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Comparison of the General-Purpose Water Accounting System and Financial Accounting

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Abstract

Water accounting is inspired by financial accounting, which is grounded in the principle of "we cannot plan and manage what we cannot measure, such as providing information about income and expenses." The purpose of this study is to compare water accounting and financial accounting in terms of their content, standards, objectives, and reporting frameworks, aiming to highlight the similarities and differences between the two systems. In this study, the Australian General Purpose Water Accounting System was selected, which defends, applies, and presents important standards, registration, and reporting structures related to financial accounting, similar to financial accounting but differentiated from it. In this study, the document examination method was used to determine the similarities and differences between the two systems. Research data were analyzed according to the stages of the document examination method. The account structures, elements, standards, and contents of the two systems were compared. In light of the findings, the format of reports in both systems, the terminology structures used in the accounts, the principle-based standards employed, the fact that the reports are publicly accessible and presented with similar principles, the presentation of information contained in the reports through integrated and standardized formats, and the conducting of audits for report assurance were identified as similarities for providing quantitative and qualitative information about the reported unit for informative users.

Keywords: *General purpose water accounting, sustainable water management, financial accounting, sustainable water accounting*

JEL Code: M41, M49, Q25

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Genel Amaçlı Su Muhasebesi Sisteminin Finansal Muhasebe ile Karşılaştırılması

Öz

Su muhasebesi, finansal hesapların gelir ve gider ile ilgili bilgi sağlaması gibi 'Ölçemediğimizi şeyi planlayıp yönetemeyiz' önermesine dayanarak finansal muhasebeden ilham almaktadır. Bu araştırmanın amacı; su muhasebesi ile finansal muhasebeyi içerik, standartlar, amaç ve raporlar açısından karşılaştırarak iki sistem arasındaki benzerlikleri ve farklılıkları ortaya koymaktır. Bu araştırmada finansal muhasebeye benzer yapıda olan ve bazı konularda finansal muhasebeden farklılaşan finansal muhasebe ile ilgili önemli standart, kayıt ve raporlama yapılarının savunulduğu, uygulandığı ve sunulduğu Avustralya genel amaçlı su muhasebe sistemi (AGASM) seçilmiştir. Bu çalışmada iki sistemin benzerlik ve farklılıklarını belirlemek için nitel araştırma tekniklerinden doküman inceleme yöntemi kullanılmıştır. Araştırma verileri, doküman inceleme yönteminin aşamalarına göre incelenmiştir. İki sistemin hesap yapıları, unsurları, standartları ve içerikleri karşılaştırılmıştır. Bulgular ışığında her iki sistemde raporların formatı, hesaplarda kullanılan terminoloji yapıları, kullanılan standartların ilke bazlı olması, raporların kamuya açık olması ve benzer ilkelerle sunulması, raporlarda bulunan bilgilerin bütünleşik bir şekilde önceden belirlenmiş ve standartlaştırılmış raporlar aracılığıyla sunulması, rapor güvencesi için denetimin yapılması, bilgi kullanıcılarına raporlanan birim ile ilgili niceliksel, niteliksel bilgi sağlamasına yönelik benzerlikler tespit edilmiştir.

Anahtar Kelimeler: *Genel amaçlı su muhasebesi, sürdürülebilir su yönetimi, finansal muhasebe, sürdürülebilir su muhasebesi*

JEL Kodu: M41, M49, Q25

Introduction

As water scarcity increases, the need to account for where water is provided and distributed also grows. Timely and reliable water information is needed to combat water scarcity and to manage water effectively. Fundamental data on the availability and utilization of water resources form the cornerstone of effective water management. Water management by various institutions is highly challenging when there are distinct plans, policies, and strategies, making it difficult to create a unified data set. Water accounting entails the analysis of water-related data within a specific geographical region or hydrological system, offering crucial information for water management to support the sustainable utilization of water resources. Water accounting is a systematic framework that consolidates water information from various data sources into a consistent system (Food and Agriculture Organization of the United Nations, 2019). Water accounting aids in determining the availability of water within a basin and in allocating water efficiently to prevent shortages. Understanding the hydrological cycle, assessing changes in water supply and demand, evaluating spatial and seasonal variations in rainfall.

Türkiye is one of the countries most exposed to both the present and future impacts of global climate change. Contrary to popular belief, Türkiye is not a water-rich country. As of 2023, Türkiye's per capita available water is 1,313 m^3. With a projected population of 100 million by 2050, this figure is expected to decrease to 1,120 m^3 per capita (Türkiye Tarım ve Orman Bakanlığı. (2023). If these projections are realized, Türkiye will be among the countries experiencing water stress (Türkiye Su Enstitüsü [SUEN], 2024) to plan water resources effectively and maximize the benefits derived from them, it is essential to manage water information accurately. Proper planning of water resources ensures that the benefits derived from them are maximized. Although water data is frequently produced, it is not presented systematically, and as a result, the information does not meet the needs of its users. Water information is employed to tackle various environmental, physical, social, political, economic, and ecological challenges, including issues related to water supply, consumption, availability, and accessibility.

There are multiple systems for recording and reporting water information, collectively referred to as water accounting systems. However, the origins, purposes, and types of reported water information in water accounting systems vary. The shared objective of water accounting systems is to effectively contribute to the resolution of water scarcity issues.

