

Accounting for Water Management: A Systematic Review of the Literature (SLR) on Water Resources Reporting and Measurement

Yuni Nurlita¹, Andi Irfan², M.Irgi Sabri^{3*}

^{1,2,3}Accounting Department, Sultan Syarif Kasim State Islamic University of Riau, Pekanbaru, Riau

ARTICLE INFO

Article history:

Received Oct 08, 2024

Revised Oct 18, 2024

Accepted Oct 18, 2024

Available online Dec 21, 2024

Keywords:

Water accounting, water resources management, sustainability reporting, Global Reporting Initiative, risk management, SDGs, corporate transparency.

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.



This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.
Copyright © 2024 by Author.
Published by UIN Suska Riau

*Corresponding author.

E-mail: 12170313204@students.uin-suska.ac.id

INTRODUCTION

Water resource management is a crucial issue in various parts of the world because water is a basic need that cannot be replaced.(Ulkaromah et al., 2023) (Fadilah et al., 2024). As human population and industrial needs increase, pressure on water availability increases. Sectors such as agriculture, industry, and households rely on adequate and sustainable access to water.(Triandini et al., 2019). However, poor water management often leads to environmental and social crises.(Fakhriyah et al., 2021). Therefore, it is important to have a good reporting and measurement system to ensure effective water use and conservation.(Tamala Salavia et al., 2024).

One of the main challenges in water management is the limited availability of accurate information on the quantity and quality of water resources.(Siti Munawaroh, 2020). Poor or inconsistent reporting can lead to policy-making errors and inefficient management.(Roni Setiawan et al., 2023) (Imani & Bayangkara, 2023). For this, reliable and measurable reporting standards are needed. Accounting in the context of water resource management is present as a solution to fill this information gap.(Roni Setiawan et al., 2023). With accounting, all parties can clearly understand the flow and use of water resources.

Water accounting enables transparent calculation and reporting of how much water is used, stored and allocated.(Riharjo, 2023). The implementation of water accounting can help improve efficiency in water use by ensuring that each sector understands their water use in detail.(Reza, 2023) (Djamaluddin, 2023). Accounting also plays a role in increasing public accountability and oversight of water use. This system can be adopted by governments, companies, and communities to monitor water resources holistically.(Ray, 2021).

In addition to efficient use, water accounting also functions as a tool for monitoring environmental sustainability.(Dau, 2023). An effective reporting system can identify potential ecosystem damage due to over-exploitation of water resources.(Rangkuti et al., 2021). Thus, water accounting plays an important role in maintaining ecological balance and sustainability of water resources.(Lndartinil, 2017). Several countries have implemented water reporting in their environmental policies, but challenges remain regarding implementation and harmonization between institutions.(Ramadani & Zakiy, 2022).

Water reporting and measurement are also relevant in supporting the achievement of the Sustainable Development Goals (SDGs), especially point 6 on clean water and sanitation. Without adequate accounting data and reports, it is difficult for governments and organizations to monitor progress in achieving SDG targets. Accurate reports facilitate the evaluation and improvement of policies related to clean water access and efficiency of its use.(Rahayu & Sudarno, 2014). Therefore, accounting integration in water resources reporting is very necessary.

Systematic literature review (SLR) plays an important role in providing a comprehensive understanding of how accounting is applied in water management in

various contexts.(Prasetyo, 2020). Through SLR, researchers can identify patterns, trends, and challenges in the implementation of water accounting based on previous research. SLR also allows for comparison of various reporting and measurement models that have been implemented in various regions. This can be the basis for better system improvements in the future.

Several studies have highlighted that water accounting reporting is still minimal in various developing countries. Limited resources and lack of regulation are the main obstacles in implementing an effective water accounting system.(Darsani et al., 2023). On the other hand, several multinational companies have started implementing water accounting as part of their social responsibility.(Pala'langan et al., 2024). This shows the potential for implementing water accounting not only in the public sector, but also in the private sector.

The challenges in implementing water accounting are not only technical but also involve institutional and policy aspects. Harmonization between sectors and a strong regulatory framework are needed for the reporting system to run effectively.(Oeghoede, 4693). Digital technologies can also play an important role in supporting water accounting by providing accurate, real-time data.(Nuwa et al., 2023) (Aruan, 2021). However, the adoption of this technology requires significant investment and increased human resource capacity.

