Study on the Water Value Conversion between Economy and Ecology and Countermeasures of Water Resources Distribution for Coordinated Development of Economy and Ecology

Hongzhen Ni[1], Hao Wang[1], Bo Zhao[1], Dangxian Wang[1]

[1]China institute of water resources and hydropower research, Fuxing road, Haidian district, Beijing, 100038 ; PH (86)010-68785703; FAX (86)010-68483367; email:nihongzhen@163.com

Abstracts: Taking Beijing as an example, the paper studies response mechanisms to water quantity and quality of economy and environment, calculates water value and studies the conversion law of water value, measuring the gains and losses of the water conversion between economy and ecology. On this basis of analysis, the paper tries to give some suggestions for water sustainable utilization. The example gives us some conclusions: (1) in Beijing 2000, the water value of economy is more than ecologic, and in the low level of life, the man could pay more attention to economic water use; (2)if 4.04×10^9 m^3 used by social economy in 2000 are reallocated between environment and economy, following utility maximum principle, 24.76 million m^3 could be used by economy which is far less than actual, comprehensive water price is RMB 8.01/m^3 which is more than actual price 2.81, present water price cannot promote water reasonable allocation and sustainable utilization.

The social economy fast development caused the economical water consumption sharply increased. It has gone beyond the natural water resources bearing capacity, which occupied the natural ecosystem water used, broke the natural biosphere water demand balance, and then initiated the humanity to live the interdependence ecological environment worsening. However, with the economics growing and the material wealth increasing, the human energetic culture demand promotes quickly, so the higher qualities of life pursue needs support of superior environment. Therefore how to rationally allocate the limited water resources between economic society and the ecological environment, and how to make water resources utility value most superior display, has now become an extremely thorny pair of contradictory in water resources management.

Beijing is China's capital, located at Huabei Plain, where is serious scarcity of water.

In this article, we take Beijing as an example; analyze the water value and influence factors and the countermeasure of water resources reasonable distribution.

1 Basic data of study region

In 2000, the Beijing GDP reached 2478.76 hundred million Yuan, the total population achieved 12,779,000 people, the land area was 16807.8 square kilometers, the waters area was 9.70 square kilometers, and the urban garden greening area was 20600 hectare [1]. According to 2000 Beijing water resources bulletin[2], in 2000, the total water use in economic and society in Beijing is 40.40 hundred million m^3, went far beyond water resources supply quantity 16.86 hundred million m^3 in the same year. Compared last year the surface water resources depletion quantity approximately was 6.91 hundred million m^3, and the groundwater resources depletion quantity approximately was 5.89 hundred million m^3. In 2000 the total sewage discharge was 13.55 hundred million m^3, in which the industrial sewage discharge reached 5.79 hundred million m^3, and the domestic sewage (including the tertiary industry) reached 7.76 hundred million m^3. Conversions [3] according to the water quality condition is that the comprehensive surface water quality rank weakened from 3.58 to 3.62 by the beginning of the year, and corresponding the synthesis ground water from 3.46 to 3.6. Calculating according to the 2000 year price, Beijing investment costs per year on water resources management, maintenance, plan, and water source projects was 0.6 Yuan /m^3; The tap water supply volume is totally 7.54 hundred million m^3,and its total cost is12.54 hundred million Yuan.

2 The eco-environment value accounting of water resources

2.1 The eco-environment value of surface water

(1) The eco-environmental water demand and deficit calculation of surface water

In Beijing, the eco-environmental water demand is mainly influenced by the eco-environmental water demand inside the rivers, the lake's eco-environmental water demand in the city and the eco-environmental water demand of the urban green spaces.

① Eco-environmental water demand inside the rivers

There are five main rivers in Beijing, in turn from west to east is Juma River, Yongding river, northern canal, Chaobai River and Ju river, and they separately belong to Daqing river system、Yongding river system、northern canal system、Chaobai river system and Ji canal system.

