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PERCEPTIONS AND ACTIONS REGARDING INDUSTRIAL AND  
DOMESTIC WASTEWATER AMONG GROUPS OF CITIZENS IN  
ZHUZHOU CITY, CHINA

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## **Abstract**

Perceptions and actions of professional regarding wastewater are essential elements in water management of a whole society. In this paper, studying of present policies and comparing perception of three types of people – that was, the public servant, the academician and the citizen on wastewater management in Zhuzhou City. During a time of the field work, social research methods of questionnaire, interview and group meeting were used to collect the data, and then the data would be described and comparative analyzed. In Zhuzhou City, most of the wastewater policies are formulated to manage the industrial waste, but they are too strict to effectively manage industrial areas. According to the views of the public servants, their main attention is on policies and management of industrial businesses. Moreover, they pursue the economic development of the society, but they pay less attention to the citizens' daily behavior that influences the water environment. In the views of the academicians, local government should formulate polices that are applicable to the local water management according to the actual situation of the society. The layout of Zhuzhou city and the consciousness of the public servants and the citizens are the main problem in wastewater management. Coming to the citizen, their views and daily behaviors about reducing the wastewater come from the reason of economy, but they ignore that their future and well-being need a sound environment as a basis. As a result, the academician has a wider view than the public servants and the citizens. Although the public servants hold enough knowledge to manage water environment, they lack consciousness such that they pay more attention to economic development instead of environmental development. Moreover, the citizens also lack consciousness about the protection and prevention of the environment.

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# Chapter 1 Introduction

## 1.1 Rational

The sustainable development of societies and human health has a direct relationship to water. Without water, societies will collapse, and humans will disappear. Whenever and wherever, water and sanitation are uninterrupted projects which are studied by humans who want to live and develop.

As we well know, water is the source of any life. With the incessant development of societies and the rapid increase of populations globally, water pollution has become one of the most serious environmental problems. Currently, there are some data showing that at least one billion people have no clean water to drink over the world, and there are about 2.2 million people who die every year due to consuming contaminated water, beside the child mortality is 9,500 per day (Cole et al., 2000). Wastewater management should be as an essential project for studying in any country and even any city.

In China, the large number of people and the development of urbanization are both main reasons for evolving water crisis. During the last three decades, the population increased from about 0.96 billion to about 1.3 billion, and the number of cities extended from 193 to 655. It goes without saying that a mass of water should be used for human consumption, factory production and agriculture development. Water resources are more and more constrictive, and they are 25% lower than the global per capita average.

Ma Jun, who is leading Chinese environmental activist and journalist, said that China has a very important challenge which is the water crisis focusing on water shortages and the deterioration of water quality. Moreover, more than half of Chinese cities have different degrees of problems of water consumption, especially the largest cities.

According to his data, there are about 300 million peasants who drink polluted water (Ma, 2004).

Actually, humans are the primary reason for environmental degradation, except earthquakes, volcano eruptions and other natural factors. Facing the serious water pollution, what about the citizen's thinking? Do they know the situation of the water pollution and how to alleviate the pollution? If they know, are they doing by some valid measures? Are the equipments and the technologies in wastewater treatment plants advanced for reducing the amount of the wastewater? Can the waterworks supply clean water for citizen based on a polluted water source? These issues are worth to be researched.

Zhuzhou city is one important heavy industrial city of China. Its environment is influenced by industrial production. According to the project of Wang, Haiyan (Wang 2002), he assessed and predicted the overall environmental quality, including the air, the water and the soil, in Zhuzhou city by scientific methods. When he focused on the water, he took the Xiang River of Zhuzhou city section and its 5 side rives as testing places, and then analyzing the pollutants within the water and giving the assessment.

From 2001 to 2003, Wang, Haiyan did another project with Arne O. Stuanes (Wang and Stuanes, 2003). During the time, they mainly researched the heavy metals in air-soil-water-plant system in Zhuzhou city. In this project, when they investigated about the water range, they only introduced the situation and reasons of heavy metals within Xiang River of Zhuzhou city section. They focused on methods of the heavy metal measurement but not on the quality of wastewater or extend of water pollution.

Until now, there have had some reports and publications about the water pollution in Zhuzhou city published over the world. They just show how the water pollution is severe and/or how to measure the pollutant within the water and/or some reasons of the water pollution on some special spots (the plant) in Zhuzhou city (Chen et al., 2008; Ceng et al., 2007; Li, 2007; Yam, 2006). However, there are some academicians

who did projects which were about relating the policy, the institution, the technology and the society with the wastewater. For example, Nawab (2006), who based on the local society, local institution and development to research wastewater in Pakistan. Coming to Zhuzhou city, where there is a big knowledge gap that is the holistic view of wastewater management and sanitation for this paper. This knowledge gap is an integrated issue. During the procedure of the project, the paper will be based on the local culture, the technology with factory of wastewater treatment and industrial economy, and the institution to analyzing and discussing the indigenous behavior and governmental policy and implementation.

## **1.2 Background**

Zhuzhou city lies in the east of Hunan province, China, (east longitude  $112.6^{\circ}$  -  $114^{\circ}$ ; north latitude  $26^{\circ}$  -  $28^{\circ}$ ). The amount of area is about 11.2 thousand  $\text{km}^2$  which is the second in Hunan province, and the number of the population is 3.76 million by 2006. Zhuhou city has jurisdiction over 5 counties (Chaling, Liling, Youxian, Yanling, Zhuzhou) and 4 districts (Tianyuan, Shifeng, Hetang, Lusong). The project will focus mainly on the urban area.

Zhuzhou city is a modern industrial city where there are so many intensive industries have been built and large amount of energies are consumed. The metallurgy, the machine manufacture, chemicals and building materials are Zhuzhou city's major industries. According to the National Environmental Protection Bureau report, Zhuzhou city was the ninth of the most serious air pollution city in China in 2003.

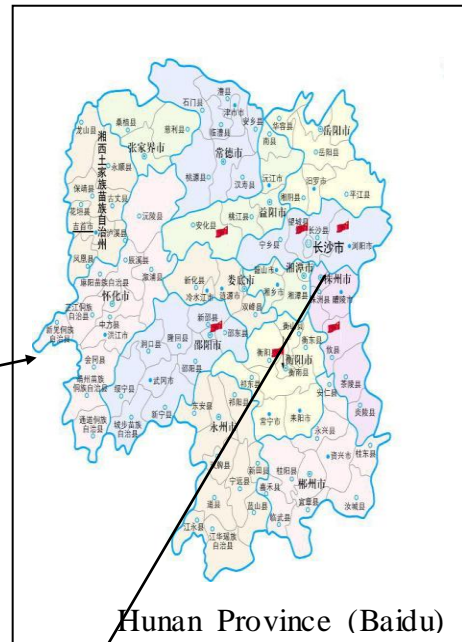
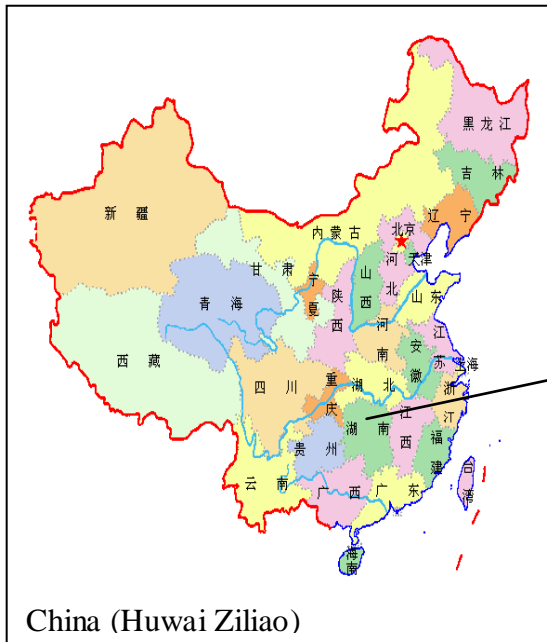


