ACCOUNTING FOR WATER MANAGEMENT: A SYSTEMATIC REVIEW OF THE LITERATURE (SLR) ON WATER RESOURCES REPORTING AND MEASUREMENT

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Abstract

This study discusses the importance of accounting in water resource management through a Systematic Literature Review (SLR). Water accounting is a crucial tool to ensure transparent and sustainable reporting and measurement of water use. This study identifies challenges in reporting standards and integration with sustainability frameworks, such as the Global Reporting Initiative (GRI). In addition, it was found that water reporting is still dominated by quantitative aspects (volume), while water quality risks and impacts are less considered. The results of the study emphasize the importance of comprehensive reporting to improve transparency, accountability, and corporate reputation, especially in supporting the achievement of the Sustainable Development Goals (SDGs). Research suggestions include the development of more holistic accounting standards and the use of technology for real-time data-based water accounting.

Keyword: *Water resources management, sustainability reporting, Global Reporting Initiative, risk management, SDGs*

A. INTRODUCTION

Water resource management is a crucial issue because water is a basic need that cannot be replaced. Increasing population and industrial needs add pressure on water availability.(Saputra & Ali, 2020a),(Nugraha, 2020),(Lenny et al., 2023). Various sectors, such as agriculture, industry, and households, depend on adequate and sustainable access to water. However, poor water management can lead to environmental and social crises. Therefore, a good reporting and measurement system is needed to ensure effective water use and conservation.(Saputra & Ali, 2020b),(Arliman S, 2018),(Riharjo, 2023).

One of the main challenges in water management is the limited information on the quantity and quality of water resources. Poor or inconsistent reporting can lead to errors in policy making and inefficient management.(Triandini et al., 2019),(Ariani et al., 2022),(Dau, 2023),(Reza, 2023). For this, reliable and measurable reporting standards are needed. Accounting in water management can fill this information gap. With accounting, related parties can clearly understand the flow and use of water resources.(Roni Setiawan et al., 2023a),(Siti Munawaroh, 2020), (Irfan et al., 2020), (Zakirani et al., 2023).

Water accounting enables transparent accounting and reporting of water use, storage and allocation. The implementation of water accounting helps improve the efficiency of water use by ensuring that each sector understands their water use in detail.(Tamala Salavia et al., 2024),(Ramadani & Zakiy, 2022). In addition, accounting plays a role in increasing public accountability and oversight of water use. Governments, companies, and communities can adopt this system to monitor water resources holistically. It also supports environmental sustainability by monitoring potential ecosystem damage due to over-exploitation of water resources.(Rahayu & Sudarno, 2014),(Oeghoede, 4693),(Fakhriyah et al., 2021).

Water reporting is highly relevant in supporting the achievement of the Sustainable Development Goals (SDGs), especially those related to clean water and sanitation.(Nuwa et al., 2023),(Imani & Bayangkara, 2023). Without accurate data, it is difficult for governments and organizations to monitor progress in achieving SDGs targets. Effective reporting facilitates the evaluation and improvement of policies related to clean water access and efficiency of its use. Therefore, the integration of accounting in

water resource reporting is essential. A transparent reporting system will help create better and more sustainable water management.(Djamaluddin, 2023),(Fadilah et al., 2024).