Four water accounting systems have been adopted and implemented by many countries. These systems are as follows (Delavar et al. (2023),

- The Australian General-Purpose Water Accounting System (GPWA)
- System of Environmental-Economic Accounting for Water (SEEAW)
- Water Footprint Accounting (WFA)
- International Water Management Institute Water Accounting System (IWMI-WA)

GPWA system shares a similar structure with the reporting and presentation aspects of financial accounting. The aim of the system is to apply the process of establishing, recording, classifying, and summarizing data in water accounting to interpret and analyze reports, thereby converting financial data into information. Additionally, the GPWA system is compatible with the reporting requirements ((Turkish Accounting Standards [TAS 1] Article 9) concerning how resources entrusted to managers are utilized in the financial statements. The GPWA system provides regular annual reports on water-related information. Consequently, the GPWA system is founded on the objectives of financial accounting, the attributes of financial information, and the elements of financial statements, preparing its reports in alignment with these principles.

This study contributes to the literature by comparatively analyzing financial accounting and the General-Purpose Water Accounting (GPWA) system developed in Australia, within the context of water accounts and accounting standards. Existing studies tend to address water accounting either from an environmental perspective or with limited reference to financial accounting principles. This research fills that gap by systematically examining the structural and conceptual parallels between GPWA and financial accounting, thus offering an interdisciplinary perspective.

Moreover, by contextualizing the analysis within Türkiye, the study provides original insights into the applicability of an internationally recognized model in a national setting. In doing so, it contributes to theoretical discussions in both water management and accounting fields, while also offering practical guidance for policymakers and practitioners.

This comparison is particularly important for practitioners and researchers in Türkiye, where increasing pressure on water resources highlights the need for more transparent and standardized reporting systems. The Australian model offers a comprehensive framework through its conceptual and methodological parallels with financial accounting, which may inform improvements in water resource monitoring and policy-making in the Turkish context.

Furthermore, this comparison can support key dimensions such as accountability, data quality, and transparency in water management, contributing to the development of sustainable practices. Thus, the study's findings are expected to offer valuable insights for both academic literature and practical implementation. This comparison is particularly important for practitioners and researchers in Türkiye, where increasing pressure on water resources highlights the need for more transparent and standardized reporting systems. The Australian model offers a comprehensive framework through its conceptual and methodological parallels with financial accounting, which may inform improvements in water resource monitoring and policymaking in the Turkish context.

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Literature Review

Water accounting

Water accounting was developed by applying concepts, principles, and practices from financial accounting. Water accounting applies financial accounting methods to water volumes rather than to financial values (Food and Agriculture Organization [FAO] and World Water Council (2018).

Effective water management is contingent upon the availability of timely and accurate information about water resources, including their generation, distribution, and use. This information aids decision-makers in planning effective interventions to enhance water security. Water accounting provides a systematic framework for integrating water data from multiple sources into a single system. Water accounting provides insights into the hydrological impacts of various supply and demand management scenarios. Water accounting functions as a 'Water Information System' by reporting the status of water resources in a standardized manner.

Water accounting is a structured process that involves identifying, recognizing, measuring, reporting, and securing water-related information, rights, and obligations from diverse data sources. Its goal is to deliver comparable, comprehensive and consistent water-related information to foster the sustainable use of water resources and ensure equitable and transparent water governance among users.

Reasons for the need for water accounting

Data on water resources must be reported using clear terminology and a standardized data collection system with predefined standards. Water accounting presents water balances for a defined area, including water use and its components, in a standardized format over a specified period (Vardon et al., 2024, p. 2). Water accounting is an approach to measuring water use and flows, based on the premise that financial accounts provide information on income and expenditure.

Water accounting provides a method for understanding the availability of water and how it is allocated to prevent shortages (FAO, 2018, p. 3). However, water accounting serves functions that are far more comprehensive than these objectives. For example, the water accounting system also aims to understand the water cycle and assess spatial and seasonal variations in precipitation, including the impact of unpredictable extreme floods and droughts (WA, 2023). The water accounting system, in isolation, does not offer significant benefits to water management. Given that water can be conceptualized in various ways, its evaluation and accounting as a natural resource, public good/service, ecosystem service, and human right require a holistic understanding that integrates multiple fields, including environmental science, ecology, law, anthropology, finance and economics, (Manore, Normyle, & Vardon, 2024, p. 1). Water accounting is considered a crucial tool for understanding water-related issues, identifying solutions, and supporting management by applying these solutions to water management. What is crucial here is determining the most effective way to utilize water accounting as a tool. The main challenge in water management is the uncertainty regarding the annual variability in both the quantity and quality of available water, especially concerning water stocks and flows, which are crucial components in water accounting calculations (FAO, 2024, p. 3).

Water accounting originated in France in the early 1980s, when the French government endeavored to manage water flows by calculating both water quality and quantity, as well as modeling all aspects of the hydrological cycle. In the 1990s, France initiated water accounting practices but was unable to further develop them. In 2012, the United Nations (UN) introduced a hybrid accounting approach called SEEA, using the French water accounting framework as a model (UN, 2012).

In 2007, the Australian government introduced water legislation that mandated national water accounting. The Australian Water Accounting Standards Board (WASB) (2014) describes water accounting as "a systematic process involving the identification, recognition, measurement, reporting, securing, and publication of water, along with rights or other claims to that water, and associated obligations" (WASB, 2014). According to the FAO, water accounting involves systematic evaluation of water supply, demand, accessibility, distribution, and utilization across specified regions and time periods, providing a foundation for evidence-based decision-making in water policy (FAO, 2024). While the hybrid model developed by the UN is being implemented, various organizations, including the Australian Bureau of Meteorology (BOM), the Food and Agriculture Organization (FAO), and IWMI, have collaborated to develop standardized frameworks for water accounting. These organizations have established two approaches to water accounting.

