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Implementing Economizing Water, Cleaning Water and Living Water Engineering for Improving Water Environmental Quality of Xuchang City

Zhao Qing and Wang Hai-Xia
School of Civil Engineering and Architecture, Henan University of Technology,
Zhengzhou Henan 450001, China

Abstract: In order to solve the outstanding water environmental question, improve water environmental quality of Xuchang city and realize the struggling aim of establishing nation environmental protection model city, the expert planning of economizing water, cleaning water and living water will be implemented completely. By analyzing water environmental present situation and question of Xuchang city, economizing water, cleaning water and living water engineering as the planning principle and objective were proposed and the project items and guarantee measures of meeting the planning aim were put forward.

Key words: Economizing water engineering, cleaning water engineering, living water engineering, planning aim, project items, guarantee measures

INTRODUCTION

In order to solve the outstanding water environmental question and realize the struggling aim of establishing nation environmental protection model city, according to the standard of nation environmental protection model city, combined with the actual situation of Xuchang City (Ren and Yu, 2011; Shi and Xiao, 2005; Ye and Zhang, 2009), using "economizing water, cleaning water, living water" as a theme, with "economizing water as priority, cleaning water as primary, living water as use" as the principle, the "economizing water", "cleaning water", "living water" projects proposed from the planning for establishing nation environmental protection model city of Xuchang city were implemented, comprehensively promoting the comprehensive improvement of water environment key issues, improving water environmental quality of Xuchang city.

WATER ENVIRONMENT

Surface water quality: Xuchang city is located in central Henan Province, belongs to Shaying River System of Huaihe River Basin. Its routine monitor sites of surface water involved 9 rivers 14 monitoring sections. The 9 rivers namely were Ying River, Qingyi River, Yingru Main Channel, Qingni River, Hucheng River, Wen River, Shuangji River, Beiru River, Yunliang River. In accordance with the

surface water environmental function zoning, these water bodies were mainly divided into drinking-water-source territorial waters and Landscape-recreation territorial waters. According to the monitoring results, the synthetical sort of the primary rivers' monitoring sections of Xuchang City in the year 2005 were shown in Table 1.

Table 1 shows, among the 14 water quality monitoring sections, besides the water qualities of Yingru Main channel and Beiru River meeting the national standards for grade 1, the water quality of upper Ying River met the national standards for grade, Qingni River met for Grade V, Others water bodies were all worse than Grade V, not meeting the water body functions and the requirements of establishing nation environmental protection model city.

Table 1: Synthetical sort of the primary rivers' monitoring section of Xuchang City

River nme		Synthetical sort
Ying river	Baisha reservoir	-
	Rubber dam	-
	Chu-river bridge	Worse than V
Qingyi river	Gaocun bridge	Worse than V
	lvma bridge	Worse than V
Yingru main channel	Zhouzhuang water plant	?
	Mifengzhang village	?
Qingni river	Changcunzhang village	Worse than V
	Wangyue bridge	?
Hucheng river	Park	Worse than V
Wen river	Yuzhai sluice	Worse than V
Shuangji river	Fuergang	Worse than V
Beiru river	Ludu	?
Yunliang river	Dongxima village	Worse than V

GROUND WATER QUALITY

In the year 2005, Xuchang city's routine monitor sites of ground water involved 5 wells. They were respectively located in Municipal Engineering Bureau, City Power Plant, Dongzhuang Water Plant, Water Company of Xuchang County, municipal government's communities. The ground water qualities of Xuchang city's were mainly in good and the standard-reaching rate was 80%. Among them, Dongzhuang Water Plant belonged to underground drinking water sources and its water quality was better but the ground water of municipal government's communities was polluted seriously.

ANALYSIS OF WATER ENVIRONMENTAL PROBLEMS

Resources water shortage: Insufficiency of water resources. The total water resource in Xuchang city was 9.35×10^8 and the average person possession of water was only 214 m^3 , just as 50.3% of the whole province's, 8.2% of our nation's. This city was one of the cities whose average person possession of water were at least.

Excessive exploitation of groundwater. Groundwater level declined at an average annual rate of 0.54 m and middle-deep groundwater level declined at an average annual decline of 4m, forming two funnel area as the center of Xuchang city and Change city with the area of 187 km^2 . Some wells were contaminated, no longer meeting the irrigation water quality standards.

Engineering water shortage: Insufficient supplying-saving ability of water conservancy facilities. The whole city presently have 29 large-medium sluices, large-medium reservoirs, 26 small reservoirs. Its supplying-saving ability of water conservancy facilities was 7.6×10^8 . After south-to-north water transfer engineering completed, the total water resources in Xuchang city was 15.87×10^8 , the supplying-saving ability of water conservancy facilities can not meet demand.

Low utilization rate of rain-flood resources. The average runoff depth of Xuchang city for many years was 96mm and the average outbound amount of rain flood for many years was 2.42×10^8 , in which the runoff in flood season of 6-9 months was 1.45×10^8 . Currently the catchment area controlled by storage projects was 2480 km^2 , no controlled was 2516 km^2 and the utilization rate of rain-flood resources only was 49.6%.

