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# World Controversy: Water Sustainability In An Environmental Accounting Perspective

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**Abstract**
Social and environmental concerns have emerged as globally compelling topics, necessitating attention from all stakeholders due to their significant impact on human life. Sustainable global economic development is intricately tied to the Triple Bottom Line concept, emphasizing Profit, People, and Planet. Among critical natural resources, water resources play a central role across various economic sectors, especially amidst escalating global water scarcity and degradation challenges. While research in this area has evolved significantly, many studies remain limited in scope, focusing on specific processes or regions and failing to provide comprehensive insights into water usage across different sectors. Building upon previous research, this study employs a Systematic Literature Review (SLR) method from 2019 to 2023 to understand trends and progress in water sustainability accounting research. Through the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) method, 23 relevant articles were identified and analyzed from various publishers such as Elsevier, Emerald, MDPI, and others. The findings reveal a diverse distribution of articles across publishers, with Elsevier being the most frequently utilized. This study contributes to the literature by offering insights into recent trends and areas of focus in water sustainability accounting research, informing future research directions and policy-making efforts to address social, environmental, and economic challenges effectively.

**Keywords:** Water Sustainability, Accounting, Environmental Accounting

## Introduction

The issues surrounding social and environmental concerns have now become globally compelling topics and are a focal point for nearly every nation. This is a matter that should be addressed by all parties, given its significant relevance to human life. Human existence is intricately tied to social and environmental issues, particularly the consequences of environmental degradation. Sustainable global economic development is underpinned by a specific focus on the Triple Bottom Line concept, encompassing Profit, People, and Planet.

Each economic sector is not solely concentrated on profits and its surrounding community; it also takes into account the impacts to prevent environmental damage. One essential natural resource for every economic sector is the water resource. The importance of managing industrial water resources has escalated due to global water scarcity issues and the increasingly significant degradation of water environments (Lyu et al., 2023).

Research in this area has undergone significant development, evolving from initially covering only a few sectors to now encompassing nearly all economic, social, and environmental sectors (Zhang et al., 2020). However, many studies have limitations, as they are focused on specific processes in certain regions and do not encompass all economic sectors. Consequently, detailed information about water usage in other sectors is rarely involved, indicating that these investigations are insufficient for a comprehensive exploration of local water issues.

This study refers to previous research by (Hasan et al., 2023) with some distinctions. The primary difference lies in the timeframe of the research. Previous research analyzed academic studies conducted over more than 8 years on environmental and social accounting related to accountability for water sustainability, covering the period from 2016 to 2023. In contrast, this study spans 5 years, from 2019 to 2023, utilizing the Systematic Literature Review (SLR) method. The objective of this research is to understand the trends or progress in research during the years 2019 to 2023 by mapping or classifying topics from a selection of related articles.

**Research Methods**

The research method used in this study is Systematic Literature Review (SLR), which aims to identify, review, and evaluate all relevant research to obtain comprehensive results and summarize them as a whole. The research follows the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) method outlined by (Salameh et al., 2020). In the initial phase, literature was gathered from Elsevier, Emerald, MDPI, Springer, Taylor & Francis, Wiley, IWA, Frontiers, and CGC databases using the Watase UAKE software. The selection process was based on articles published from 2019 to 2023 and Scopus Q1, Q2, Q3, and Q4 criteria. Limitations were imposed with the aim of obtaining recent research, considering the rapid evolution of investment decision-making, causing various studies to lose relevance over time quickly. A search was conducted using the keyword "Water Sustainability Accounting" in article titles, resulting in a total of 285 articles. Among these, 187 articles fell outside the time range of 2019-2023, 4 articles did not meet Scopus Q1, Q2, Q3, and Q4 criteria, and 3 articles lacked abstracts.

After removing these articles, 91 articles remained for further examination. The next selection was based on specific article titles and abstract reading, leading to the exclusion of 60 articles. The exclusion criteria for articles required them to be journal articles, excluding books or book chapters. Additionally, the exclusion applied to all literature not published in

English outside the 2019-2023 timeframe and literature not falling into the category of journal articles. After reviewing all selected articles, only 23 articles were found to be fully relevant for in-depth analysis. Thus, this study is grounded in the analysis of the 23 most relevant articles.

