Evaluation on the Policies for Water Environmental Protection in Huai River Basin in China

Song Guojun, Jin Shuqin, Xu Sha, Li Peijie, Jiang Yan, Du Minlei
School of Environment and Natural Resources, Renmin University of China 100872

Abstract
This paper evaluates the effectiveness of water pollution control policy in Huai River Basin, with a focus on management activities, effluent control results, and status of water quality. The conclusions are as follows: no evidences to show the water quality do not become better or worse; the pollutant effluents is not yet under control; the main pollutants (COD and Ammonitrigen) load comes from industrial sources and domestic sources. There are several government agencies involved in water monitoring but coordination is rare, so the data quality is bad. The insufficient investment on water pollution control is another main reason for serious water pollution. Suggestions are as follows: making and implementing strict discharge permits system to large point pollution sources; establishing the platform for water environmental information sharing; the central government should take more responsibilities for the river basin's water pollution control through permits system and special funds; improving the water environmental planning system, and making the river basin's strategic planning with a long term view.

Key words: Huai River Basin; Water Environmental Protection; Policy Evaluation

Purpose of the evaluation

The Huai River Basin extends through five provinces, including Hubei, Henan, Anhui, Jiangsu and Shandong with a drainage area of 270,000 km^2 and population of 169 million. As the first river basin for its water pollution, Huai River attracts the nationwide concerns both from leaders of the country and the people. Many measures were taken for the pollution control. For example, the first and special water pollution and prevention trial regulation has been enacted and implemented by State Council in Huai River Basin in 1995. However, the water pollution is still serious and the degree of the water quality reported in the State Environmental Protection Agency' bulletin (2005) is still mid- polluted.

It is hard to settle the disputes on water pollution control in the Basin. Professional and objective evaluation on effect of the water pollution control is necessary. The significance of the evaluation on policies for water environmental protection in such a huge basin is that it provides comprehensive, systematic, and professional analysis. The evaluation has provided not only an objective and cogency evaluation conclusion on the existing efforts and experiences, but also a reference to policy orientation and action models in the future.

The time range of this evaluation is 1995-2005, covering the period of "9th Five-Year Plan"

and “10th Five-Year Plan”. The tasks of evaluation are arduous and complicated with such a long time range in such a huge river basin, and we believe that any attempt to evaluate the effect of water pollution control in the Basin in a simple way will result in adverse effects.

Framework of the Evaluation

Objectives and Clue of the Evaluation

Policy evaluation not only serves as a basic way to examine the result, benefit and efficiency of the policy, but also influences the orientation of the policy[1]. The purpose of this paper is to evaluate the impact of environmental management in the Basin, analyze factors that influence the result of the policy, and propose suggestions to improve the environmental policy and management. Following the general model of policy evaluation and according to the top-down manner, this paper starts from the policy goals and evaluates the effects of policy implementation in the following aspects: the detailed interpretation of policy goals, the framework of the policy, the implementation mechanism, the institution’s responsibilities, the financial mechanism, the environmental protection actions and its performance. Finally, we reach some conclusions of the evaluation, and put forward corresponding policy suggestions.

The methodology of this paper is to take final goals of water environmental protection as the starting point, analyze downward the logical clue of pollutant discharge, spread and the influence water quality, that is, to discuss the problems of environmental policy and management by evaluating water quality, pollutant effluent and pollution control.

Methodology and Criteria

We collected different sources of data, analyzed and mined them in several ways to reveal the real rule and the information that embeded in the data. It contains:

(1) Time series analysis of water quality and pollutant effluent[2].

In this research, all statistical data from 1995 to 2005 about basin water quality and pollutant effluent in Huai River Basin has been collected to carry on the vertical contrast within the range of a long time and analyze the tendency of the whole or specific section water quality in the basin. The collected data is mainly from the Huai River publication, environmental statistical yearbook and local water supply departments. The comparative analysis among data from different sources is an important policy analytical methodology. The importantance of comparing data from different sources lies in examining the validity of the data, and reaching accurate conclusion through reliable data.

(2) Comparison the objectives with planning

Water pollution control in the Basin is based on two prevention and control plans of water pollution, that is, the “9th Five-Year Plan” and the “10th Five-Year Plan”. This paper draws a direct conclusion by comparing the status of water quality in latter stage of planning with its

former objectives, so as to assess the effect of basin pollution control and the status of the plan's implementation.

