

# Research on the Framework of Water Resources Accounting

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**Abstract.** The problems of water shortage, serious water pollution and deterioration of water ecological environment in China have become increasingly prominent. However, the economic development has made the demand for water resources in production and life continue to grow. Therefore, the importance of establishing water rights transfer system is self-evident. With regard to water resources accounting, the Australian Water Accounting Standards theory system is the most distinctive. It uses volume as the measurement attribute and based on the accrual basis, and uses the double-entry bookkeeping method to prepare water accounting statements. Based on the theory of water resources accounting at home and abroad and the water accounting standards in Australia, this paper proposes an accounting framework for Chinese water resources accounting entities based on national conditions, laying the foundation for macro resource environment calculation.

## 1. Introduction

Water is a key factor in growing food, generating energy, producing industrial products and other goods and services, and ensuring ecosystem integrity. The rapid development of Chinese economy has deepened the dependence of life and industry on water resources. At the same time, water shortages and pollution problems have emerged one after another. The Party Central Committee advocated the concept of green development from a macro-strategy. The 'Decision of the Central Committee of the Communist Party of China on Several Major Issues Concerning Comprehensively Deepening Reform' adopted by the Third Plenary Session of the 18th CPC Central Committee clearly stated that it was necessary to carry out market entity accounting for water resources and their ownership in the whole country, establish an accurate registration of water resources and a water rights trading system, conduct audits of natural resources assets such as water resources for leading cadres, and establish a lifelong accountability system for ecological environmental damage.

Chinese water resources statistical accounting system is relatively macroscopic. It is generally responsible for national or regional water resources accounting at the government level. It is not yet able to supervise and judge the water-related activities of individual water resources entities, and cannot provide real-time information for both water rights trading parties or potential trading parties. It is even more difficult to reflect the adverse effects of water-related activities on water resources, water environment and water ecology objectively. Therefore, it is of great significance to learn from the Australian water accounting theory and method, combined with Chinese basic national conditions, to carry out water resources accounting. Firstly, it helps information users to keep abreast of the dynamic changes of micro-individuals' possession, use, consumption and appreciation of water resources, and evaluate the quality of water-related activities of entity users. Secondly, it helps water resources



management department to determine the amount or interest of individual water users to obtain water scientifically, promote the water rights system and water market construction, and improve the water price formation mechanism. Thirdly, it helps the physical users to reduce the adverse effect of engaging in water activities, water resources, water environment and water ecology. At the same time, the water resources accounting assess physical users role in water resources development, utilization, conservation and protection, and lay the foundation for the micro-accounting layer to expand the macro-resource environment accounting level.

## **2. Literature Review at home and abroad**

Water resources accounting is a new field. Its related theories and practice are in the exploratory stage, facing a series of theoretical, methodological and practical problems.

### *2.1. Domestic Literature Review*

The Environmental Economic Accounting System 2012-Centre Framework integrates environmental information (mainly based on physical quantity accounting) and economic information (mainly based on value accounting), and sets environmental protection expenditures, resource management expenditures, environmental assets from the perspectives of flow and stock. Australia has carried out beneficial exploration and reform in water accounting, water allocation and dispatching, water rights and trading, forming an internationally advanced water accounting system and management system. In 2012, Australia promulgated and implemented Water Accounting Standard No. 1 and Water Accounting Standard No. 2, which requires water equity entities to use the accrual basis to conduct accounting of water assets and water liabilities, and prepares annual water accounting statements. The implementation of water accounting standards No. 2 ensured the quality of water accounting reports, which provides basic information support for the optimal allocation of water resources.

### *2.2. Foreign Literature Review*

China started late in water resources research. The earliest literature on the concept of water resources is in the article 'Trying to Evaluate Water Resources and its Value', Juqin Shen believed that water resources meet the definition of assets and should be accounted for as an asset. Water resources assets assessment should also adopt its own standard methods. Erxing Lou said that natural resources such as forests, oil fields and water are regarded as 'consumptive assets'. Yuchun Wang and Jie Ding believed that water resources are one part of environmental resources, so water resources assets should be used as an environmental asset, and 'environmental assets' and 'environmental assets accumulated depletion' subjects should be set up.

Based on the basic theories and methods of water resources accounting, environmental accounting and balance sheet, Pu Zhou proposed a water resources accounting framework for water equity entities. The physical water accounting system for water accounting documents, water accounting books and water accounting statements is constructed. Bo Chen and Shizhong Yang, after studying the Australian Water Accounting Standards System, proposed to draw on the Australian Water Accounting Standards and combine the actual situation in China to construct a distinctive water accounting standards system. Throughout the domestic and international research results, it is found that the water accounting system established in Australia is original. However, the literature lacks the summary and analysis of specific contents of Australian water resources accounting. Based on the analysis of principle of water resources accounting, this paper proposes a suitable accounting framework for water resources in China.