**Table 1. Articles Distribution**

| Publisher | Publish Year | | | | | Total | % |
|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | 2023 | | |
| Elsevier | 2 | 1 | | 1 | 4 | 8 | 35 |
| Emerald | 1 | | | | | 1 | 4 |
| MDPI | | | | 2 | 1 | 3 | 13 |
| Springer | | 2 | | | | 2 | 9 |
| Taylor & Francis | | | 2 | | | 2 | 9 |
| Wiley | | 1 | 1 | | | 2 | 9 |
| IWA | | 1 | | 2 | | 3 | 13 |
| Frontiers | | | | 1 | | 1 | 4 |
| CGC | | | | 1 | | 1 | 4 |
| Total | 3 | 5 | 3 | 7 | 5 | 23 | 100 |

Based on the data distribution above, it is evident that the most frequently utilized articles originate from Elsevier, accounting for 25%. The data analysis process in this study involved several stages. First, the articles gathered from various publishers were categorized based on their publication year and publisher. This categorization allowed for an understanding of the distribution of articles across different periods and publishers.

Next, the distribution of articles by publisher and publication year was analyzed to identify patterns and trends. This analysis provided insights into which publishers were most frequently utilized and how the number of publications varied over time. Furthermore, the percentage distribution of articles by publisher was calculated to determine the relative contribution of each publisher to the overall body of literature reviewed in this study.

This calculation helped in assessing the significance of each publisher in terms of the number of articles included in the analysis. Lastly, the implications of the data distribution were discussed, particularly focusing on the dominance of articles from Elsevier and the varying publication trends across different years and publishers. This discussion provided context for understanding the landscape of water sustainability accounting research and informed recommendations for future research directions.

Overall, the data analysis process aimed to provide a comprehensive overview of the literature reviewed in this study, highlighting key patterns and trends that contribute to the understanding of water sustainability accounting research.

## Result And Discussion

### Water Sustainability

Water sustainability involves managing water resources effectively to ensure their provision, use, and preservation for both present and future generations, promoting collective well-being and societal opportunities (Passetti & Rinaldi, 2020). Although water and sanitation have become new development priorities, they still face challenges, particularly in some areas (Nansubuga, Smith, & Jeffrey, 2022). In times of clean water scarcity, tracking water consumption can aid planners in more efficiently managing usage across different sectors to tackle water scarcity (Zhang et al., 2020). Intense competition often emerges in securing water supplies, whether among economic sectors or users upstream and downstream within a river basin (Kyei & Chitiga-Mabugu, 2021). Incorporating water savings and reducing water demands into infrastructure planning is crucial for sustainable water management (Nam et al., 2023). Recognizing water's importance in production and optimizing its allocation for economic and sustainable development is also vital (Nia, Soltani, Shahdany, & Guan, 2023). Moreover, addressing critical challenges in water resource conservation, such as limited availability, waterlogging, declining quantities, rising salinity levels, and the necessity for enhanced coordination, is essential for maintaining food and water security (Hirwa et al., 2022).

Water usage can also encompass a significant percentage of total water consumption in certain cities. It is crucial to pay more attention to managing water usage by industrial and urban household sectors in specific cities (Zhang et al., 2020). As the societal and environmental consequences of human actions become more pronounced, the significance of sustainable development is escalating. Despite the enactment of diverse water conservation measures, the effectiveness and efficiency of these policies in achieving sustainability persist as critical concerns influencing strategic decisions (Nalbandan, Delavar, Abbasi, & Zaghiyan, 2023).

### Water Accounting

The utilization of natural resources, including water and energy, mirrors industrial operations and carries significant implications for ecosystems (da Rosa, Lunkes, & Mendes, 2020). For corporations, environmental concerns such as the effects on water and energy usage can present legal and competitive challenges (da Rosa et al., 2020). Sustainable accounting involves the preparation of social and environmental reports, serving as valuable tools for fulfilling stakeholder expectations, self-assessment, and external scrutiny of an organization's responsibility for the resources utilized (Huang et al., 2022).