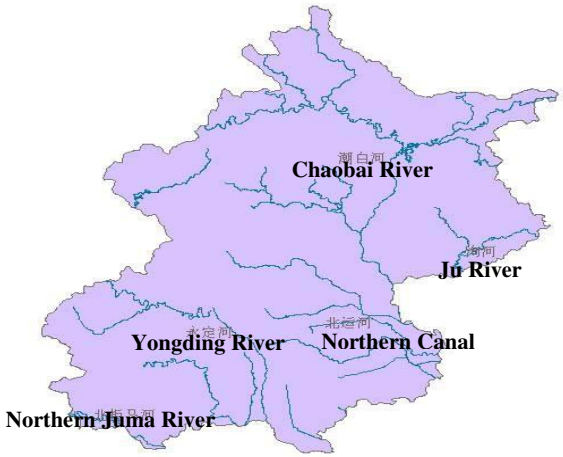

Figure 1. Distribution map of main rivers in Beijing

Here the calculating is directed towards to the five rivers in Beijing, and the eco-environmental water demand inside the river should meet three requirements: 1) to maintain the minimum flow of river; 2) to satisfy the water surface evaporation in river; 3) for the groundwater level in Beijing now falls generally and seriously, the water demand should also contains the channel leakage.

$$Q = Q_1 + Q_2 + Q_3 \quad (1)$$

which： Q Stands for the minimum eco-environmental water demand inside river;

Q_1 Stands for the water volume to maintain the minimum flow of river;

Q_2 stands for the water volume to satisfy the surface evaporation；

Q_3 stands for the water volume to satisfy the channel leakage；

The calculation of Q_1, take Guanting, Tongxian and Suzhuang stations as the controlling stations of Yongding River, Northern canal and Chaobai river systems. For the three stations locate on the main streams, they can stands for the changes of each water systems in Beijing. And other three stations, as shown in Table 1, Zhangfang station use the extrapolate formula in Hai river project; Ju river is a sub steam of Ji Canal, so here take the average flow in minimum month of Ju river's Sanhe station in the 1960s. The results are shown in Table1. The water volume to maintain the minimum flow of river in Beijing is 0.124 hundred million.

Q_2 The annual average surface evaporation in Beijing is 1100mm, according to the relationship between surface water wide and flow, we can obtain the water surface wide to each water system's minimum flow. So the total surface evaporation volume in Beijing is 6.473 hundred million. The results are shown in Table 1.

Q_3's calculation formula ：

$$Q_3 = K\ F \quad (2)$$

K is empirical coefficient， F stands for water surface area.

Considering Beijing area is in the plain before the mountain, seepage property is worse

from west to east, therefore take Northern Juma River and the Yongding River's K value as 1.5, take northern canal and Chaobaihe River as 1, and take Ji Canal as 0.8. After computation the year river leakage quantity is 6.389 hundred million m^3, see Table 1.

Table 1. The eco-environmental water demand and water deficit of river

River name	Northern Juma River	Yongding River	Northern Canal	Chaobai River	Ju River	Total
River system	Daqing River	Yongding River	Northern Canal	Chaobai River	Ji Canal	
Control stations	Zhangfang	Guanting	Tongxian	Songzhuange	Sanhe	
River length（km）	51	240	339	680	85	
River water surface wide(m)	40	35	50	45	10	
Minimum ecological flow(m^3/s)	1.67	4.46	1.42	6.37	0.4	
Flow percentage (%)	7.22	7.4	12.1	10.5		
Water volume to maintain the minimum flow of river Q_1 (hundred million m^3)	0.014	0.039	0.012	0.055	0.004	0.124
Water volume to satisfy the surface evaporation Q_2 (hundred million m^3)	0.224	0.924	1.865	3.366	0.094	6.473
Water volume to satisfy the channel leakage Q_3 (hundred million m^3)	0.306	1.26	1.695	3.06	0.068	6.389
Total (hundred million m^3)	0.545	2.223	3.572	6.481	0.165	12.986
Status water volume （hundred million m^3）	0.40	1.64	2.64	2.98	0.12	7.78
Water deficit (hundred million m^3)	0.14	0.58	0.94	3.51	0.04	5.21

According to major achievement of the tenth five-year plan projects torch-plan countries -- China's regional ecological water use standard research, by 2000 correlation controlling stations' actual flow analysis, calculated that the rivers' extant water volume is 7.78 hundred million m^3, and get the result in the present situation that rivers ecological environment water deficit finally is 5.2 hundred million m^3.

