Analysis on the causes of water contaminated by toxic and harmful substances in the Yangtze River Delta

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Abstract. In recent years, with the rapid development of economy in the Yangtze River Delta, the water pollution are becoming more and more serious. The expansion of urban agglomeration also makes water pollution show significant regional and complex nature. This paper takes water quality of the Yangtze River Delta as an example, the toxic and harmful substances such as ammonia nitrogen, petroleum, volatile phenol and cyanide discharged from waste water were analysed, which has led to increasing attention being paid to the phenomenon of water contaminated by toxic and harmful substances. The causes of water pollution in the Yangtze River Delta are considered to solve the problem of subsequent pollution control. In conclusion, this paper analyzed the causes of water pollution in this area from the angles of geographical environment, legal system, economic development model and so on, and expected to provide the basis for water pollution control.

1. Introduction
From an undeveloped country, suffering from famine and starvation, China has transitioned into an economic powerhouse that took over the world’s production in the last few decades. From the early 1980s to the 21st century, the average annual growth rate of China’s gross domestic product (GDP) has increased immensely. China keeps growing faster than any other leading country with its escalating economic development and technological advancements.

The Yangtze River, longest river in China and Asia, serves as a major factor in inter-regional commercial trade and the economic growth. Benefiting from this river’s resources, areas surrounding the river known as the Yangtze River Delta (YRD), one of China’s three metropolitan regions, plays a significant role in the country’s current and future growth and expansion [1]. The YRD, lies in the center of Jiangnan region, is comprised of areas of Shanghai, southern Jiangsu province and northern Zhejiang province. Because of its geological location and population cluster, YRD is one of the fastest-growing and wealthiest regions in East Asia measured by the country’s GDP. With its warm and humid climate, this region produces most of the country’s grain, cotton, and tea.

Because of the rapid changes in the Yangtze River Delta, environmental problems have arisen as a result. Having a better understanding of the causes of water contaminated by Toxic and Harmful Substances in this region from various aspects will not only help mitigate some of water pollutions but as well as further expand our country’s economic and technological growth. It is also imperative to adopt policies and programs to adjust to some of these changes in the fast urbanization process.
2. Materials and methods
The Yangtze River Delta has developed industry and large discharge of waste water, and the waste water contains a large number of toxic and harmful substances, which causes the pollution of river water in the middle and lower reaches of the Yangtze River [2]. According to China Environmental Statistics Annual Report 2015, the total discharge of toxic and harmful substances from waste water in the middle and lower reaches of the Yangtze River in 2015 are listed in Table 1.

| Toxic and harmful substances          | Discharge |
|--------------------------------------|-----------|
| waste water / million tons           | 131.9     |
| COD/10,000 tons                      | 354.1     |
| ammonia nitrogen /10,000 tons        | 44.7      |
| petroleum/ton                         | 3730.7    |
| petroleum/ton                         | 57.8      |
| cyanide/ton                           | 31.0      |

From Table 1, it can be seen that the main toxic and harmful substances in the middle and lower reaches of the Yangtze River Delta are petroleum pollutant which come from the discharge of industrial waste water. Water quality of rivers is polluted to varying degrees, and Taihu Lake Basin is the most serious. According to the national water quality monthly report of 2020, the total water quality of Taihu Lake in 2020 is class IV. The main toxic and harmful substances are total phosphorus and total nitrogen. And the whole lake is mildly nutritious.

3. Results

3.1. The environmental legal system is not perfect
The water contamination problems in river delta are caused by the characteristics of its own geographical environment. The Yangtze River Delta (YRD) is mostly alluvial plains which are relatively low, with many rivers but mostly lakes. With insufficient liquidity and a large number of people living in the water supply, water supply in this area is scarce and inadequate. The discharge of daily water and industrial waste water containing a large amount of organic waste are discharged into rivers. Rivers usually has the ability of self-purification to eliminate organic pollutants, however because of the Yangtze River’s large net pressure and insufficient capacity, making it difficult to boost water quality.

A well-established legal management can be effective measures for environmental pollution control, and the legal system provides a strong guarantee and foundation to have a maintainable environmental development. However, our country’s regional environmental legal system is obviously very deficient. In the Yangtze River Delta region, law enforcement under the environmental legal system is poorly regulated, the legal systems are not complete, not interconnected, and unclear. The legal system of the individual government in the YRD region is not obvious, and the prevention and control characteristics of the entire cooperative regulation are lacking. Several laws associated with water resources and regulation in the YRD have been able to contain this problem. For example, the YRD water pollution control protection law, measures the management of key water pollution permits in the Huaihe River and Taihu Lake, and other smaller lakes and rivers [3]. However, laws and regulations on the utilization of environmental resources, comprehensive protection, emission standards, and quantification of pollution damage are still imperfect.

