degradation, and climate change. Data from the

Indonesian Central Statistics Agency show that the distribution of clean water between regions remains highly unequal, with eastern Indonesia having access to safe drinking water at only 52%, far below the national average (Badan Pusat Statistik, 2024b). The Directorate General of Water Resources report and Presidential Regulation Number 37 of 2023 concerning the National Water Resources Policy indicate that most river basins in Indonesia are facing serious pressure due to environmental degradation, land conversion, and increasing domestic and industrial water demand (Direktorat Jenderal Sumber Daya Air, 2025). These conditions have led to a decline in watershed carrying capacity, an increase in the frequency of seasonal floods and droughts, and a decline in water quality in various regions.

The water crisis has direct implications for fiscal policy. Central and regional governments allocate significant budgets for water infrastructure, irrigation, sanitation, and flood control, but the effectiveness of this spending remains difficult to measure in an integrated manner. A report by the Fiscal Policy Agency (BKF) indicates that the climate change budget allocation in Indonesia, through Climate Budget Tagging (CBT), accounts for approximately 4.1% of the state budget (APBN) (Badan Kebijakan Fiskal, 2023). However, this classification does not fully encompass aspects of water resource management (Badan Kebijakan Fiskal, 2023). Water-related government spending is dispersed across various ministries and institutions, resulting in a lack of a system that can trace the link between fiscal output and environmental outcomes. This highlights the limitations of public accounting instruments in accurately capturing the impact of fiscal policy on natural resources.

In terms of environmental reporting, Indonesia lacks a nationally integrated water accounting system. Although the Indonesian Central Statistics Agency (BPS) has published Clean Water Statistics and Indonesian Environmental Statistics (Badan Pusat Statistik, 2024a), which refers to the System of Environmental-Economic Accounting for Water (SEEA-Water) framework (United Nations, 2012), this data remains sector-specific and has not been used as a basis for fiscal decision-making. However, globally, the SEEA-Water framework has been used by various countries to link water resource management with economic indicators and fiscal policy. The OECD emphasizes that integrating environmental data, including water, into public budgeting systems is a key feature of transparent and results-based green fiscal governance (OECD, 2024a).

International practice suggests that implementing water accounting can be a solution to bridge the gap between environmental reporting and fiscal policy. Countries such as Australia, India, and South Africa have adopted the Water Accounting Plus (WA+) approach to measure water use efficiency and link it to public spending programs (Chen et al., 2025; Delavar et al., 2022; Vardon et al., 2023). Through this approach, governments can assess the contribution of spending to increasing water availability and resource resilience. In Indonesia, the opportunity to adopt a similar approach is wide open through the implementation of the 2025-2029 National Medium-Term Development Plan (RPJMN) (Peraturan Presiden RI, 2025) and the 2025-2045 National Long-Term Development Plan (RPJPN) (Undang-Undang RI, 2024), which explicitly emphasizes the importance of water management within a green development framework.

The above review demonstrates a gap between environmental reporting capacity and fiscal policy in Indonesia. The fiscal system has shifted toward a green approach through climate budget tagging, while the environmental statistics system has adopted the SEEA-Water framework. However, both operate in parallel without an integrative mechanism. As a result, fiscal policy does not fully reflect the economic value of water, and the effectiveness of public spending on water resource resilience cannot be quantitatively measured. This situation provides a crucial basis for studying the integration of water accounting into green fiscal policy, in order to develop a reporting model that not only records expenditures but also measures the environmental outcomes of government fiscal policy.

The lack of integration of the water accounting system into Indonesia's green fiscal policy framework has resulted in a weak link between environmental data and fiscal decisions. Consequently, the effectiveness of public spending on water resource management and resilience cannot be measured in a comprehensive and evidence-based manner.

On the one hand, the government has adopted climate budget tagging (CBT) to mark the allocation of climate mitigation and adaptation spending, but this mechanism does not explicitly include the water resource dimension. Furthermore, the Central Bureau of Statistics has implemented the System of Environmental-Economic Accounting for Water (SEEA-Water) framework to measure water stocks and flows, but this data has not been utilized in the public budgeting process. Consequently, the contribution of fiscal policy to water resource management and resilience cannot be measured quantifiably and transparently. This lack of synergy between fiscal and environmental reporting systems creates an information gap that has the potential to undermine the effectiveness of sustainable development policies. Therefore, the topic of integrating water accounting into green fiscal policy is important for further research to support accountable, data-driven, and environmentally sustainable fiscal governance.

Research on water accounting has grown rapidly in tandem with the increasing pressure on water resources and the growing demand for transparency in environmental management. Hoekstra (2019) proposed green–blue water accounting, which differentiates between rainwater (green water) and surface water (blue water), providing a deeper understanding of the efficiency and economic dependence of water resources. Delavar et al. (2020, 2022) developed a model-based water accounting approach at the watershed scale, utilizing a modified SWAT hydrological model to map water stocks and flows across economic sectors. This approach illustrates how physical data can effectively support evidence-based water policy decisions. Meanwhile, Chen et al. (2025) introduced an integrative water accounting framework that combines indicators of water efficiency, productivity, and economic value using multi-source data, bringing water accounting closer to the realm of fiscal policy. Nedkov et al. (2022), and Zhou et al. (2021) complement this perspective with ecosystem service-based models and water sustainability analysis, demonstrating how SEEA-Water can be adapted to assess economic and ecological impacts simultaneously.

Issues of climate risk and adaptation further reinforce the urgency of developing an adaptive water accounting system. Gorelick et al. (2020) emphasize that water accounting systems must account for the dynamics of climate change and water supply uncertainty to be operationally usable in public infrastructure planning. These findings are reinforced by Richter

et al. (2024), who employed comprehensive water budget accounting to elucidate the causes of declining river discharge resulting from overuse and inadequate cross-sector coordination.

At the global level, Rosa & Sangiorgio (2025) demonstrate that the water gap, or the disparity between water availability and consumption, is projected to increase by 14.7% under a three-degree global warming scenario, indicating that any fiscal policy must consider water risk as a macroeconomic factor.

Grafl (2021) introduced the concept of Environmental Financial Accounting (EFA) in the public sector as a framework bridging environmental reporting with government financial accounting systems based on the IPSAS conceptual foundation, highlighting its role in linking environmental disclosure to fiscal responsibility while not specifically addressing water management issues. Garrido-Rubio et al. (2020) mapped corporate water disclosures across international frameworks, revealing that reporting remains largely descriptive. Kosasih et al. (2024) applied the GRI 303 standard and found similar patterns, highlighting limited measurement of economic impact and water efficiency.

