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# Environmental accounting in public sector: systematic literature review

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**JAI Website:****Abstract**

**Research aims:** The literature on Environmental Accounting (EA) in the public sector is scarce, unlike in the private sector. Hence, this study aims to ascertain the trajectory of EA research in the public sector and extract insights from prior research on EA in the public sector.

**Design/Methodology/Approach:** The research process was conducted in several stages following Anggraini et al. (2022) and Poje et al. (2022) with several modifications. The keywords were used to discover the articles relating to the topic, namely: "Environmental Reporting," "Environmental Management," or "Environmental Accounting," "Green Accounting," and "Public Sector". The study employed an extended period, namely papers published in 2010-2023 in the database Scopus.com. Based on the specified criteria, the final paper that could be analyzed was 69 out of 112 articles.

**Research findings:** Using VOS-viewer, 15 items of keyword themes were discovered. Then, the 15 items were classified into three clusters: Green Accounting, Environmental Regulation, and Sustainable Development Goals in the Public Sector.

**Theoretical contribution/Originality:** The authors are unaware of any existing literature review research on EA, specifically in the public sector, even though it arises from environmental management accounting in the public sector. This study also demonstrates the inferences that can be derived.

**Keywords:** Environmental Management Accounting; Green Accounting; Environmental Accounting; Public Sector; Government

## Introduction

Climate change and environmental damage are the focus of the world today (Murshed et al., 2021; C. Wang et al., 2023). Research on the green economy and its influence on sustainable development has emerged as a highly important and essential area of study (Gunay et al., 2022). The green economy is considered essential for promoting sustainable economic and environmental growth in a region. The objective is to improve individuals' standard of living by prioritizing the generation of satisfactory employment opportunities, augmenting income levels, optimizing the exploitation of natural resources, limiting carbon emissions, conserving biodiversity, and mitigating pollution (Gunay et al., 2022; C. Wang et al., 2023).

Nevertheless, environmental disclosure and accounting research focuses heavily on the private sector (Che Ku Kassim et al., 2022; Fusco & Ricci, 2019), and research in the public sector tends to be neglected. Further, it is explained (Fusco & Ricci, 2019; Giacomini et al., 2021) that sustainability reporting of public institutions remains in its infancy, and its potential is overlooked because of doubts regarding its application to public organizations. Therefore, environmental disclosure and accounting research in the public sector is an important research topic and should be a concern today. Furthermore, the demand for environmental disclosure is increasing due to stakeholders' increasing awareness of environmental issues (Che Ku Kassim et al., 2016; Lima and Guzman, 2010). As a result, organizations are pressured to carry out their accountability by providing disclosures related to environmental practices across multiple communication channels, and local governments are no exception.

Thus, this study examines papers on EA to understand EA research conducted in the public sector comprehensively. Hence, the research inquiries to be examined are:

**RQ1:** *What are the patterns observed in the studies of environmental accounting in the public sector, specifically in terms of the subject matter, year of publication, quality of publishing, and name of the journal?*

**RQ2:** *What knowledge about environmental accounting and Sustainability Development Goals in the public sector can be learned from these articles?*

EA is crucial for efficient environmental management since it goes beyond the limitations of conventional accounting systems and incorporates extensive environmental data into organizational management. These EAs focus on determining the specific amounts of raw materials and energy used and the flow and ultimate disposal of these resources. They also aim to determine the direct costs, savings, and profits connected with activities potentially harming the environment (Qian et al., 2018). Therefore, EA can positively impact the quality of environmental performance information disclosure and help public sector organizations accurately identify and measure relevant environmental costs and savings (Qian et al., 2018).

In addition, EA is critical to study because the success of public sector entities concerns aspects of services provided and environmental sustainability due to services provided. Public sector organizations must prioritize social and environmental aspects when delivering public services, as they bear responsibility for the surrounding environment and other stakeholders, including communities and governments, who will also be impacted. For that reason, this research aims to generate insights for public sector entities, government, and the community regarding effectively utilizing environmental management accounting to regulate environmental factors.

