

2011 3rd International Conference on Environmental  
Science and Information Application Technology (ESIAT 2011)

## Comprehensive Utilization of the Water Resources in small Watershed

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### Abstract

The water problem is a vital question which relates to the sustainable development of the national economy. And the water resource is also a kind of comprehensive natural resources which has a variety of use values and can supply with the water needs for many sections, which involves economy, resource, science and technology, ecosystem and environment. Sustainable utilization is a better form for the water resources. This paper gives a brief introduction about the technology of comprehensive utilization of the water resources in small watershed.

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Selection and/or peer-review under responsibility of Conference ESIAT2011 Organization Committee.

*Keywords:* small watershed; water resources; comprehensive utilization

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### Introduction

Comprehensive utilization of the water resources in small watershed should emphasis on the comprehensive development and utilization of the various types of water resources, and establish a perfect and reasonable water resources developing system, and come into being a favorable economic, social and ecological benefit and may improve the economic, social and ecological environment, so that the limited water resources can maximize its function. Therefore, the water resources comprehensive utilization in small watershed, to some extent, has a strategic importance.

### Current situations of the Water Resources in China

With the rapid development of the national economy, there is an increasing demand for the water conservancy in China. Meanwhile, the water technique is getting more and more important. But now there are lots of problems in utilization of water resources in China.

### *Serious water shortage and frequent flood disasters.*

The water resource is very serious shortage in China, the total amount per mu is only 1/2 of the world average, and the amount of per capita procession is only 1/4 of world average[1]. Especially in north and northwest China, the water resource amount per capita is less than 8% of the world average[2]. The spatial and temporal distribution of the precipitation is very uneven which mainly concentrate in the flood season, and this characteristic intensifies the shortage of the water resources in China. At the same time, the flood disaster happens frequently which nearly happens very year. Meanwhile, the criterions of flood control of the water conservancy project are generally low, and the loss caused by the flood disaster is serious.

### *Utilization rate is low.*

The utilization efficiency of water resources is very relatively lower in China. Since 30 years of reform and opening, the utilization coefficient of irrigated water resources had increased from 0.35 to 0.46 in China[3], however, it is 0.7~0.8 in the advanced countries. The food production capacity of per stere water is 0.8~1.0kg/m<sup>3</sup> in China, which is more than 2.0kg/m<sup>3</sup> in America and Israel. China is an agricultural country, the agricultural water consumption account for more than 70% of the total used water volume. Therefore, agricultural development must take the road of water-saving agriculture.

It is unreasonable for the development and utilization of the surface and ground water resources. For example, China has built lots of irrigated areas in the past 50 years, which played a vital role for the developing and the utilization of the water resources and improving the construction of the national economic construction. Since the 1970s, a lot of well-irrigated areas have been set up, and there are about 418 million pumping ground water wells for the irrigating areas is nearly 0.14km<sup>2</sup> by the end of 2004, which relived the lack of the surface water resources. Being the largely continuous exploitation of the groundwater, the level draws down sharply and forms the depression cone whose area reaches to more than 15 million km<sup>2</sup>

### *Pollution is serious.*

“The river basins are generally contaminated and will get worse and worse in China.” said the professor Hongliang Liu who is the academician of Chinese academy of engineering and the chief scientist of Chinese lake environmental research. The survey results for the 55000km long national river showed that 23.3% of the rivers are polluted so serious that it can not be used for irrigation and 45% of the rivers have no living fishes and the water quality of 85% of the rivers cannot satisfy the III standard. The ecological function degenerated severely, the ecological environment has been destroyed dramatically and water resources cannot be used again.

### **The comprehensive utilization measures of the water resources in small watershed**

There are all kinds of water bodies in the small watershed, such as rivers, lakes, reservoirs, unconfined groundwater, confined groundwater, rainwater etc. so the water resources comprehensive utilization should be emphasis on the whole. The purpose of the research is to joint dispatches all kinds of the water resources, make all the water resources developed fully base on the different quality and quantity of the water resources. So that establishes a favorable, reasonable water resources comprehensive development utilization system, and improves the economic, social and ecological environment in the area, maximum the effect of the water resource and achieves the sustainable utilization of water resource.