While most international research continues to focus on technical models and corporate reporting, studies in Indonesia are relatively limited and fragmented. Maleimau et al. (2024) conducted a scoping review, demonstrating that the implementation of water accounting in Indonesia has begun through BPS statistics, following the SEEA-Water framework. Kurniawan & Verawati (2024) expand this perspective by emphasizing the role of environmental accounting in strengthening public transparency and accountability, although they have not yet linked it directly to fiscal policy. Other studies, such as those by Prabowoputra et al. (2020) focus on the technical engineering aspects of water utilization, whereas (Pratama et al., 2024) emphasize institutional and policy-oriented perspectives on implementing water accounting in the agricultural sector. Furthermore, Lyu et al. (2025) integrate water accounting with water rights trading management to assess water behaviors and risks in irrigation districts, marking progress toward multidimensional evaluation within resource governance frameworks.

This study aims to map the readiness of water accounting integration into green fiscal governance in Indonesia by developing a conceptual framework that explains the relationship between water accounting data, the public fiscal system, and the effectiveness of environmental spending, providing a basis for designing Environmental Budget Tagging in Indonesia. This research differs from previous studies that generally focus on the technical aspects of water resource measurement (Chen et al., 2025; Delavar et al., 2020) or corporate reporting (Garrido-Rubio et al., 2020; Kosasih et al., 2024). This study explicitly links water accounting with public fiscal mechanisms, including Climate Budget Tagging and budget outcome reporting. Compared with Grafl (2021), who highlighted Environmental Financial Accounting in the public sector in general, this study more specifically positions water as a strategic fiscal object in the context of Indonesia's green policy. This study integrates four main literature streams, water balance (SEEA-Water), climate risk, sustainability reporting, and public accounting, into a single conceptual map applicable to the formulation of national fiscal policy.

This study expands the environmental and sustainability accounting literature by introducing a new perspective on water accounting as a fiscal instrument. This study bridges the gap between SEEA-based environmental reporting and results-based fiscal governance. By linking water data to the public budget system, this study enhances the discourse on integrating environmental accounting with fiscal policy. It broadens the understanding of the role of public accounting in supporting sustainable development. This study is expected to provide a conceptual basis for the government in developing a green fiscal governance framework that includes the water resources dimension. The results of this study can be used to strengthen coordination among the Indonesian Central Statistics Agency (BPS), the Fiscal Policy Agency (BKF), and the Indonesian National Development Planning Agency (Bappenas) in integrating environmental data with fiscal reporting. Furthermore, this study has the potential to support the formulation of a more comprehensive Environmental Budget Tagging (EBT) policy, enabling every rupiah of public spending to be tracked for its contribution to water conservation and environmental resource resilience. Ultimately, this research is expected to help the government improve fiscal accountability, strengthen the legitimacy of green policies, and support the achievement of SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action).

Literature Review

Water Accounting

Water accounting is a systematic framework designed to measure, record, and report the relationship between water resources and economic activity, in both physical and monetary terms. According to the United Nations, in its System of Environmental-Economic Accounting for Water (SEEA-Water), water accounting organizes information on water availability and use by economic sectors to support evidence-based water resource management and policymaking (United Nations, 2012). Batchelor et al. (2016) assert that water accounting provides a transparent and consistent framework for identifying, measuring, and reporting water flows and uses across sectors, thereby strengthening efficient water governance. Meanwhile, Vardon et al. (2023) note that the primary objective of water accounting is to produce credible and comparable quantitative and qualitative information on water stocks and flows, enabling more informed decision-making regarding water resource sustainability.

Thus, water accounting serves as an environmental-economic information system that links hydrological data with economic activities to support fiscal policy planning, evaluation, and sustainable development. The primary framework at the global level is the System of Environmental-Economic Accounting for Water (SEEA-Water) published by the United Nations in 2012. This system bridges hydrological statistics and national economic statistics through three main components: physical supply and use tables, monetary supply and use tables, and asset accounts, enabling integration between water balances and the System of National Accounts (SNA) (United Nations, 2012). Its follow-up version, SEEA Ecosystem Accounting (United Nations, 2024), expands the scope to include water ecosystem services and enables simultaneous assessments of both economic and ecological value. Vardon et al. (2023) note that nearly one hundred countries have adopted this system as the basis for

national water reporting due to its consistent terminology and ability to link environmental data with economic policies.

The SEEA-Water approach is complemented by applied models, such as Water Accounting Plus (WA+), which combines hydrological and economic data at the watershed level. A study by Delavar et al. (2022) demonstrated the application of WA+ to the Karkheh watershed in Iran, utilizing a model-based approach with the Soil and Water Assessment Tool (SWAT). The results showed a 10% decrease in rainfall and a 24% increase in agricultural evapotranspiration, confirming that water accounting is capable of detecting dynamic changes in water supply and demand due to climate change and economic behavior. Similar findings were also reported by Lyu et al. (2025), who applied water accounting concepts to track water ownership and trade in irrigation districts. This study confirmed the function of water accounting as a tracking system for water assets, liabilities, and rights, which can be integrated with public policy mechanisms.

In addition to the macro framework, micro-reporting on water is governed by GRI 303: Water and Effluents (2021), which is used at the entity level (Global Reporting Initiative, 2025). This standard requires disclosure of data on water withdrawal, consumption, and discharge, as well as areas at high risk of water shortages. Thus, GRI 303 provides organizational reporting, while SEEA-Water serves as the basis for national statistics; the two complement each other in a comprehensive water accounting reporting system (Polat & Ekerg, 2025).

Another important dimension in water accounting is the distinction between green and blue water, as explained by Hoekstra (2019). Green water refers to rainfall stored in the soil and used directly by vegetation, while blue water includes surface and groundwater that can be allocated economically. This approach enhances the understanding of irrigation efficiency, water footprint, and the relationship between agricultural production and water resource pressure (Wang et al., 2022). In the context of global climate change, Rosa & Sangiorgio (2025) demonstrate that the gap between water availability and consumption (water gap) could increase by up to 14.7% under a 3°C warming scenario, underscoring the importance of water accounting as a tool for projecting resource risk.

In terms of principles, Vardon et al. (2023) emphasize three elements that must be inherent in a water accounting system: (1) transparency, data must be publicly verifiable to ensure accountability; (2) comparability, information must enable analysis across time and regions; and (3) assessment of the economic value of water, water is recognized as an economic asset that contributes to added value and social welfare. Water accounting, therefore, serves not only as an environmental measurement tool but also as a policy instrument for green fiscal governance. The integration of SEEA-Water, WA+, and GRI 303 enables the preparation of a national water balance that supports public spending efficiency, water risk mitigation, and the achievement of SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action) targets. In the Indonesian context, this approach can serve as the basis for developing Water Accounting for Public Finance at the ministerial and local government levels, ensuring that green fiscal policies reflect sustainable water resource management.