Figure 1. Map of Zhuzhou city and the Xiang River, Hunan province, China. (Huwai Ziliao, Google Earth, Baidu, 2010)

The Xiang River is one of distributaries of the Yangtze and one of the main water sources for drinking and irrigation in Hunan province. It is 89.6 km long in Zhuzhou section which occupies 10.46% of the whole length (Wang, 2002). And the surface width is 500 – 800 m. The average flow of every year is 1730 m<sup>3</sup>/s, the maximum flow is 20200 m<sup>3</sup>/s, and the minimum flow is 101 m<sup>3</sup>/s, the amount of runoff of every year is 64.4 billion m<sup>3</sup> (Zhu, 2006). Xiang River is the major container for the municipal sewage and industrial wastewater. With city developing, the quality of the river has deteriorated gradually. In 2002, “the water quality within the Zhuzhou section of the Xiang River belonged to Class IV” (Wang, 2002).

Table 1. Water environmental quality classification in China. (Wang, 2002)

Water environmental quality classification	Level	Function area
	I (Excellent)	Source water and national nature reserves.
	II (Good)	Centralized drinking water sources first-degree reserves, rare fish reserves and spawn sites.
	III (Ordinary)	Centralized drinking water sources second-degree reserves, normal fisheries and swimming pools.
	IV (Poor)	General industrial water sources and recreation areas not directly reachable by people.
	V (Bad)	Agricultural water sources and general scenery.

### **1.3 Problems**

Be as a modernized industrial city, the environment of Zhuzhou city has been polluted seriously. Particular the water pollution, large number of municipal wastewater with high organic materials and industrial effluent water with abundant heavy metals are discharged directly into Xiang River which is the water source of Zhuzhou city. It not only impacts the indigenous health but also stops the sustainable development of the society. This information is just general.

As developing of the whole society and producing of industrial factories, the industrial estates are occupying the most areas of the central city. A large number of industrial wastewater is discharged from factories into Xiang River directly. According to The Environmental Protection Bureau, the amount of industrial effluent water was 85 million m<sup>3</sup> in 2003 (Ministry of Environmental Protection of Hunan Province, 2004). These waters contain abundant heavy metals that are not able to manage by factories. Since 1954, the country supported Zhuzhou city as a key industry city for development. So many factories were established on here until today. One proportion of factories have not advanced their technologies and/or improved their equipments. Resulting in the industries are low efficient and have a lot of serious problems of environment pollution. It is obviously structural pollution, which blocks economic sustainable development and also threatens indigenous health (Wang, 2002).

Zhuzhou city is the second biggest in Hunan province, and it is the key transportation hinge in the central southern China. Most of population in here are immigrating from others cities. The density of people who are living and working in Zhuzhou city is very high. The residents of Zhuzhou produce the increasing amount of wastewater. The Environmental Protection Bureau showed that the amount of sanitary wastewater was 58 million tons in 2003 (Ministry of Environmental Protection of Hunan Province, 2004). The wastewater also contains large number of chemical materials and organic materials. On the other hand, Zhuzhou city has an important situation that the large

amount of population are living intensively in the central area. Resulting in the governmental management gets some difficulties. Most of wastewater from human being is collected into the special system (the cloacae), but some dwellers put their wastewater outside of the door. It is the real phenomenon. These behaviors not only pollute the surrounding environment but also impact their health.

The Xiang River of Zhuzhou section is the main water source for consumption and industrial utilizing. And it receives the large amount of the effluent waters with abundant chemical materials and organic materials from the whole city. They have gone beyond the resistant capacity of the Xiang River. The quality of the water environment of Zhuzhou city does not reach the district standard (Ministry of Environmental Protection of Hunan Province, 2004). Xiang River has 5 side rivers, such as Tongtang, Baishi, Fengxi, Jianning and Xiawan. They are flowing through the city and receiving the municipal sewage and industrial effluent water into the Xiang River directly (Wang, 2002). Some sections water of Xiang River in Zhuzhou city belong Class III, but the Fengxi section and Baishi section cannot reach to Class III and even the Xiawan section belongs to Class V (Ministry of Environmental Protection of Hunan Province, 2004). Due to a lot of heavy metals and organic pollutant within wastewater are discharged into Xiang River, it is serious impacting the citizen's drinking water of the quality and health, and as well impacting the water utility of Xiangtan city and Changsha city which stand on the downstream of the Xiang River of the Zhuzhou section.

Every year, the Xiang River has a time of low water which normally happens in about October and/or November. The main reason is that the precipitation is few in that time. However, now human being also cannot be ignored. Recently, with the rapid social development, abundant sand is necessary for social construction. It supplies much commercial profit for the sand market. Resulting in a lot of boats are working on the river for exploring the sand within the river. During the procedure, most of them are random and have no regulation. Consequently, the riverbed of the Xiang River has

been broken, and it speeds the water pollution in the time of low water. Resulting in that the capability of the Xiang River should be declined for diluting the wastewater. It makes not only people have no enough drinking water but also have no more cleaning water for consumption.

Facing the large amount of municipal wastewater, a wastewater treatment is indispensable. Today, in Zhuzhou city there are only three factories of wastewater treatment, such as Xiawan, Dongjiaduan and Longquan. Their whole capacity of wastewater treatment is 172 000 m<sup>3</sup> per day (Ministry of Environmental Protection of Hunan Province, 2004). This number just occupies a small proportion of the whole municipal wastewater including municipal waste water and industrial effluent water. A large number of wastewater cannot be treated in time and is discharged directly into Xiang River.



Figure 2. The Xiang River during the time of low water. (Siyue De Tangyu, 2008)



## 1.4 Objectives

1. Facing the situation of the water environment, how does the local government manage the wastewater emission?

- What policies are promulgated to control the water pollution?
- What problems occur when the local government enforces the relevant policies?
- Whether the policies can or cannot manage efficiently wastewater emission?

2. What attitudes do the people of Zhuzhou city hold focusing on the wastewater?

- What views do the public servants hold about the wastewater management and existing problems in Zhuzhou city?
- What do the academicians discuss regarding the situation of water environment and wastewater management in Zhuzhou city?
- What do the citizens talk about regarding water in their daily life?

3. Comparing with three groups people, what are the different attitudes among them?

- What different views they holding on wastewater based on policy?
- How different they thinking about wastewater from the point of view of economy?
- What are the different culture quality and consciousness regarding using and saving water among these three groups' people?

## Chapter 2 Literature Review

Along with Chinese economic reform, economic structural change and people's living standards improve, the level of water supply technology has been developing, but the deterioration of water quality and lack of water, there are some new problems. In recent years, the country's total water supply decreased, but increased per capita water consumption. In China, water supply always increased. In 1994, water supply reached 48915 billion m<sup>3</sup>, however, it started to decline in 1995 and declined again to 46612 billion m<sup>3</sup> (Zhong, 1998). In contrast, per capita water consumption increased steadily year by year. In 1994, it was 194 L/d per person, 195 L/d per person in 1995 and increased to 208.0 L/d in 1996 (Zhong, 1998). Obviously that was an appeared trend due to declining of industrial water consumption was more than increasing of living water. It is possible that the structure of urban water supply will gradually adjust and stable develop along with urban water supply is extending to towns and after the formation of regional water supply (Zhong, 1998).