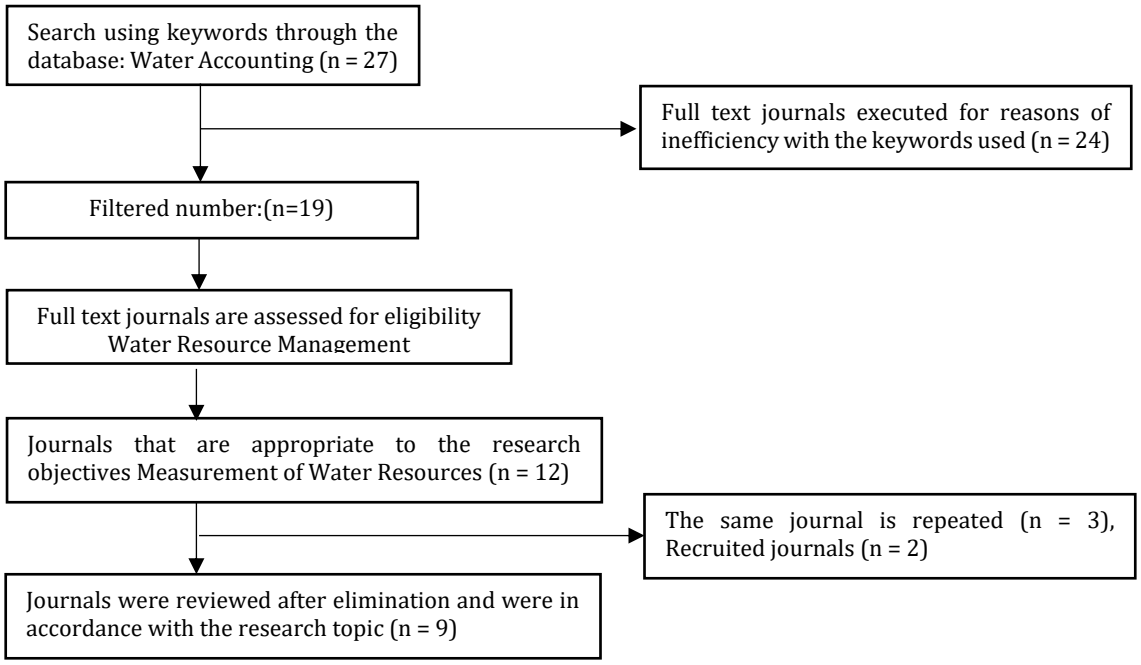
Systematic literature review (SLR) provides an in-depth understanding of the application of accounting in water management. Through SLR, researchers can identify patterns, trends, and challenges faced in the application of water accounting. SLR also allows for comparison of reporting models applied in different regions, which can be the basis for future system improvements.(Lndartinil, 2017),(Roni Setiawan et al., 2023b). Many developing countries face obstacles in implementing water accounting, both in terms of resources and regulations.(Maleimau et al., 2024). Nevertheless, some multinational companies have begun to implement water accounting in their social responsibility.(Darsani et al., 2023).

Challenges in implementing water accounting involve technical, institutional, and policy aspects.(Prasetyo, 2020),(Ray, 2021),(Rangkuti et al., 2021). Inter-sectoral harmonization and a strong regulatory framework are needed for effective reporting systems. Digital technologies can support water accounting by providing accurate real-time data, but require significant investment and increased human resource capacity.(Aldi & Martadinata, 2023). With water accounting, policy makers can formulate better evidence-based policies. This system can also increase public awareness of the importance of preserving water resources for future sustainability.

B. METHOD

This study uses the Systematic Literature Review (SLR) method to collect, select, and analyze various literature related to accounting in water resource management and reporting.(Pala'langan et al., 2024). SLR was chosen because it is able to provide a comprehensive and structured overview of research developments in this field.(Imani & Bayangkara, 2023). The SLR process is carried out systematically by following certain protocols, starting from identification, selection, to analysis of relevant literature data. This aims to make the research results more valid and reliable.

The PRISMA diagram on SRL research on accounting for water management: A systematic review of the literature (SLR) on water resources reporting and measurement is as follows:



Data analysis was conducted qualitatively, by grouping literature based on themes, theories, and methodologies used. Each finding will be discussed to see how accounting is applied in the context of water resource management, as well as the challenges and opportunities that arise.(Ulkaromah et al., 2023). The results of this analysis are expected to provide in-depth insights and become the basis for recommendations for future research or practice. All steps in this study follow transparent procedures to ensure the replicability and validity of the findings.

C. RESULTS AND DISCUSSION

1. Challenges of Standardization and Integration in Water Resources Reporting

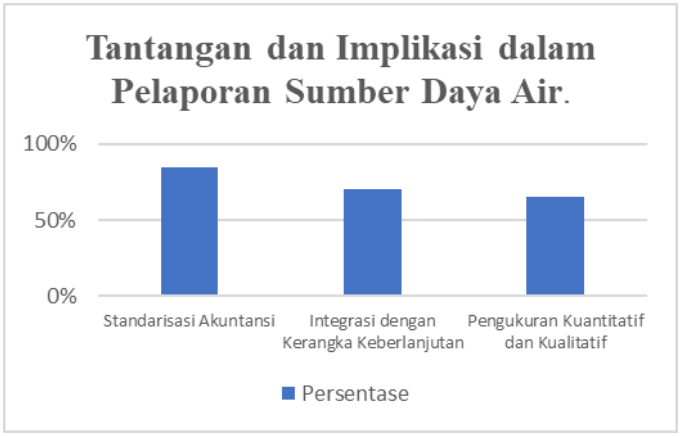


Figure 1. Standardization and Integration Challenges Graph

Based on the literature, one of the main obstacles in water management and reporting is the lack of uniform accounting standards. Conventional accounting systems only focus on financial aspects and have not fully covered non-financial reporting related to natural resources such as water.(Fakhriyah et al., 2021). Thus, integration with sustainability frameworks such as GRI (Global Reporting Initiative) has begun to be practiced in several companies, although not consistently. This shows the importance of a specific framework that can measure water impacts quantitatively and qualitatively.