Green Fiscal Policy (Green Fiscal Governance)

Green fiscal governance is a public policy framework that integrates environmental and climate change considerations into the entire fiscal cycle, encompassing planning, budgeting, implementation, and reporting. According to the OECD, effective green fiscal governance requires transparency, accountability, effectiveness, and cross-sectoral policy coherence to ensure that public resource management supports sustainable development outcomes (OECD, 2015). This approach emphasizes the importance of coordination between fiscal, environmental, and development planning institutions to achieve an efficient use of natural resources, including water, and reduce fiscal risks associated with environmental degradation.

In developing its concept, the OECD also emphasized that effective green fiscal governance requires integration between financial and environmental data (OECD, 2024a). This framework outlines three main pillars: green budgeting, environmental fiscal reform, and sustainability reporting. Green budgeting acts as an instrument that identifies and characterizes government budget allocations based on their impact on environmental and climate objectives. In contrast, environmental fiscal reform emphasizes adjusting fiscal incentives through taxes or subsidies to promote more environmentally friendly economic behavior. The final pillar, sustainability reporting, serves to evaluate the environmental outcomes of public spending in a transparent and auditable manner. These three pillars, when implemented simultaneously, form a fiscal system that is not only economically efficient but also ecologically responsible.

The concept of green budgeting has become a central tool in implementing green fiscal policies in various countries. According to the OECD, green budgeting is defined as a public budgeting process that assesses a program's contribution to environmental and climate change goals through a transparent classification system (OECD, 2024b). This approach includes an ex-ante assessment to assess environmental impacts before budget approval and an ex-post evaluation to assess the effectiveness of its implementation. Several countries, including France, Ireland, and South Korea, have implemented green budget tagging systems to ensure that fiscal policies support the transition to a low-carbon economy (OECD, 2024).

In Indonesia, the implementation of green fiscal policy has been operationalized through the Climate Budget Tagging (CBT) mechanism developed by the Fiscal Policy Agency in collaboration with Bappenas and the Ministry of Environment and Forestry (Badan Kebijakan Fiskal, 2023). CBT is a tagging system in the state budget (APBN) that identifies and classifies government spending based on its contribution to climate change mitigation and adaptation. Since 2016, Indonesia has been one of the first developing countries to implement CBT at the national level. The implementation results indicate that Indonesia's climate spending accounts for approximately 4.1% of the total APBN, with the majority allocated to the energy, transportation, forestry, and water management sectors (Badan Kebijakan Fiskal, 2023). This mechanism demonstrates the potential for implementing environmental budget tagging for other resources, such as water, as a step toward integrating environmental accounting into national fiscal policy.

Green fiscal policy also plays a crucial role in enhancing public accountability. With a reporting system that links fiscal output to environmental impact, the government can assess the

effectiveness of its programs and evaluate the alignment of public spending with its sustainable development commitments. This approach aligns with the principle of an open and data-driven government, as emphasized by the OECD, which stresses that the publication of green budgeting information helps to promote transparency, accountability, and citizen participation (OECD, 2024b). In this context, environmental accounting-based reporting, such as SEEA-Water, can serve as a fiscal evaluation instrument that more accurately measures the impact of policies on natural resources.

Thus, green fiscal policy serves as a bridge between environmental resource management and fiscal governance. Integrating water accounting data into the public budgeting system will strengthen oversight of resource use, improve spending efficiency, and support the achievement of the Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action) and SDG 6 (Clean Water and Sanitation). In the Indonesian context, strengthening green fiscal governance through the use of water accounting at the national and regional levels has the potential to drive fiscal reform toward a budgeting system that is oriented towards environmental and social outcomes.

Integration of Water Accounting and Green Fiscal

The integration of water accounting into green fiscal policy represents an effort to link environmental data with the fiscal decision-making process. This approach stems from the basic principles of Environmental-Economic Accounting (EEA), which emphasizes the importance of integrating economic and environmental systems through the preparation of integrated accounts. As stated by the United Nations, environmental-economic accounting integrates environmental and economic information to provide a more comprehensive and consistent framework for analysis and policy design (United Nations, 2012). In a fiscal context, this integration enables the government to assess how budget policies, public investment, and development spending contribute to sustainable water resource management. Thus, water accounting serves not only as a measurement tool but also as an instrument of results-based fiscal governance.

This concept aligns with the view of Vardon et al. (2023), who assert that the successful implementation of water accounting depends on the government's ability to integrate water resource measurement results into the national planning and budgeting system. Through this integration, water accounting information can be used to assess policy efficiency, identify pressures on water resources, and allocate budgets based on evidence (evidence-based budgeting). Water accounting has been implemented in Australia through the Water Act 2007, with the Australian Bureau of Statistics and the Bureau of Meteorology producing regular national water accounts (Vardon et al., 2025). In South Africa, Statistics South Africa has developed national water accounts based on the SEEA framework to monitor the physical and monetary flows of water resources (Maila et al., 2018).

According to the ADB, FAO, and World Bank, implementing water accounting in developing countries requires a phased approach that involves institutional integration among statistical agencies, environmental ministries, and finance ministries (ADB et al., 2020). This model is known as policy-data-budget linkage, where environmental accounting data are transformed into a budgeting framework that supports sustainable development goals. In a green fiscal

context, data from water accounts can be used to assess the impact of public spending on water resource sustainability and water use efficiency across regions. Recent studies in India and China highlight how climate change and increasing water demand are intensifying water gaps and driving the need for improved water resource accounting and management frameworks (Lyu et al., 2025; Rosa & Sangiorgio, 2025).

The integration of water accounting into green fiscal policy can also strengthen the practices of green budgeting and climate budget tagging that have been developed in Indonesia. The Fiscal Policy Agency noted that the Climate Budget Tagging (CBT) system in the State Budget (APBN) can be expanded to include natural resource dimensions, including water (Badan Kebijakan Fiskal, 2023). By utilizing data from the Indonesian Clean Water Statistics and Environmental Statistics (Badan Pusat Statistik, 2024a, 2024b), the government can identify programs and activities that have a direct impact on water availability and quality. This approach opens up opportunities for the development of Environmental Budget Tagging (EBT), which involves categorizing public spending based on its environmental impact and water resource utilization. Thus, water accounting has the potential to become a fiscal reporting tool that measures the budget's contribution to water resource management and the achievement of SDG 6 (Clean Water and Sanitation).

In addition to supporting environmental spending tracking, integrated water accounting also provides institutional benefits. According to the OECD, effective green fiscal governance requires coordination among fiscal, planning, and statistical institutions to ensure the consistent use of environmental data in budget decision-making (OECD, 2024b). In this context, Bappenas, the Ministry of Finance, and BPS play a key role in harmonizing data and reporting systems to establish a cross-ministerial Water Accounting Unit. This institution will serve as a national coordinator, ensuring consistency between fiscal reports, statistical data, and environmental policies.