- The UN's SEEA and the Australian Water Accounting System Flow Accounting,
- IWMI-WA and IWMI-WA+ represent Depletion Accounting methods.

Countries can select different water accounting approaches based on their water management policies (Amgad, 2020). The application of water accounting methods aligned with these policies play an active role in managing water resources, particularly in regions experiencing water scarcity. (Additionally, evaluating future developments and taking action to achieve other goals also influence the choice of water accounting approaches (Elmahdi, 2020).

The prolonged drought that took place in Australia from 1997 to 2010 is commonly known as the 'Millennium Drought' (Banerjee, Bark, Connor et al., 2013). Australia implemented comprehensive water management reforms during the Millennium Drought to reallocate scarce water resources. For this reason, the Australian Water Accounting Standards are highly comprehensive in accounting for all flow information and water storage within the field of water accounting. Australian water accounts aim to expand the scope of water accounting by focusing on the physical boundaries of the basin, rather than encompassing every component of the water cycle (Australian Bureau of Statistics. (2021). When water

accounting is viewed as an instrument for enhancing transparency and control in water management, its application to regional areas and the entire water cycle provides more robust and reliable data (Chalmers, Godfrey & Potter, 2012). It also aims to ensure the quality of water accounting reports, which deliver crucial information to efficiently allocate water resources.

The financial accounting framework and standards form the foundation of the GPWA Standards Framework. Since 2001, more than 150 countries have adopted the International Financial Reporting Standards (IFRS) to ensure high-quality, understandable, and uniform accounting standards (Dakata & Hasnah, 2016). Australia has developed International Water Accounting Standards, inspired by frameworks that allow financial accounting to communicate a unified accounting language globally.

This study focuses on the GPWA system, which develops standards to promote organizational and technical harmonization and guides the creation of a common water language, aiming to find a global solution to the worldwide issue of water scarcity. Thus, a comprehensive review was conducted on the GPWA system, which provides sustainable solutions to enhance transparency and accountability in water data at the international level.

General-Purpose water accounting system (GPWA)

Australia has developed a GPWA, which serves as a model for financial reporting and aims to possess the capability to support a global water accounting system. Among other water accounting systems, GPWA is an applicable and accountable framework (WASB, 2012). GPWA has developed an advanced, internationally recognized water accounting and management system through research and advancements in water allocation and distribution, enhancing public understanding of water resource management, water rights, and trade (Australian Bureau of Meteorology (BOM), 2010). Therefore, Australia has established an independent water accounting framework and set water accounting standards. Water Accounting Standard 1 (AWAS-1), published in 2012 by Australian Water Utilities, is a comprehensive water accounting framework. Building on the development of AWAS-1, BOM, the Water Resources Standards Committee and the Australian Audit and Accounting Committee introduced Water Accounting Standard 2 (AWAS-2) to improve the reliability and relevance of water accounting information quality (Zehui, 2018).

Australian General-Purpose water accounting reports

The Australian focus on water availability, entitlements, supply obligations, and withdrawals and releases from both groundwater and surface water sources. GPWAR is intended to deliver information regarding the provision, management, distribution, and utilization of water resources. During the reporting period, data is provided on water availability, allocation, trade, and the volume of water abstracted for usage or removal for societal benefit (WASB, 2012). GPWAR is published annually for each hydrological year.

The following are key factors of water accounting (WASB, 2012):

a) A Contextual Statement

b) A Statement of Water Assets and Water Liabilities

c) A Statement of Changes in Water Assets and Water Liabilities

d) A Statement of Physical Water Flows

e) An Accountability Statement

f) An Assurance Statement

Method Research Models

This research is qualitative, as the document review technique was used to compare financial accounting and GPWA systems. Document analysis is a structured approach to reviewing and assessing both print and digital materials (Bowen, 2009).

Document analysis is a qualitative research method that entails analyzing and interpreting data to uncover meaning, develop understanding, and derive empirical information (Corbin & Strauss, 2008). The outcomes of qualitative methods are more descriptive, allowing for easier inferences to be drawn from the gathered data (QuestionPro, 2024).

Due to the nature of the study, informed consent or ethics committee approval was not required.

Data collection tools

Primary data sources were utilized in the research. As primary sources, the International Water Accounting Standards (AWAS-1) and (AWAS-2), published by the BOM under the Australian Government, as well as water reports regularly released to the public during the hydrological year, guidelines, official websites of institutions and organizations regulating water accounting, national and international articles, book chapters, technical and annual reports, and theses were examined to collect information on the systems. The two systems were compared using the information obtained.

- The stages of the document review method employed to collect data for the research were considered. These stages are outlined as follows:
- Access to Documents: Standards, published reports, technical reports, and archival reports are available on the website.
- Access to Documents: The website provides access to standards, published reports, technical reports, and archival reports.
- Understanding Documents: Documents consist of data obtained from reports prepared in accordance with internationally accepted standards and made available to the public. The accuracy of the data was verified by the authors through an examination of whether the data was original, up-to-date, and official.
- Analyzing the Data: The documents were first classified under broad headings and then analyzed and evaluated comparatively based on these headings.