3.2. Lack of laws and regulations on the prevention and control of inter-regional governments
The absence of the regional environmental management institution, the lack of regional cooperation system design, improper arrangement of the administrative system, constraints of local governments and
institutions, and other factors cause many obstacles in regulating regional cooperation which restricts the regulation of regional environment in the YRD.

Under the rule of regional environment law, the effect of governance mainly hinges on the effectiveness of the implementation of local environmental law, since the specific implementation work of the environmental law by local governments and the related officials has distinctive features of a rational political man [4]. Lack of financial support and resources, poor financial input as well as irrational operation evaluation system have all, to a great degree, affected the implementation of the environmental law by local government and officials. There is a need to introduce a more fitting system arrangement, establish a more effective incentive system. Meanwhile, the supervision of environmental law enforcement by society and the masses should also be strengthened and more capital should also be invested into environmental protection.

Generally speaking, the legal system of regional characteristics is not obvious in China's environmental legal system [5]. Moreover, there is no effective coordination system between the laws and regulations and the central environmental legal system. In a seemingly perfect legal system, there are few real places where the regional environmental legal system can be implemented. Therefore, China's environmental legal system should be interpreted in accordance with the laws and regulations formulated by the central government, correctly corresponding to the characteristics of regional environmental problems and interpret and perfect it pertinently, enact a regional environmental legal system that can be implemented and scientific and form an effective and reasonable legal system for the integration of the environment.

3.3. Regional environmental laws and economic characteristics are not well connected
In the economic behavior of domestic enterprises, the company is a profit-making organization, the pursuit of profit maximization is its fundamental way of survival. Under the "One Belt and One Road" wave, more and more companies will come to the great development era and the arrival of multinational companies. But in the process, these companies are pursuing economic benefits while the hidden "cost" is higher than the "cost" of obeying the law and often ignoring the sustainable development of ecological benefits and environment.

For example, in the provisions of the water pollution prevention law issued in 2008, the ministry of environmental protection is responsible for 20 percent of the direct losses caused by water pollution. But the big pollution accidents we know will not only cause direct losses, the indirect loss that we cannot estimate is not accurately accounted for in the whole area. The law enforcement issues, including how to evaluate them and how to measure them, are very vague. The water pollution incident in the Songhua River in 2005, for example, the price paid by the company is only the $1 million limit set in the water pollution prevention act of 1996, which is less than half a year's earnings. But in fact, for the waters of economic loss and environmental ecological loss and even threaten the waters of the people's life safety, these are not just 1 million to compensation.

Similarly, for these environmental pollution incidents, legal systems in foreign countries are very different from our country. We looked at Mobil oil, a foreign company, in 1989, when the Exxon Valdez oil tanker crashed in Alaska, causing hundreds of thousands of barrels of oil to leak For instance, in 1989, Mobil, a US-based oil company, crashed its Exxon Valdez oil tanker in Alaska, causing a massive amount oil barrels to leak into the atmosphere. According to the Associated Press, the United States Court of Appeals for the Ninth Circuit Court of Appeals (for the Ninth Circuit) ruled that Exxon Mobil (Exxon Mobil Corp., XOM) need Valdez oil tanker Exxon Valdez oil spill in the plaintiff to pay about $500 million in damages, and pay interest of 5.9% per year since 1996, on the basis of calculating the total amount is about $1 billion.

Therefore, the legislation, reform and improvement of the environmental legal system in the region should take into account the characteristics of its internal economic development and the factors of economic cost-effectiveness. It is because of the unitary environmental legal system, the lack of function of the internal economic characteristics, and the difference of tax rate of relevant industries, the problem of water pollution in the Yangtze River delta is so destructive and severe.
4. Conclusion
The relationship between environmental pollution and societal development has long been a controversial topic. The impact of China’s rapid social, economic, technological growth on the environment has become a serious problem in China as well as the international community. As one of the most prosperous areas in China, The Yangtze River Delta has paid a huge environmental price while developing its economy. Environmental pollution, especially water pollution, show regional and complex nature, which affects the high quality development of the economy in the Yangtze River Delta. Therefore, it is significant to further understand the problem of water pollution, and carry out an analysis of the causes of water pollution.

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