② Eco-environmental water demand of the urban green spaces

According to each kind of material, Beijing city green space vegetation water used fixed quantity: Yearly average $1m^3/m^2$, so calculated that the urban vegetation green space need man-power water supply 2.06 hundred million m^3. According to investigates Beijing city green space vegetation's real water supply is $0.25m^3/m^2$, and the urban green space actual water used total quantity is 0.52 m^3, so the water scarcity is 1.54 hundred million m^3.

③ The lake eco-environmental water demand in the city

According to "Ecological environmental Water demand Theory, Method And Practice" (Yang Zhifeng and so on, Scientific Publishing house, 2003) (in city limit's lake and artificial river) the smallest eco-environmental water demand is 0.70 hundred million m^3.See Table 2.

Table 2. the minimum lake eco-environmental water demand in Beijing in 2000 (hundred million m^3)

Evaporation	Seepage	Habitat	Water recharge	Based flow	Total
0.0328	0.0064	0.0205	0.0137	0.6307	0.7041

In 2000, the actual water supply is 0.43 hundred million m^3, water storage capacity is

0.980 hundred million m^3 in the beginning, and the ecological environment water scarcity is 0.17 hundred million m^3.

Table3. the minimum surface water eco-environmental demand in Beijing in 2000(hundred million m^3)

	Channel	River and lake	Green vegetation	Total
Water demand	12.98	0.70	2.06	15.74
Water consumption	7.78	0.53	0.52	8.83
Water scarcity	5.20	0.17	1.54	6.91

(2) Surface water eco-environmental demand value and water scarcity loss accounting

①Value of eco-environmental water demanded and water scarcity loss accounting in channel

Use Haihe river's basin data 1.35 Yuan /m^3 to calculate the Beijing rivers' dilution value, the result is 17.52 hundred million Yuan /a.

According to Costanza etc.（1997），and if according to the price index in 2000 the conversion price is 3488.26 Yuan /hm^2, considered that the ecological environment value's increment effect, take the growth factor is 3%, then it results in 3811.72 Yuan /hm^2, then Beijing river eco-environmental water for biodiversity value is 0.21 hundred million Yuan /a, converted 0.02 Yuan /m^3.The surface water can adjustment temperature and saves the energy, the parameter is 56.67 Yuan /m^3.a, so Beijing's rivers adjustment climate and save energy 366.63 hundred million Yuan /a.

②Value of rivers and lakes eco-environmental water demanded and water scarcity loss accounting

According to the dilution ability[3] (1.35 Yuan /m^3) and the channel cleanout effect (refers to "15" research projects " Key technologies of Ecology Water Computation Research", 5.12 Yuan /m^3) the water's value is 6.47 Yuan /m^3, the river-lake eco-environmental water demand value is 4.53hundred million Yuan, and the water scarcity loses 1.10 hundred million Yuan.

③Value of the urban green vegetation eco-environmental water demanded and water scarcity loss accounting

The country "85" research project "Beijing City Botanical garden Ecological benefit's Research" indicate that vegetation can absorb CO_2 228.72t/hm^2, and release O_2 159.13t/hm^2 and so on, so the urban green vegetation eco-environmental water demand value and water scarcity loss is as Table 4.

