Discussion on evaluation model of water resource value

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Abstract. From the perspective of western economics, this paper discusses the evaluation model of water resources value. It is concluded that the evaluation of water resources value can’t solely rely on the labor value theory or western utility value theory in economics. Based on the previous evaluation of water resources value, with the combination of two theories, a four-quadrant model of water resources evaluation is established. The model shows that utility value is the starting point of water resources value research. As the demand of water resources increases, more and more labor input and labor value gradually become prominent. Throughout the whole process of interaction, the economic development and technology improvement is an important factor for the evaluation of water resources value, the two factors need to be fully considered in the process establishing the model.

1. Introduction
Water resources, especially freshwater resources, are the basic natural material basis for the survival and development of human society [1]. Sustainable use based on the value of water resources is a hot and difficult issue in current theory and practice. It faces the challenge of traditional values but also the methodology and basic theoretical challenges. Under the conditions of market economy, Analysis of water value accounting depend on theoretical basis is of great significance to guide the accounting of water resources value.

2. Research Status of Natural Resources Value Theory
With the development of society and economy, the question of natural resources value, people's understanding generally gone through two stages, which were from the invalidity of natural resources to the value of natural resources. At first, the discussion of the paid use of natural resources focused on resources such as oil, natural gas and mineral resources, and the research on the paid use of water resources also involved less.

Since 1985, academic circles published a series of articles on the paid use of natural resources and prices in China, marking a deeper development of China's natural resources research and the start of the research on the value of natural resources [2]. Starting from the discussion of the value of natural resources, there had been different theories of value the theory in the history of economics.

Based on Marx's labor value theory, some scholars think that the value of natural resources is the socially necessary working time invested in the reproduction of natural resources [3, 4]. Due to the
inability to accurately measure utility, there was only contention for the theory of natural values based on Western utility theory of value, and few empirical studies had been conducted. Li Jinchang [5] envisaged determining the values of natural resources on the basis of the "three theories" of wealth theory, utility theory and Land rent theory, but this theoretical framework has not been applied to the empirical study of water resource value calculation. Discussing the essence of resource prices from the Marxist theory of rent, some scholars think that resource prices are capitalization of rent, analyzed the mechanism and form of resource price formation, the impact of resource price on price system, the redistribution of national income and the general price level, as well as the conditions for the realization of resource price [6, 7].

Generally speaking, it didn’t reach a consensus for the research on the theory of water resource value, which is still limited to the discussion of the measurement method, and scientific theoretical system has been formed. Therefore, the research on the water resource value and the origin of value has not been seen yet.

3. Water resource value

From a philosophical point of view, water resource value refers to the relationship between the existence, attributes and changes of water resources and human needs, and the scale of the relations is the so-called 'water resource value standard'. This 'value standard' is also the value of water resources in economics. Its composition is social, practical and accumulative. The market economy highly developed, technology and capital-intensive industries dominated nowadays, the live labor elements are declining in components of the value but the role of other elements is increasingly important, the buyer's market has been formed, the demand has become the dominant factor in value, we cannot ignore the role of consumer demand discussing content of the value in this case. However, considering the natural characteristics of water resources, we must consider supply. The essences of scientific value theory don’t lies in the argument and disagreement of values but in the real harmony and unity between man and nature. Therefore, the following points should be included in modern water resource value theory:

(1) The value of water resources comes from consumption at first. Consumption mainly refers to consumers' subjective psychological perception for water resources, that is, the utility level of consumers. Whereas, the main body of consumers is not only a human being, but also the environmental factors human beings depends on. Utility illustrates the function and attributes of water resources to humans and their environment. Under certain socio-economic and technical conditions, the supply of water resources is certain while the demand is constantly increasing. The functions, roles and significance of water resources for meeting the needs are constantly increasing. That is, the higher the utility level, the higher the value. (As shown in Figure 1).

(2) The value of water resources comes from the production of water resources, and the production mainly refers to the socially necessary working hours paid in the process of water resource production and reproduction. Labor reflects human cognitive and practice the process of water resources. In order to survive and develop, human beings use of water resources, pay socially necessary working time for the various functions of maintaining and restoring water resources. Specifically, due to the input of socially necessary working hours, the amount of water supply has changed. Under certain economic conditions and other conditions remain unchanged, the supply of water resources increases. The value of water resources changes as a result of the amount of socially necessary labor input (as shown in Figure 2).