The integration of water accounting and green fiscal policy in Indonesia has the potential to create a reporting system that integrates economic, social, and ecological dimensions. By adopting the SEEA-Water framework and the OECD's green fiscal governance principles, the government can develop a Green Water Accounting Framework. This system not only measures water stocks and flows but also assesses fiscal contributions to the sustainability of water resources. This approach strengthens the role of public accounting as an instrument of fiscal and environmental accountability, moving Indonesia toward the full implementation of data-driven fiscal governance in the era of the green economy.

Methodology

This study employed a descriptive qualitative approach with a scoping review method. This approach was chosen to map the extent to which concepts, policies, and data systems supporting water accounting integration have developed within the context of green fiscal policy in Indonesia. The scoping review method enabled researchers to identify the scope and availability of policy evidence, as well as potential implementation gaps at the national level. The review process followed the PRISMA-ScR (Preferred Reporting Items for Systematic

Reviews and Meta-Analyses Extension for Scoping Reviews) guidelines as developed by Tricco et al. (2018), which emphasizes the importance of transparency, systematization, and traceability at every stage of data identification, selection, extraction, and synthesis.

The data used are secondary and obtained from official documents of international and national institutions relevant to the topics of water accounting, the environment, and green fiscal policy. A total of twenty-two documents were analyzed. International sources include the System of Environmental-Economic Accounting for Water (SEEA-Water) (United Nations, 2012), System of Environmental-Economic Accounting-Ecosystem Accounting (United Nations, 2024), Water accounting for water governance and sustainable development (Food and Agriculture Organization & World Water Council, 2018), Making water accounting operational (ADB et al., 2020), OECD principles on water governance (OECD, 2015), green budgeting (OECD, 2024b), GRI 303: Water and Effluents (Global Reporting Initiative, 2025), international water accounting (Water Accounting Standards Board, 2011) and academic publications by Vardon et al. (2012, 2025).

The national documents consist of ten central policies and regulations, namely Law Number 17 of 2019 concerning Water Resources (Undang-Undang RI, 2019), Law Number 32 of 2009 concerning Environmental Protection and Management (Undang-Undang RI, 2009), Law Number 1 of 2022 concerning Financial Relations between the Central and Regional Governments (Undang-Undang RI, 2022), Law Number 59 of 2024 concerning the 2025-2045 RPJPN (Undang-Undang RI, 2024), Government Regulation Number 122 of 2015 concerning Drinking Water Supply Systems (Peraturan Pemerintah, 2015), Presidential Regulation Number 12 of 2025 concerning the 2025-2029 RPJMN (Peraturan Presiden RI, 2025), Presidential Regulation Number 37 of 2023 concerning the National Water Resources Policy (Undang-Undang RI, 2023), the 2019-2021 Climate Change Mitigation and Adaptation Budget Report (Badan Kebijakan Fiskal, 2023), the Water Resources Performance Report (Direktorat Jenderal Sumber Daya Air, 2025), and the Technocratic Plan of the Master Roadmap for Safe Drinking Water in Indonesia (United Nations Children's Fund, 2024). Two national statistical documents serve as the primary empirical data sources: the Clean Water Statistics 2019-2023 (Badan Pusat Statistik, 2024a) and the Indonesian Environmental Statistics 2024 (Badan Pusat Statistik, 2024b). These documents were compiled in accordance with the SEEA framework and provide physical and monetary data related to water resources at the national level.

The identification and selection process was conducted in stages through searches on the official websites of publishing institutions. Documents were selected if they contained concepts related to water accounting, environmental-economic accounting, green fiscal policy, or national policies concerning water management. Conceptual, regulatory, and data-based sources were included in the review, while irrelevant publications were excluded. Each document meeting the criteria was extracted based on information regarding the publishing institution, year of publication, policy scope, primary objectives, and relevance to the integration of water accounting within a green fiscal context.

The analysis was conducted through document content analysis and thematic synthesis as recommended in the PRISMA-ScR framework and the Joanna Briggs Institute (JBI) Manual (Peters et al., 2017). In the initial stage, key concepts such as SEEA-Water, budget tagging, green fiscal governance, and sustainable water management were identified. Subsequently,

all information was categorized into four areas of analysis: (1) global water accounting framework and reporting standards, (2) national environmental policies and regulations, (3) green fiscal policy, and (4) national institutions and data systems. The synthesis was conducted to explore the interconnections between these areas to illustrate Indonesia's readiness to adopt water accounting under green fiscal policy. Validity and reliability were ensured by verifying that all data sources originated from official international and national institutions. Each document was verified based on the publisher's legitimacy, policy context, and the currency of the information. Transparency in the selection, recording, and analysis processes was maintained by adhering to the PRISMA-ScR principles as described by Tricco et al. (2018) to ensure that the study results could be replicated and independently verified.

Results and Discussions

Results

The results of the study indicate that the integration of water accounting into green fiscal policy in Indonesia has an adequate methodological, regulatory, and empirical basis. Based on a review of 20 international and national documents, the findings of this study are grouped into four areas of analysis, namely: (1) the global water accounting framework and reporting standards, (2) national policies and environmental regulations, (3) green fiscal policy, and (4) national institutions and data systems. These four areas are interconnected and illustrate Indonesia's conceptual, institutional, and fiscal readiness to adopt water accounting as part of sustainable fiscal governance.

In general, international documents such as the System of Environmental-Economic Accounting for Water (SEEA-Water) (UN, 2012), GRI 303: Water and Effluents (GRI, 2021), and Green Fiscal Governance (OECD, 2024) provide a conceptual foundation for measuring and reporting water resources that integrate physical, economic, and social aspects. Meanwhile, national policies such as the 2019 Water Resources Law, the 2025–2029 National Medium-Term Development Plan (RPJMN), and the Fiscal Policy Agency (BKF, 2023) report on Climate Budget Tagging demonstrate that the government has established a green fiscal system compatible with the implementation of water accounting. Furthermore, the statistical publication by BPS (2024) has provided empirical data that aligns with the structure of the System of Environmental-Economic Accounting (SEEA) and can serve as a basis for compiling national water accounts.