Findings and Discussion

In this section, the similarities and discrepancies between the GPWA and financial accounting will be discussed within the scope of the research.

The relationship between GPWA and financial accounting

The GPWA system aims to utilize the principles of financial accounting to establish water accounts. Therefore, there are various similarities and differences between the suggested water accounting framework and the established financial accounting standards. GPWAR is based on a set of documents whose content and format are similar to those of financial accounting (WASB, 2012). GPWAR is based on a series of documents whose content and format are similar to those of financial accounting (WASB, 2012).

The water accounts proposed in the Australian methodology are designed based on the Framework for the Preparation and Presentation of Financial Statements. Therefore, there are significant similarities between the terminology and format used in Australian water accounts and those found in financial accounts. A complete set of financial statements under the Accounting Standards includes the Statement of Financial Position at the End of the Period, the Statement of Profit or Loss and Other Comprehensive Income, and the Statement of Cash Flows for the Period (TAS 1, 2018, article 10). The reports included in the GPWA system, namely "Water Assets and Water Liabilities," "Changes in Water Assets and Water Liabilities," and "Physical Water Flows," are prepared based on financial accounting statements.

Statement of water assets and water liabilities

Water accounting enables managers, governments, organizations, and other stakeholders to make well-informed choices regarding the governance and distribution of water and other resources. The nature of water accounting is analogous to the role that financial accounting reports play in facilitating economic decision-making (Day, Godfrey, & Hanley, 2010).

The Statement of Water Assets and Water Liabilities, commonly referred to as the water balance sheet, is prepared using a methodology analogous to that of the End-of-Period Financial Position Statement (balance sheet) within the comprehensive framework of financial statements. In this context, water assets are defined as water resources that a water organization owns, whether physically or through acquired rights. Water Liabilities in water accounts represent the water supply obligations contracted for in the specified period, which will be executed in the subsequent period.

Equity is calculated by subtracting total liabilities from the total assets of a company. Similarly, in the Water Assets and Water Liabilities Statement, Net Water Liabilities are subtracted from Net Water Assets to determine Net Water Resources. In other words, the calculation is performed by deducting water liabilities from existing water resources, ensuring that water assets are represented without compromising supply obligations (WASB, 2012).

Statement of changes in water assets and water liabilities

The Statement of Changes in Water Assets and Water Liabilities is analogous to the Statement of Profit or Loss and Other Comprehensive Income for the Period within the set of financial statements, as it summarizes a company's financial activities and reflects the profit or loss realized during a specific period. In financial accounting, profit is determined as the disparity between revenue and costs, based on the accrual accounting method. The accrual basis in water accounting is defined as the recognition of the effects of water-related transactions when the commitments or decisions underlying these transactions are made. The rise or fall in resources included in water accounts represents the amount of water gained or lost, either physically or through vested rights. The rise or fall in resources included in water accounts represents the amount of water gained or lost, whether physically or through vested rights.

The water accounting recommendations in the Australian methodology are structured according to the Framework for the Preparation and Presentation of Financial Statements. As a result, there are notable similarities in both the terminology and structure between Australian water accounts and those found in financial statements.

The changes in net water resources, as calculated in the Changes in Water Assets and Water Liabilities account, are equal to those derived from the unexplained difference (1) (accounting equivalence).

However, these values cannot be matched with water quantities due to measurement and recording errors, or the inability to identify specific water sources or flows in the calculations. Unlike in financial accounting, an unaccounted difference is calculated to more precisely quantify the overall discrepancy in the statements. Water accounting aims to manage the accounts in the statements and ensure the reliability of the water accounts.

The statement of physical water flows

The Physical Water Flows Statement is prepared on an accrual basis, consistent with established accounting principles. It exhibits similarities to the Cash Flow Statement, which constitutes a fundamental component of financial accounting reports. The cash flow statement presents data on the variations in a company's cash and cash equivalents over the reporting period. The Statement of Physical Water Flows records the water inflows and outflows physically owned and managed by the water utility. It provides data on water flows for the reported hydrological year, based on a flow basis (WASB, 2012).

GPWAR provides reliable, comparable, relevant, and understandable information, similar to financial reports, to support decision-making processes. While financial reports deliver critical financial data for economic decision-making, GPWAR provides valuable insights for decision- making and assessment related to resource allocation. GPWA Standards and the IFRS are both principles-based. This implies that the standards in both systems are grounded in fundamental concepts.

The first general characteristic of GPWAR is the fair presentation principle. GPWAR is presented in accordance with the principle of fair presentation, covering water assets and liabilities, changes in water assets and liabilities, and physical water flows. Another principle in the preparation of the GPWAR is the accrual basis. The statement of Water Assets and Water Liabilities, as well as The Statement Of Changes in Water Assets and Water Liabilities, are also prepared on an accrual basis (WASB, 2012). In accounting, accrual is defined as the recognition of transactions when they occur and their inclusion in the financial statements for the relevant period.

According to the accrual principle, it is sufficient for a transaction to be finalized in terms of both quantity and quality. The statement of Water Assets and Water Liabilities and the Changes in Water Assets and Water Liabilities are prepared based on the accrual accounting principle. Currently, corrections are being made for future entries or exits related to the existence of the water report. GPWAR prepared on an accrual basis provide users with both information about previous transactions or incidents related to the tangible movement of water and insights into current obligations and rights regarding the future transfer or transformation of water. While preparing the GPWAR, the 'materiality principle' is applied, as it is in financial statements. According to the materiality principle, information is considered material if its omission or misrepresentation in reports could influence the decisions of users of the report (WASB, 2014). While preparing the GPWAR, the 'materiality principle' is applied, as it is in financial statements. According to the materiality principle, information is considered material if its omission or misrepresentation in reports could influence the decisions of users of the report (WASB, 2014).