(3) Under market economy conditions, the value of water resources is determined jointly by consumers and producers, the changes between the degree of satisfaction of water resources to people's needs and the socially necessary labor time consumed in the production of water resources, formed a value.

Therefore, the value of water resources depends firstly on its usefulness for mankind and environment. The value of water resources depends on the party who’s utility and social necessary
labor time dominate. When the demand increase is equal to the socially necessary working hours, the value of water resources is the largest.

4. The Application of Four-Quadrant Model in Water Value Theory

4.1. Four-quadrant model
The four-quadrant model is a tool for analyzing the long-term equilibrium of the real estate market. In essence, it is a comparative static model. The four-quadrant model is based on two market segments, namely, the stock market and the flow market of water resources. The so-called water stock market refers to the total amount of water resources, while the water flow market refers to the amount of repeated use. Dividing the two markets is based on the different relationship of supply and demand that affects the two markets. Of course, there is also a close relationship between the two markets. Based on the division of the two markets, the model established four quadrants, quadrants I and IV are water stock markets, and quadrants II and III are markets for water resources flow. The functional utility of water resources determine the values of the water resources in water stock markets, and a lot of socially necessary working time determine the values of water resources in the flow of market.

4.2. Model Analysis
Referencing four-quadrant model (as shown in Figure 3), we conducted economic analysis for the water value theory. In order to simplify the analysis, the following assumptions are made: (1) The short-term water supply will be a certain amount; (2) when all of its water supply increment are transferred to the next water supply.
Figure 3. Four-quadrant Model Analysis of the Interaction

In the first quadrant, due to the natural characteristics of water resources, the initial water supply curve is a straight line perpendicular to the horizontal axis, which determines the value of water resources by demand. Supply remains unchanged. The value of water resources depends on demand and is positively correlated with demand. The second quadrant in which reflects the relationship between utility labor values. Due to the economic development and the improvement of people's living standards, the demand for water resources has increased, which has stimulated people to increase their supply. As a result, a great deal of socially necessary working time has been invested, in which case the utility value determines the value of labor. The third quadrant, Dc is the demand curve, form the intersection C leading from the labor value P to Dc, C point is the increased water resources because of social production under certain conditions. The fourth quadrant shows the relationship between the initial supply of water resources and the increase in the supply of water resources as a result of the socially necessary labor input. Since the change in the supply of water resources equals the amount of water resources reproduced minus the water resource depletion rate multiplied by the amount of water resources supply, that is, \( \Delta S = C \cdot r \cdot S \). Considering the water consumption reduction rate \( (0 \leq r \leq 1) \), we can see that there is a positive correlation between the increase of water supply and the total supply. In the long run, if the increase of water supply is less than its consumption reduction under the certain demand growth level, the amount of water transferred to the next period will decrease, the supply will decrease and the value will increase, the process is also a process of water depletion and should be avoided. In order to meet the increasing demand of water resources, the input of socially necessary labor is constantly increasing. If the increase of water resources is greater than its reduction, the amount of water transferred to the next period will increase and the supply will increase following, value decreases, when the increase in supply is far greater than the increase in demand, the value of water resources is determined by the socially necessary working hours.

5. Conclusion
With changes in social, economic and environmental conditions, human understanding of water resources and their values are also changing. The theory of water resources value can neither be western utility theory nor labor theory value. Based on the organic combination of the two theories, we can examine the value of water resources from the aspects of consumption and production so as to explain the theoretical basis of water resources value more effectively, In the process of coordination
between man and nature, the two sides are engaged in complicated games and are looking for a reasonable intersection point, which reflects the unification of labor and utility. It can be seen from the interaction between the two values of labor and utility that the demand and consumption of water resources (the utility value of water resources) are the source and driving force of water resource value, that is, water resources are valuable regardless of whether they are developed or not. While in the process of increasing demand and consumption, more socially necessary labor inputs are promoted, and the role of labor value is more and more obvious. In the entire process of interaction, the level of economic and technological development is an important factor affecting the value of water resources, when people's demand increases equal to the socially necessary working hours, water resources have the greatest value. Correct understanding of the value composition of water resources theoretically has important practical significance and guiding role for us in water resources management and value accounting.

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