China's handling of micro-polluted water research began from the research stage into the production test (application) stage. Moreover, it will exceed the current traditional process, resulting in leading the reform of China's water treatment process (Zhong, 1998). In China, the water resource of many cities is to be contaminated and high content of ammonia. Meanwhile, the organic pollution influences the conventional treatment; the eutrophication of reservoir caused by algae; and the gap between the water quality deterioration and the requested improvement of water quality in the city water plant is outstanding (Zhong, 1998). The considered responses of the current tendency are that long-distance transportation of water, change of water resource; enhance of conventional treatment to improve effluent quality; and research of the biological treatment and advanced treatment to find acceptable ways (Zhong, 1998). In many organizations of China, Biological Pretreatment have obtained many research results, however, the effect of pollutant removing, the field of application and the experience of successful and fail in tests of current production are different. Therefore,

when the Biological Pretreatment is used in production, it must be researching the combination of necessary follow-up treatments according to the specific situation of the original water (Zhong, 1998). The biological activated carbon is gradually used in the formal treatment process as the depth of treatment. Coming to the ozone treatment, it had no development in 20 years; however, the situation of water resource will promote the research and use of ozone treatment in China (Zhong, 1998). Chlorine dioxide as a disinfectant was applied early in many countries, but it has not been used in China due to problems of the raw materials and disinfection by-products of chlorine dioxide. Recently, it was tried to use in several water plants of Shanghai city, Kunshan city, Changshu city (Zhong, 1998).

China is a country with severe water shortage, and water resources per capita possession of only 25% of the world average (Yao, 2002). The spatial and temporal distribution of water resources is also very uneven. The north of the Yangtze River occupies 64% cultivated land and 46% population of China, but volume of water resource has only 19% of the national total (Feng, 2000). In addition, lack of awareness of traditional water using as well as water resource management, resulting in waste of water is quite serious in most places of China (The Technology Department of State Environmental Protection Administration of China, 2001). Worsening of water pollution and degradation of water environment speedy reduce water resource. Along with China's market economy gradually improved and the marketization reform of water, the effect of economic instruments for water resource management play an important role (Yu et al., 2005).

Today, there are law means, administrative means economic means and educational propaganda means and so on as management instruments for environmental management (Ma Zhong, 1999). Among of them, economic means is current famous in environmental management. According to the thinking of solve the problem, the economic means can be divided into two categories – that was, the Pigou means, which focus on regulating of the market; and the Coase means, which focus on

establishment of the market (Yu et al., 2005).

Pigou means mainly through the government to solve environmental problems, and its core idea is that the government make a reasonable negative price for external diseconomy, meanwhile, the manufacture of external diseconomy bear the full external costs (Ma Zhong, 1999; Shen, 2001). Coase means mainly through the market mechanism to solve environmental problems. And its core idea is that when finding of a solution to externality problems, how to achieve the maximization of total social benefits, but not the complete elimination of externality, while the solution of external problems should pay attention to the damage between each other (Ma Zhong, 1999; Shen, 2001). Compared with other management means, economic means is to base on the market and focus on indirect macro-control by changing market signals, so that affecting the economic effect of the policy objects and guiding the change of their behavior. It does not require full control of micro-activities in policy objects, therefore, it greatly reduces the cost of policy implementation, to make environmental management more flexible and can adapt to different conditions, capacities and levels of development of the policy objects. In addition, economic instruments can effectively configure the required funds for the environmental protection (Yu et al., 2005).

Pigou means can be divided into the tax measure and subsidy measure. And Coase means can be divided into the measure of voluntary consultation and the measure of emission right trading (Yu et al., 2005). Pigou means and Coase means both are important means of water resource management, they have their own advantages and disadvantages. Pigou means more reliance on government intervention and more able to adapt to the market economy with not very sound economic system. It should prevent the environmental issues of "government useless" when using of the Pigou means. Coase means greater reliance on market mechanisms and only can adapt to the economic system with developed market economy. It should prevent the environmental issues of "market failure" when using of the Coase means (Yu et al.,

2005). Pigou means requires higher management costs, but the limitation on the property rights under the Coase means is more stringent than under the Pigou means. Tax measure and subsidy measure are the two components of Pigou means. Their theoretical bases are the same. Using of tax measures, the government can generally derive some economic benefits, which can be used as the Environmental Protection Fund. Moreover, using of subsidy measures, the government is just doing pure expenditure, which may cause some financial pressures. The measures of Voluntary consultation and emission rights trading both require a clear definition of property right of water resource. If it is complete to use the measures of voluntary consultation in the production activities, the Government will have no economic benefits in the management process. However, using of the measures of emission rights trading, government can derive the benefits from the trading of emission rights (Yu et al., 2005).

More than 600 cities in China, nearly 400 cities lack of water year round, in that, 110 cities are severe water shortage, and the quantity of water shortage per day is 16 million m<sup>3</sup>, moreover, the quantity of annual water shortage 6.0 billion m<sup>3</sup> (Guo, 2003). It is serious that the situations of worsening pollution of rivers in China have not been prevented, while the overall quality of the environment is still deteriorating. Faced such a serious water crisis, it has great significance that using of the circular economy concept to guide urban water cycle for the reliving of water pollution in China (Lu 2007).

Circular economy have three operating principles – that was, reduction, reuse, recycling, namely the 3R principles. Reduction belongs to the method of input port, to reduce the quantity of materials and energy flow in the process of production and consumption; re-use belongs to the method of procedural, to extend the time of productions and services. Recycling belongs to the method of output port, to change productions to renewable resources after complete using of their function. Sustainable use of water resources and urban water circulation should also follow the three

principles (Lu 2007).

Traditional urban water circulation model is a one-way linear metabolic system, which is emphasizing the supply management of water resources, meanwhile, the demand of water resource is given and its main task is to build water supply facilities to expand the supply capacity. In addition, the sewage and rainwater are considered as the kind of burden rather than as a resource to use in the model, therefore, they are discharged as soon as possible after collection and treatment in the proceeding of practice management (Ma Zhongyu, 2006). Circular economy of urban water cycle model is a closed-loop water system. Comparing with the traditional model, this model is more emphasis on water management and focusing on the use efficiency and effectiveness of water. For the sewage and rainwater, they are considered as valuable resources in circular economy of urban water cycle model. The sewage and rainwater are treated as water re-use after collection (Lu 2007).

Circular economy mainly functions on the area of water use at the technical level. It is to maximize water purification, recovery and recycling, so that arriving at or closing to zero emissions of wastewater. Circular economy mainly functions on the area of respecting of the law of nature at the economic level. In a regional context, adjusting of the spatial and the temporal distribution of water is to maintain the natural circulation of water, so that the sustainable use of urban water resources (Li, 2006)

## Chapter 3 Methodology and Research Method

### 3.1 Methodology

The project main research “perception and actions regarding wastewater in Zhuzhou city, Hunan province, China”. It can be consider as a social research. The data sources were from the Environmental Protection Bureau, some correlative governmental sections and the 4 districts of Zhuzhou city by questionnaires, photos, interviews, and discussions. And some documents that are as some special data was asked from the Environmental Protection Bureau of Zhuzhou city. Then the data will be described and comparatively analyzed, and be discussed with professional men – that was, the staff of the Environmental Protection Bureau, the local correlative academicians. Finally, after series of analysis and discussion of results, the paper will give some suggestions and be as a reference for the wastewater management in Zhuzhou city.