Table 1 Summary of Findings Based on Four Areas of Analysis

Field of Analysis	Main Document	Focus of Findings	Contribution to Water Accounting Integration
1. Global Framework for Water Accounting and Reporting Standards	1. UN (2012) 2. UN (2021) 3. FAO (2018) 4. ADB-FAO-World Bank (2020) 5. OECD (2015)	Describes the SEEA-Water methodology, GRI 303 reporting guidelines, and environmental and fiscal integration in	To be a conceptual and technical reference for the preparation of water accounts and integrated environmental

	6. OECD (2024) 7. GRI (2021) 8. Water Accounting Standards Board (2011) 9. Vardon et al. (2012) 10. Vardon et al. (2025)	Green Fiscal Governance.	reporting in fiscal policy.
2. National Policy and Environmental Regulations	1. Law No. 17/2019 2. Law No. 32/2009 3. Law No. 1/2022 4. Law No. 59/2024 5. Government Regulation No. 122/2015 6. Presidential Regulation No. 12/2025 7. Presidential Regulation No. 37/2023	Affirming the public's right to water, the state's responsibility in managing water resources, and the direction of long-term sustainable development.	Provides a legal basis and national policy direction for implementing water accounting systems in the public sector.
3. Green Fiscal Policy	1. Fiscal Policy Agency (2023) 2. OECD (2024) 3. UNICEF (2024)	Demonstrates the application of Climate Budget Tagging (CBT) and opportunities for expansion to Environmental Budget Tagging for the water sector.	Provide fiscal mechanisms and policy instruments to integrate water reporting into public budgeting.
4. National Data Institutions and Systems	1. Central Bureau of Statistics (2024a) 2. Central Bureau of Statistics (2024b) 3. Directorate General of Water Resources (2025)	Presents physical data, distribution, economic value, and water quality compiled with reference to SEEA.	To provide an empirical foundation for the preparation of national water accounts and support cross-agency coordination in environmental data-based fiscal policies.

The findings in Table 1 demonstrate that all system components necessary for implementing water accounting are already in place in Indonesia. From a methodological perspective, SEEA-Water provides a statistical framework that can be adapted by Statistics Indonesia (BPS) as a basis for compiling national water accounts. From a regulatory perspective, the Water Resources Law and the 2025-2029 National Medium-Term Development Plan (RPJMN) provide strong policy legitimacy for integrating water indicators into development planning.

In the fiscal realm, the BKF (2023) report indicates that Climate Budget Tagging has become a green fiscal practice, enabling the measurement of budget performance based on environmental outcomes. Meanwhile, BPS (2024) data serve as an empirical backbone, enabling the consolidation of water data across ministries and local governments. Overall,

the results of this study confirm that Indonesia is at the "readiness to adopt" stage for implementing water accounting within green fiscal policy. The following steps are required, including data harmonization between institutions, the establishment of a national Water Accounting Unit (WAU) to coordinate water data integration, and the implementation of a regional fiscal incentive system based on environmental reporting.

Discussion

Conceptual Integration between Water Accounting and Green Fiscal Policy

The integration of water accounting into green fiscal policy represents a paradigm shift in public financial management, transitioning from mere input control to result-based green governance. According to the United Nations, in its System of Environmental-Economic Accounting for Water (SEEA-Water), water is considered an economic asset with dual value, as both a natural resource and a factor of production within the economic system (United Nations, 2012). SEEA-Water provides a statistical framework that links physical information (water stocks and flows) with monetary information (the economic value of water) to measure the relationship between human activities and water resource availability. By providing both physical and monetary accounts, this system helps governments assess the extent to which economic and fiscal policies impact the sustainability of national water resources.

This integration concept is reinforced by Hoekstra (2019) through the green–blue water accounting approach, which distinguishes between rainwater stored in the ground (green water) and surface water or groundwater that is economically released (blue water). This approach emphasizes that water sustainability must be measured not only by its physical availability, but also by its economic value and the efficiency of its use in production and consumption. In a fiscal context, this information is relevant for assessing the effectiveness of government spending on water management, particularly in the agriculture, energy, and sanitation sectors, which are important components of the national development budget.

Meanwhile, the environmental reporting standard GRI 303: Water and Effluents extend the concept of water accounting to the organizational level. This standard requires public and private entities to disclose quantitative data on water withdrawal volumes, water sources, and wastewater treatment, taking into account the risks associated with areas prone to drought (Global Reporting Initiative, 2025). The principles of transparency and comparability embodied in GRI 303 align with the values of public accountability, also upheld by the green fiscal system (Global Reporting Initiative, 2025). By adapting GRI 303 reporting principles at the public sector level, such as regional water companies (PDAM) or irrigation management institutions, the government can build integration between micro (organizational) and macro (national) reporting within the green fiscal reporting system.

On the other hand, the OECD emphasizes that green fiscal governance can only be effective if environmental data is integrated into the fiscal cycle from planning and budgeting to reporting (OECD, 2015, 2024b). According to the OECD (2024), integrating environmental data into fiscal policy enhances transparency and accountability by providing the public with clear information on how government budgets contribute to environmental and climate objectives.

In this context, water accounting can function as a supporting mechanism by generating measurable environmental performance indicators based on physical and economic water data. (OECD, 2024b). These indicators can complement green budgeting instruments, including Climate Budget Tagging (CBT), by offering an empirical basis to evaluate how public spending contributes to sustainable water resource management.

Furthermore, Delavar et al. (2022) show that model-based water accounting can integrate multiple physical components of water resources to support scenario assessment and decision-making at the basin level. Chen et al. (2025) further demonstrate that linking physical water flows with economic valuation through the SEEA framework can strengthen policy analysis by providing more comprehensive information on water allocation and ecosystem service values. This approach is consistent with the policy–data–budget linkage promoted by the ADB, FAO, and World Bank, which emphasizes that environmental data, including water accounts, should inform policy and investment decisions to ensure alignment between development objectives and the sustainability of natural resources (ADB et al., 2020).

This integration concept also intersects with the concept of Environmental Financial Accounting (EFA), as proposed by Grafl (2021), which places environmental reporting within the framework of public sector financial accounting. Grafl (2021) asserts that a government's fiscal reporting system should not only record financial flows but also the environmental and social impacts resulting from public spending. In the context of water accounting, EFA provides an approach that combines hydrological data, social indicators, and government financial records to assess the economic value of water and the fiscal risks associated with water resource degradation. By integrating EFA and SEEA-Water, the government can build a fiscal reporting system that is not only financially transparent but also ecologically accountable.

Conceptually, the integration of water accounting and green fiscal policy in Indonesia can be viewed as a form of evidence-based green governance, where budget decisions are based on verifiable environmental indicators. By combining the principles of SEEA-Water, GRI 303, and the OECD's Green Budgeting, the fiscal system can be transformed into a policy instrument that balances economic growth and environmental conservation. This integration not only strengthens green fiscal governance but also supports the achievement of Sustainable Development Goals (SDG) 6 (Clean Water and Sanitation) and SDG 13 (Climate Action) through budgeting mechanisms based on environmental outcomes and scientific evidence.

Thus, conceptually, Indonesia already has an adequate foundation for linking its water reporting system and its green fiscal system. The next challenge is to institutionalize this integration operationally, so that water accounting extends beyond statistical reporting and becomes a sustainable tool for evaluating fiscal performance in public decision-making.