In the preparation of the GPWAR, the 'net-off principle' is applied. In the process of preparing water accounting reports, water assets are documented independently from water liabilities, variations in water assets are differentiated from variations in water liabilities, and water inflows are isolated from water outflows. These items are not offset in the water accounting reports, as offsetting items by general-purpose water accounting standards would reduce the ability of water report users to interpret actions and incidents that occurred during the reporting period (WASB, 2012, p.28).

When presenting the GPWAR, the water volumes reported for the current period should be compared with those reported for the previous year. In line with the provision stated in Article 38 of the Turkish Accounting Standards (TAS), which requires enterprises to present a complete set of financial statements (including comparative information) at least once a year, this approach enables stakeholders to compare the nature and volume of their water assets and liabilities, as well as the changes in them (WASB, 2012).

When presenting items in the GPWAR system, no modifications are made to the water accounting report unless the changes provide useful information to the users of the water report. As outlined in Article 45,

"Consistency in Presentation," of the Turkish Accounting Standards, the report must maintain consistency across reporting periods, in accordance with the "principle of consistency and comparability" in GPWAR. The water report provides users with useful information (WASB, 2012).

Water information is provided in statistical statements rather than being presented in an integrated manner. Water accounting consists of three accounting statements, each providing specific information about how water is used. Integrated water accounts are developed and provided in alignment with water accounting standards. The water report provides conceptual information regarding the water assets and liabilities of the reporting organization, including any conditions or changes in conditions that affect the management of these water assets and liabilities. Water rights in the statement of Water Assets and Liabilities, the statement of Changes in Water Assets and Liabilities, and the statement of Physical Water Flows offer a new perspective on climate and water management. It includes information on all conditions that affect the management of water assets and liabilities.

Water accounting provides a fundamental equation similar to the financial accounting equation. The components of water accounting must adhere to two fundamental equations. The two basic equations in water accounting are as follows (Zehoi, 2018):

Net Water Assets = Water Assets- Water Liabilities

Changes in Net Water Assets = Changes in Water Assets- Changes in Water Liabilities

The fundamental equation of financial accounting is as follows (Kaygusuz, Aslan, & Kepçe, 2018, p. 49):

Assets = Capital + Liabilities

Both systems are based on fundamental accounting equations and employ a double-entry accounting system. Table 1 illustrates the similarities between the GPWA system and financial accounting.

Table 1

Similarities between the Australian GPWA System and Financial Accounting

General-purpose Water Accounting	**Financial Accounting**
GPWAR is developed in compliance with water accounting standards.	Financial statements are generated following recognized accounting standards.
Standards are typically founded on underlying principles.	Standards are typically founded on underlying principles.
It offers users both quantitative and qualitative data regarding the reported water utility.	It provides users with both quantitative and qualitative information regarding the financial position of the reported organization.
The water accounting reports are compiled using both a physical flow approach and an accrual method.	In financial accounting, financial statements are generated utilizing both the cash flow and accrual methods of accounting.
In the double-entryac counting system, transactions are recorded as either assets or liabilities in the respective accounts.	In the double-entry accounting system, transactions are recorded in accounts as debits and credits.
Information users involve multiplestakeholders in making and evaluating water- related decisions.	Users of financial information include various stakeholders who utilize this information.
Comparing data from several hydrological years is necessary to interpret water calculations.	Interpreting financial accounts and analyzing financial statements require at least two years of data.
Water accounts are statements that show how water resources are obtained, managed, distributed, and used throughout the reporting period.	Accounting accounts are tables developed to facilitate the tracking of commercial transactions and are statements where transactions of the same nature are collected.
There are standardized reporting and water auditing practices in water accounting.	In financial accounting, there are standardized reporting and financial auditing procedures.

Table 1 illustrates the similarities between the GPWA system and financial accounting. The GPWA system is standardized along a single dimension to accommodate various water management policies. When examining the GPWA, it becomes apparent that although water resources are incorporated into the financial accounting framework, water accounting differs from traditional accounting due to its unique characteristics. Table 2 illustrates the differences between GPWA system and Financial Accounting.

Table 2

Differences between of General-Purpose Water Accounting and Financial Accounting

General-Purpose Water Accounting	**Financial Accounting**
The measurement unit is quantity.	The unit of measurement used is currency
The measurement feature refers to volüme measurements, such as cubic meters, cubic hectometers, and cubic millimeters.	The measurement attributes comprise present value, fair value, net realizable value, and historical cost.
The reporting unit is the water reporting agency.	The reporting unit comprises enterprises.
The accuracy of water data exhibits higher variability in contexts requiring data modeling and predictive analyses for quantitative assessment.	Quantitative assessments do not necessitate data modeling and estimation. Financial data typically exhibit variability.
The fundamental components of water accounting are Water Assets, Water Liabilities, Changes in Water Assets, and Changes in Water Liabilities.	The fundamental components of financial accounting include assets, liabilities, equity, revenue, expenses, profit.
Data sources for water accounting include direct observations, conceptual models, and satellite-based methods.	Financial accounting data is derived from all financial transactions within the business.
Engineers, meteorologists, hydrologists, experts, and accountants can collaborate to obtain data on water resources.	Only accountants are responsible for working with financial information.