(3) Criteria of Evaluation

The aim of water environmental protection is the health of aquatic ecosystem, which is also the highest standard in the water policy evaluation. The ecosystem health develops through the improvement of water quality. Therefore, water quality becomes the direct standard of the water policy evaluation. Intermediate objectives related to water quality goal also include pollutant effluent, pollutant effluent entering into rivers, pollutant flux, etc.

Contents and conclusions

Evaluation on the Implementation Activities

Water pollution prevention and control activities refer to the environmental protection activities of the stakeholders aimed at slowing down the water quality deterioration or improving the water quality. [3] Water pollution prevention and control activities are divided as follows: industrial water pollution prevention and control, urban wastewater treatment, agricultural non-point resources pollution control, ecology protection and drinking water project.

(1)There is an obvious effect on the Industrial Water Pollution Prevention and Control Project, but the planning objective has not been achieved completely. In the aspect of Industrial Water Pollution Prevention and Control, although there is still a major gap between the actual implementation and the objectives of "the 9th Five-Year Plan" and "the 10th Five-Year Plan", outstanding effects in the Basin have been observed as a result of the joint effort, which can be well proved by the declining of industrial COD discharge. However, such conclusions are drawn from the government's statistical data which is lack of further demonstration.

(2) The domestic waste water treatment plant projects have not been well completed in the whole basin. In the end of the "the 9th Five-Year", the unimplemented projects took up 25.4% of the planning projects, and rose to 44.1% in "the 10th Five-Year" by January, 2005. Investigation and analysis show that the main reason is the funds were not in place. According to the estimation on sewage treatment capacity, the investment accomplishment percentages are 43.88% and 28.7% respectively during the periods of "the 9th Five-Year" and "the 10th Five-Year". Meanwhile, the waste distribution network is not enough to support the construction of wastewater treatment plants. Moreover, the charge of polluted water processing is too low to support the daily operation of the polluted water process factory, and the local environmental protection agency's supervision on the wastewater treatment plants is very weak.

(3) The objectives of agricultural non-point pollution resources control have been basically achieved. In the " Ninth Five-Year Plan", the agricultural non-point sources pollution control had not been taken into account. With the strengthening of industrial point sources pollution control and the emerging impacts of the ammonia-nitrogen pollution, non-point sources pollution was taken as an important part of pollution control plan in the "10th Five-Year Plan". The implementation of 6 projects of the agricultural non-point source pollution control has been also included in the "10th Five-Year Plan". The projects under construction or have been constructed took up 83.3% of the total projects with a total investment of CNY 120 million by January, 2005.

(4) The ecological protection activities are insufficient.

The focus of the "9th Five-Year Plan" is on industrial pollution control and is lack of enough attention to ecological protection. Some actions aimed at soil and water conservation and water resources protection have been taken but there is no obvious effect. The local Water Sectors and the Basin Management Departments didn't reach consensus on the water utilization management. In the aspect of water saving, there are still major problems such as severe waste in water using, and the weakness of water gauging management. One of the important reasons for the improper water resources allocation is that the water price is too low to reflect the value of the water resource, despite a continual rise in water price in recent years. The basin ecological protection has been strengthened since the "10th Five-Year", and a series projects of Sewage Interception and Watershed Comprehensive Harness have been conducted. The implementation effects of Wastewater Interception Projects are bad while the results of the Watershed Comprehensive Harness Projects are relatively better.

(5) The Funds of drinking water project are well in place.

The deep-well and drinking-water projects are accomplished well. The drinking water projects include rural drinking water projects and urban surface drinking-water guarantee projects in four provinces along the Huai River. The availability rate of construction investment, especially for the urban surface drinking-water guarantee projects, is higher than that of other projects like the industrial point source control, industrial structure adjustment, clean production and sewage centralized treatment works.

Evaluation of the effluent control effect

According to the two five-year plans, we chose the amounts of pollutant effluent, pollutants into river and pollutant flux as the indicators to evaluate the Huai River's pollution control effect. The amount of pollutant effluent is the aggregate value of target sources, which is value in environmental yearbook. The amount of pollutants into river is the total pollutant effluent discharged into the target river, which can be got by monitoring the water volume and the pollutant concentration. The pollutant flux is the amount of a certain pollutant that passes a river cross section in a unit-time. By comparing the three indicators in a river shed, we can

estimate actual pollutant effluent. If most of the pollution sources have been covered in statistics, the pollutant flux would be less than the amount of pollutants entering the river, and the amount of pollutants entering the river would be less than the amount of pollutant effluent from pollution sources.