Public institutions must play a critical role in achieving the Sustainable Development Goals (SDGs) by recognizing public service innovations that have led to more effective and inclusive public service delivery in countries worldwide. The importance of effective

and equitable delivery of quality services from the public sector institutions will lead to achieving all the SDGs and promote creativity and innovation in service delivery by the public sector.

This research contributes to the accounting body of knowledge in the public sector. This systematic literature review will provide valuable insight into public sector practice by considering the environmental aspect. In addition, the public sector must be a pioneer in implementing the essentials of SDGs rather than the private sector because the public sector's aim is the social aspect. Then, this research will point out that the government has a significant role in establishing regulations relating to EA in both private and public sectors.

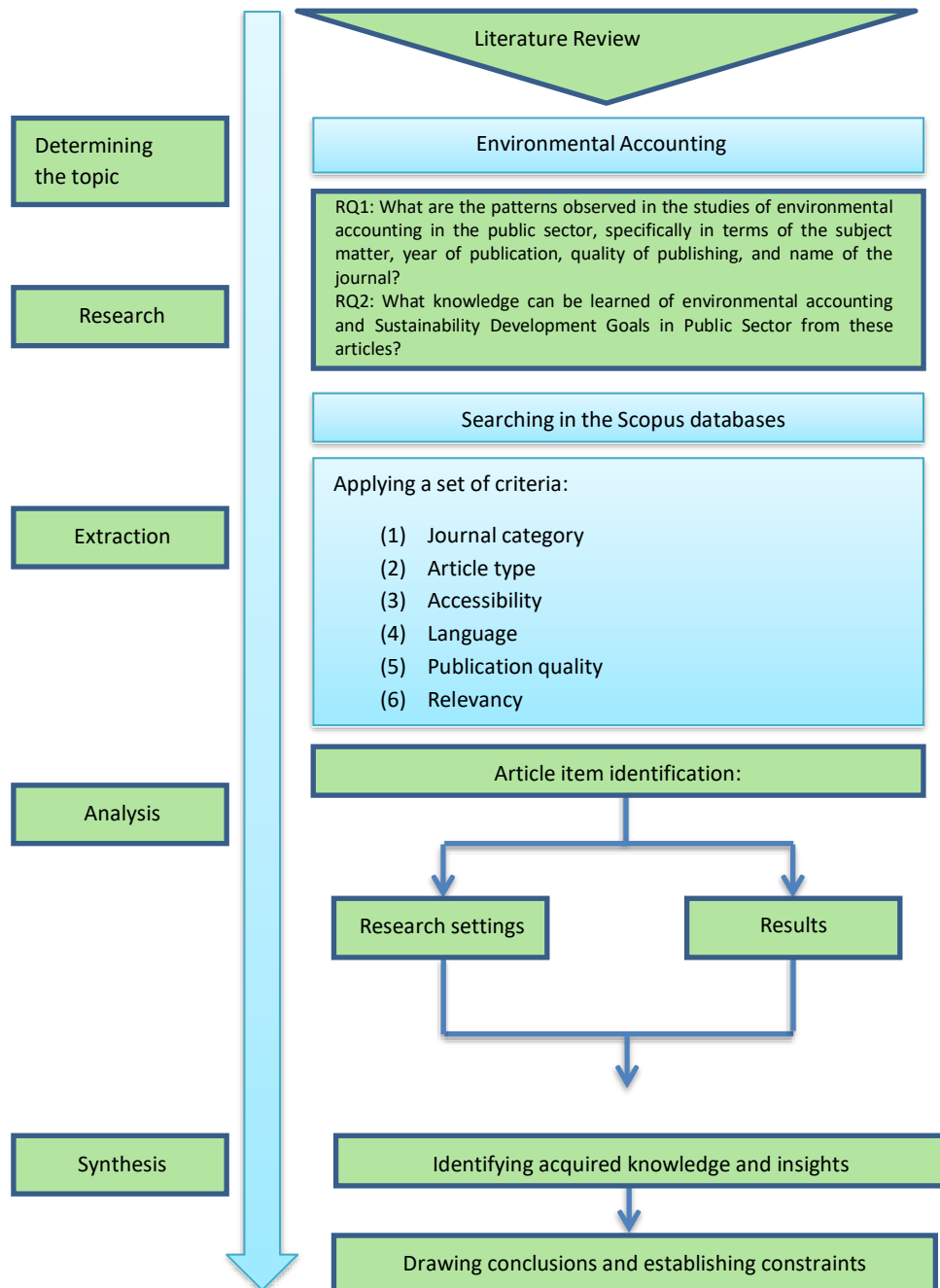
## **Literature Review**

### **Environmental Management Accounting**

Environmental Management Accounting (EMA) is an approach in accounting that pays attention to environmental aspects in the financial management of an organization (Che Ku Kassim et al., 2022). Its primary objective is to help companies identify, measure, and manage the environmental impact of the organization's operational activities. EMAs enable organizations to understand how their business activities contribute to natural resource use, pollution emissions, waste, and energy consumption. Thus, organizations can take more sustainable actions by reducing their environmental impact, improving resource efficiency, and complying with environmental regulations. By integrating environmental aspects into their accounting systems, companies can make better decisions to achieve financial goals that align with environmental sustainability. EMAs also assist in reporting environmental performance to stakeholders, such as investors, consumers, and governments, who are increasingly concerned about environmental issues (Chen et al., 2017).