Low utilization rate of wastewater regeneration. Because of lack of funds, no proper reuse user of wastewater, the municipal wastewater of Xuchang city was not recycled, which utilization rate of wastewater regeneration was zero.

Water quality-induced water shortage: Large area water body was polluted. According to the surface water monitoring data in the year 2005 and "Surface Water Environment Quality Standard" (GB3838, 2002), the water quality indicators of main river exceeding standard was still common and most of them can not meet the requirements of the surface water environmental function zoning. The pollutant indexes in main rivers of Xuchang city were COD, $\text{NH}_3\text{-N}$, BOD₅, volatile phenol and permanganate index, belonging to organic pollution.

In 2005, the total amount of wastewater emission in Xuchang city were 91.62 million tons containing municipal waste water, the total amount of ammonia nitrogen were 1789 tons and the total amount of COD were 0.015 million tons. The COD didn't complete the gross control task, the handling rate of urban sanitary sewage was 85% and the amount of water resources per GDP was 343 tons per thousand yuan.

Lack of basic urban ecological flow. Sewage Intercepting in urban river can effectively avoid pollution importing, also can cause lack of basic urban ecological flow, especially in dry season.

Industrial wastewater seriously polluted. In 2005, the total amount of wastewater emission in Xuchang city were 91.62 million tons, including industrial wastewater 38.98 million tons, accounting for 42.5% of total wastewater emissions. Industrial wastewater emissions of paper-making, hair products, dyeing and printing industry were accounting for 78.3% of all year. The attainment rate of the industrial waste water from the significant pollution sources was 98.13%, not meet the requirements of establishing nation environmental protection model city.

Unsound of water resources management systems. Xuchang city was lack of unified control and unified management of water resources. Water diversion, watercourses and self-supply wells water management were attributed to Xuchang Municipal Bureau of Water Resources, urban water supply and urban river management were attributed to Urban Construction Committee, sewage treatment were attributed to sewerage companies, causing "water source place didn't manage water supply, water supply didn't manage water draining, water draining didn't manage pollution control, pollution control didn't manage sewage reusing".

WATER PROTECTION PLANNING OBJECTIVES

Economizing water target: Propagating living water saving, the popularity rate of water efficient appliance should be increased year by year. Popularizing the use of industrial water saving, water saving irrigation and wastewater reuse. Ensure the amount of water resources

per GDP decreasing to 300 tons per thousand yuan, the area of water saving irrigation reaching 300 acres, the recycling utilization rate of urban sewage reaching 40% in 2008. Developing and utilizing of rainwater resources, the available amount increasing to 0.02 billion cubic meters in the year 2008.

Cleaning water target: Continue to increase the protection of the water source place, to ensure drinking water quality standard-reaching rate stably remain 100% (Zhang *et al.*, 2005). Improve the building of the wastewater treatment plants and the handling rate of urban sanitary sewage reach 90% in 2008. Strengthen the management of significant pollution sources, to ensure the attainment rate of the industrial waste water from the significant pollution sources reach 100%.

Living water target: Divert clean water, increasing urban water circularly, make the urban water "living", ensure to divert clean water 160 million cubic meters. Reform or renovate the urban main rivers, ensuring to the water quality compliance rate of water environmental functional district in urban Rivers reach 100% and no the water body of worse than Grade V. Do well water system planning of the unified design between the city and the countryside (Zhu *et al.*, 2009), ensuring the basic ecological flows and landscape water.

Major project: Xuchang City will input 1.163 billion yuan fully implement the major project of economizing water, cleaning water, living water.

Major project of economizing water: Water conservation program of living, agriculture, industry. Water Conservation Program of Living: closing self-supply wells at least 50 annually, constructing 5 demonstration projects of reforming water efficient appliance in residents living quarters. Water Conservation Program of Agriculture: Constructing 4 national and 12 provincial demonstration areas water saving, totally improving the efficiency of agricultural water use. Water Conservation Program of Industry: Constructing water conservation program as technological innovation, wastewater treatment and reuse of wastewater, industrial wastewater recycling, cleaner production audit for example Henan Feiyada Paper Co., Ltd. Improving the efficiency of industrial water, Reducing industrial GDP water consumption.

Wastewater recycle engineering: Constructing 2 wastewater recycle engineering such as Xuchang city's sewage purification company, the recycling amount daily

reach 70 thousand cubic meters, mainly reused for industrial waste, to realize the utilization rate of wastewater regeneration reach to 40%.

Rainwater resource utilization project: In rural area, implement various utilization project according to different terrain. In plains region, making full use of precipitation resources, controlling groundwater level, reasonably installing hindering-water threshold and hindering-water sluice making use of field groove; In hills region, digging trenches and building ponds guiding or channel action according to circumstances; In mountains, mainly improving the eco-environment, impounding rainwater defense and engineering construction such as barn, cellar, pond dam with soil and water conservation. In city, extending rainwater directly using technology, collecting-storing recirculation technology, environmental and ecological utilization technology.