The financial sector has presented difficulties regarding accountability, particularly regarding duties, accountability, and legal enforcement (Erdem Türkelli, 2021). Various accounting approaches result in different implementation consequences, which carry substantial practical implications for the sustainability of water transfer initiatives and economic progress in water-rich regions (Chen, Wang, & Li, 2022). The quantity of water

extraction and the implicit intensity of water usage further contribute to uncertainty, acting as a limitation for sustainable economic advancement (Zhang et al., 2020).

As per (Bassi, Schmidt, & De Stefano, 2020), water accounting functions as a valuable tool aiding policymakers in making informed decisions concerning the correlation between water availability and usage, resource allocation, investment in water infrastructure, enhancement of water use efficiency, and comprehension of water management impacts. Water accounting stands as a pivotal instrument for water management, facilitating the analysis of water utilization, depletion, and production. Through water accounting systems, diverse economic, social, and environmental challenges can be addressed (Huang et al., 2022). Water accounting encompasses the identification, quantification, and disclosure of data pertaining to water movement within a system, marking an initial phase towards formulating effective and sustainable water management strategies in any given nation (Fakoya & Imuezerua, 2021).

Sustainability reporting is a dynamic concept that continuously adapts to various business environments and sectors where such reporting practices are implemented (Gutberlet, Preuss, & Thorpe, 2023). Corporate water management accounting refers to providing and analyzing both financial and non-financial information to assist management in making decisions related to water management (Olusanmi, Emeni, Uwuigbe, & Oyedayo, 2021). Improving the framework of water accounting within sustainable water resource management is essential due to the extensive use of these methods/tools and the progression of corporate/organizational water accounting over time (Nia et al., 2023). Water accounting encompasses pertinent subjects, report formats and contents, audit procedures, and other related matters (Lyu et al., 2023).

In terms of financial reporting, the Australian Accounting Standards Board suggests categorizing water rights as intangible assets with an undetermined useful lifespan (Seidl, Wheeler, & Zuo, 2020). Integrating water accounting with accountability can aid organizations in identifying suitable actions to promote water conservation and enable stakeholders to oversee the organization's responsibility for ensuring clean water availability (Huang et al., 2022).

Water Management Accounting (WMA) encompasses the categorization, quantification, and documentation of water movement data within a system aimed at optimizing or maximizing current supply (Fakoya & Imuezerua, 2021). In scholarly discussions concerning the utilization of resources like materials, energy, and water, coupled with the accrual of expenses associated with environmental factors, the adoption of Environmental Management Accounting (EMA) becomes essential (da Rosa et al., 2020). EMA constitutes a framework enabling the identification, quantification, analysis, and interpretation of a firm's environmental aspects.

EMA addresses the planning, control, and management of organizational policies, practices, and accounting procedures aimed at assisting in decision-making processes

regarding environmental performance. EMA allows companies to enhance performance and gain economic benefits from managing organizational resources such as materials, water, and energy. EMA can also improve economic and environmental performance by integrating the two fundamental blocks of sustainable development—environment and economy—since these aspects emerge in the company's internal decision-making processes. Therefore, EMA can help companies identify the environmental and economic benefits of their activities, assisting them in achieving sustainable business practices.

EMA represents a corporate strategy for environmental management that utilizes accounting methodologies to aid managers in decision-making processes. Through the EMA framework, companies can gain insights into the environmental dimensions of their operations, which are frequently obscured in traditional management accounting systems (Imtiaz Ferdous, Adams, & Boyce, 2019). Combining Environmental Management Accounting with innovation allows firms to mitigate environmental footprints, such as excessive water and energy consumption, while simultaneously achieving a competitive edge (da Rosa et al., 2020).

