

Exploration on the practical compilation of balance sheet of water resources in Tibet Autonomous Region

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Abstract

Water is a huge ecosystem services and support one of the most important strategic resource for social stability and economic development, to make clear water resources quantity, quality, evaluate negative influence of human social development on the water resources system, supervise the leading cadres will intensify economic input and work of water conservation in the tenure, it is necessary to compile the balance sheet of water resources. Research according to the connotation of "water balance" and "water liabilities", constructs the framework of water balance sheet, selects the Tibet autonomous region area as a typical case, counts the quantity and the value of assets and liabilities of water resources in Tibet autonomous region, and forming the "bottom table - auxiliary table - main table - total table" system. It has made beneficial exploration for enriching the theoretical and practical research in this field.

Key words: *Balance sheet of natural resources, water resources, Tibet Autonomous Region*

1. INTRODUCTION

The proposal of the balance sheet of natural resources is an outstanding achievement conforming to the cause of socialism with Chinese characteristics and a concrete practice of the construction of ecological civilization. At the third Plenary Session of the 18th CPC Central Committee, the Decision of the CPC Central Committee on Several Major Issues Concerning Comprehensively Deepening the Reform was adopted, which clearly put forward: exploring the compilation of the balance sheet of natural resources, carrying out the audit of outgoing officials' natural resources assets, and establishing a lifelong accountability system for ecological and environmental damage; the report to the 19th National Congress of the COMMUNIST Party of China focused on the key areas of environmental protection and pointed out that a sound environmental protection responsibility system with clear responsibilities and rational division of labor should be established, environmental protection inspectors should be continuously carried out, and a lifelong accountability system for ecological and environmental damage should be strictly enforced. As one of the most important natural resources, water is an important guarantee for human production and life. It is also a strategic resource to give full play to the huge ecosystem service function and support the stable development of economy and society. In order to make

clear the quantity and quality of water resources, assess the adverse impact of human social development on water resources system, urge leading cadres to increase economic investment and efforts in water ecological protection during their term of office, it is urgent to develop the overall compilation of water resources balance sheet. Because the domestic research in this field is not mature, there is not a complete set of methods and compilation technology for reference.

At present about water "assets" and "liabilities" the definition, connotation and accounting methods have not formed a unified opinion and regulations, most of the existing research stays in the process of building the framework of water resources quantity, the value of basic stay in using water directly accounting statistics [1-3], due to the introduction of the "resource depletion" and the related concept of "environmental damage", its real establishment principle and economics is still a lot of differences. There are many methods and models for the accounting of water resources value. The theories on which different methods are based vary greatly, the disciplines involved are extremely complex, the data required for models are different, and there is no unified standard. How to determine the accounting method of water resources value is still one of the mainstream issues discussed in the academic circle [4]. Traditional way of thinking is based on some characteristics of China's water resources, and to some extent, reflects the "assets" and "liabilities" content of the resources, it is easy to obtain the required data, on the account settings can also be very appropriate with accounting principle, this method has certain feasibility but neglected ecological value of water into "assets" and "liabilities" consideration, only around the discussion of "water", have underestimated the actual value of water resources. At present, Chinese scholars

Feng Zhiming, Song Xiaoyu present a more comprehensive accounting framework to just water balance sheet, which both the economic value and ecological value of water resources, combining the intersection of subject areas, using the current mainstream and advanced technology to calculate the value of ecological service and pollutant carrying capacity of water resources, it promote the comprehensive perspective of multidisciplinary jointly explore the important progress of the preparation work [5-7].

With its unique geographical features and important ecological status, the Tibet Autonomous Region is the birthplace of China's great rivers and is known as the "water tower" in Asia and the world at large. However, the spatial distribution of water resources in the study area is extremely uneven, the relevant statistical information is scarce, and empirical research is missing. Demanded by the country and the autonomous region establishment, the various social and economic information in relation to the development and utilization of water resources need to be linked together. On the basis of the existing water resources asset liability accounting framework, the study area should perfect the system of the framework and accounting contents, record the Tibet autonomous region water resource stock and flow rate includes the condition of ecological function, reflect the efficiency of water use structure, as well as the negative ecological effects. This way is significant to construct the ecological civilization of autonomous.