## **Research Method**

This section is an overview of the research process conducted, adapting several stages by Anggraini et al. (2022 and Poje et al. (2022) with several modifications. This study also applied the procedures by Anggraini et al. (2022), detailed in Figure 1. The first stage was to determine the topic of discussion, namely environmental management accounting in the public sector. Since this study aims to investigate EMA research and lessons learned in the future, the researchers limited articles published in journals with business, management, and accounting types through scopus.com, subscribed by Universitas Gajah Mada and Universitas Muhammadiyah Yogyakarta.



**Figure 1** Literature Review Process from Anggraini et al. (2022) and Poje et al. (2022)

The keywords were used to discover the articles relating to the topic, namely: “Environmental Reporting,” “Environmental Management,” “Environmental Accounting,” “Green Accounting,” and “Public Sector.” A total of 112 articles related to the keyword were published. However, the researchers only downloaded papers that matched the criteria used to answer the research questions. The papers should be in

English. Also, the researchers could access them in pdf form. Furthermore, the researchers included papers indexed by the Scimago Journal. The Scimago journal rating was employed to assess the caliber of the papers, with unindexed journals being excluded. Articles that were irrelevant to the topic under investigation were also eliminated. Based on the specified criteria, the final paper that could be analyzed was 69 out of 112 articles. Besides, the study used an extended period, namely papers published in 2010-2023.

## Result and Discussion

### Article Frequency Distribution by Year

Figure 2 depicts the frequency distribution of articles by year. Seven of the 69 publications assessed (10.14%) were published in 2023. Then, in 2022 and 2018, there were as many as six articles apiece (8.69%). In contrast, the most articles were published in 2020, with ten (14.49%). Meanwhile, the articles published in 2021, 2016, and 2013 each had up to five (7.24%). Furthermore, eight articles were published in 2019 and 2017 each (11.59%), while in 2015 and 2014, only one article was published (1.49%), and in 2012, only three articles were published (4.34%). Then, two articles were published in 2011 and 2010 each (2.89%).