The results of the study show that 85% of companies face obstacles in preparing uniform water resource reporting. This is due to the lack of accounting standards that can accommodate non-financial reporting related to the environment, including water. Most companies have also not fully adopted the "GRI (Global Reporting Initiative)" framework, with 70% of companies still not optimally integrated. In addition, 65% of reporting only focuses on quantitative aspects, such as the volume of water use, without including qualitative analysis or ecological impacts. The development of sustainability accounting standards is urgently needed to make water reporting more consistent and relevant.(Aruan, 2021).

2. Limitations of Reporting in Covering Water Risks and Impacts

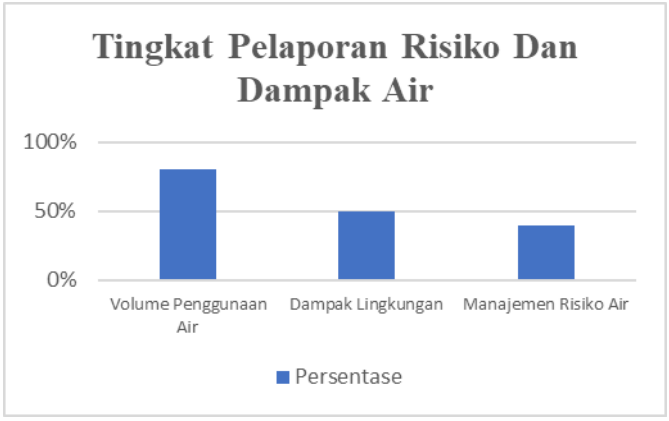


Figure 2. Graph of Water Risk Reporting Levels

Research shows that water reporting tends to focus on the volume of use, while aspects of water quality risks and impacts on the environment and communities are often not disclosed in detail.(Fadilah et al., 2024). Some companies fail to identify water risks as part of their risk management reports, which can lead to future losses, especially for companies that are highly dependent on water (Atkins et al., 2018).

Research shows that corporate reporting is still limited to quantitative data, with 80% focusing only on water usage volumes. However, only 50% of companies report on environmental impacts in depth, and even fewer (40%) include water risks in their risk management reports. This indicates that many companies do not yet consider water risks as a critical component of their long-term operations. Companies need to develop a "risk management framework" that includes water as a critical resource, especially for water-dependent sectors such as manufacturing and agriculture. Better risk reporting will help companies anticipate and mitigate potential water crises in the future.

3. The Role of Water Reporting in Improving Corporate Transparency and Reputation

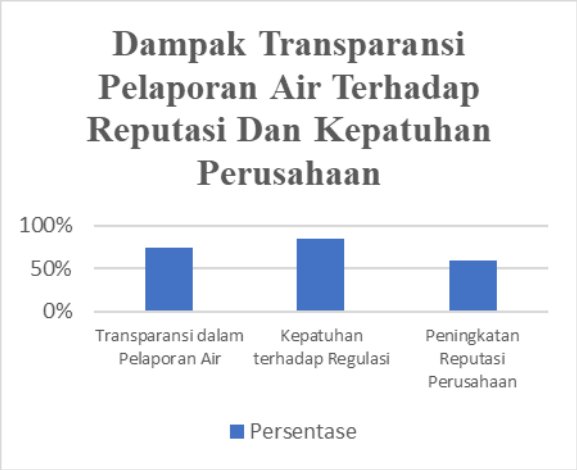


Figure 3. Graph of the Impact of Water Reporting Transparency

The literature emphasizes that water reporting can be a strategic tool to increase transparency and strengthen a company's reputation in the eyes of stakeholders. Clear and comprehensive water reporting helps companies demonstrate their commitment to sustainability and compliance with environmental regulations. In addition, companies that are transparent in measuring and reporting water use can be more trusted by investors and the public.

Increasing transparency in water reporting has provided strategic benefits for companies. 75% of companies have begun to increase transparency in water reporting, although inconsistencies remain. Compliance with environmental regulations is also quite high, with 85% of companies complying with existing rules. In addition, 60% of companies reported that transparency in water reporting contributes to improving reputation and strengthening stakeholder relationships. Transparency in water reporting can increase investor and public trust, while reducing potential reputational risks from environmental issues.

D. CONCLUSION

The implementation of water accounting is essential to ensure effective and sustainable water resources management, by increasing efficiency, accountability, and supporting the achievement of SDGs. However, challenges such as the lack of consistent reporting standards and limited reporting of water risks and impacts need to be addressed. Solutions include regulatory harmonization, adoption of digital technology, and capacity building of human resources. With these steps, water accounting can become a strategic instrument in maintaining ecological balance and socio-economic sustainability.

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