**Water Management Disclosure**

The absence of standardized procedures and uniformity in water evaluation can lead to various financial and political ramifications (Seidl et al., 2020). The government has introduced multiple pollution control initiatives to diminish pollution levels and mitigate water scarcity in basin regions (Kyei & Chitiga-Mabugu, 2021). Challenges persist due to the general absence of robust political guidance and institutional structures, the lack of agreements on water distribution among countries sharing river basins conflicts over water resources, and uncertainties between upstream and downstream states regarding water resource management (Hirwa et al., 2022).

Environmental performance indicators utilized by water organizations often prioritize compliance with regulations rather than being tailored to improve environmental outcomes. Consequently, it is common for water service organizations to justify their actions based on legislative requirements, reflecting institutional norms (Imtiaz Ferdous et al., 2019). Furthermore, voluntary disclosure of water management in accordance with GRI standards has been shown to enhance stakeholder confidence and mitigate information imbalances (Huang et al., 2022).

**Transparency of Water Sustainability Practice**

The involvement of diverse stakeholders plays a pivotal role in advancing toward Sustainable Development Goal 6, which aims to ensure universal access to water and sanitation by 2030, a target currently falling behind schedule (Dickin et al., 2022). Although the majority of rural clean water supply and wastewater management systems are financed and constructed by donor organizations and governments, the responsibility for maintenance is often transferred to end-users, such as community-based management groups (Nansubuga et al., 2022). It is imperative for policymakers to comprehend the potential repercussions of

their policies on marginalized and vulnerable communities. Policies have a significant influence on the distribution of outcomes both among and within these groups (Kyei & Chitiga-Mabugu, 2021).

The right to water is assessed through historical cost or fair value water accounting, depending on stakeholders. However, due to a lack of standardized methodologies, assessment policies, and rapidly changing markets, there can be significant variations in water assessment values. Recommendations emphasize the need for greater transparency and standardized water assessment methods (Seidl et al., 2020). Various parties are developing water management plans, which can be seen as a form of accountability socialization where different groups hold each other accountable and share responsibilities (Hale, Legun, & Campbell, 2022).

Legitimacy theory is a mechanism that encourages organizations to voluntarily produce social and environmental disclosures justifying their existence through legal and socially beneficial economic actions that do not harm the community and the environment (Huang et al., 2022). Moral legitimacy is not always a dichotomous variable but operates on a continuum established by managers and negotiated through the use of accounting (Passetti & Rinaldi, 2020). Every company is obligated to disclose matters related to social and environmental responsibility, including those related to the use of natural resources such as water (Huang et al., 2022).

Companies need to have a management system that can establish performance indicators to reduce risks and identify new opportunities related to environmental sustainability in a competitive landscape (da Rosa et al., 2020). Environmental performance can be enhanced through information systems, knowledge management, and technological processes to improve energy efficiency, reduce water usage, lower greenhouse gas emissions, or minimize waste and effluents (da Rosa et al., 2020). Therefore, contemporary companies must rely on environmental policies as an operational foundation, demanding the presence of a management system that can simultaneously consider environmental and economic aspects. We can scrutinize more carefully how the accountability process determines who is responsible and who are legitimate and beneficial participants in the process (Hale et al., 2022). Sustainability reporting can be seen as a continually evolving phenomenon adapting to different business contexts and sectors where this reporting is adopted.

## Conclusion

Research in the field of environmental and social accounting related to responsibility for water sustainability has been continuously evolving over time. The demand for clean water continues to rise across various sectors globally, particularly in the economic sector. Water is acknowledged as a right for every individual on this planet, and its use requires responsibility to avoid environmental harm. Companies, as users and managers of water, play

a crucial role in ensuring the availability of clean water needed by ecosystems and surrounding communities. Taking responsibility for water management also benefits companies by providing transparent information about water usage and management, which, in turn, can enhance public trust. As of now, there are no globally established and widely accepted standards for water management disclosure by companies. The implementation of these standards faces various challenges, including differences in water availability and needs in each entity, resulting in few companies being able to disclose their water resource usage. This disclosure is tailored to the unique conditions of each company. In the effort to achieve water resource sustainability, corporate management strives to maintain a balance between water needs and potential risks. Management is expected to make efficient and effective decisions regarding water resource usage while considering the broad-ranging impacts, including potential environmental damage.

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