2. BACKGROUND

2.1. Overview of the research area

The Tibet Autonomous Region is located in the southwest of the Qinghai-Tibet Plateau, bordering Xinjiang in the north, Sichuan in the east, Qinghai in the northeast and Yunnan in the southeast. It is located at 26°50' ~36°53' north latitude and 78°25' ~99°06' east longitude, with an average altitude of over 4000 meters. The terrain is generally high in northwest and southeast, and the natural conditions are complex and diverse. The Tibet autonomous region is the originating matrix of many large rivers in China, the northwest rivers area of up to 49.4%, the largest, southwest rivers accounted for 48.7%, 1.9% of the Yangtze river area. In addition to the rivers, lakes in Tibet autonomous region is numerous, among them, the lake which perennial water area reached more than 1 km² sun to 816, waters with a total area of 28900 km²; the total precipitation in Tibet Autonomous Region is distributed very unevenly throughout the year. Generally, the precipitation is concentrated from June to September, accounting for over 40% of the total annual precipitation. "Distinct dry and wet seasons" is the biggest characteristic of regional precipitation distribution law [8].

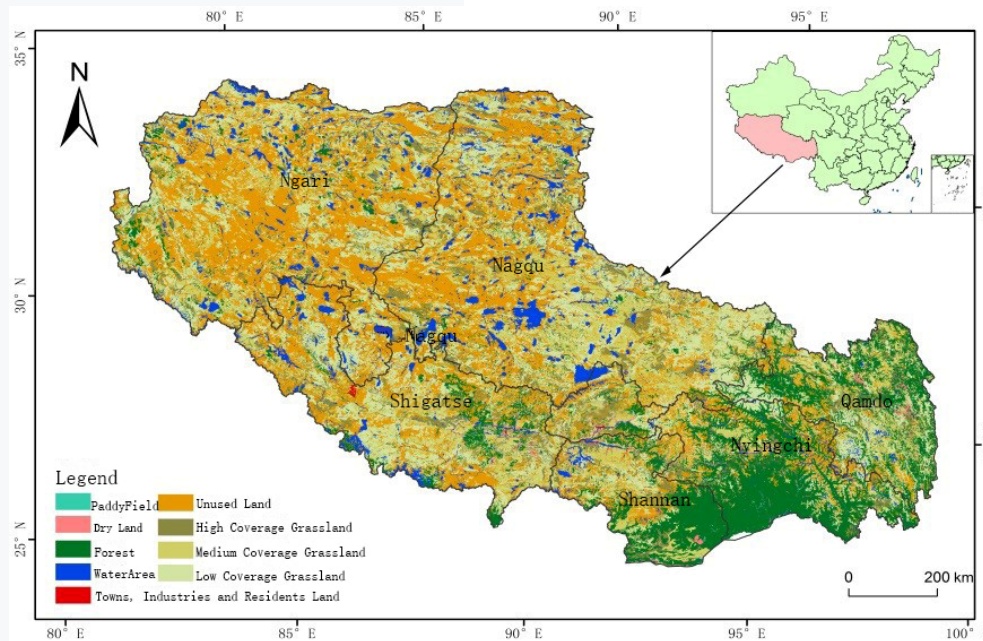


Figure1 Survey of the Research Area

2.2. Framework system of balance sheet of Water resources in Tibet Autonomous Region

2.2.1. The top table

The statement system of the water resources balance sheet is composed of four sets of tables from the bottom to the secondary to the main to the top table, each of which

includes two kinds of statistical tables, namely "physical type" and "value type". The "top table" mainly reflects the overall situation of "assets" and "liabilities" of regional water resources, which is formed by the other "main tables". The content of the "main table" consists of the classification accounting of water resources and is included in the "top table". All kinds of "main table" are summarized by corresponding "secondary table", and the accounting contents of "secondary table" are mostly itemized statistical accounts of the results of "main table". The "bottom table" is the smallest unit of the overall reporting system, and multiple "bottom tables" eventually

converge to form the related "secondary tables", which form the framework system of "main table", and finally form from the bottom and summarize layer by layer,

forming the unique "top table" of water resources assets and liabilities (as shown in Table 1).