## **3. Main Contents of Australian Water Resources Accounting**

### *3.1. Development of Australian Water Accounting and its Report Subjects*

Australia enjoys a high reputation of 'the Country Sitting on the Mine Car' and 'the Country Riding on the Back of the Sheep'. The demand for water in industry and agriculture is very large. The

traditional financial accounting cannot reflect the water resources in the national economic system. Australia has therefore created an independent water accounting model and water accounting standards. Its Water Accounting Standards No. 1 (AWAS1) is the first comprehensive water accounting standard in the world. Based on the development of AWAS1, the Australian Audit and Accounting Committee, the Meteorological Bureau and the Water Resources Standards Committee have released AWAS2, in order to improve the relevance and reliability of water accounting information quality.

Accounting entity refers to the specific unit or organization of accounting and supervision. According to AWAS1, the main body of water accounting is the regional manager or the owner of the water resources system. The accounting entity is responsible for water resources accounting report as long as one of the following conditions is met. (1) owning or transferring water; (2) owning the right to water or directly or indirectly claiming water; (3) having water inflow and outflow; (4) having relevant water management responsibility. It can be seen that the wading unit or individual should be the main body of water accounting. According to these four conditions, water resources accounting institutions can be divided into four categories, including state and regional government agencies, urban and rural water resources public utilities, large water users and environmental water rights holders.

### *3.2. Water Resources Accounting Based on Accrual Basis*

The Australian Water Accounting Standards follow the accrual principle of modern financial accounting. In addition to the water flow statement, the water balance sheet, the water assets and the statement of changes in water liabilities are prepared on an accrual basis. The water reporting entity shall confirm the measurement with the rights and obligations that occurred in the current period, and shall not use the actual physical quantity transfer as the standard for accounting confirmation.

AWAS1 stipulates that the five major types of accounting elements are the same as financial accounting. The water accounting objects are divided into five major factors, which include water assets, water liabilities, water purification assets, changes in water assets and changes in water liabilities. All water reporting entities must regularly prepare water assets and water balance sheets, water assets and water liabilities change tables, and water flow meters. The water accounting elements must satisfy two basic balances, water assets - water-liable assets = net water assets, changes in water assets - changes in water-based liabilities = changes in net water assets. According to these two identities, accounts are set up, and double-entry bookkeeping is used. Any water rights transaction and matter must be registered in equal amounts in two or more accounting subjects that are related to each other, thereby reflecting information such as confirmation, measurement and transfer of water rights.

### *3.3. Water Resources Accounting Method*

The accounting of Australian water resources is to refer water resources to the theoretical framework of traditional financial accounting, with accounting element, measurement attribute, and units of measurement. Its water accounting standards specifically calculate the changes in water resources of micro-waist entities, measured by physical unit (volume), measured in cubic meters (liters).

In the quality requirements of accounting information, the quality requirements of Australian water accounting information mainly include reliability, relevance, comparability, comprehensibility, timeliness, substance more important than form, importance and prudence, which the same as financial accounting information quality requirements. Reliability and relevance are the basic principles. Relevant, complete, and objective information is an important prerequisite for our decision-making. The correctness of decision-making depends on relevance and reliability. Comparability, importance, timeliness and comprehensibility are principles of improvement that make relevant and real information useful.

### 3.4. Summary

By studying the accounting system of the Australian Water Accounting Standards, it can be seen that although water resources are placed in the framework of financial accounting, water resources accounting is somewhat different from traditional accounting because of its particularity. The differences are listed on the table 1.

**Table 1.** Differences between Australian Water Accounting and Traditional Financial Accounting.

Project	Measurement Attribute	Unit of Measurement	Accounting Factors
Water Accounting	Volume	Cubic meters (L)	Water Assets, Water Liabilities, Water Purification Assets, Changes in water assets, Changes in water liabilities
Financial Accounting	Historical Cost, Replacement Cost, Net Realizable Value, Present Value, Fair Value	Currency Measurement	Assets, Liabilities, Owner's Equity, Income, Expenses, Profits

## 4. Accounting confirmation of water resources in China

### 4.1. Current Status of Accounting for Water Resources in China

With the shortage of water resources, serious water pollution, and deteriorating water ecological environment in China, the importance of the establishment of a water rights trading system has become increasingly apparent. Compared with the establishment of Australian water accounting standards, Chinese current water accounting process is still in its infancy. Our current water accounting is mainly for enterprises to obtain water rights and interests, water resources development and investment, development costs and expenses, development income, water resources protection expenditure, recycling, and water use right transfer in accordance with the requirements of the Accounting Standards for Business Enterprises. It is accounted for in the financial accounting report of the company.