### 3.2 Research Method

In the whole proceeding of the project, the research methods that were used are social research methods. As well known, every country, city and town have their own environment, culture, history and development. It is impossible that using one or two immobility social methods to research any place. It should be changed and improved to accommodate the local situation.

Table 2. Research methods are on different groups

Method \ Group	Indigene	Public servant	Academician
Questionnaire	X		
Interview	X	X	X
Group- meeting discussion	X		

Here, the object of study is divided to three group types – that was, the public servant, the academician and the indigene (including the worker and employee in factories). There are some factors that respective influenced these groups' perspective will be discussed in later, so that it is impossible that every method can be used on each group.

### **3.2.1 Questionnaire**

The method of questionnaire was focusing on the local people. It is mostly effective method to collect data from this group based on the amount of population. Zhuzhou city has 4 districts – that are, Lusong district, Tianyuan district, Hetang district and Shifeng district. Comparing with each district, the population of resident is more or less, there is no obvious distinction. Therefore, the same content and the same number of questionnaires were handed out on the 4 districts and just only on the living quarters, except to the business regions and factory regions. Because most of people who did not pay attention to their questionnaires in the business regions and factory regions. Based on the population of districts, there were 60 questionnaires that were handed out and drew back the same number papers on each district. Therefore, the response rate of 240 questionnaires is 100%. That due to questionnaires would be picked back on time after few questionnaires were answered.

Coming to the content of questionnaire, there are 4 types of questions.

First of all, what their attitude about the situation of water of the big area – that was, the whole society or Zhuzhou city.

Second, some questions about Xiang River. How people consider about the situation of Xiang River. And what are their suggestions related to the development of Xiang River.

Third, what behavior the indigenes will choose when they use the water in daily life.

The last one, as far as they are concerned, what are their opinions to reduce the



wastewater and/or improve the water environment in Zhuzhou city.

In the questionnaire, there is an extra item about some curt information to explain questions, so that answerers could easily know and answer the questions. It is good to collect better data from them. From the first question to the last one, degree of difficulty presents a ladder-type. In the whole proceeding of questionnaire method, it was pre-tested and improved.

### **3.2.2 Interview**

In the fieldwork, the interview is more difficult than other methods. Concern to the project, it is impossible that every body can be asked for interview and collecting data. Three kinds of worker were invited to be as the interviewees. The first one, public servants who are working in the Environmental Protection Bureau and correlative governmental sections; the second one, academicians of environment field are from several universities or colleges; the third one, employees and/or manager are working in different factories. The total number of interviewees is 21 – that was, 6 public servants, 7 academicians of environment field and 9 workers who are from factories.

Based on the interviewees' duty in their working place and their own knowledge related to water and environment, they have different attitudes to talk about the questions that were asked. Sometime, they have common point on some problem, but they would give some themselves own sight. Moreover, so much extra valuable information was collected among these different kinds of workers.

During the time of the interview, three core questions were given to the interviewees.

In the first place, what situation of the water and environment of Zhuzhou city are in their mind.

Next, how they talked about the policy related to the water management in Zhuzhou city, and other people's behavior in their own sight.

Finally, concerning about themselves' knowledge and position that are in their work field and/or whole society, what are their suggestion about how to improve the situation of water and environment along with wastewater management in Zhuzhou city.

Although most of interviewees were glade to answer questions, some questions could not get valid result from them. For example, when public servants talked about some political questions, they would unwillingly describe them, even did not say anything about some one. It is well known that the reason which there are some special political influences in it. Another one, when the employee talked about wastewater management in factory, some of them also unwillingly to answer questions. Those are their factory's privacies that cannot be make out easily for outside people. Every talking topic had been deliberated, tested, and improved, so that more and more value data could be obtained for the project.

### **3.2.3 Group-meeting Discussion**

In the fieldwork, the group-meeting discussion is very interesting research method. Every time of group-meeting discussion is open-ended interview. Each member in this meeting can speak what he or she want based on the topic. And every member enjoy the discussion, they can show their own ideas; they can complain other's behaviors; they can support some policies and so on. During the time of discussion, they supported each other's some standpoints, but they also could be against other's some views. Then they would learn more information about the situation of water and environment of their living area. Meanwhile, a lot of value data could be obtained for the paper, moreover, much extra information that could be learnt can not be read from books.

The members who are come from indigene families have enough experience to know about the surrounding water environment and the habit of daily living. So the aim of the group-meeting discussion was to explore three important problems.

One, how the degree of their knowledge which were about the situation of the water and environment of Zhuzhou city they have been obtained.

Two, what were they talked about themselves' and others' behaviors and thinking in their sight related to water using.

Three, based on their real daily living, what is their thinking that is about population how to improve surrounding water environment, and how to manage the water resource.

There were 4 times of group-meeting that had been hold. The first time of group-meeting had 6 persons (4 males and 2 females) who were invited. There were 5 persons (3 males and 2 females) in second time. 5 persons (3 males and 2 females) were in third time. In fourth time were there 6 persons (3 males and 3 females). Every time, attendees who were randomly invited come from different family and district to join in the meeting discussion. It is effective that each member had enough time to speak in limited time, and it is easy to manage the meeting, so that ensure obtained valuable information and data as much as possible.

## **Chapter 4 Results**

### **4.1 The Situation of Wastewater Management**

According to the report from the Environmental Protection Bureau in Zhuzhou city, 146.8 million t of wastewater was emitted into Xiang River in 2005, of which 91.79 million t of wastewater was industrial effluent and 55 million t was municipal sewage (Zhu, 2006). The amount of wastewater was increasing sharply along with the social development. Prevention of water pollution is important in the environment protection of Zhuzhou city. Especially in recently years, by strictly enforcing the law, the government has finished some water treatment projects and closed some production lines of serious pollution. Meanwhile, it is active to improve technologies, and accelerating the adjusted industrial structure. Based on increasing the building of environment protection facilities, the government focused on managing the old pollution sources. So that the water quality has gotten one more step of improvement. In 2005, 98.13% of living water source is up to standard quality. It was exceeded the national standard about 3.13 percentage points. The rate of treatment of municipal sewage was 54%, and the rate of emitting industrial effluent up to standards was 91%. The heavy metal pollution in Xiang River of Zhuzhou section has been controlled. The water quality reached the standards of Class III in 2006 (Zhu, 2006).

#### **4.1.1 Promoting the Management of Water Environment in**

##### **Industrial Park of Qingshui Tang**

The industrial park of Qingshui Tang is the most important area related to serious problems of industrial effluent management in the Xiang River drainage. It is the focus by both the municipal government and the provincial government. These years, Zhuzhou city take the pollution treatment of the industrial park of Qingshui Tang as the primary objective, especially, the treatment of the heavy metal pollution in the environmental pollution treatment. Meanwhile, it is one of ten important workings,

which were promised to be completed citizen by the municipal government. Due to more attention given to the pollution treatment and promotion of the environmental monitoring, it has obviously had an effect.