With water accounting, policy makers can more easily formulate evidence-based policies. Information obtained from accounting reports helps the government in setting water rates, subsidies, and water saving policies. In addition, water accounting reports can also be used to raise public awareness about the importance of preserving water resources.(Ariani et al., 2022) (Aldi & Martadinata, 2023). Therefore, water accounting is not only a technical tool but also a strategic instrument for sustainable water resources management.

In the context of this research, the SLR on water resources reporting and measurement through an accounting perspective is expected to provide in-depth insights into best practices and implementation challenges.(Maleimau et al., 2024). By conducting a systematic review, researchers can identify knowledge gaps and opportunities for further development. The results of this study are also expected to be a reference for academics, practitioners, and policy makers in improving better water resource governance in the future.

METHODOLOGY

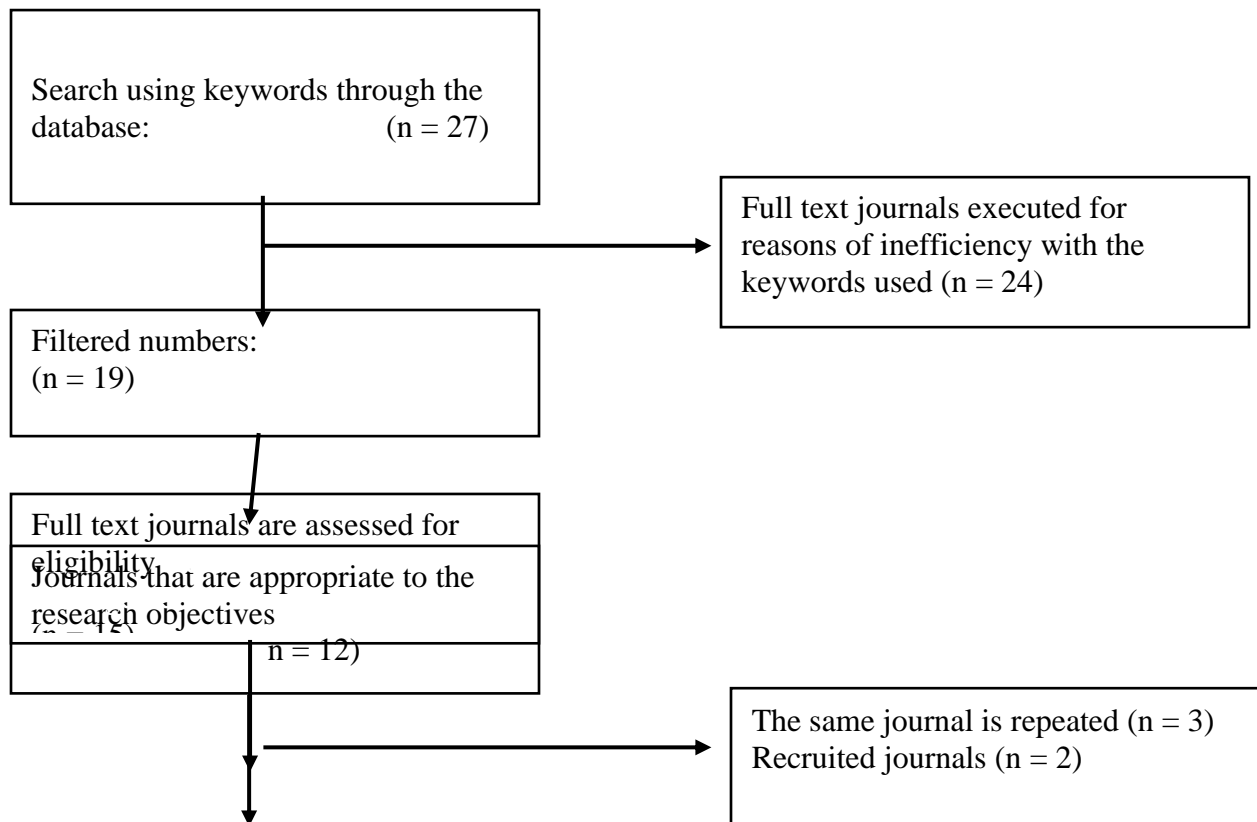
This study uses the Systematic Literature Review (SLR) method to collect, select, and analyze various literature related to accounting in water resource management and reporting. SLR was chosen because it is able to provide a comprehensive and structured picture of research developments in this field.(Imani & 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.