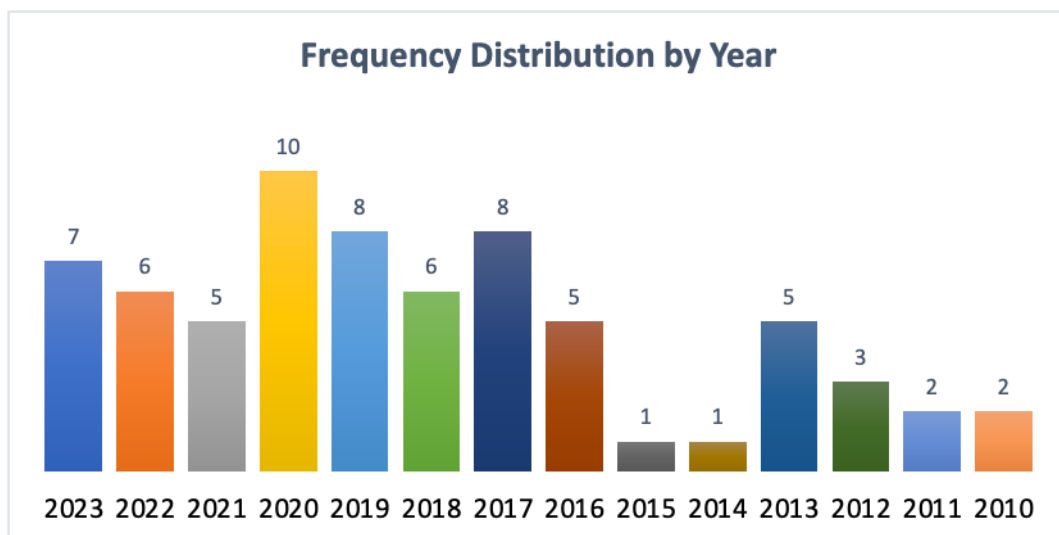


Figure 2 Distribution of Articles Frequency by Year of Publication

### Article Frequency Distribution by Publication Quality

Figure 3 displays the frequency distribution of articles based on their publishing quality. The publication quality of the article was classified into four categories, i.e., Q1, Q2, Q3, and Q4. This classification is referred to as scimagojr.com. Of the 69 articles reviewed, 40 (57.97%) were published in the highest-quality journals (Q1). Then, fourteen articles (20.29%) were published in high-quality journals (Q2), and ten articles (14.49%) were

published in middle-quality journals (Q3). Furthermore, five articles (7.24%) were published in low-quality journals (Q4).