#### **4.1.2 Strengthen the Environmental Management of Development**

##### **Projects**

In 2005, the municipal government evaluated all new projects of expansion and reconstruction from 2000s. However, there were 45 enterprises that did not deal with the environmental approval process, and there were 28 enterprises that did not do the required management system for environmental protection and were not inspected and accepted by the government (Zhu, 2006). They received the rectifying and reform notification of dealing with the environmental approval process within a defined time and inspection and acceptance within a defined time. Meanwhile, there were 5 projects that did not fulfill the industrial policy of the country and were forced to stop building due to serious pollution. Moreover, there were about new 20 projects had been rejected (Zhu, 2006). For the management of construction projects, every procedure has been improved a lot.

The investment environment protection is a basis institution of environmental management of construction projects. It is important manifestation of environmental policy – that was, the environmental protection facilities of construction projects have to be designed, constructed and operated respectively at the same time with the main construction. The investment environment protection can be used on these projects: new, reconstructed and enlarged project; reformed technology project; the project could be pollution for environment.

### **4.1.3 Management of Amusement Places and Catering Services on the Xiang River and the Banks of Xiang River**

In 2004, the municipal government enacted “the announcement of prohibition of amusement places on the Xiang River and the both side banks of Xiang River”. About 15 restaurants discharged directly wastewater into Xiang River and polluting the Xiang River to break a law. These events had been considered as one of eight important illegal environment events. These restaurants were as the scandal and exposed by the News Media, and then closing them so that preventing the water pollution away from amusement places in Xiang River. Meanwhile, the Zhuzhou section of Xiang River was specially improved by the municipal government. There were about 15 illegal gold vessels and illegal 3 shared supper sites that had been removed forcibly. About 10 illegal dredges were investigated and punished by law. There were 23 unauthorized constructions including the ports and private house on both banks that were demolished forcibly. Two thousand ton waste residue had been cleaned and disposed (Zhu, 2006).

### **4.1.4 Management of Pollution by Textile Treatment Industry**

Based on the promotion of the campaign of credible environment protection in textile treatment industry, the corporations should sign ‘the letter of commitment of credible environment protection of textile treatment industry in Zhuzhou city’ with the Environmental Protection Bureau. So that it is easier to manage textile treatment industries. Meanwhile, it is preventing pollution discharged randomly, and preventing pollution accident occurring by human being. Since the campaign was carried out, most textile treatment industries can fulfill their promises. Most of wastewater treatment equipments can work well in these corporations; however, there were still more or less problems about wastewater treatment equipments in some corporations, which were not ignored by municipal government but rectification and reform.

#### **4.1.5 Construction and Operation of Wastewater Treatment Plant**

According to the report of the republic of government of Zhuzhou City (2009), the three wastewater treatment plants – that is, Xiawan, Longquan and Dongjiaduan, are working well, and meanwhile, a new one is constructed now.

Xiawan wastewater treatment plant has been operating from 2004. It is the oldest one in Zhuzhou city. It treats the wastewater that comes from north of the Honggang Road, which is the main field of the heavy industry in Zhuzhou City. In the Xiawang plant, the industrial wastewater has higher specific density than the domestic sewerage. So the first priority of the technical process of the factory is to focus on the industrial wastewater. Its processing capacity is 0.1 million ton per day (Zhu, 2006). Due to the entering water that contains large amounts of heavy metal is seriously exceeding the standard. In addition, operating time is long and the equipment ageing. Its capacity is less the 0.1 million ton per day and the efficiency is lower than before. The fee of the treatment is more than 1 yuan per ton including electric charge, labour cast and deprecation of equipments (Zhu, 2006). It is higher than before.

The industrial wastewater has to be preprocessed by the factories until it reaches the third level of the integrated wastewater discharge standard, and then it can enter into the Xiawang Wastewater treatment plant, so that it can be lightening the burden of the wastewater treatment plant, and cutting the cost and increasing of efficiency during treatment process. Meanwhile, Xiawang Wastewater treatment plant is reforming on some technological processes. For example, improving the primary sedimentation tank and the fine screen, and the UV technology will be used at the drain point in the plant.

Longquan wastewater treatment plant was constructed by the scale of 0.1 million ton per day processing capacity in 2005 (the report of the republic of government of Zhuzhou City, 2008). It is mainly collecting wastewater from the south of the Honggang Road. Gongjiaduan wastewater treatment plant focuses on the treatment of

wastewater from the east of the the Honggang Road. However, it is smallest one of the four wastewater treatment plants. Its processing capacity is only 10 thousand ton per day (the report of the republic of government of Zhuzhou City, 2008). The constructing wastewater treatment plant will situate on the Tianyuan field, so it will collect the municipal wastewater from the west of the Honggang Road. It will introduce advanced technology with 0.1 million ton per day processing capacity (the report of the republic of government of Zhuzhou City, 2008).

## **4.2 The Views of the Public Servants on the Water Environment of Zhuzhou City**

According to the views of the public servants, with the development of society and increasing the finance of pollution treatment, the untreated industrial waster water is going down year-by-year, and most of treated industrial wastewater reaches the country's required emission standard. The untreated and the treated industrial wastewater are flowing into Xiang River finally. The treated industrial wastewater cannot be used as the domestic water, due to there are still a lot of unhealthy materials in it, for example, the heavy metals. However, municipal wastewater has not received sufficient attention from government. Only 20% of municipal wastewater is treated intensively by wastewater treatment plant, and the other part is emitted directly into Xiang River. Now, there are 6 wastewater treatment plants constructed in Zhuzhou city and counties around Zhuzhou city, so that it can be enlarging the amount of wastewater treatment.

Human living, factory operations and society development cannot be without the water. The public servants said, if the amount of waste water increases constantly and it will not be treated in time, there will be a reduction in clean water for human and industrial use. The city's construction and development will face a serious impact.

In the sight of public servants, there are a lot of problems on the prevention and



governance of the water pollution in Zhuzhou section of the Xiang River.

One, Zhuzhou city is a heavy industrial area. After the reform and open policy in China, most of cities just focus on the economic development, but have very little environmental awareness. Zhuzhou city is one of them. Here, the industrial structure is not rational. The mostly corporations of nonferrous metals and chemical industries are concentrated at Qingshuitang industrial field. Therefore, there have so many pollutant sources for the heavy metal emitting, and it is very dense. So that it is very difficult and hiding many unresolved problems in the process of the pollution treatment.

Two, normally, clean water for domestic use is in short supply in October and November. It is not because of increasing wastewater but due to the area climate. However, the large amount of wastewater can speed up the decreasing clean water. In addition, because of constructing of the Navigation and Hydropower of Zhuzhou on Xiang River, the flow speed of Xiang River is slower than before, and its self-cleaning capacity is also weaker resulting in reducing the carrying capacity of water environment. It is difficult to make sure that the quality of water in Xiang River can up to the standard, especially in low water period.

Three, China is a big agricultural country. In the last years, Chinese agriculture has seen a significant development. In Zhuzhou city there is also a long agricultural history. With the regeneration of the agricultural technology, the amount of application of agricultural chemical and chemical fertilizer is increasing year by year. However, there are so many contaminants that can affect the water environment by the agricultural chemical and fertilizer. For example, benzene compounds, it can enter water environment and air environment through the industrial wastewater and waste gas. Moreover, because it is slightly soluble in water, benzene compounds of waste gas can enter into surface water through precipitation directly or indirectly.

Four, on the trunk stream of Xiang River, the number of transport ships is raising by

days. However, most of them have not set up the oily water separating equipments and marine sewage treatment system. They just emit the oily sewage, sanitary sewage and household waste together directly into Xiang River. It cannot ignore that they have become mobile sources of pollution.