### 4.2. Asset Recognition of Water Resources

*4.2.1. Reasons Why Water Resources Accounting is not suitable for Implementation in China.* It is not suitable for the implementation of Australian water accounting standards system in China. Although China and Australia also have problems of uneven water resources distribution, water shortage and water quality decline, even the current situation of Chinese water resources is more worrying than the situation in Australia, but Chinese national conditions are different from those of Australia. Firstly, Chinese water rights are mainly in the hands of the state and the collective. The development and utilization of water sources must be authorized by the state and the collective, and it is impossible to diversify the main body of water resources in Australia. Secondly, Australia has an adequate system of measurement, regulation and reporting on standardization of water accounting practices and Chinese practice is still relatively small. Thirdly, China has a large population with huge differences in water use, and water resources are related to the national economy and security. The development of the water resources trading market is very immature, basically taking the government as the leading role. It is not feasible to establish a water rights trading market by formulating and implementing the water accounting standards system.

*4.2.2. Water Resources Should be recognized as an Intangible Asset.* Water resources have a very inextricable relationship with corporate finance. Like carbon emission rights, water resources can be used as a physical asset in the daily production and operation of enterprises, and it belongs to the category of financial accounting. The value of water resources is not due to its physical characteristics,

but it is reflected in the transactions and issues in production and life, and the accounting entity is also able to own water rights through transactions and events. Based on the above, it can be found that water resources meet the definition of assets in accounting. Whether the economic benefits can be brought about in the definition of assets is an essential feature of assets. In the fast-developing social economy, water resources and water rights will undoubtedly bring economic benefits to the holders, and the cost and value of their acquisition are also obvious.

Therefore, water resources should be materialized into traditional assets and attached to traditional financial accounts. It is more reasonable to attribute them to intangible assets. The water right is a comprehensive right that includes water intake rights, water use rights and drainage rights. The IASB's 'Emission Rights' interpretation provides that the emission rights are in line with the definition of assets and there is no physical form, which belongs to intangible assets. Furthermore, the intangible assets system are divided into intellectual property (patents and copyrights) and franchise rights (goodwill and concessionary property). As a non-monetary asset, water rights can be owned by accounting entities and can be distinguished from other assets. It is recognizable and conforms to the definition of intangible assets. Therefore, water rights should be classified as intangible assets.

*4.2.3. Accounting Content and Disclosure of Accounting Statements of Water Resources.* The accounting body of water resources is a micro-related body. It must bear the accounting responsibility associated with the law. The economic entity that can play a dominant role in the management of water resources should be the accounting entity of water resources, and the measurement scale should be monetized. As an asset of a company, water resources should ultimately be reflected in the statements. Australian use of volumetric measurement, while reflecting changes in water resources itself, does not reflect the value changes behind water resources, so monetary measurement should be used. In terms of measurement properties, the principle of measurement scale phase should be followed. The measurement attributes stipulated in Chinese accounting standards mainly include historical cost, replacement cost, net realizable value, present value and fair value. Chinese current water trading market is not mature enough, and the corresponding valuation techniques are not perfect. Therefore, the initial measurement model adopts the historical cost model, and when the market matures, it will turn into a fair value measurement model that is more closely linked to the market.

In the traditional financial statements, the disclosure of corporate water property rights is increased. The reporter users are able to see the utilization of water resources in more detail. Where there is a major change in water use and water quality, it shall be disclosed in a timely manner and explained in the notes to the statement.

## 5. Conclusions and Prospects

Water resources accounting belongs to green accounting derived from the concept of sustainable development, and it is bound to receive widespread attention with the development of the green economy. Learning from the Australian Water Accounting Standards System, China will gradually improve water resources accounting system. Different from Australia, it is well-believed that Chinese water accounting should be carried out in the theoretical framework of financial accounting, accounting for an intangible asset of the enterprise, so that the water resources can be capitalized. The production and operation are linked, which further drives the enterprise to save water resources.

The scientific systematization of water resources, in the aspect of accounting theory, should continue to deepen the connotation of accounting subjects and realize the docking of physical flow accounting and value accounting, thus consolidate the accounting foundation of water resources accounting. In terms of water cost accounting technology, diversification should be achieved. Physical flow accounting is the basis of value accounting, so the state should establish a water footprint accounting system to achieve the combination of water management and supply chain management.

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