### *Flood storage to supply drought, allocate the water resources reasonably.*

Flood storage is a reasonable way to protect from flooding. Under the condition of safety, more floods should be stored in order to satisfy the water demand in the coming drought years. Firstly, all the reservoirs should be well managed and dispatched and more and more small reservoirs should be built to utilize fully the local runoff. And the groundwater reservoirs should be built if the geology condition permission, so that the reservoirs on the surface and underground could compose a competing system in water protection.

*Develop the ecological forestry and improve the rate of vegetation coverage to retain the water.*

The ecological forestry means to attain the ecology functioning requirements by combining diverse kinds of plants in three-dimensional. The ability to prevent water loss and soil erosion for the forestland is not only related to the coverage rate but also the height of the leaf canopy. When the height is lower than a certain value, it could effectively prevent the soil from washing away by the rain. So developing the ecological forestry not only requires the optimum combination of species, ages and spatial match but also realize the optimum for the whole ecology function. So that boosts the ability of environmental accidents to retain the water.

*Control water loss and soil erosion and protection water environment.*

The happiness for water loss and solid erosion not only degenerate the solid, wreck the forest coverage but also cause reservoirs waters and lakes sedimentation and worsening the nature environment. One of the most efficient ways to manage the water loss and soil erosion is harness the mountain, hillside and channel together and combine biology method with project method to curb erosion and protect water environment. The project method offers an easy way to deal with the erosion problems, but if only using the project method, the project that works now would ruin as time goes by. The biology method is slow in getting the intend results but it is better when times goes by. So, only combined biology method with project method is the best way to curb erosion and protect

*Planning the regional ecological environment, adjusting the agricultural land use.*

When developing and utilizing all sorts of natural and biological resources, it is necessary to plan generally according to the different ecological environment conditions and solve the local people's live and production problem while protecting the ecological environment. The economic development and environmental protection are not separable. If economic cannot develop well, the ecological environment will also not be protected well, which will influence the sustainable development economic. Making full use of the water resources, developing forestry and increasing the farmer's living standards without destroying the existing ecological environment.

*Establish the organic mechanism for urban and industrial water use.*

The demand for water resources is growing very fast in urban and industry with the development of economy, the growth of population and the improvement of people's living standards, which conflicts with the agricultural irrigation.

In order to ensure the urban and industrial water use, it is necessary to save water, and push the development of water resources by high-tech and use high input to support the development of high-tech. The urban water use should be well planned, managing the water saving reform for the existing enterprises, and guiding the existing enterprise and new enterprises to go on the road of development of water-saving. Industry water use should adopt water circulation to improve the reuse rate, and use less water to produce more material products. Moreover, rationally adjusting the relationship between

agricultural irrigation and urban industrial water use to prevent water pollution and ensure the stable source of water.

#### *Stereoscopic development and comprehensive administration.*

Researching the reasonable layout of water resources in different conditions, it should accomplish the comprehensive administration for the hillock, ditch, low-lying area, slope etc, and build the small reservoir, dig ditch to intercept the runoff to preserve the water and facilitate the irrigation. Increase the innovation of science and technology from soil and water conservation, artificially engineering, development and utilization of the natural water, the inter-basin diversion project, reducing water consumption, the sewage disposal, the promotion of water-saving technology, etc. In addition, we should try to create public opinion atmosphere and policy environment that conducive to the development and protection of water resources. Enhance support of policy measures. Take measures to gradually solve the questions about exploitation, protection and utilization of water resources fundamentally.

### **Conclusion**

Comprehensive utilization of the water resources in small watershed should make the whole area as the study object and make the surface water, groundwater, water out of basin, rainwater, wastewater of production life, mine water etc. as a whole system. First, keeping and allocating water sources including engineering measures, biological measures and agricultural practices, etc. Second, developing and utilizing water resources scientifically, exploiting water resources and utilizing of the industries comprehensively, managing uniformly and coordinating organically; third, saving water including agriculture, industry and life. Using the limited water resources in industry, agriculture, urban and rural water supply, forestry, animal husbandry, ecological environment, water and soil conservation, etc, and making water produce the best results and realizing the sustainable development and utilization of water resources.

### **Acknowledgement**

This work was supported by the Shandong Distinguished Middle aged and Young Scientist Award Foundation (BS2009NY008), and by the foundation item of Key lab for crop water requirement and regulation of ministry of agriculture (CWR2010003).

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