Table 2 illustrates the differences between GPWA system and Financial Accounting. It has been found that differences exist in terms of measurement and reporting units, data modeling, and the fundamental components of the reports, particularly due to the varying purposes for which the reports are intended.

GPWAR addresses the fundamental information needs of individuals who are unable to obtain information directly from an organization, including water users, water market investors, auditors, financiers, traders, local governments, researchers, organizations, planners, policymakers and brokers (Meurer & Van Bellen, 2024).

Water reporting agencies and financial reporting organizations are entities upon which information requesters rely for reports in their decision-making processes. However, assurance is crucial for users and their information needs. This assurance requires an assurance statement and independent verification that the information has been prepared and presented by the relevant standards (WASB, 2014).

Water auditing is an analytical technique that measures water demand, supply, usage trends, and quality (Batchelor, 2016). When integrated with water auditing, water accounting helps uncover the political economy of water (FAO, 2018). Grounded in financial accounting, water accounting has enhanced water auditing by utilizing financial auditing to ensure the reported water information. Water auditing is essential for reliably recording all processes and data, from the source of water flow to its treatment and delivery to the water users (Ekergil, & Polat, 2023, p. 398).

Water auditing, which connects water accounting to water management, provides qualitative assessments of water accounts. It serves as a tool for contextualizing water accounting findings, outputs, water supply, and water service delivery within a social framework (Deloitte Access Economics, 2013).

Conclusion

Access to water is a fundamental human right and a prerequisite for social justice (Polat, Ekergil, & Kavak, 2024, p. 209). Therefore, the need for greater transparency and accountability in water resource management has emerged. Various approaches have been developed for recording and reporting data related to water resources. Effective water management depends on timely and accurate information about water resources, including their formation, distribution, and utilization. This information supports decision-makers in planning interventions that enhance water security (Amdar, Mul, Al-Bakri, et al., 2024, p. 881).

Developing interdisciplinary research that reflects the multidisciplinary nature of water contributes to advancing water accounting practices and frameworks. Water accounting is an effective method for showcasing the responsible and sustainable management of this crucial resource. Based on financial accounting principles, water accounting seeks to deliver thorough, comparable, and consistent data on water, supporting its sustainable management and encouraging equitable and transparent water governance among stakeholders.

The water accounting approach is of significant importance, as it serves as a standardized reporting system for the status of water resources and functions as an effective water information system.

GPWA and financial accounting are systems derived from the same discipline but require distinct areas of knowledge and expertise (Tingey-Holyoak & Pisaniello, 2019). GPWAR have revealed a weak correlation between the statement of changes in water assets and liabilities and the water assets and liabilities themselves. The primary reason for this is that the water management policies of countries differ from the calculations in GPWA. Water Accounting Standards should monitor emerging trends in the financial recognition of water processes (such as basins, regions, and other relevant areas) reported by countries and provide a roadmap for improving this correlation. Research in this field indicates that the implementation of accounting methods and practices in particular contexts can be both influential and impactful, having the potential to shape individual behavior as well as the operations of organizations and societies (Power, 1994).

Water accounting methodologies seem to need further refinement of standardized methods for computing and reporting water accounts to enable wider application, as well as to improve the comparison and exchange of information. The lack of diversity, particularly in water accounting technology, challenges accessing the necessary data. Incomplete data distances the GPWA system from the accounting discipline. It has been determined that there are no content-based similarities between the two systems, with only a few similarities in the presentation of reports. In particular, the inability to access essential data, including meteorological information, land use maps, and groundwater data, required for water accounting reports causes water accounting to deviate from its accounting foundation (Karimi, Molden, Bastiaanssen, & Xueliang, 2012).

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Genişletilmiş Özet

Amaç

Su muhasebesi, finansal hesapların gelir ve giderle ilgili bilgi sağlaması gibi, "Ölçemediğimiz şeyi planlayıp yönetemeyiz" önermesine dayanarak finansal muhasebeden ilham almaktadır. Genel Amaçlı Su Muhasebesi Sistemi'nin, finansal muhasebe sistemiyle benzer bir şekilde geliştirilmesi, şirketlerin su muhasebesini kolayca uygulaması, raporlaması ve sürdürülebilirliğini sağlaması açısından son derece önemlidir. Bu araştırmanın amacı, Genel Amaçlı Su Muhasebe Sistemi (AGASM) ile finansal muhasebeyi içerik, standartlar, amaç ve raporlar açısından karşılaştırarak, iki sistem arasındaki benzerlikleri ve farklılıkları ortaya koymaktır.

Bulgular ışığında, her iki sistemde raporların formatı, hesaplarda kullanılan terminoloji yapıları, kullanılan standartların ilke bazlı olması, raporların kamuya açık olması, benzer ilkelerle sunulması, raporlarda bulunan bilgilerin bütünleşik bir şekilde ve önceden belirlenmiş, standartlaştırılmış raporlar aracılığıyla sunulması, rapor güvencesi için denetim yapılması ve bilgi kullanıcılarına raporlanan birimle ilgili niceliksel ve niteliksel bilgi sağlamaya yönelik benzerlikler tespit edilmiştir.