In the first stage, literature identification was carried out through searches in academic databases such as Scopus, ScienceDirect, Google Scholar, and ProQuest. The main keywords used included "water accounting," "water resource management," "reporting," and "measurement of water resources." The search was limited to publications in the last 10 years (2014–2024) to ensure results that are relevant to current developments. In addition, inclusion and exclusion criteria were used, such as only selecting journal articles that have gone through a peer-reviewed process and are in English or Indonesian.

The next stage is the selection and screening of literature using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. This process includes screening based on title, abstract, and full content to ensure that the selected literature is truly relevant to the research topic. Irrelevant or duplicate literature will be removed at this stage. After screening, the literature that passes will be analyzed in depth to identify patterns, concepts, and key findings related to water resource reporting and measurement.

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:



Journals are reviewed after elimination and are in accordance with the research topic.
(n = 9)

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. 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.

RESULTS AND DISCUSSION

Results

1. Challenges of Standardization and Integration in Water Resources Reporting

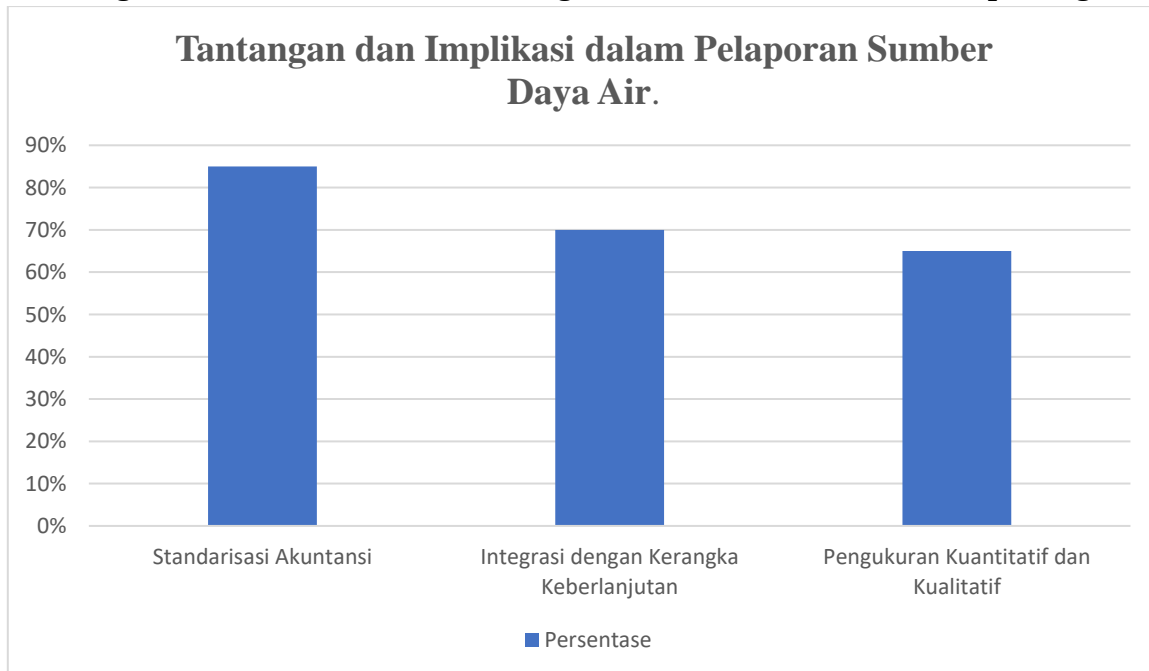


Figure 1. Standardization and Integration Challenges Graph

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.