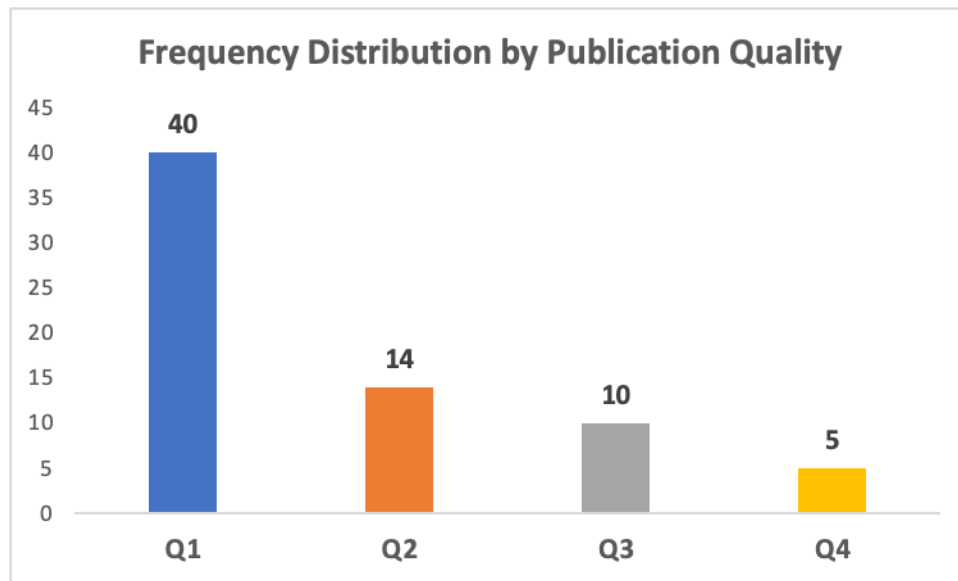


Figure 3 Distribution of Articles Frequency by Publication Quality

#### Article Frequency Distribution by Journal

The analysis relied on the journals provided to determine the frequency distribution of articles. The Journal of Cleaner Production had the highest number of publications on EA, with 16 articles out of 69 (23.19%). This journal covers a wide range of EA research subjects. Then, the Accounting, Auditing, and Accountability Journal came in second, publishing six out of 69 articles (8.70%). Further, Meditari Accountancy Research came in third, publishing five out of 69 articles (7.25%). Furthermore, Pacific Accounting Review and IEEE Transactions on Engineering Management, each journal published three out of 69 articles (4.35%). Following that, Socio-Economic Planning Sciences, International Journal of Scientific and Technology Research, Business Strategy and the Environment, International Journal of Production Economics, and Sustainability Accounting, Management, and Policy Journal, each journal only published two out of 69 articles (2.90%). In addition, the remaining journals depicted in Figure 4 each published one out of a total of 69 papers, accounting for 1.45% of the total.

#### Keyword Analysis

Figure 5 demonstrates the outcomes of the keyword analysis conducted on the 69 articles. The diameter of the circle representing each phrase corresponds to the frequency of occurrence of words in the article's keywords. The researchers employed a minimum of five occurrences of the keyword. Figure 5 also illustrates the frequency of co-occurrence of these words in the keywords of an article. VOSviewer discovered numerous keywords associated with environmental cost accounting. Keywords such as

“environmental regulations,” “sustainable development,” “environmental protection,” “public policy,” “environmental reporting,” and others were frequently featured.