National Regulatory and Policy Readiness

Indonesia's readiness to integrate water accounting into green fiscal policy is primarily determined by the clarity and consistency of the legal framework governing water resource management, the environment, and fiscal relations between the central and regional governments. In this context, Law Number 17 of 2019 concerning Water Resources is a key milestone, affirming the state's role as manager and guarantor of the people's right to water (Undang-Undang RI, 2019). This law positions water as a public good whose use must be based on the principles of justice, sustainability, and efficiency. This regulation provides conceptual legitimacy for the implementation of a water accounting system by requiring transparent measurement, monitoring, and reporting of water availability and utilization throughout Indonesia.

Operational provisions regarding clean water services are outlined in Government Regulation No. 122 of 2015 concerning Drinking Water Supply Systems, which establishes the responsibilities of central and regional governments in ensuring the availability and quality of drinking water services (Peraturan Pemerintah, 2015). This regulation strengthens the accountability mandate of regional governments by obligating them to prepare performance and financial reports on the management of drinking water supply systems. This provision can serve as an entry point for implementing water accounting principles at the regional level, particularly for regionally owned enterprises (BUMD) in the water sector, as it enables synchronization between physical data (capacity, distribution, and quality) and financial reports that are part of the national fiscal system.

From a comprehensive water resources governance perspective, Presidential Regulation No. 37 of 2023 concerning the National Water Resources Policy establishes a strategic direction for water management, encompassing conservation, utilization, control of water's destructive potential, and strengthening of institutions and data (Undang-Undang RI, 2023). This document emphasizes the importance of cross-agency data integration and policy harmonization across river basins. In the context of water accounting, this regulation reinforces the need for an integrated information system that can link water balances with development planning and public budgeting.

From an environmental perspective, Law Number 32 of 2009 concerning Environmental Protection and Management serves as the legal basis for the implementation of environmental economic instruments. Article 42 of the law states that the government may use environmental economic instruments to support the preservation of natural resources and the environment (Undang-Undang RI, 2009). This clause opens up space for integrating water accounting data into environmental budgeting and fiscal incentive mechanisms. Thus, Indonesia has normatively recognized the importance of measuring the economic value of natural resources as a basis for public policy, in line with the principles of environmental-economic accounting as stipulated in the SEEA-Water (United Nations, 2012).

The link between water resources management and fiscal policy is strengthened through Law Number 1 of 2022 concerning Financial Relations between the Central Government and Regional Governments (HKPD). This regulation introduces the principle of performance-based fiscal decentralization and its impact on development outcomes. Through the performance-based Fiscal Incentive Fund (DIF) and Special Allocation Fund (DAK) mechanisms, the

government can assess the effectiveness of regional spending on national priorities, including environmental and water resource management (Undang-Undang RI, 2022). The integration of water accounting in this context is relevant because it can provide measurable indicators that demonstrate the contribution of regional spending to improving access to clean water, conservation, and efficient water use.

From a development planning perspective, the 2025-2029 National Medium-Term Development Plan (RPJMN) and the 2025-2045 National Medium-Term Development Plan (RPJPN) explicitly position water resources management as an integral part of the national green development agenda. Both documents emphasize the importance of a green economy, cross-regional water resources management, and increased regional fiscal capacity to support climate change adaptation (Peraturan Presiden RI, 2025; Undang-Undang RI, 2024). In this context, water accounting plays a strategic role as a reporting system that links environmental data with green economic development indicators.

Fiscal policy support for water accounting integration is reinforced by the Fiscal Policy Agency's Climate Budget Tagging (CBT) report, which establishes CBT as Indonesia's primary mechanism for identifying and tracking government spending related to climate change mitigation and adaptation (Badan Kebijakan Fiskal, 2023). Although the current tagging structure focuses mainly on the energy, forestry, and transportation sectors, the framework provides a basis for potential expansion to other environmental domains, including water resource management. This direction is consistent with OECD, which emphasizes the importance of budget classification systems that transparently link public expenditure to environmental and climate outcomes as part of green budgeting practices (OECD, 2024b).

Thus, the research on the regulatory framework indicates that Indonesia has an adequate legal and policy basis to support the implementation of water accounting. The 2019 Water Resources Law and the 2022 Water Resources and Water Resources Management Law provide legal legitimacy, Government Regulation 122/2015 provides the operational basis for drinking water services, while Presidential Regulation 37/2023, the National Medium-Term Development Plan (RPJMN), and the National Medium-Term Development Plan (RPJPN) establish the strategic direction for green development that places water as a national priority. Although this normative framework is robust, key challenges remain in inter-institutional harmonization and cross-sectoral data integration. Thus, regulatory readiness has been established, but its technocratic implementation requires institutional synergy and adequate fiscal capacity support.

Fiscal Dimension and Environmental Budgeting

Fiscal policy is a strategic instrument in realizing sustainable development because it determines the direction of public resource allocation and measures national economic performance. In this context, water accounting can serve as a reporting mechanism that links environmental dimensions with fiscal policy through a green budgeting approach. According to the OECD, green budgeting is a budgeting process that assesses the impact of fiscal policy on environmental and climate change objectives (OECD, 2024b). This framework emphasizes the importance of utilizing environmental data at every stage of the budget cycle, from planning and implementation to evaluation, ensuring that fiscal decisions are based on evidence (evidence-based policy) (OECD, 2024b). The integration of water accounting into the

public budgeting system aligns with this framework because it allows the government to assess the extent to which public spending contributes to water management, resource conservation, and the achievement of green development targets.

The green budgeting concept in Indonesia is implemented through the Climate Budget Tagging (CBT) mechanism, developed by the Fiscal Policy Agency (BKF) in collaboration with the Ministry of Environment and Forestry and Bappenas (Badan Kebijakan Fiskal, 2023). The CBT system serves as an instrument for tracking and identifying budget activities that support climate change mitigation and adaptation. Through CBT, the government has mapped activities that contribute to the green transition across various sectors. However, the current CBT classification still focuses on the energy, transportation, forestry, and waste sectors, while the water resources sector has not been explicitly accommodated (Badan Kebijakan Fiskal, 2023). This indicates room for development to expand the scope of budget tagging to include the water sector as one of the pillars of climate change adaptation that is crucial for environmental and social resilience.

This direction is consistent with OECD, which highlights the importance of budget classification systems that link public expenditure with environmental and climate objectives as part of green budgeting practices (OECD, 2024b). In this context, water accounting can serve as a technical instrument to identify, measure, and report the contribution of public spending to water resource management. Water accounting data based on the SEEA-Water can be used to assess how fiscal interventions relate to environmental outcomes, such as improvements in clean water availability, more efficient water use in agriculture and industry, and reductions in non-revenue water (United Nations, 2012).