About the green space water holding capacity, through the former experiments take 25% as the proportion of interception rainfall. With the shadow project method to calculate the water conservation value computation, the investment which namely the construction same storage capacity's storage facility (for example reservoir) needs, the value = water-holding capacity×the unit storage capacity cost. According to 2000's price the reservoir's cost to construct is 5.714 Yuan /m^3 , converted by Beijing city green space area, Beijing green space for water conservation's value can reach 0.295 hundred million Yuan.

According to related green vegetation improvement mass of atmosphere value correlation data: Antiseptic value 875 Yuan / hm^2•a, increases negative oxygen ion

value is 55.0 Yuan / hm^2•a, the storage preserves soil moisture value is 1065.6 Yuan / hm^2•a, humidification and adjusting temperature value is 278.0 Yuan / hm^2•a, so Beijing green vegetation value that make purification mass of atmosphere is 0.47 hundred million Yuan (in 2000 price).

Through the accounting, the green space eco-environmental water value is as Table4. According to normal water demand 2.06 hundred million m^3 of existing construction area green space in Beijing in 2000, the value converts for 5.92 Yuan/ m^3. And there are also large green spaces need artificially recharge water, so green space water scarcity loss is 9.12 hundred million Yuan. According to the value contribution, of water resources to the green space, takes the water used benefit sharing coefficient as 0.5, so the net value of green space's eco-environmental water used was 6.1 hundred million Yuan in 2000 in Beijing, and per m^3 water's value contribute to green vegetations is 2.96 Yuan, the green space water scarcity creates loss 4.56 hundred million Yuan.

Table 4. Eco-environmental water use value of green spaces in Beijing

Function	Amount of dust absorption	Absorb CO_2	Release O_2	Improve Air quality	Water conservation	Total
Value(hundred million Yuan)	0.19	7.95	3.28	0.47	0.30	12.19

According to the ecological and environmental experts' opinion, municipal reservoir constructions in Beijing destroyed the natural river 's ecological equilibrium, the reservoir's eco-environmental benefit did not arrive at original natural river system displaying the ecological environment benefits as river mouth, therefore did not calculate the value of reservoir's ecology water used adding to the total eco-environmental value in Beijing. And based on the water resources disposition, the surface water eco-environmental demand value and water scarcity loss accounting is as Table 5. The conversion for per m^3 water's value is 23.11 Yuan /m^3.

Table 5. The value and water scarcity loss on the satisfaction to minimum surface water eco-environmental demand in 2000 in Beijing

Classification	Channel	River and lake	Green spaces	Sum
Value (Yuan/m^3)	29.61	6.47	2.56	
Total value(Hundred million Yuan)	384.36	4.53	6.10	394.99
Water scarcity loss (Hundred million Yuan)	154.27	1.1	4.56	159.93

2.2 Eco-environmental value of ground water

Beijing ground water's ecological environment value can be calculate mainly through the value which prevent the surface subsidence and the value maintaining the bearing pressure of water-bearing to prevent the ground water form being polluted. As a result of the material limit, the ground water ecological environment's value is taken by: max {economic loss which avoids reducing ground water ultra exploitation, ground water recharging cost}.

According to Chinese Geology University's "City Groundwater resources Sustainable Mining Model Study" report, that in 2000 Beijing land subsidence surpassed 0.15m, and average economic loss of unit area will reach 4.5 Yuan /m^2. In 2000 in Beijing the most greatly land subsidence surpassed 0.59m, the area of influence surpassed 600km^2.Estimating from this, the eco-environmental loss which for the ground water ultra exploitation creates 27 hundred million Yuan in 2000 in Beijing. And in 2000 the

ground water ultra exploitation is 11.97 hundred million m^3, ultra exploitation the per m^3 water loss is 2.26 Yuan /m^3. (If according to the multi-annual means 24.55, in 2000 the ground water ultra exploitation is 2.6 hundred million m^3, and the unit water loss is 10.38 Yuan /m^3.)