2. Limitations of Reporting in Covering Water Risks and Impacts

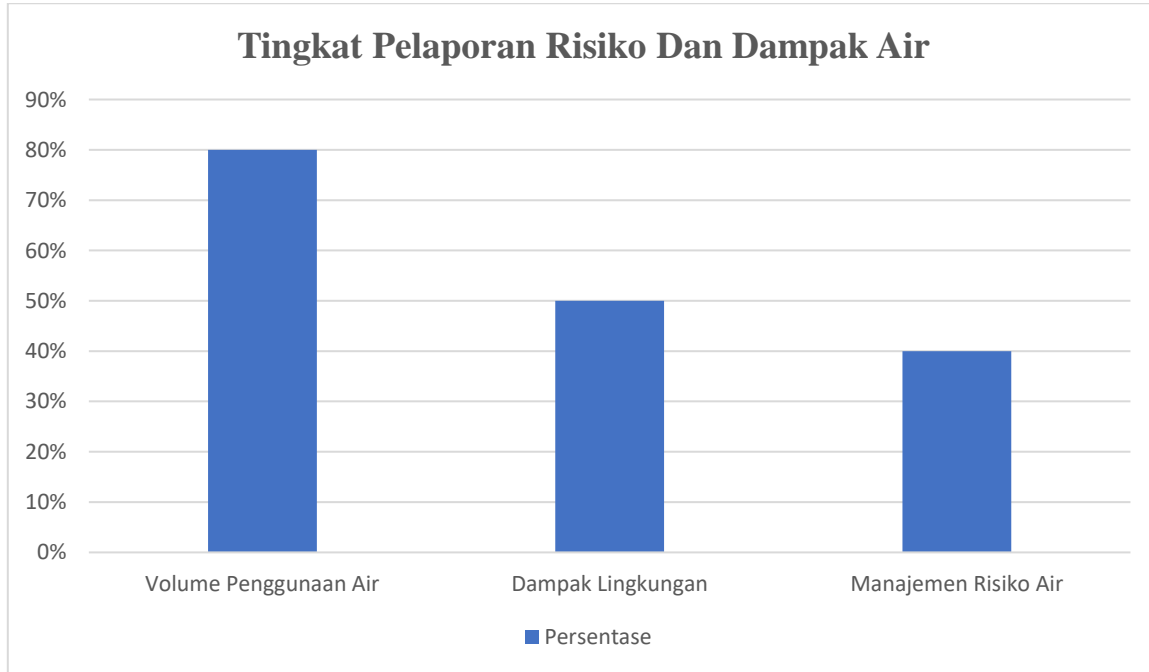


Figure 2. Graph of Water Risk Reporting Levels

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).

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

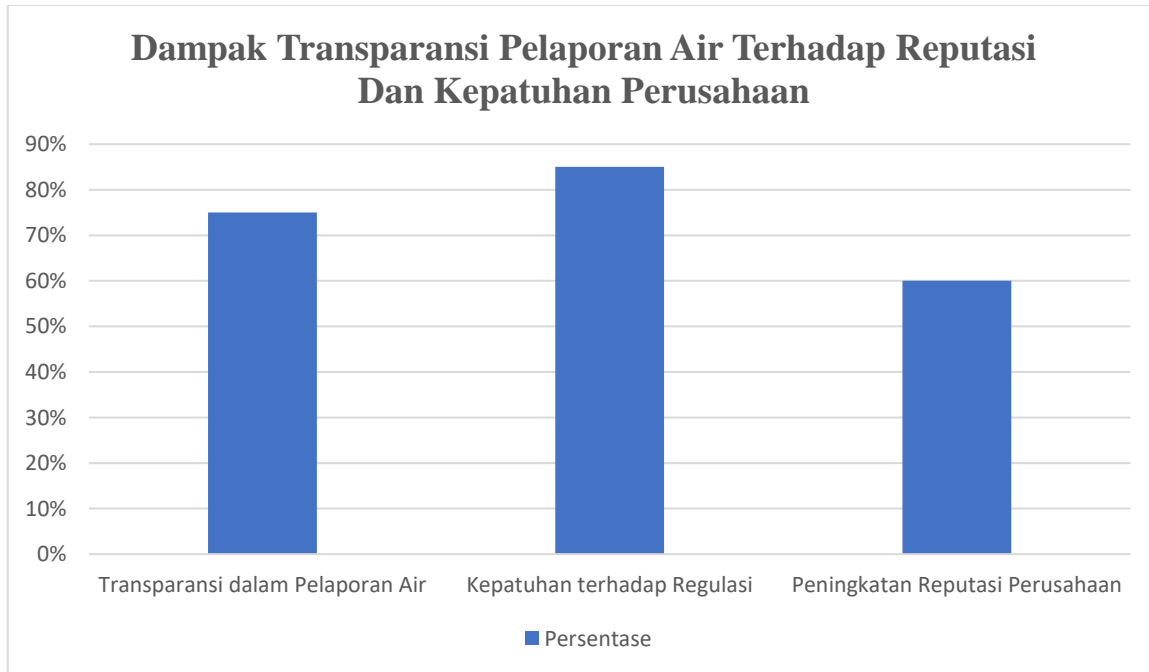


Figure 3. Graph of the Impact of Water Reporting Transparency

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.

Discussion

1. Challenges of Water Reporting Standardization and Integration

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 reports only focus on quantitative aspects, such as the volume of water use, without including qualitative analysis or ecological impacts.