Tasarım ve yöntem

Bu araştırmada, finansal muhasebe ile AGASM sistemlerinin karşılaştırılmasında doküman incelemesi tekniği kullanıldığından, araştırma nitel bir araştırma özelliği taşımaktadır. Doküman analizi, hem basılı hem de elektronik materyallerin incelenmesi veya değerlendirilmesi için sistematik bir prosedürdür (Bowen, 2009). Doküman analizi; anlamı ortaya çıkarmak, anlayış geliştirmek ve ampirik bilgiyi bulmaya yönelik olarak verilerin incelenmesini ve yorumlanmasını gerektiren nitel bir araştırma yöntemidir (Corbin & Strauss, 2008). Nitel yöntemlerin sonuçları daha betimleyici olmakta ve elde edilen verilerden çıkarımlar daha kolay yapılmaktadır (QuestionPro, 2024).

Araştırmada birincil veri kaynaklarından faydalanılmıştır. Birincil kaynak olarak, Avustralya Hükümeti bünyesinde Avustralya Meteoroloji Bürosu tarafından yayımlanan Uluslararası Su Muhasebesi Standartları, hidrolojik yılda düzenli olarak kamuya açıklanan su raporları, yönergeler, su muhasebesi ile ilgili düzenleme yapan kurum ve kuruluşların resmî web siteleri, ulusal ve uluslararası düzeyde yayımlanan makale, kitap bölümü, teknik ve yıllık raporlar, yönergeler, tezler incelenmiş ve sistemlere yönelik bilgiler toplanmıştır.

Elde edilen bilgilerle iki sistem karşılaştırılmıştır. Araştırmada verilerin toplanması için kullanılan doküman incelemesi yönteminin aşamaları göz önünde bulundurularak gerçekleştirilmiştir. Bu aşamalar aşağıdaki gibi sıralanmaktadır:

Dokümanlara Erişme: Standartlar ve yayımlanan raporlar ile teknik ve arşiv raporlarına internet sitesinden ulaşılmıştır. Özgünlüğü Kontrol Etme: Dokümanlar, rapor sunan kurumun web sitesinden ve yayımlanan raporlardan elde edildiğinden, orijinaldir.

Dokümanları Anlama: Dokümanlar, uluslararası alanda kabul gören standartlar kapsamında düzenlenen ve kamuya sunulan raporlardan elde edilen verilerdir. Verilerin orijinal, güncel ve resmi olup olmadığı incelenerek doğruluğu yazarlar tarafından kontrol edilmiştir.

Veriyi Analiz Etme: Dokümanlar önce temel başlıklar altında, ardından analiz edilecek başlıklar temelinde sınıflandırılarak karşılaştırmalı bir şekilde incelenmiş ve değerlendirilmiştir.

Veriyi Kullanma: Yapılan analiz, yazarlar tarafından görüş alışverişi yapılarak sonuçlandırılmıştır.

Bulgular

Su kıtlığına yönelik stratejiler, su arzı ve talebi ile bunun mekânsal ve zamansal boyutları dahil olmak üzere su dengesinin kapsamlı bir şekilde anlaşılmasına dayanmaktadır. İçilebilir suyun kilit paydaşlarının ihtiyaçlarının ve önceliklerinin belirlenmesi ve karşılanması, yaşamın sürdürülebilirliği açısından önemlidir. Su muhasebesi, sürdürülebilirlik raporlarının hazırlanmasında ve yaşamın sürdürülebilirliğinde en önemli kilit taşıdır. Stratejik su yönetiminde su dengesinin kurulması ve su denetiminin sağlanmasında su muhasebesine ihtiyaç vardır.

AGASM sistemi, finansal muhasebenin su hesapları oluşturma temelinden yararlanmayı amaçlamaktadır. Bu nedenle, önerilen su muhasebesi modeli ile mevcut finansal muhasebe gereklilikleri arasında birtakım benzerlikler ve farklılıklar bulunmaktadır: AGASM içeriği ve formatı, finansal muhasebeye benzer bir dizi belgeye dayanmaktadır (WASB, 2012). Bu raporlar, tıpkı finansal tablolar gibi üç aylık, altı aylık veya yıllık olarak sunulmakta ve kamuya açık bir şekilde yayımlanmaktadır.

Avustralya metodolojisinde önerilen su hesapları, Finansal Tabloların Hazırlanması ve Sunumu Çerçevesi'ne dayanarak tasarlanmıştır. AGASM sistemi, suya yönelik bilgileri her yıl düzenli olarak raporlamaktadır. Bu sebeple sistem, finansal muhasebenin amaçları, finansal bilginin nitelikleri ve finansal tabloların bileşenleri temelinde oluşturulmakta ve raporlarını bu temelde hazırlamaktadır. Bu nedenle, Avustralya su hesaplarında kullanılan terminoloji ve format ile finansal hesaplarda görülenler arasında önemli benzerlikler bulunmaktadır. AGASM sistemi, “Su Varlıkları ve Su Yükümlülükleri”, “Su Varlıkları ve Su Yükümlülüklerindeki Değişiklikler” ve “Fiziksel Su Akışları” tabloları hazırlamaktadır. Bu tablolar, Muhasebe Standartlarındaki tam bir finansal tablolar seti arasında yer alan Dönem Sonuna Ait

Finansal Durum Tablosu, Döneme Ait Kâr veya Zarar ve Diğer Kapsamlı Gelir Tablosu, Döneme Ait Nakit Akış Tablosu (md. 10) dayandırılarak düzenlenmektedir (Türkiye Muhasebe Standardı [TMS] 1, 2018).