Beijing is in Huabei region, if take the Shandong Province cost which recharges ground water to restores the ground water's eco-environment as references, considering the price factor and the time effect, the eco-environmental value in 2000 in Beijing is 4.43 Yuan /m^3.

2.3 Ecological environment value of water resources

The eco-environmental water used value in Beijing in 2000 is: surface water is 23.11 Yuan/m^3,ground water is 4.43Yuan/m^3，and the comprehensive value is 10.56 Yuan/m^3。

3 Value accounting of economic water use

The water resources' social and economy value calculation includes the effective and the disadvantageous consequence which caused by all social economy water use, which embody the advantageous and disadvantageous effect or the utility that the water resources produce in economic society (including ecological environment loss and water pollution economic loss).

3.1 Economic society water use accounting

The total water use volume of economic society in 2000 in Beijing is 40.40 hundred million m^3， including 13.25 hundred million m^3 surface water and 27.15 hundred million m^3 groundwater，which far beyond the water supply volume 16.86hundred million m^3。According to the basic data of Beijing, the accounting results are as shown in Table 6.

Table 6. Water resources use condition in 2000 in Beijing (Hundred million m^3)

Sub item		Industry	City life	River and lake	Agricultural use	Sum
Water use volume		10.52	9.76	0.43	19.69	40.4
Water source classification	Surface water	5.27	4.45	0.43	3.1	13.25
	Ground water	5.25	5.31		16.59	27.15

3.2 Positive effectiveness of economic society water use

The effectiveness economic society water use manifests in water used benefit shares among various departments. Because the lack on data information, it is difficult to establish the detailed relations between water use volume and production volume in minute department, so from the entire society national economy production angle, established Douglas production function which take capital, labor force and water as the essential factors, to analyze the production water supply utility value.

The total water volume in 2000 year in Beijing is 40.4 hundred million m^3, GDP is

2478.76 hundred million Yuan. The value that unit water shared in GDP is 61.355 Yuan /m^3. By the total water consumption, GDP, total capital and employed population during 1988~2002 year economic society, when caring about factor in which the water used efficiency, the capital enhance use efficiency and the labor force level developing along with the time, obtains the entire social product function through fitting as follows:

$$GDP = 0.0023K^{0.528}L^{0.545}W^{0.242} \quad (3)$$

By the functional relations, in the situation which capital, labor force and so on essential factors are invariable, increasing per m^3 water used value in the economic society to GDP is 14.73 Yuan /m3.

3.3 The water polluted cost caused by economy society water use

(1) Surface water polluted cost caused by economy society water use

According to the water quality ~ economical loss factor function in economic society water use [3], the surface water polluted cost caused by economy society water use in 2000 in Beijing is 112.32 hundred million Yuan; the estimate result is as shown in Table 7.

Table7. Water polluted cost caused by economy society water use in 2000 in Beijing

Sub item	Agriculture	Industry	City life	Tourist industry	Town planning	Sum	Total water (hundred million m^3)	Per m^3 water loss (Yuan/m^3)
Loss(hundred million Yuan)	12.59	8.43	43.99	23.94	23.36	112.32	40.4	2.78

(2)Ground water polluted cost caused by economy society water use

Ground water polluted cost caused by economy society water use in 2000 in Beijing is 2.25 hundred million Yuan[3], and the per m^3 water loss is 0.06 Yuan/m^3。

Generalized analyzing, the ecological environmental loss caused by the economic society water use sums as 114.57 hundred million Yuan, according to same year economic society water use 40.4 hundred million m^3,the shared per m^3 water use cost is 2.84 Yuan /m^3.

3.4 Value and loss of economic society water use

Considering each loss calculation achievement, the accounting results are as shown in Table 8. The total ecological environmental loss caused by the economic society water use sums as 327.95 hundred million Yuan, the shared per m^3 water use cost is 8.11 Yuan /m^3.