Table 1 Water Resources Balance Sheet

Assets Class	Period of Initial Value	Final Value	Liabilities Class	Final Value
Water Quantity			Over Consumption of Water Resources	
Water Area			Reduction of Water Area	
Water Ecosystem Services			Water Ecological Damage	
Water Carrying Capacity			Water Environment Damage	
Assets Total			Total Liabilities	
Total Balance of Assets and Liabilities				

2.2.2. The main table

2.2.2.1. Amount of water resources

The table structure and composition of the water resources scale basically refer to the basic table of water resources accounting in the UN Central Framework for Environmental and Economic Accounting 2012, which is the basis and source of the national accounting scale[9]. Among them, the converting of water resource accounting overall structure in the table according to "the final stock = beginning inventory + stock increase - stock reduction", according to a source of stock increase, water resource will be account content is set to "natural increase" and "social increase " two big account, "natural increase" include "precipitation formation of the water resources quantity", "inflows and call in the water" and "other water supply project," "social increase" includes the main "social economic return water quantity", etc. According to the sources of water resources stock reduction, the account contents are set as "natural reduction" and "social reduction", in which "natural reduction" includes "outflow and outflow" and "social reduction" includes "water withdrawal".

2.2.2.2. Water area

The classification of water area is based on the land use classification proposed by Mr. Liu Jiyuan [10]. Among them, the water area can be divided into 7 categories: river channels, lakes, reservoirs, permanent glaciers and snow, tidal flats and tidal flats. Remote sensing technology of geography is needed for the statistical classification of water area physical quantities. In the corresponding time period, the range of water area is interpreted and extracted, and the area variation at the beginning, the end and the current period is calculated.

2.2.2.3. Water ecosystem services

According to the core functions of water resources ecosystem service functions, considering the availability of data, the water resources of ecological service function is divided into "soil conservation" and "regulating climate", "water conservation" and "biological diversity", "bio-productivity" five parts. As the water accounting method is diversiform, and the cost of data acquisition about study area is high, we choose "equivalent factor method" for easy operation for water ecosystem service value accounting [11-12].

2.2.2.4. Water pollution carrying capacity

The capacity of water resources to carry pollutants is determined according to the "Opinions on the Strictest Water Resources Management System" issued by the State Council. As the most representative indexes are COD and ammonia nitrogen content in the general statistics of water resources pollutants, the maximum discharge of these two indexes is selected as the evaluation standard of water resources' capacity to carry pollution.

2.2.2.5. Over-consumption of water resources

The liability is based on the amount of water that has been used beyond the 'water red line.' According to the basic table published by the National Bureau of Statistics, the types of water resources are divided into two categories: "groundwater" and "surface water", among which groundwater includes "groundwater" and "deep groundwater". The accounting relation of "liability" of water resources amount is calculated according to the formula of "exceeding the standard amount = actual water consumption - water control amount". If exceeding the standard amount is greater than 0, then liabilities will be

generated; if less than 0, then water resources have not been overused.

2.2.2.6. Reduction of Water Area

The value of "reduction of water area" is calculated as the area of water at the end of the period is smaller than the area at the beginning. When improper exploitation and utilization of water resources leads to the narrowing of the boundary of water area, debt will be generated. The liabilities of "water area reduction" are calculated according to the relational expression "Area of change during accounting period = area at the end of accounting period -- area at the beginning of accounting period". When the area of change during accounting period is greater than or equal to 0, it means that the water area has no liabilities, but when the area of change during accounting period is less than 0, it means that the water area has incurred liabilities.

2.2.2.7. Damage to water ecosystem services

The value accounting of "damage to water ecological services" is measured according to the change value of the accounting value at the end of the period. When the inappropriate development and utilization of water resources leads to the reduction of water area and the impairment of water ecosystem service function, the "damage to water ecosystem service" liability will be generated. The calculation relationship of "Change of value in accounting Period = value at the end of accounting period -- value at the beginning of accounting period". when the value change in accounting period is greater than 0, it means that the research area has not generated liabilities for "water ecological damage"; when the value change in accounting period is less than 0, it means that the research area has generated liabilities for "water ecological damage".