Figure 4 Distribution of Articles Frequency by Journal

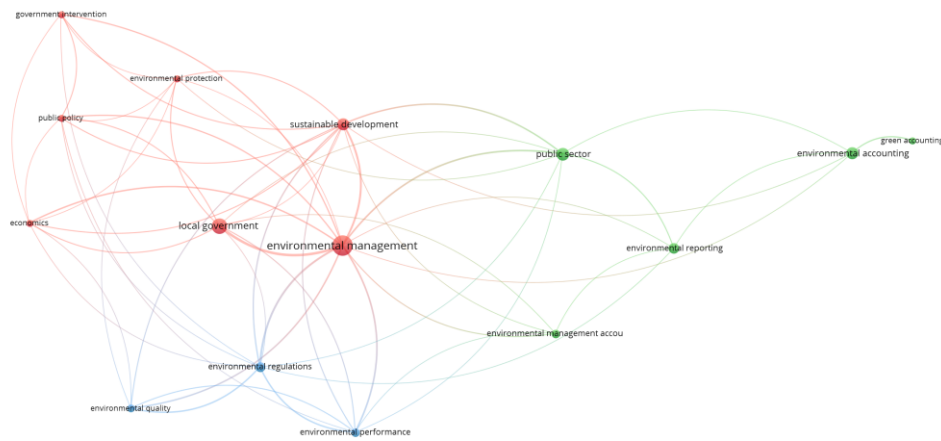


Figure 5 Keyword Analysis

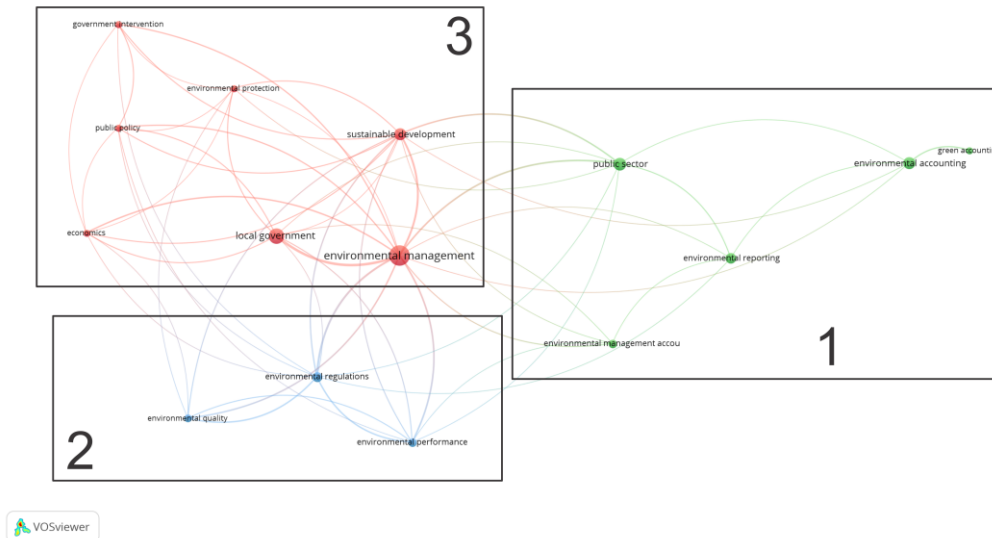
Figure 6 exposes that 15 items keywords of themes had been discovered beyond in this article: green accounting, environmental accounting, environmental reporting, public sector, environmental management accounting, environmental management, environmental regulation, environmental quality, environment performance, local government, sustainable development, environmental protection, public policy, economic and government intervention. Then, the 15 items were classified into three clusters. The first cluster discussed the development of green or environmental accounting in the public sector, such as environmental reporting and environmental management accounting. The second discussion was about environmental regulation. The second discussion on environmental regulation mainly focused on environmental performance and quality. Then, the third cluster discussed environmental management in local government, such as sustainable development, economics, environmental protection, public policy, and environmental intervention.

### Research Findings by Theme

#### Green Accounting in the Public Sector

Green accounting, often known as environmental accounting (EA), is an emerging field within accounting that aims to integrate environmental costs into the financial outcomes of different activities (Lee' et al., 2020). Green accounting compels firms to act responsibly to prevent detrimental environmental consequences (Gray & Laughlin, 2012; Lee' et al., 2020). Schaltegger and Csutora (2012) found that, regarding how accounting may aid the quantification and communication of conservation and restoration activities in non-profit organizations and government sectors, biodiversity loss is now regarded as a more severe threat to the globe than climate change.





**Figure 5** Analysis of the Main Discussion Based on Keywords

Furthermore, implementing EA in the public sector is no less critical than in the private sector (Tommasetti et al., 2023). Implementing EA allows organizations to obtain physical information related to the environment or financial information about environmental costs and obligations. It assists organizations in assessing and reporting material aspects associated with their services, such as records of energy, water, pollution, and waste use (Che Ku Kassim et al., 2022). EA reporting is needed to provide information related to environmental management. Qian et al. (2011) elucidate that the absence of accounting information has impeded the transparency and effectiveness of trash and recycling management. Hence, it fits to scrutinize public sector organizations' existing waste management and recycling accounting methods and explore potential factors contributing to determining comprehensive cost and impact data in waste management.

Ribeiro et al. (2016) researched EA and reporting practices (EARPs) in Portugal. The results showed that the degree of development of EARPs in Portuguese local entities was low. Besides, Che Ku Kassim et al. (2022) found that the three dimensions of isomorphism, namely mimetic, coercive, and normative, could influence local governments in Malaysia to adopt environmental management accounting.