The development of sustainability accounting standards is essential for more consistent and relevant water reporting. Integration with the GRI framework can help companies report water impacts more transparently and holistically.

2. Limitations of Reporting in Covering Water Risks and Impacts

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 risk in their

risk management reports. This indicates that many companies do not yet consider water risk to be 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 future water crises.

3. Reporting Transparency and Its Impact on Reputation

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 due to environmental issues. Therefore, companies are advised to continue to improve the quality of water reporting and strengthen their commitment to sustainability.

CONCLUSION

It can be concluded that the implementation of water accounting is an important solution in ensuring effective and sustainable water resource management. Accurate and transparent reporting on water use, risks, and impacts facilitates policy makers and the private sector in making evidence-based decisions. In addition, water accounting improves efficiency of use and accountability in public oversight and strengthens commitment to environmental sustainability, especially in supporting the achievement of the Sustainable Development Goals (SDGs).

However, the implementation of water accounting still faces various challenges, such as the lack of consistent reporting standards and minimal integration with sustainability frameworks such as GRI. Another challenge is the limited reporting related to water risk and impact aspects, with most companies only focusing on the volume of use. To overcome these obstacles, regulatory harmonization, adoption of digital technology, and increased human resource capacity are needed so that water reporting is more comprehensive. Thus, water accounting can be a strategic instrument in maintaining ecological balance and socio-economic sustainability.

REFERENCES

- Aldi, M., & Martadinata, S. (2023). Treatment of Environmental Accounting Implementation in Waste Management at Asy-Syifa Regional Hospital, West Sumbawa. *Cafetaria Journal*, 4(1), 305–309.

- Ariani, M., Zulhawati, Z., & Darmawan, D. (2022). Application of Environmental Accounting in Hospital Waste Management. *PETANDA: Journal of Communication Science and Humanities*, 3(2), 87–98. <https://doi.org/10.32509/petanda.v3i2.1975>
- Aruan, BJ (2021). Application of Environmental Accounting to Waste Management of Animal Feed Factory PT Universal Agri Bisnisindo. *Accounting Perspective*, 3(3), 217–252. <https://doi.org/10.24246/persi.v3i3.p217-252>
- Darsani, H., Amelia, R., & North Sumatera Corresponding Author, U. (2023). Analysis of Environmental Accounting Implementation in Hospital Waste Management (Case Study of Dr. Pirngadi Regional General Hospital, Medan City). *Journal of Research and Scientific Work*, 1(5), 319–331. <https://doi.org/10.59059/mutiara.v1i4.505>
- Dau, YB (2023). Analysis of the Implementation of Environmental Accounting as Social Responsibility at the SK Lerik Regional General Hospital, Kupang City. *Journal of Accounting: Transparency and Accountability*, Vol 11(2), 121–132.
- Djamaluddin, J. (2023). Analysis of Water Resources Availability in Landscape Management in Makassar City. *Journal of Landscape and Environment*, 1(2), 100–107.
- Fadilah, Bachtiar, Y., & Syukri, F. (2024). Environmental Accounting Analysis and Impacts Occurring at Massenrempulu Regional General Hospital, Enrekang Regency. *Journal AK-99*, 4(1), 83–93. <https://doi.org/10.31850/ak99.v4i1.3072>
- Fakhriyah, Yeyendra, & Marianti, A. (2021). Integration of Smart Water Management Based on Local Wisdom as an Effort to Conserve Water Resources in Indonesia. *Indonesian Journal of Conservation*, 10(1), 67–41. <https://doi.org/10.15294/ijc.v10i1.31036>
- Imani, ES, & Bayangkara, IBK (2023). Analysis of Environmental Performance Reporting at Lavalette Hospital in 2022. *Journal of Trends Economics and Accounting Research*, 4(2), 498–508. <https://doi.org/10.47065/jtear.v4i2.1116>
- Lndartinil, M. (2017). (Case Study of Clean Water Demand from Drilled Wells in Villages for Madiun District, Madiun City). 6.
- Maleimau, AF, Fahrizal, A., & Firmansyah, A. (2024). Scoping Review: Implementation of Water Accounting in Indonesia. *Akuntansiku*, 3(2), 122–137. <https://doi.org/10.54957/akuntansiku.v3i2.634>
- Nuwa, YC, Dethan, MA, & Oematan, HM (2023). Analysis of the Application of Environmental Accounting for Waste Management at the Kupang City Health Office. *Journal of Accounting: Transparency and Accountability*, 11(1), 9–21. <https://doi.org/10.35508/jak.v11i1.10074>
- Oeghoede, CJA (4693). ANALYSIS OF THE APPLICATION OF ENVIRONMENTAL ACCOUNTING TOWARDS HOSPITAL WASTE MANAGEMENT IN JAYAPURA CITY. *Scientific African*, 114(June), e00146. <https://doi.org/10.1016/j.sciaf.2019.e00146>
- Pala'langan, EN, Saerang, DPE, & Tirayoh, VZ (2024). Analysis of the application of responsibility accounting as a tool for assessing the performance of cost centers at