The integration of water accounting into fiscal policy is also in line with the reform direction outlined in Law Number 1 of 2022 concerning Financial Relations between the Central Government and Regional Governments (HKPD). Through the Fiscal Incentive Fund (DIF) and performance-based Special Allocation Fund (DAK) mechanisms, the government can provide incentives to regions that successfully achieve water management and environmental conservation targets (Undang-Undang RI, 2022). Water accounting data can be used to develop fiscal-water performance indicators, such as the water efficiency ratio per unit of public spending or the level of improvement in household access to clean water. Thus, water accounting has the potential to become a basis for evaluating fiscal effectiveness, measuring not only economic output but also the environmental impact of public budget use.

This view aligns with Vardon et al. (2023), who emphasize the importance of the linkage between policy, data, and budget (policy–data–budget linkage) in sustainable fiscal governance. According to them, integrating environmental data into the fiscal process can improve government accountability and transparency in managing public resources. In the Indonesian context, the implementation of water accounting can strengthen the results-based green budgeting system, where fiscal decisions are based not only on sectoral needs but also on measurable environmental effectiveness.

However, implementing this integration still faces institutional and technical challenges. Environmental data produced by Statistics Indonesia (BPS), the Ministry of Environment and Forestry (KLHK), and the Ministry of Public Works and Housing (PUPR) are not yet fully connected to the budgeting system managed by the Ministry of Finance. As a result,

environmental spending reporting does not reflect the actual impact on water management. To address this, an integrated fiscal-environmental reporting system is needed that links national water accounts with budget planning and evaluation processes. Climate Budget Tagging, combined with water accounting data, can provide an objective and transparent instrument to measure fiscal contributions to environmental outcomes.

Thus, the integration of water accounting into Indonesia's fiscal and public budgeting systems is not only a technocratic innovation but also part of broader fiscal governance reforms aimed at enhancing transparency, accountability, and sustainability. This approach will strengthen Indonesia's position in the transition to green fiscal governance, expand the scope for tracking environmental spending through Environmental Budget Tagging, and provide a strong measurement basis for achieving Sustainable Development Goals (SDG) 6 (Clean Water and Sanitation) and SDG 13 (Climate Action).

National Water Accounting Institutions and Data Systems

Institutions and data systems are fundamental elements in implementing water accounting in the public sector. Regulatory readiness and green fiscal policies will be challenging to implement without the support of an accurate, consistent, and integrated data infrastructure. In the Indonesian context, the Central Statistics Agency (BPS) holds a strategic position as the National Statistical Authority responsible for providing environmental and economic data. Through the publication of the 2019-2023 Clean Water Statistics (Badan Pusat Statistik, 2024a) and the 2024 Indonesian Environmental Statistics (Badan Pusat Statistik, 2024b), BPS has adopted some of the principles of the SEEA-Water by presenting data on water stock, distribution, and consumption at the national and regional levels. The data have been classified by water source, sector of use, volume, and economic value, making it a relevant initial foundation for establishing national water accounts.

In addition to BPS, the Directorate General of Water Resources (DGWR) of the Ministry of Public Works and Public Housing (PUPR) has a crucial mandate in collecting and managing data on river basins and national hydrological conditions. The DGWR report emphasized the need for integrating data on water conservation, utilization, and control of destructive forces to support evidence-based decision-making (Direktorat Jenderal Sumber Daya Air, 2025). This aligns with Presidential Regulation No. 37 of 2023 concerning the National Water Resources Policy (Undang-Undang RI, 2023), which emphasizes the importance of cross-agency data harmonization and an integrated water information system in development planning and evaluation.

The completeness of data from Statistics Indonesia (BPS) and the Directorate General of Water Resources (DGWR) demonstrates progress toward compiling a national water balance; however, the main challenge remains harmonizing data sources across ministries. As noted by Maleimau et al. (2024), Indonesia's water accounting system remains sectoral and is not fully integrated with the fiscal system. For example, the Ministry of Public Works and Public Housing (PUPR) manages data on water infrastructure and irrigation networks, and the Ministry of Environment and Forestry (KLHK) manages data on water quality and pollution. In contrast, the Ministry of Finance manages budgeting data. Each agency employs different classifications and methodologies, making it challenging to establish an integrated water accounting system that can serve as a unified basis for fiscal decision-making.

National statistical institutions already have a methodological framework that enables this integration. Vardon et al. (2023) emphasize that the success of water accounting at the national level depends heavily on cross-institutional coordination between data providers, policymakers, and fiscal institutions. They suggest the establishment of a national Water Accounting Unit (WAU) tasked with consolidating cross-sectoral data and ensuring methodological alignment between institutions. In the Indonesian context, this idea aligns with the role of Statistics Indonesia (BPS) as data coordinator and the One Data Indonesia principle, which calls for uniformity in reference codes, metadata, and data quality standards. The establishment of a WAU under the coordination of BPS, the Ministry of Finance, and the Directorate General of Water Resources (DGWR) could be a concrete step towards integrating water data into the national green fiscal system.

Furthermore, strengthening data systems also requires adopting an open data approach and digitizing environmental reporting. The OECD emphasizes the importance of data transparency in green fiscal policy, where government-generated environmental data must be publicly accessible and used to assess the effectiveness of public spending (OECD, 2024b). In the context of water accounting, this data transparency will strengthen public participation and accountability in water management. For example, national water balance data can be used by local governments to develop evidence-based water conservation policies, while research institutions can develop fiscal-environmental evaluation models. This approach also strengthens the linkages between national statistical systems, fiscal institutions, and sustainable development planning.

However, although the data capacity of BPS and the Directorate General of Water Resources has increased, the main challenge remains data interoperability and continuity across time. The United Nations emphasizes in its System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA-EA) that environmental accounting requires temporal consistency to assess changes in natural resource stocks accurately (United Nations, 2024). In Indonesia, water data from various agencies is still produced with varying frequencies and formats, making longitudinal analysis of changes in water availability and efficiency of its use difficult. Therefore, strengthening the SEEA-based reporting system is necessary to enable the periodic preparation of water accounts and integration with government financial reports.

Water accounting institutions must also be synergized with fiscal planning mechanisms. Coordination among Statistics Indonesia (BPS), the Fiscal Policy Agency (BKF), and the National Development Planning Agency (Bappenas) is crucial to ensure that environmental data are used consistently in the planning and budgeting cycle. This coordination model could emulate practices implemented in Australia and South Africa, where statistical and fiscal units collaborate to compile environmental-economic accounts, informing public spending decisions. Such synergy would strengthen the implementation of Climate Budget Tagging (CBT) and expand it into a more comprehensive Environmental Budget Tagging (EBT), as recommended by the OECD.