Meanwhile, Mir et al. (2015) reported a positive effect between “political competition” and “environmental reporting.” The number of local governments in New Zealand that reported voluntary environmental information increased throughout the financial years of 2006-2007 and 2007-2008, compared to the previous year of 2005-2006. Nevertheless, there was a decline in the number of local authorities providing this data following the 2007-2008 fiscal year. The increase in disclosure can be attributed to the municipal elections in October 2007. This finding is consistent with the expectations of

"agency theory" and provides insight into the pattern of perceived costs associated with agency. The survey also revealed a paucity of "financial" and "negative" news coverage.

### **Environmental Regulation in the Public Sector**

The theme of environmental regulation highlights environmental performance and environmental policy. Organizations that follow sustainable principles are more likely to pay attention to environmental management accounting and environmental management. Organizations implement environmental management accounting to oversee and control environmental performance effectively. Environmental performance is a strategy used by organizations to focus on environmental impacts caused by service, relationships with stakeholders, and other types of legal accountability (Feng et al., 2023). Solovida and Latan (2017) uncovered that environmental strategies exert a beneficial and significant influence on the environmental performance of organizations, and the presence of environmental management accounting can operate as a mediator in this connection.

Next, Hao et al. (2018) discovered that In China, the environmental control methods and legislation have failed to regulate and mitigate pollution as intended effectively. Moreover, the adverse effect of Foreign Direct Investment (FDI) on China's environment is antagonistic, indicating that the "Pollution Heaven" theory is corroborated. In addition, Liu et al. (2017) underscore the need for a more serious, open, and transparent decision-making process to improve government environmental performance management.

Environmental regulations were then established to protect the environment from damage to organizational operations. J. Wang and Lei (2020) discovered that environmental administrative discourse stimulates a market-based disciplinary impact, serving as a novel instrument for environmental governance and implying a deterrent effect in environmental management. Besides, Ali et al. (2023) investigated the effects of a single-unit rise in government intervention, mandatory environmental regulations, gross regional domestic product, investment in environmental pollution, actual foreign investment, market demand, and material-enhanced green innovation growth at the urban level in China. However, they found no significant correlation between energy and green innovation. In addition, the government plays a crucial role in regulating carbon and greenhouse gas emissions. Sununta et al. (2019) reported that the community contributes to greenhouse gas emissions. Therefore, regulations from the government are needed to reduce greenhouse gas emissions from the community.

### **Sustainable Development Goals in Public Sector**

This theme underlines the aspects of public sector organizations in supporting SGDs. Intellectual capital and market orientation are efforts by public sector organizations to support SGDs. In improving and maintaining public sector performance sustainability, López-Gamero (2011) identified human, structural, and relational intellectual capital as the three foundations of long-term intellectual capital. Workshops focused on

environmental training, information, and awareness contribute to developing and utilizing knowledge, which in turn helps establish sustainable human intellectual capital. Creating a collection of environmental technologies and setting up new environmental departments enhances the long-term foundation of intellectual assets. The sustainable relationship and intellectual assets emphasize the importance of the connection between the firm and its environment, as suppliers are taking a more active role in environmental management in the primary and secondary sectors, and customers are becoming more engaged in the service sector.

Furthermore, the efficacy of organizational strategy has been discussed, with less empirical study conducted on its worth, especially in the context of public sector organizations. Mitchell et al. (2013) found that the importance of Sustainable Market Orientation (SMO) in public service strategy management lies in its ability to effectively balance environmental, social, and economic strategies, provide clear criteria for public service marketing, and ensure the seamless integration of short-term and long-term goals. They also highlighted the difficulties in achieving conceptual equilibrium in overseeing the environmental, social, and economic objectives of SMOs in protected regions while employing publicly owned resources and the predicaments that arise from decreased public sector backing for conservation in these locations. Additionally, Chiarini et al. (2017) disclosed that the health sector can substantially impact attaining sustainable development by prioritizing sustainability in procurement activities.