- the Regional Drinking Water Company (PDAM) of Tana Toraja Regency. *Business Management and Corporate Finance*, 2(2), 119–127. <https://doi.org/10.58784/mbkk.122>
- Prasetyo, W. (2020). Bedhaya Banyu Ning Kali's Message for Water Management Accounting: An Ecophenomenological Approach. *EQUITY (Journal of Economics and Finance)*, 4(1), 87–106. <https://doi.org/10.24034/j25485024.y2020.v4.i1.4265>
- Rahayu, W., & Sudarno. (2014). Analysis of Accounting Treatment of Wastewater Treatment Costs of Lestari Sugar Factory Nganjuk PT Perkebunan Nusantara X (Analysis of the Accounting Treatment of Wastewater Treatment Costs of Lestari Sugar Factory Nganjuk PT Perkebunan Nusantara X). *Scientific Article of FE UNEJ (University of Jember) Students*, 1–5. <https://repository.unej.ac.id/handle/123456789/64777>
- Ramadani, RD, & Zakiy, FS (2022). Implementation of SAK ETAP in the Clean Water Management Recording System in Dawung Village, Kedungpane Subdistrict, Mijen District, Semarang City. *Journal of Sharia Accounting and Audit (JAAiS)*, 3(1), 40–52. <https://doi.org/10.28918/jaais.v3i1.4844>
- Rangkuti, EM, Abdullah, I., Arif, MA, & Azim, F. (2021). Clean Water Management in Medan Industrial Area. *Medan Journal of Management and Accounting*, 3(2), 98–104. <https://doi.org/10.47709/jumansi.v3i2.2386>
- Ray, AR (2021). Review of Water Accounting Implementation (Case Study at PDAM Tirta Lontar, Kupang Regency). *ABIS: Accounting and Business Information Systems Journal*, 9(3), 3–14. <https://doi.org/10.22146/abis.v9i3.68606>
- Reza, A. and LDJ (2023). WORKSHEET: Journal of Accounting WORKSHEET: Journal of Accounting. *WORKSHEET: Journal of Accounting*, 3(1), 27–37.
- Riharjo, IB (2023). Accounting Information System for Payment of Clean Water Usage Fees in Preventing Lapping. *Journal of Accounting Science and Research*, 12(4), 1–14.
- Roni Setiawan, Raihan Aditya Perkasa, & Zacky Maulana. (2023). Application of Environmental Accounting in Terms of Production Waste Management at the Tuna Canning Company PT. *Aneka Tuna Indonesia. Journal of Accounting Research*, 2(1), 95–102. <https://doi.org/10.54066/jura-itb.v2i1.1329>
- Siti Munawaroh. (2020). Analysis of the Aqua Mineral Water Inventory Recording Method at Ud Kaltim Makmur in Berau Regency. *STIEP Economic Journal*, 5(2), 37–44. <https://doi.org/10.54526/jes.v5i2.38>
- Tamala Salavia, Putri Seftiana Fitri, & Dien Noviany Rahmatika. (2024). The Influence of Environmental Accounting Implementation on Company Performance: Systematic Literature Review. *Accounting and Tax Economics: A Global Perspective*, 1(3), 108–122. <https://doi.org/10.61132/aepg.v1i3.281>
- Triandini, E., Jayanatha, S., Indrawan, A., Werla Putra, G., & Iswara, B. (2019). Systematic Literature Review Method for Identification of Platforms and Methods for Information System Development in Indonesia. *Indonesian Journal of*

Information Systems, 1(2), 63. <https://doi.org/10.24002/ijis.v1i2.1916>
Ulkaromah, A., Suyanto, S., & Nusantoro, J. (2023). Analysis of the Implementation of Environmental Accounting at PT Pemuka Sakti Manis Indah in Way Kanan Lampung. *Expensive: Journal of Accounting and Finance*, 2(1), 123–135. <https://doi.org/10.24127/exclusive.v2i1.3696>