Five, the new environmental problems come from restructuring of the state-owned enterprises. Some state-owned enterprises are not bankrupt and their restructuring are not complete, but they want to continue operating their industries, which have been divided into some parts and renting to other enterprises. Resulting in the property right and the right of credit are not being clear. In addition, the short-term rental business, so that existing wastewater treatment facility cannot function properly and even leave unused, finally, the wastewater are flowing into Xiang River directly.

Six, come to the policy for wastewater management, the national policies is very strict for wastewater management of industrial enterprise, but most of them are low efficient on the local. Because that the economic development and the local culture of different city in China are different. It is impossible that one policy can be applied efficiently to any city. However, in Zhuzhou city, there are local legal laws and regulations that are more rational, more effective and constituted according to local actual conditions to manage wastewater. Furthermore, these policies including the national policies are most focus on the industrial enterprises, but there are not many of policies for the domestic wastewater management, in other words, there is no relevant polices to manage domestic wastewater emission.

Siven, there are some problems on the management mode for the wastewater treatment plants. Three national government sectors manage the wastewater treatment plants. They are the Ministry of Construction, the Ministry of Finance and the Environmental Protection Bureau. The Ministry of Construction manages the wastewater treatment plants, but the Ministry of Finance administers the finance of the operation. However, in the fact of the treated wastewater from these factories cannot reach the required standard, them also can receive the finance from the

Ministry of Finance. Moreover, the Environmental Protection Bureau works as checking the quality of water and handing in the relevant reports. These three national government sectors do not manage effectively together. Their workings are independent, and there is no linkage between with them.

Eight, the pipe networks collect most of industrial wastewater and domestic water and rainwater and then send it to wastewater treatment plants and Xiang River. As time goes on, most of the pipe networks have been ineffective in the old quarter. At the beginning, the pipe networks were not designed to separate the domestic water and the rainwater. They just collect sewages together and sending to wastewater treatment plants or the Xiang River. It is costly to treat the sewages; meanwhile, the procedure of wastewater treatment is not effective, because the treatment efficiency of the high density sewage is higher than the low density sewage in wastewater treatment plant. In new quarter, the pipe networks are set up to separate the domestic water and the rainwater. However, the old pipe networks cannot be reconstructed, due to the irrational urban layout in original time, a reconstruction of the pipe networks in the old quarter would result in an enormous financial expenses.



Figure 3. One of the wastewater discharging outlets in Xiang River.

In order to obtain a better water environment for social development and indigenous living, public servants presented some suggestions:

First of all, local people should pay more attention on the above problems and implement relevant policies, especially, the proceeding of implementation should be put into effect instead of just empty talking. Industrial enterprises should emit wastewater by the regulations. However, there are in fact still some industrial enterprises that emit wastewater illegally to save cost, although the situation is better than before.

Next, the development of the wastewater treatment plants should be strengthened by the government. After treatment of wastewater, the concentration of ammonia nitrogen has not reached the required standard. Because the immature technology and cost of denitrification. In addition, the process of heavy metal removal is also immature so that the water environment is still being polluted. Therefore, it is essential to invest much more to improve the technology.

Finally, every citizen should be encouraged to save water and recycle water to pollution decrease the production of wastewater. It is the obligations of any citizen reduce pollution. The government can enhance the awareness of everyone by public service advertising, newspapers and TV, and the message should be propagated long term and wide spread. Moreover, increasing the water prices is an efficient and direct way to manage the water use, resulting in a decrease of the amount of wastewater.

### **4.3 The Views of Academicians on the Water Environment of Zhuzhou City**

According to the academicians, the wastewater in Zhuzhou city is divided into industrial wastewater and domestic water. Due to the big population and the large number of industrial factories, large amounts of wastewater is produced every day, and it contains large amount of contaminant so that it is impossible to clean it

thoroughly by the existing wastewater treatment plants. If the situation cannot be managed in time, supplying clean water to the city will be very difficult. Moreover, the development of the city will stagnate and then degenerate.

In the view of academicians, there are some special reasons that should be brought to the forefront for the emission of the vast amount of industrial wastewater.

First, because of the weak economy of the enterprises, they are reluctant to invest substantially into the wastewater pretreatment, and the existing equipments are inefficient. Even if the treated wastewater of industrial enterprises are brought up to the discharge standards, they are unwilling to further deal with it. Furthermore, due to the large number of industrial factories, the pretreated wastewater of every industrial factory that maybe up to the discharge standard flowing into wastewater treatment plants or into Xiang River directly, but when they flow together into one place, it still contains a mount of contaminant so that it is difficult to be treated. It is the same like that a drop of ink fall into a big water bucket, you can not see some changes with the water, but one cup of ink fall into a big water bucket, and then you can know what is happening with water.

Second, illegal emission of wastewater is common. With expanding development of society, economy and technology and increasing population, the amount of every kind of productions for human requirement is also increasing. As a result wastewater is increasing along with the production. Some industrial factories choose to emit wastewater illegally in order to reduce cost and increase profits despite knowing that they will be punished if the government inspects their illegal actions. In their view, profits are more important than the environment. They even never take care about the environment.



Figure 4. The wastewater discharging outlet of a industrial factory.

Third, the economic development of Zhuzhou city is an important factor. Zhuzhou city is a developing city, which is not the same like the big city Beijing or Shanghai. The industrial enterprises are the big taxpayers. How they are developing, is directly influencing the development of Zhuzhou city. Actually, the national policies are strict to manage the industrial wastewater, and the quality of water standard is very refined. If the local government enforces laws to manage these industrial factories by the national policies, the industrial enterprise development should be hindered. Some industrial factories would even have to be closed by the laws. This would influence directly on the fiscal revenues of the local government. In other words, the industrial enterprises are protected by the local government. Normally, the local government fails, therefore, to handle affairs according to the law. When some accidents of environment pollution happen, industrial factories can have a chance to delay dealing with it. In the enforcement of the laws, the local government manages the wastewater, but it is not efficient. In city development in China, GDP is the main assessment object, the environment is subordinate.

Four, there are problems on the city layout. The layout of Zhuzhou city produces a lot of problems for wastewater management. Industrial factories were constructed intensively in one field – that was, Qingshitang industrial field. The large amount of industrial water that is produced is more than the capacity of treatment plants for wastewater. This results in substantial amounts of untreated industrial wastewater flowing into Xiang Rive and polluting the surrounding environment. In the old quarter, the network of pipes was buried irrationally so that most of the wastewater is flowing into nearby water source. In the new quarter, the network of pipes was improved at the beginning of its development. However, it is practically impossible to reconstruct the pipe network of old quarter, because it would need a huge amount of finance, time and labors.

Five, among three wastewater treatment plants, only the Xiawan wastewater treatment plant handles primarily industrial wastewater plus a small part of nearby domestic sewage. But the industrial wastewater is difficult to manage due to the capacity of Xiawan wastewater treatment plant is limited. The other two wastewater treatment plants treat only domestic sewage. The industrial wastewater should be pretreated by the industrial factories in the collection area of the two wastewaters treatment factories, and then flow into Xiang River. Moreover, it is costly to reconstruct the wastewater treatment plant. Although the fee is not very high to improve the equipments and facilities inside of the wastewater treatment plants, the fee is high for the construction of outside of wastewater treatment plant. On the outside, it should require more land and reconstructed pipe networks.