MAJOR PROJECT OF CLEANING WATER

Drinking water source protection project: Focused on implementing patrol mechanism of water source, further strengthening the protection of water source. Including enhanced target responsibility, doing well water pollution prevention work of water source protection zone, strengthening law enforcement for putting an end to all kinds of damage to water sources, establishing emergency plan, monitoring upstream runoff of Beiru River, establishing shrub isolation strip along river, establishing economic compensation mechanics of water source conservation area, establishing resident moving-out scheme in water source conservation area. Implementing drinking water source protection project, to ensure drinking water quality standard-reaching rate stably remain 100%.

Sewage treatment plant construction project: Newly constructing sewage treatment plant with the treatment capacity of 85 thousand tons per day in Xiangcheng county, Yanling county, Shangji town, Changge city south industrial park. Enhancing the treatment capacity of 180 thousand tons per day with the extension projects of urban sewage purification company in Xuchang city. Overall starting the construction of villages and towns treatment plant. Ensure the handling rate of urban sanitary sewage to reach 90%.

Water pollution control engineering of industrial point source: Carry out the strategic adjustment of economy structure. Shutting down the company of "Fifteen Small

Kinds” and “New Five Small”. Greatly promoting cleaning production, strengthening the trade management of tannery industry and the installation of on-line monitoring facilities in sewage outfalls of key enterprises. Conducting industrial enterprises relatively centralized development.

MAJOR PROJECT OF LIVING WATER

Water diversion projects: Improve the water supply capacity by water-storage projects, storage-capacity increase, headwater channel clearing to ensure the basic ecological flow. The water diversion projects include constructing the rubber dam of Beiru river, water pumping station of Wuwan village, river widening and deepening of Yingru Main Channel, canal desilting in urban.

Urban river restoration project: Dredging and intercepting of Yunliang river, Xufu canal, Qingni river, Qingyi river. Renovating both sides of the river embankment, building the road of dike crest, constructing the comprehensive treatment of ecological berm and greening, Completely changing the status of river pollution. Clearing garbage and floating of landscape river, reducing the impact on the landscape.

River engineering of urban-rural integration: Recently focusing attention on the river improvement of Qingyi River, the construction of Caocao drink-horse River; in the middle focusing attention on the river improvement of Xiaohong River, Shiliang River, Sanba ditch, according to the requirements of flood control excavating saving-water lake.

SAFEGUARD MEASURES

Establishing special lead bodies: All the staff of government departments shall clarify the task, ascertain responsibilities, coordinate, form Resultant Force. To ensure the realization of the project implementation and planning objectives, Xuchang city must strengthen leadership, build strong coordinating body.

Establishing integrated management organization: Emphasize that government functions in water resources should be concentrated in one institution of city. The management object of institution should be city water source, water supply, water consumption, water draining, water economization and wastewater treatment, including developing, utilizing, protecting of urban water resources.

Establishing fund-input mechanism in diversity: Funds needed for construction projects should be solved through the channels of diversified investment. Win the support of government bonds and the grants at home and abroad, absorb social funds made use of on home and overseas loans, encouraging BOT models as a trading.

Increased input in scientific and technological progress: Improve project quality and standard, preferentially start research projects including total pollution load distribution, sewage treatment, comprehensive use, cleaner production, scientific management. Emphatically construct a resource-saving technical support system, enhance key technology research of water conservation, water reuse, water cycle.

Strengthening propaganda and education: Continue to implement the “National Action Platform for Environmental education”, fully play the guiding role of the news media and public opinion, improve the environment-legal concept of leadership at all levels and the masses, establish public participation and oversight mechanisms, encourage civil society participation to protect water environment, encourage popular participation in activities to build a water-efficient city, water-efficient firm, water-efficient residential quarter.

REFERENCES

- GB 3838, 2002. Environmental quality standard for surface water. http://english.mep.gov.cn/standards_reports/standards/water_environment/quality_standard/200710/t20071024_111792.htm
- Ren, J. and L.J. Yu, 2011. Status quo analysis and prospect of national environmental protection model cities. *Sichuan Environ.*, 6: 149-154.
- Shi, J. and J.J. Xiao, 2005. Assessing key point of environmental monitoring index in establishment national model cities and districts. *Environ. Monit. China*, 4: 75-76.
- Ye, M. and L.H. Zhang, 2009. The changes and development of indicator system of building. *Nat. Environ. Protect. Model City*, 10: 6-7.
- Zhang, H.L., W. Wang, J. Wang and M.C. Zuo, 2005. Investigation and consideration of establishing the exemplary city of national environmental protection in Jinan. *Environ. Monit. China*, 6: 1-4.
- Zhu, S.F., Y. Li and Q.H. Zhang, 2009. The study on the management characteristic of FoShan constructing a NEPMC and its environmental quality corresponding change *Environ. Sci. Manage.*, 2: 37-40.