Thus, the institutional and data systems analysis indicates that Indonesia has a strong statistical and institutional foundation for developing water accounting; however, its integration into the fiscal system remains a potential area for improvement. Publications from

Statistics Indonesia (BPS) and the Directorate General of Water Resources (DGWR) have provided an empirical basis consistent with the SEEA-Water framework. In contrast, the One Data Indonesia policy provides a coordinating framework that supports data interoperability across agencies. The next step is the establishment of a national Water Accounting Unit (WAU) to ensure methodological uniformity, data consistency across sectors, and the utilization of water accounting results in green fiscal policy. This step would mark a transition from a descriptive statistical approach to a comprehensive, results-oriented, environmental data-driven fiscal system.

System Integration and Indonesia's Readiness Stage

This research demonstrates that Indonesia already has a mutually supportive methodological, regulatory, fiscal, and institutional framework for integrating water accounting into green fiscal policy. Although these four elements are still developing sectorally, their integration is beginning to take shape through various national initiatives in water resources management, environmental statistics, and results-based budgeting. This confirms that Indonesia has reached the readiness to adopt stage, a phase in which all conceptual and structural prerequisites for water accounting implementation are in place and can be operationalized through cross-institutional synergy.

From a methodological perspective, the application of the SEEA-Water framework provides a strong conceptual basis for systematically measuring water stocks, flows, and economic value (United Nations, 2012). Publications by Statistics Indonesia (BPS), such as the Clean Water Statistics 2019-2023 and the Indonesian Environmental Statistics 2024, demonstrate that the national statistical system has partially adopted a reporting structure compatible with SEEA-Water (Badan Pusat Statistik, 2024b, 2024a). The availability of this data illustrates the achievement of data readiness, where physical and economic water information can be utilized to support fiscal policy analysis and sustainable development planning.

From a regulatory perspective, Law Number 17 of 2019 concerning Water Resources and Law Number 1 of 2022 concerning Financial Relations between the Central Government and Regional Governments (HKPD) demonstrate the integration of environmental policies and a performance-based fiscal system. Furthermore, Presidential Regulation Number 37 of 2023, concerning the National Water Resources Policy, provides strategic direction for the conservation, utilization, and control of water resources, which necessitates cross-agency data integration. Together with the 2025-2029 National Medium-Term Development Plan (RPJMN) and the 2025-2045 National Medium-Term Development Plan (RPJPN), this regulatory framework affirms the legal and political legitimacy of water resources management as part of national green development. Therefore, from a policy and legal perspective, this study indicates that Indonesia has achieved policy readiness to integrate water accounting into a sustainable fiscal system.

From a fiscal perspective, the Climate Budget Tagging (CBT) mechanism developed by the Fiscal Policy Agency (BKF) demonstrates the readiness of fiscal instruments to identify and track public spending that contributes to climate change mitigation and adaptation. Although the water resources sector is not yet explicitly covered by the CBT classification, this system can be expanded through the Environmental Budget Tagging (EBT) approach, as recommended by the OECD. Integrating water accounting into budgeting systems, such as

CBT and EBT, will enhance the government's capacity to evaluate fiscal effectiveness in terms of environmental outcomes. Therefore, this study demonstrates that Indonesia has achieved instrumental readiness to implement fiscal policies that measurably link environmental data and budget performance.

From an institutional perspective, coordination between agencies such as BPS, BKF, Bappenas, KLHK, and PUPR is a crucial element in supporting the sustainability of national water accounting. The Directorate General of Water Resources also emphasized the need for integrated hydrological data and river basin information systems to support cross-sectoral policies (Direktorat Jenderal Sumber Daya Air, 2025). Vardon et al. (2023) emphasized that successful water accounting implementation requires collaboration between statistical, fiscal, and planning institutions to maintain methodological consistency and data accuracy. In the Indonesian context, the One Data Indonesia policy and BPS's role as the national statistics coordinator have provided a strong coordinating foundation. This reflects institutional readiness, namely structural readiness that enables the effective implementation of water accounting under cross-institutional coordination.

Thus, this study confirms that Indonesia has the conceptual and structural readiness to adopt water accounting as part of a green fiscal policy. The four dimensions-methodological, regulatory, fiscal, and institutional-have formed a relatively integrated framework, although improvements in data harmonization and inter-institutional coordination are still needed. In this context, water accounting integration in Indonesia can be viewed not as a conceptual idea but as a system ready to be consolidated to support transparent, accountable, and environmentally sustainable fiscal policies.

Conclusions

This study confirms that Indonesia has strong prerequisites for integrating water accounting into green fiscal policy. The analysis revealed that conceptual, regulatory, fiscal, and institutional frameworks are in place, although implementation remains partial. From a methodological perspective, the national statistical system has partially adopted a reporting structure compatible with the environmental accounting framework, indicating readiness to establish a measurable national water account. From a policy perspective, there is integration between the water resources management agenda, green development planning, and a performance-based fiscal system. Regulatory support and national development direction demonstrate a strong commitment to water resource sustainability as part of a sustainable fiscal policy. On the fiscal side, the environmental budget tracking mechanism has provided the basis for developing a more comprehensive system, which could include the water sector as part of the environmental expenditure classification.

Furthermore, statistical and fiscal institutions have demonstrated the capacity to support systemic integration through cross-agency coordination. Thus, Indonesia can be said to be at the readiness-to-adopt stage, which encompasses the conceptual, regulatory, fiscal, and institutional readiness to implement water accounting within a green fiscal policy. This integration has the potential to enhance the transparency, accountability, and effectiveness

of fiscal policies focused on environmental sustainability, thereby supporting the achievement of the Sustainable Development Goals.

This research has several limitations. The scope of the analysis is limited to publicly available documents through 2025, so it may not capture all internal policies or technical initiatives that remain undocumented. The approach used focuses on mapping concepts and policies without empirical testing of implementation effectiveness, so the findings are more conceptual than quantitative. Integration between fiscal and environmental data is also difficult to track because there is no national reporting system that directly combines the two.

Future research is expected to expand this study through empirical and comparative approaches. Quantitative studies can be conducted to measure the relationship between environmental budget allocations and water management performance indicators. Cross-regional or cross-country studies can provide insights into best practices for integrating water accounting into fiscal systems. Furthermore, developing a water accounting index or fiscal-water performance indicator based on environmental data could be an important contribution to assessing the effectiveness of future green fiscal policies.

This research also has practical implications for government institutions involved in fiscal and environmental policy. Strengthening statistical systems and integrating data across sectors is necessary to ensure the availability of credible and comparable information. Developing an environmental results-based budgeting mechanism will help the government assess the effectiveness of public spending in supporting water management and natural resource sustainability. By strengthening synergies between institutions, Indonesia can accelerate the transition from the readiness stage to the full implementation of water accounting, enhance fiscal transparency, and strengthen the credibility of public environmental policies.

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