Table 8 Environment and resources accounting evaluation indexes of economic society water use

Idem	Total (hundred million Yuan)	Percentage of GDP	Per capital volume (Ten thousand Yuan)
1. Environment loss index	114.57	4.62%	0.090
Surface water polluted loss	112.32	4.53%	0.088
Ground water polluted loss	2.25	0.09%	0.002
2. Resources depletion index	213.02	8.59%	0.167
Surface water depletion loss	159.93	6.45%	0.125
Ground water depletion loss	53.09	2.14%	0.042
Sum of two index	327.59	13.21%	0.257

Through the green account of water resources, the eco-environmental synthesized water used value was 10.56 Yuan /m^3 in 2000 in Beijing, the economic society synthesized water used value is 14.73 Yuan /m^3, and the environment economy synthesis loss was 8.11 Yuan /m^3.

4. The conversion of water value and analysis of gains and loss

If ignoring the negative effect or loss caused by economy water use, Driven by interest, the economic man should be in the pursuit of economic development as a main goal because of the water use benefits of economy outweighing environment. Furthermore, the local people are still in the low level life, and the role and value of water used in ecological environment is still in the senses, not completely and deeply. Similarly, now many propaganda material also just stay in scattered, rather than the profound information, could not to hit and shock the theory of driven by interest which is in the souls deeply. The economic man only values the positive benefits of economic water use, not from the overall social welfare including direct and indirect, tangible and intangible, positive and negative, short-term and long-term, economy and natural environment, to study and evaluate, and make an optimal decision. Therefore, in the life level below or at the primary stage of rich, especially in state of paying less attention to high quality requirements in ecological environment and its demand weakening, or the destruction of ecological environment due to water scarce not endangering the survival, the economic man will be yet driven by interest to consider economic water use at first, although the ecological environment water use and benefits can get attention gradually, it is also in secondary demand status.

At present, people's knowledge is not enough to calculate the value of ecological water use completely. From the simple arithmetic, social welfare value of economic water use is still positive, namely 6.62 yuan/m^3. If seeing the problem in a shortsighted view, it is profitable to economic occupying ecological water. But 6.62 yuan/m^3 < 10.56 yuan/m^3, the net benefits of economic water use are less than the value of environmental water use; water does not reach the optimal allocation and utilization.

5 Economical regulation analysis of water resources optimal allocation

In the view of social welfare, put environment and economy into a virtual water market (not exist yet), use the market water price mechanism to study the allocation of Beijing economic water use in 2000, according to the optimal allocation principle. Applying the theory of partial equilibrium analysis, studies the effect of water price.

5.1 Water demand equation

The budgetary expenditures of water consumption *M*, according to the coefficients of development stage [5] and the international average standard: the charge of living water is about 3% of water incomes; the charge of industrial water could be 5% of total industrial output value.

According to the 2000 Engel's coefficient 36.3% [1], Beijing economic development stage coefficient $l = \frac{1}{1+e^{-1/0.363+3}} = 0.44$. The proportion of expenditure budget of living water consumption for income: $3\% \times 0.44 = 1.32\%$; The proportion of expenditure budget of industrial water use for total industrial output value: $5\% \times 0.44 = 2.2\%$. In 2000, the second industrial output value of Beijing is 3878.35 billion Yuan [1], the budgetary expenditures of water consumption are for 85.324 billion Yuan; According to the 6.5% (international rate) of output value of the tertiary industry and the coefficient of development stage, budgetary expenditures of the tertiary industry water consumption are: $3952.92^{[1]} \times 6.5\% \times 0.44 = 113.05$ billion Yuan; Income of resident is 695.5 billion Yuan [1], the budgetary expenditures of the water consumption are for 9.18 billion Yuan; According to 1.32% of GDP (same as living), the budgetary expenditures of the agriculture water consumption are for $195.18^{[1]} \times 1.32\% = 2.58$ billion Yuan. The budgetary expenditures of whole society total up to 210.14 billion Yuan, namely 8.5% of GDP.