2.2.2.8. Liability for water environment damage

"Water environment damage liability" is calculated according to the amount of water pollutant discharge exceeding the "carrying pollution red line". The excess part is "water environment damage liability". The accounting relation of "water environment liability" is calculated according to "Excess discharge of water pollutants = actual discharge of water pollutants - discharge control amount of water pollutants". If the excess discharge of water

pollutants is greater than 0, the liability will be generated; if it is less than 0, the water resource pollutants have not been discharged excessively.

2.3. Valuation method

In the process of the value of the physical account, it need for integrated the comprehensive water resources value, the water area value, the water ecosystem service value, the cost of water pollution control. The main econometric model are used in the paper includes fuzzy mathematics comprehensive evaluation of, standard land price evaluation, equivalent factor evaluation, shadow engineering method, cost method. As limited to space reasons, references listed the specific process [13-15].

3. CONCLUSION

3.1. Balance sheet analysis of Water resources in Tibet Autonomous Region

On the basis of the accounting framework established in the previous work and combined with the relevant data of Tibet Autonomous Region from 2004 to 2016 obtained from the survey, the balance sheet of water resources of Tibet Autonomous Region for the period from storage to flow, from "physical" and "value" type was compiled. The specific accounting results are as follows.

From 2005 to 2015, the initial value of water resources assets in Tibet Autonomous Region is 2.19trillion yuan, including 960.054 billion yuan of water quantity, 2.20585.376 trillion yuan of water area, 3.19 trillion yuan of water ecosystem services and 763 billion yuan of water pollution carrying capacity; at the end of the period, the water resources assets amounted to 3.1625131 trillion yuan, of which water resources assets amounted to 1.63 trillion yuan, water area assets amounted to 2.951003 trillion yuan, water ecosystem service assets amounted to 457.13 billion yuan, water pollution carrying capacity assets remained unchanged at 763 million yuan, and total water resources increased by 9.76trillion yuan. During the accounting period, the total liabilities were 6.08 billion yuan, including 0 yuan for overconsumption of water resources, 1 billion yuan for water area reduction, 6.08 billion yuan for environmental damage, 1 billion yuan for ecological damage. 3.16 billion yuan for balance between assets and liabilities.

Table 2 Water Resources Assets and Liabilities Unit: 100 million Yuan

Assets Class	Period of Initial Value	Final Value	Liabilities Class	Final Value
Water Quantity	9600.54	16262.4	Over Consumption of Water Resources	0
Water Area	205853.76	295410.03	Reduction of Water Area	0

Water Ecosystem Services	3185.44	4571.25	Water Ecological Damage	0
Water Carrying Capacity	7.63	7.63	Water Environment Damage	60.8
Assets Total	218647.37	316251.31	Total Liabilities	60.8
Total Balance of Assets and Liabilities		316190.51		

4. DISCUSSION

Water balance sheet reflects a country or a region " real situation " of water resources utilization status and its ecological environmental impact of effective information disclosure way, at present most of the accounting framework is set with a quantity of two accounts, but as a policy work remains to be rich. To summarize the existing theories and cases, the research and compilation of the balance sheet of water resources are mainly faced with the following problems: (1) How to achieve the "balance sheet of water resources" and the national economic system "seamless" integration; (2)The application of "water resources balance sheet" still lacks policy guidance and implementation basis; (3) The concept, connotation and measurement methods of "water resources accounting" are still not unified, which brings the biggest problem to the overall progress of the research; (4) The difficulty in obtaining data has become one of the most objective problems faced by the compilation of "water resources balance sheet". For this field of research summarizes several opinions as follows: (1)The government should establish a working team and water balance sheet expert team;(2) The accounting should be as close as possible to the existing national economic accounting framework and environmental economic system;(3) The preparation work of the balance sheet of water resources should proceed from the principle of being operable and easy to operate;(4) Building a comprehensive water resources information collection and data monitoring network;(5) Unifying the water resource value quantification method and set the conversion parameter index.

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