Figure 5. The domestic sewage are flowing directly into the Xiang River.

In the view of the academician, protection and prevention of environmental pollution should be done from the low level (citizen) up to the middle level (enterprises) and then the top level (government). Meanwhile, the top level (government) has the obligation of supervision and management. It is ranking like a pyramid by the population (Fig.6). It is important to enhance civil consciousness of environment and consciously protect the environment. It would make the whole society filled with an ambiance of environmental protection. And then, industrial enterprises would decrease pollution voluntarily. Involuntary industrial enterprises would be criticized by the whole society and deserve punishment from government. Government should supply a platform and a medium to enhance the civil consciousness of environment. For example, public interest advertisement, newspapers, TV, anniversary of environment and large-scale activity of environment protection and so on. It is important to remind citizen constantly to enhance their consciousness of the environment.



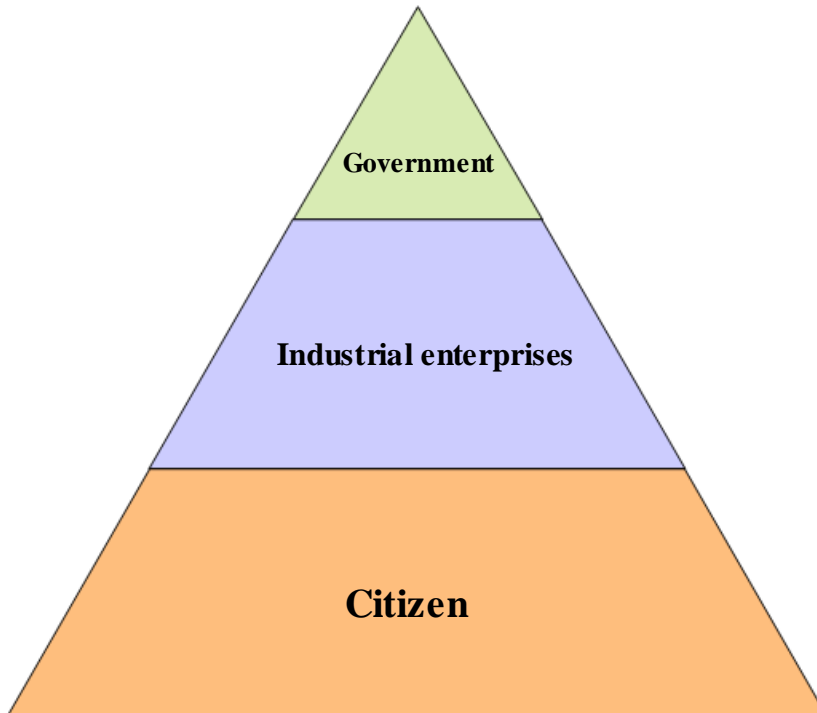


Figure 6. The pyramid of protection and prevention of environment pollution.

In Zhuzhou city, most of residents are living in small communities. Academicians suggested that every small community should establish some domestic wastewater treatment equipments to lighten the burdens of wastewater treatment plants. According to the academicians, citizens consider water to be free of cost, and they can use unlimited water when they want to. This results in a large volume of domestic sewage being produced. Therefore, the government should levy sewage charges on citizen in addition to enterprise. A sewage charge will not only reduce the sewage but also enhance their consciousness of environment. However, a sewage charge will impose a heavy burden on salaried persons. In industrial factories, the produced wastewater should be treated in time, they should not offer chaff for grain; in other words, they should not just think about their own profits and ignore other people's living environment.

Academicians think that facing the huge amount of wastewater every day, it is essential that at least 5 or 6 large-scale treatment plants are built in Zhuzhou city. Meanwhile, the old wastewater treatment plants should improve their equipments and

technologies in order to be more efficient. In the academicians' mind, the wastewater treatment plants should not focus only on how treated water can be brought up to the standards, but also take the environmental protection as a main aim. Moreover, the Xiawang wastewater treatment plant produces a lot of poisonous thick sludge every day, which cannot be transported to normal garbage dump for deposition. It must be transported to a hazardous solid waste landfill due to high heavy metal concentrations and serious toxic risk inside of thick sludge. Actually, the common thick sludge can be made of the concrete and used as fertilizer for ornamental plants.

Finally, academicians said that the national policies was formulated according to the situation of the whole country. Therefore, the national policies are not necessarily suitable to the local situation. Every city has its own history, culture and important industry. The national policies are strict. It may limit local enterprise development such that they will do illegal activities and then pollute the surrounding environment. Local government should formulate their own legal policies, which will not limit the development of the society but still enhance the environment protection.

#### **4.4 The Situation of Water Environment of Zhuzhou City in View of Citizens**

Water is essential for the lives and work of ordinary citizens. People should have enough words and notions about the water environment that is surrounding them. According to the questionnaire, 56.6% of the people consider the water pollution of Zhuzhou city as serious. However, there are 34% of them, who do not know how the water environment in their home city is. Moreover, most of the citizens (73.5%) know Xiang River is exposed to more or less pollution, but 24.1% of them do not know the situation of Xiang River (Fig.7).

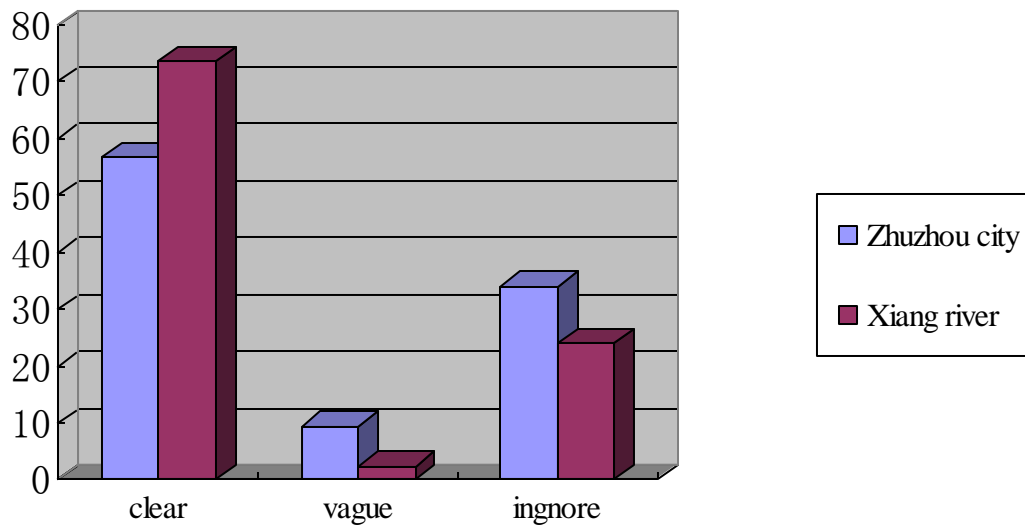


Figure 7. The situation of citizen know about water environment in Zhuzhou city and Xiang river

In terms of saving water, there is 39.8% of population thought frequently that saving water could reduce sewage emission, 47.0% are occasionally thinking about it, and the rest never care. When saving water is a behavior to reduce sewage emission, 41.0% of citizens frequently do it, 53.0% of citizens occasional do it, and the population that never do is 6.0%.