According to value, economic water utility preference coefficient set as 0.6, the ecological environment water utility preference coefficient set as 0.4.

Based on the analysis of water use in 2000, the ecological environment basic water demanded cannot be guaranteed and lack 6.91 billion m^3. According to the basic human "water" (BRW) 50L for each day [7], the basic water of life to safeguard should be 230 million m^3/a. To establish the utility maximization equation of water demand.

$$\begin{cases} \max U = 0.6\ln(Q_s - 2.3) + 0.4\ln(Q_e) \\ p_s Q_s = M = 0.085GDP = 210.14 \\ 2.3 \le Q_s + Q_e \le 40.4 \\ Q_s, Q_e, p_s \ge 0 \end{cases} \tag{4}$$

U is the utility of total water use, Q_S is the water demanded by economic society, Q_e is water demanded by ecological environment, p_s is the price of economic water use.

5.2 Water supply equation

From the water supply, according to the market mechanism, take the profit maximization of water supply as an aim, the equation is as follow:

$$\begin{aligned} \max\ \pi &= v_e Q_e + p_s Q_s - C \\ &= 10.56 \times (40.4 - Q_s) + p_s Q_s - C \end{aligned} \tag{5}$$

π is the profits of water supply, v_e is the value of ecological water use, C is the total cost of water supply to economy and ecological loss due to economic water use not rationally.

When to meet the basic water demanded by ecological environment, the water 40.4-6.91 $=$33.49 billion m^3 might be use by economy. With the whole cost accounting of economic society water use, setting the quantity of tap water supply as a constant, by the analysis of the financial costs in Beijing 2000, the relationship between whole cost of social economic water use and water consumption is as bellow:

$$\begin{cases} C = 8.11 Q_s + 0.6(Q_s - 7.54) + 12.54 & Q_s > 33.49 \\ C = 2.84 Q_s + 0.6(Q_s - 7.54) + 12.54 & Q_s \le 33.49 \end{cases} \tag{6}$$

Taking the simultaneous equations of water supply and demand, do the iterative computation. In 2000, the total water 40.4 billion m^3 used by social economy are reallocated between ecological environment and social economy, the result is that comprehensive water price is RMB 8.01/m^3 under maximum utility of water use, 24.76 million m^3 could be used by social economy, water quantity available for ecological environment is 15.64 billion m^3, the optimal comprehensive benefits of economic and environmental water use is 440 billion Yuan. Through analysis, it can be found if the ecological basic water demanded can not be satisfied, with the bear ability of social economy, all the cost caused by social economy water use would not be recovered.

In 2000, Beijing actual comprehensive price is 2.81 yuan/m^3 that cannot promote reasonable allocation and sustainable utilization of water resources.

6 Counter measures of water reasonable allocation

Beijing water failed to reach optimal allocation, the main reason is not only market failure, such as water price etc., but also water management and macro-control measures problems. Therefore, for the optimal allocation of water resources rationally, many kinds of methods combined are necessary. Overall, mainly these points should be taken seriously as following.

(1) To strengthen ecological water right management. Considering the ecological benefits enjoyed by the human as a right, set up the water resources management control system which rights and obligation is peer to peer. The basic standard of ecological environment water demanded should be taken scientifically, to ensure social economy and ecological environment coordinated development.

(2) Use the preferential policy encouraged, promote economic sectors saving water, and then protect the ecological water use. Through the priority development, tax cuts and subsidies, encourage cleaning production and saving water.

(3) Fully exert the market mechanism, scientifically make water price to allocating water rationally and optimally. With the passage of time, the ability to shoulder economically cost of water use and scarce degree of water resources will change, water price must dynamically be adjusted accordingly, in order to guarantee their normal adjustment ability of supply and demand of water resources. With the water became restriction of production and life environment beautification more and more seriously, it can be consider to gradually set price of ecological environment water use relating to human welfare, changes the view of ignoring value of ecological water use, promote to value ecological water use as well as economics'.

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