The relationship of them is shown in Figure 1:

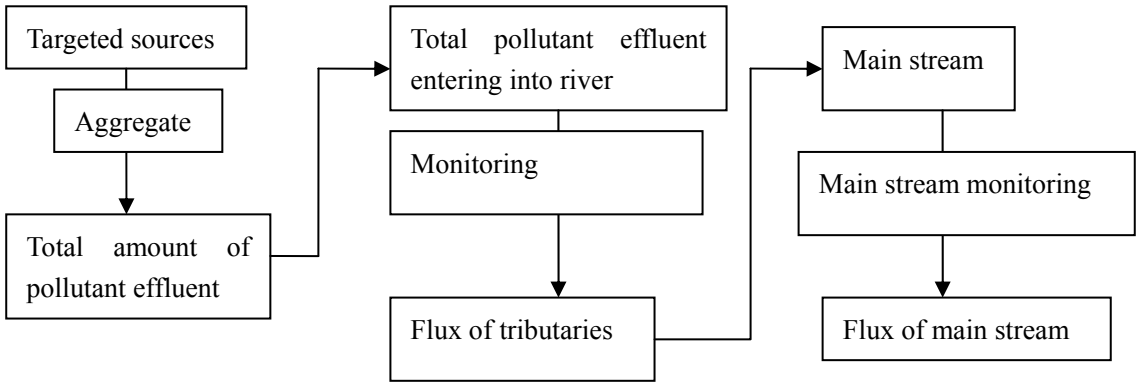

Fig 1. Evaluation route map of pollutant effluent

(1) The amount of total pollutant effluent is still higher than the target value of the plan, and the amount of pollutant effluent entering into rivers is not clear.

Generally speaking, the 10th five-year planning goal in Huai River has not been achieved yet. The statistic data indicates that, the COD effluent amount is 1.5 times more than the target of the plan in the past years. That is to say that the COD effluent has exceeded more than half of the plan's requirement. Regional pollutant effluent amount refers to the total amount of the pollutant effluent which is counted in the environment statistics of China. It is almost the definition of Pollutant Effluent Amount in China's Environmental Statistic.

The environmental agency has no statistic of pollutant effluent entering into each river. Huai River committee issues a pollution effluent bulletin of important water functional areas every month, but it only monitors the functional areas at random, The monitor frequency for one area is too low to ensure the data continuity, hence we can not get the real amount of pollutant effluent entering Huaihe River basin. Meanwhile, the Water Function Area used by Huai River Committee is different from Environment Protection Department's Controlled Section and Controlled Unit, which makes the effluent data unusable. Therefore, the real effluent discharge load into each river is not available.

(2) The pollutant effluent has not been controlled.

Although the statistic amount of pollutant effluent has showed a declining trend, the Flux estimated in WuJiaDu section which is located in downstream of Huai River in Bengbu city, Anhui Province, is changing greatly every year without any regular pattern.

From figure 2 and figure 3, we can see that both the effluent amount of NH_3-N and COD have huge shaking in different year. There is no evidence indicating that they are decreasing. So the statistical data is unreliable, and we can not say that the pollution is under control.