### **Lesson Learned**

This section analyzes the potential consequences that can be inferred from studying the research and discoveries of publications on environmental management accounting. The consequences include addressing sustainability difficulties faced by public sector firms and governments in environmental management from an accounting perspective in the future. By law, organizations must include environmental cost information in their environmental reports (Razak et al., 2020). In addition, allocating environmental management accounting is one of the strategic policies organizations can implement to improve organizational performance (Feng et al., 2023). This pertains to the organization's strategy of distributing expenditures for environmental initiatives and other services and operational operations inside the firm. Thus, the public sector must consider the environmental cost of the service provided (Hsiu-Yu Lee, 2020), and the government must make regulations that protect the natural environment (Jiang et al., 2019).

The factors influencing the organization in adopting and implementing environmental management accounting include isomorphism (Che Ku Kassim et al., 2022; Imtiaz Ferdous et al., 2019; Jalaludin et al., 2011; Kassim et al., 2021). On the other hand, the regulation of EA only focuses on the private sector. The public sector continues to neglect environmental practices. New Public Management (NPM) emphasizes internal organizational aspects, aiming to enhance the public sector's performance by adopting strategies typically employed in the private sector (Wagner, 2020). Therefore, the public

sector can adopt the paradigm of environmental management accounting like the private sector.

Based on the prior research that had been undertaken, implementing EA can help organizations minimize the costs related to the environment and enhance environmental performance. On the other hand, empirical evidence related to implementing EA in the public sector is still lacking. The theoretical implication of this systematic literature review is that research about contingency factors relating to adopting EA and the consequences on the public sector after implementing it must be conducted.

This study provides a thorough examination of the potential for future research. Further inquiry might be undertaken to determine if adopting environmental management accounting in Indonesia can improve the quality of accounting information and the utilization of financial reports by consumers of public sector financial reports. Because there is no empirical evidence regarding the adoption of environmental accounting can improve the quality of accounting information and the usefulness of public sector financial reports. Hence, additional research might explore the determinants that impact the adoption of environmental accounting in public sector organizations.

Further research can consider isomorphism, contingency, and other factors that can explain how public sector organizations can implement environmental management accounting. In addition, further research can examine the costs incurred by organizations for implementing environmental management accounting and the benefits obtained. It is necessary because the costs incurred are commensurate with the benefits obtained, such as increasing community welfare, community satisfaction, and community legitimacy towards public sector organizations.

## **Conclusion**

The literature on EAs in the public sector is limited, unlike in the private sector. Therefore, this study aimed to discover the trend of EA research in the public sector and lessons that can be learned from previous research on EA in the public sector. The study used an extended period, namely papers published in 2010-2023 in the database Scopus.com. Based on the specified criteria, the final paper that could be analyzed was 69 out of 112 articles. Using VOS-viewer, 15 items of keyword themes were discovered. Then, the 15 items were classified into three clusters: Green Accounting, Environmental Regulation, and Sustainable Development Goals in the Public Sector. Then, most articles were published in the Q1 journal and the Journal of Cleaner Production. Most articles were published between 2010 and 2023 in 2020.

Further, implementing EA allows organizations to obtain physical information related to the environment or financial information about environmental costs and obligations. Environmental regulations were consequently established to protect the environment from damage to organizational operations. Then, environmental training, information,

and awareness workshops that contribute to acquiring and using knowledge help build sustainable human intellectual capital. Furthermore, the factors influencing the organization in adopting and implementing environmental management accounting include isomorphism. As such, the public sector can adopt the paradigm of environmental management accounting like the private sector.

However, this study has numerous drawbacks. Initially, this study exclusively employed the terms "Environmental Reporting," "Environmental Management," "Environmental Accounting," "Green Accounting," and "Public Sector" in Scopus, resulting in a restricted number of search outcomes. Subsequently, specific papers obtained from the Scopus database were unattainable and could not be incorporated into this study evaluation. Besides, many articles were qualitative studies, not empirical ones. Thus, the theme discussion could not be deep.

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### Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.



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