Finansal muhasebeden ilham alan su muhasebesi sisteminin finansal muhasebeye benzeyen uygulamaları; raporların formatı, hesaplarda kullanılan terminoloji yapıları, kullanılan standartların ilke bazlı olması, raporların kamuya açık olması ve benzer ilkelerle sunulması, raporlarda bulunan bilgilerin standartlaştırılmış raporlar aracılığıyla sunulması ile ilgili benzerlikler tespit edilmiştir. Her iki sistemin kullandığı hesap unsurları, ölçü birimleri ve verilerin değişkenliği açısından ise farklı yönler belirlenmiştir.

Sınırlılıklar

Genel Amaçlı Su Muhasebesi Sistemi, finansal muhasebeden ilham alarak geliştirilmesine rağmen, finansal muhasebeden nasıl beslendiği ve hangi konularda ayrıştığına dair yapılan çalışmalar literatürde oldukça kısıtlıdır. Genel Amaçlı Su Muhasebesi Sistemi, su kaynaklarındaki su kullanımının verimli bir şekilde değerlendirilmesini sağlayan kapsamlı bir araç olmasına rağmen, uygulama alanı açısından yeni gelişen bir alandır.

Öneriler (teorik, uygulama ve sosyal)

Su, dünya çapında kritik bir doğal kaynaktır, ancak suya yönelik bilgiler, etkili yönetimin merkezinde yer almasına rağmen çoğunlukla yetersizdir. Finansal muhasebe ilkelerine dayalı olarak su kaynaklarını hesaba katmak için geliştirilen yenilikçi bir Avustralya sistemi olan Genel Amaçlı Su Muhasebesi Sistemi, su ile ilgili bilgilerde ve bu bilgilerin sunumunda iyileştirmeler sağlayabilir.

Çalışmada esas olarak su muhasebesi ile finansal muhasebe arasındaki farklılıklar ve benzerlikler tespit edilmiştir. Su yönetimi ve raporlamasında hesap verebilirliğin temel bir bileşeni olan şeffaflığın sağlanması çerçevesinde, su raporlamasının şeffaflığı artırabileceği gösterilmektedir. Ancak metodolojik zorluklar hâlâ çözülmemiştir. Özellikle, mevcut veri kısıtlamaları (örneğin, veri bulunabilirliği) ve finansal muhasebeyi su bilgilerinin diline dönüştürme süreci, bu sistemin uygulanmasındaki temel zorluklardır. Bu zorlukların aşılması için doğru hidrolojik modellerin kurulması, ihtiyaca uygun ve standartlaştırılmış veri elde etmeyi mümkün kılabilir.

Su muhasebesi, tek başına hiçbir su krizi için çözüm aracı olmamakla birlikte, etkili su yönetiminde karar alma aracı olarak kullanılabilir. Bu kapsamda, Genel Amaçlı Su Muhasebesi raporları (AGASMR); mevcut su miktarını, ne kadar kullanıldığını ve su kullanımının anlaşılmasını teşvik etmek ve su yönetiminin iyileştirilmesine yardımcı olmak için, kullanımdan elde edilen değeri hesaba katan çok ölçekli bir yöntem olarak su yöneticilerine destek verebilir.

Özgün değer

Bu konuda yapılan farklı araştırmalar, su muhasebesinin sürdürülebilirlik açısından önemini ortaya koymuştur. Bu çalışma ise, muhasebe ve mali skandallar sonucunda büyük bir dönüşüme giren finansal muhasebeden ilham alarak su krizlerine çözüm arayan Genel Amaçlı Su Muhasebesi Sistemi'ne odaklanmaktadır. Bu çalışma, farklı su kaynaklarından gelen su miktarlarının standartlaştırılmış bir veri toplama yöntemi sunan Genel amaçlı su muhasebesi sisteminin, finansal muhasebe ile karşılaştırılmasının sonuçlarını sunmaktadır. Su muhasebesi, su kaynakları yönetimi, çözüm önerileri ve su politikası ile ilgili karar alma süreçlerinde faydalı ve şeffaf bilgiler sağlamak amacıyla finansal muhasebeye dayandırılmaktadır. Farklı ölçüm yöntemleri ve kaynaklardan su bilgilerinden doğru veri toplama ve standartlaştırılmış şekilde sunma potansiyelinin daha fazla kabul görmesi söz konusudur.

Bu yönüyle, AGASM sistemi, diğer su muhasebesi sistemlerinden farklılık göstermektedir. Çünkü diğer su muhasebesi sistemleri, finansal muhasebe raporlarıyla benzerlik göstermemektedir. Bu bakış açısıyla çalışma, sürdürülebilirlik ve yeni muhasebe yöntemleri gibi konularda özgün katkılar sunmaktadır. Bu

araştırma hem mevcut literatüre katkı sağlama hem de yeni bir muhasebe paradigması oluşturma açısından özgün bir değer taşımaktadır.

Çalışmanın en özgün yanı, belirlenen benzerlikler ve farklılıkların metodolojik sorunların çözülmesine yönelik çıkarımlar yapması ve standartların daha da iyileştirilmesi gerektiği yönündeki bulgulardır. Ayrıca, hesap verebilirliğin artırılması için daha büyük revizyonların gerekebileceği vurgulanmaktadır.