The Comprehensive Management of Watershed and Its Market Present State

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Abstract. When building a resource-saving and environment-friendly society, our country is facing a severe challenge about basin water pollution. With the environmental pollution increasing, and the strengthening of people's environmental protection awareness, watershed pollution has aroused great attention[1]. And it has become an important topic for the International Study Center on Water Environmental Management to control and deal with basin water pollution. The paper introduces the present situation of the watershed environment in China and gives an overview of the comprehensive management approach of watershed, finally points out the market present state of the comprehensive management of watershed.

The Present Situation of the Watershed Environment in China

According to the “China Environmental Status Bulletin 2016” [2] released by the Ministry of Environmental Protection of the People’s Republic of China, there are 1617 national examination sections of the seven major watersheds which include the Changjiang River, the Yellow River, the Pearl River, the Songhua River, the Huaihe River, the Haihe River and the Liao River and the Zhejiang and Fujian rivers, the northwest China rivers and the southwest China rivers. There are 34 sections at Grade 1, accounting for 2.1%. There are 676 sections at Grade 2, accounting for 41.8%. There are 441 sections at Grade 3, accounting for 27.3%. There are 217 sections at Grade 4, accounting for 13.4%. There are 102 sections at Grade 5, accounting for 6.3%. There are 147 sections at worse than Grade 5, accounting for 9.1%. Among these rivers, the water quality of the Zhejiang and Fujian rivers, the northwest China rivers and the southwest China rivers is high, the water of the Yellow River, the Songhua River, the Huaihe River and the Liao River is light pollution. the water of the Haihe River is heavy pollution.

Up to now, there are 2100 malodorous black rivers which are confirmed and troubleshoot in a total of 224 cities. Among these malodorous black rivers, 794 rivers were completed, accounting for 37.8%; 656 rivers are completing, accounting for 31.2%; 642 rivers are making plan, accounting for 30.6%; 8 rivers are ungoverned, accounting for 0.4%.
The Comprehensive Management Approach of Watershed

The comprehensive management of watershed is not simple environmental engineering. It’s about more extensive ecological engineering. In the detail, it can include controlling the external pollution resource, the sediment management, the wastewater treatment, the ecosystem construction, the water quality automatic monitoring and the operations management.

The Controlling the External Pollution Resource

The basic premise of the management of the malodorous black rivers is controlling the external pollution resource which is the most effective engineering measures. There are two types of the controlling the external pollution resource. One is sewerage cutoff work which is retaining sewage into the collection and treatment systems to reduce pollutant emission from the source. For the sewage which is no condition to do sewerage cutoff work at present, it can adopt efficient first grade enhanced sewage treatment technology or process in situ to remove pollutants rapidly and efficiently. The other one is non-point source pollution. The urban non-point source pollution is mainly caused by the pollutants contained in runoff which is controlled by LID technology, initial rainwater control technology and ecological protection technology and so on. The rural non-point source pollution is mainly caused by agriculture, cultivation and livelihood. The disadvantages of the controlling the external pollution resource technology include large quantity, strong engineering system, long period and difficult implementation.

The Sediment Management

The sediment management mainly refers to dredging sediment. There are dry and wet two types to choose[3]. Dry-type dredging refers to draining the water using drainage dredging equipment such as the bulldozer and the mud scraper to. The type is limited. Wet-type dredging refers to dredging the sludge from the water by the dredger directly. Appropriate measures should be taken in accordance with the characteristics of pollutants during dredging. Minimize secondary pollution during excavation. The type is used widely. The disadvantages of the sediment management technology include the expensive overhead expenses, high precision and accuracy and existing problems of sludge treatment.

The Wastewater Treatment

The watershed pollution control is a complex system project. The main technologies include physical, chemical and biological - ecological methods[4].

The Physical Method

1. Aeration technology

Aeration technology is the use of natural water reaeration or artificial aeration to promote the mixing of upper and lower water and to keep the water in a good aerobic condition which aims at inhibiting the release of the N and P.
(2) The mechanical algae removal technology
The mechanical algae removal technology is with the aim of controlling the breakout of algae bloom and reducing the internal source of N and P effectively[4].

(3) The water transfer project
The water transfer project is to introduce upstream or nearby clean water sources into rivers to dilute polluted water through the water conservancy facilities to improve the quality of water environment[5].

The Chemical Method

(1) The flocculation deposition technology
The flocculation deposition technology is aimed at removing pollutants by adding chemicals (usually coagulants).

(2) The chemical removal technology
The chemical removal technology is aimed at inhibiting the rapid growth of algae by adding medicaments such as bluestone, alum, ferrous sulfate and so on.

The Biological - Ecological Method
The biological-ecological method is the process of degradation, transfer and transform the pollutant in the water to make water purification by means of plant inoculation and microbiological culture[6]. The main methods include the aquatic plant purification method, the bio-film technology, land treatment and the bioremediation method and so on [7].

(1) The aquatic plants purification method
There is an obvious effect on increasing oxygen in the water, removing the N and P from water and inhibiting algae growth in use of the natural purification function of aquatic plants [8].

(2) The bio-film technology
The bio-film technology is to adhere microbial groups to the surface of the carrier membrane. In the contact with sewage, microorganisms on the biofilm absorb the organic matter in the sewage as food and then assimilate the organic matter to purify the sewage [9].

(3) The land treatment
The land treatment refers to taking the land as the basic treatment facility, using the adsorption and purification function of the plant root system and the soil to achieve the water purification effect.

The Ecosystem Construction
The water ecosystem construction technology is a comprehensive technique based on underwater ecosystem construction. To realize the organic unity of the producers (aquatic animals), consumers (aquatic animals), decomposers (beneficial microflora) in the underwater ecosystem and to realize the water self-purification.

The goal of the water ecosystem construction is to create a multi-level waterscape and enhance the ornamental, to restore the natural ecosystem and maintain steady water quality and to create humane water scenery and embody the human water blend.

The Water Quality Automatic Monitoring
The water quality automatic monitoring refers to testing the chemical, suspended solids, sediment, water ecosystems in the water regularly or irregularly to make sure the type, composition and quantity of pollutants in the water.

The methods of the water quality automatic monitoring include the chemical method, the electrochemistry method, the atomic absorption spectrophotometry, the ion chromatography, the gas chromatography.

The water quality automatic monitoring can make a contribution to make sure the distribution of pollutants in the water, to trace the source of the pollutants, to ensure the pollution approach. And it can help to forecast the trend of pollutants in the water and provide data and information for management of watershed.
The Operations Management
The operations management of watershed include the establishment of the ecological Internet monitoring system, the maintenance of water habitats, the conservation and supplement of biological resources, the mechanism of emergency response, the mechanism of public relations maintenance.

The Market Present State of the Comprehensive Management of Watershed
With the releasing and implementing Water Pollution Control Action Plan and the concept of ecological civilization of “Beautiful scenery is the gold and silver mines”, the comprehensive management of watershed has risen to unprecedented height. With the social capital into the environmental construction, PPP is the dominant mode of the comprehensive management of watershed. The mode of one enterprise as lead manager and other several enterprises as a federation is normal.

Summary
With the releasing and implementing "13th Five-Year Plan" and Water Pollution Control Action Plan, the comprehensive management of watershed shows a blowout state and the concept has been changed from the traditional mode of "terminal treatment" to the mode of "source reduction, process disruption, terminal treatment". The environmental engineering management project has gradually formed ILBM mode which includes pipe networks, sewage treatment plants, rivers management, coastline landscape and operations management.

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