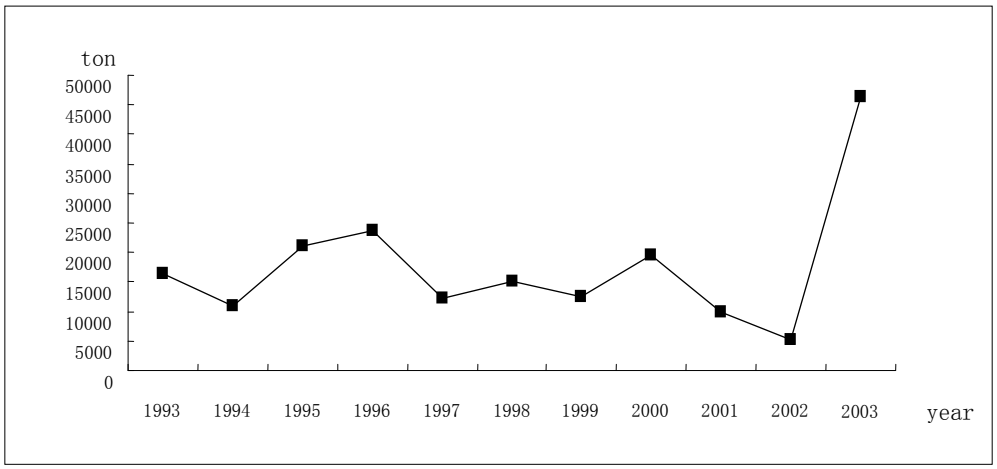

Fig.2 NH_3-N flux in Wujiadu section

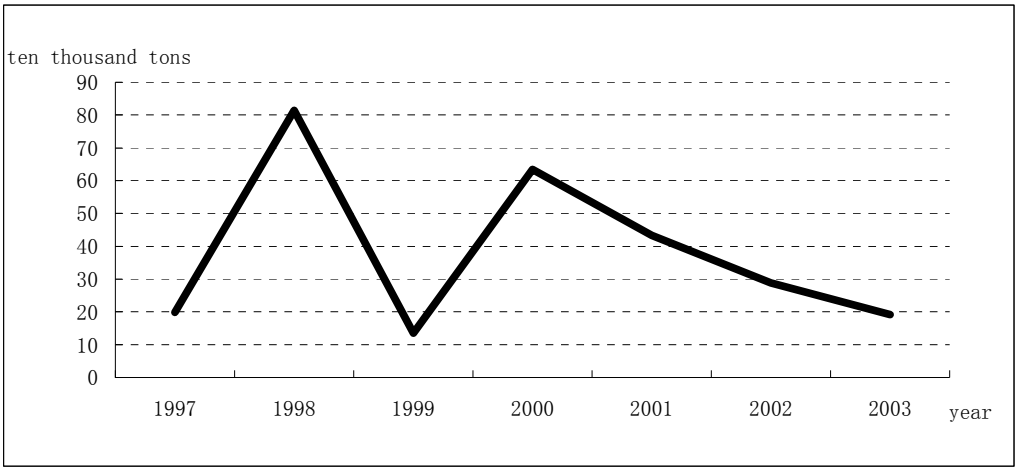

Fig. 3 COD flux in Wujiadu section

We have also compared the effluent amount by statistic with estimated pollutant by flux, as shown in table 1, and found that there is a huge gap between them. In some years, the latter is even lager than the former, which is odd. The inconsistence between the estimation of the general amount and the effluent amount statistics shows the inaccurate effluent amount statistics and the un-controlled pollutant effluent.

Table 1 Comparison of flux and statistic effluent of COD unit: ten thousand tons

Year	Amount of COD load in Henan and Anhui province	Amount of COD load in Henan and Anhui part of Huai River(above Bengbu section)	The flux of COD in Wujiadu section
1998	134.9	30.63	81.41
1999	139.68	31.76	13.46
2000	126.3	29.58	63.59
2001	110.33	25.33	37.01
2003	96.37	22.12	19．12
average	121.52	27.88	42.92

(3) Although 70% of pollutants come from agriculture non-point sources, the industrial and domestic point pollution sources are the major factor that makes the water quality bad.

We compared the proportion of pollutant from industrial and domestic waste water sources with non-point sources in table 2. The former takes up less than 30% while the latter takes up more than 70% in each year. But according to the relationships between flux, water flow rate, concentration and water quality discussed above, we know that the non-point pollution takes place in the rainy season in which the water quality is better than in the dry season. In contrast, in the dry season, the pollutant is discharged from industrial and domestic sources. Therefore, the industrial and domestic sources are the main sources.

Table 2 the proportion of industrial and living sources by year (%)

	Huaibin	Bantai	Huaidian	Jieshou	Lutaizi	Wujiadu	Average
NH_3-N	33.08	39.64	24.45	31.32	5.92	31.68	27.68
COD	29.40	36.40	21.91	20.86	23.87	16.42	24.81

Figure 4 to figure 7 indicate such a series of relationships: the larger the water quantity, the more the pollutant effluent, the lower the pollutant concentration, the better the water quality, and vice versa. And the relationships showed by the data are consistent with logistic deducing: There's a positive correlation between the amount of pollutant entering the river and the rainfall, with non-point sources as the main influencing factor. It is also assumed that some of pollutants are stored to be discharged when raining.