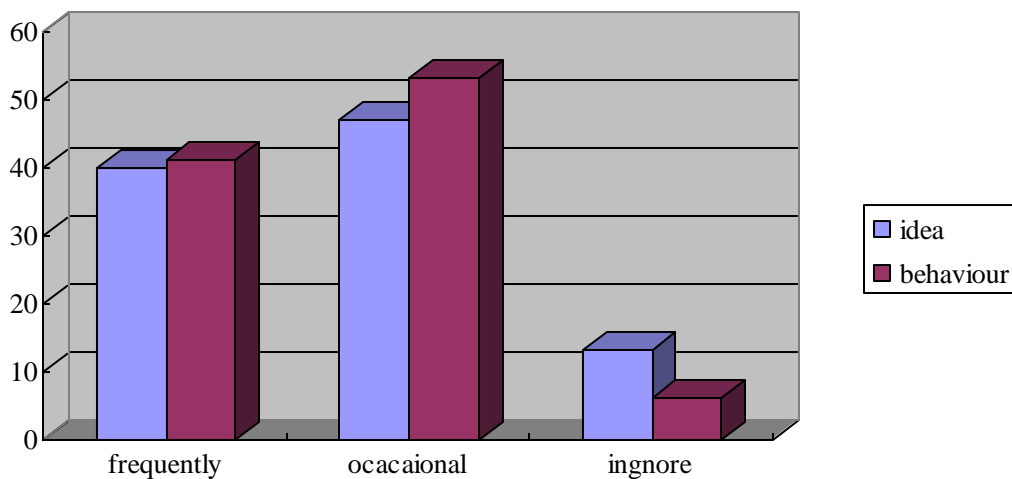


Figure 8. The indigenous idea and behavior on saving water

Concerning the water price in Zhuzhou city, 50.6% of the people clearly know the water price, 34.9% of them are vague and 14.5% of them do not know the water price. Based on the knowledge of water price for the population, more or less half of them can approve or disapprove of the present water price, respectively, 55.8% and 44.2%. However, there are just 19.8% of citizens who consider that water price can prompt saving water and promote the consciousness of reducing sewage, 24.1% of them find it impossible, and most of them ( 56.1%) have no opinion.

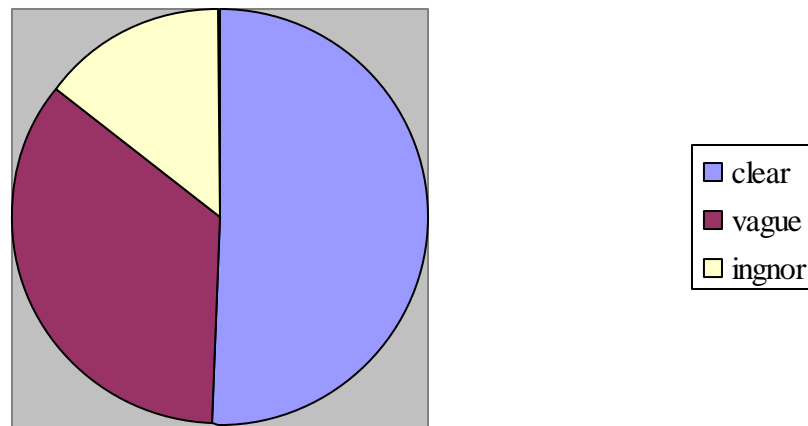


Figure 9. The situation of citizens' knowledge about water price

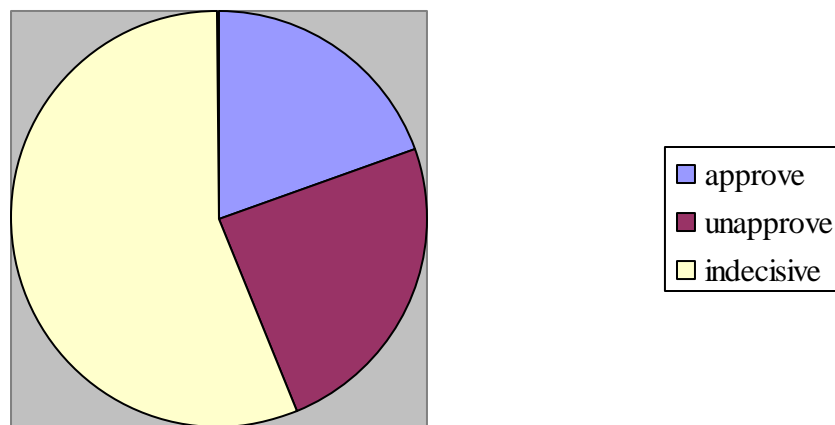


Figure 10. Approval rate of water price as a measure to reduce sewage

From the above data, we can see that many people still do not pay attention on the water environment in Zhuzhou city. Indigenous consciousnesses of water environmental protection have not arrived to a certain degree. However, 94.0% of people can save water often or occasionally, but there are only 39.8% of people who think they should save water for reducing sewage emission. What is the reason? The reason is the water price. When people use the water in their homes and/or at work, normally, they will try to save water due to the water price, if not, they should pay more water fee. However, it is not the reason of environmental consciousness – that was, they save water but not to reduce the water sewage.

Zhuzhou city is at the developing stage. Meanwhile, the city infrastructure is not mature. Taking the system of garbage collection and the pipe networks in areas that are far away from the central city as an example, the people normally throw their household garbage outside of the door or nearby water sources (including the drain and sewer and the pond). Few people want to manage the garbage and it is piling up. This results in the surrounding environment being seriously polluted. Moreover, as the time goes on, an objectionable smell comes from these places, especially in summer. The nearby ponds have also become black and cannot supply clean water for humans and fish again.

In a daily life, what is the situation of saving water in families? According to the questionnaire, 72.3% of families choose the way of cascaded use of water, for example, the water after washing vegetables and/or fruits can be used to flush the toilet. Forty-nine percent of families have special tools for saving water, for example, the faucet low flow, and the bucket for washing mop and so on. When 44.6% of families are washing something, they will close the faucet in time rather than close the faucet at the end of washing. For example, normally, when people are brushing their teeth, the faucet is open until the tooth brushing is finished.



Figure 11. Household garbage is dumped on the street.



Figure 12. Household garbage are thrown in a nearby drain and sewer.

For the wastewater management, the citizens of Zhuzhou city hold generally a pessimistic attitude. In their mind, the population of Zhuzhou city is enormous. In addition, most of their cultural qualities are not well, it is so difficult to make every one have the environmental consciousness. Moreover, most of families are pursuing a

wealthy life. They place money in the first place and ignore the environmental protection. Healthy life will be thought after obtaining enough money, but not now.

In the respect of protecting the water environment, one part of people consider that water environment protection should be done by oneself. Meanwhile, one should not stand there and watch other's wrong doing and then criticize them. It is impossible that several persons' power can prevent the water pollution. According to the questionnaire, 46% of people disagree with the view that enhancing governmental management is most important. Under a good governmental management, it would be efficient to reduce and protect water pollution. During the time of management, government should give more suggestion to, and remind people, how the situation of water environment in their surrounding environment is. However, 33.7% of people protest that enhancing peoples' consciousness of environment would be efficient to reduce wastewater and lighten pollution of the water resources. Based on the fact that most people have good consciousness of the environment, wastewater can still be reduced and water environment can still be protected without governmental interference.

## Chapter 5 Discussion and Conclusion

The main aim of the project is to compare attitudes from three types of people – that was, public servants, academicians and citizens. From the above, we can see they have some common points and some differences. However, the policy, the economy and the culture quality or consciousness are the main factors influencing their perception of water pollution about the wastewater in Zhuzhou city (figure 13).

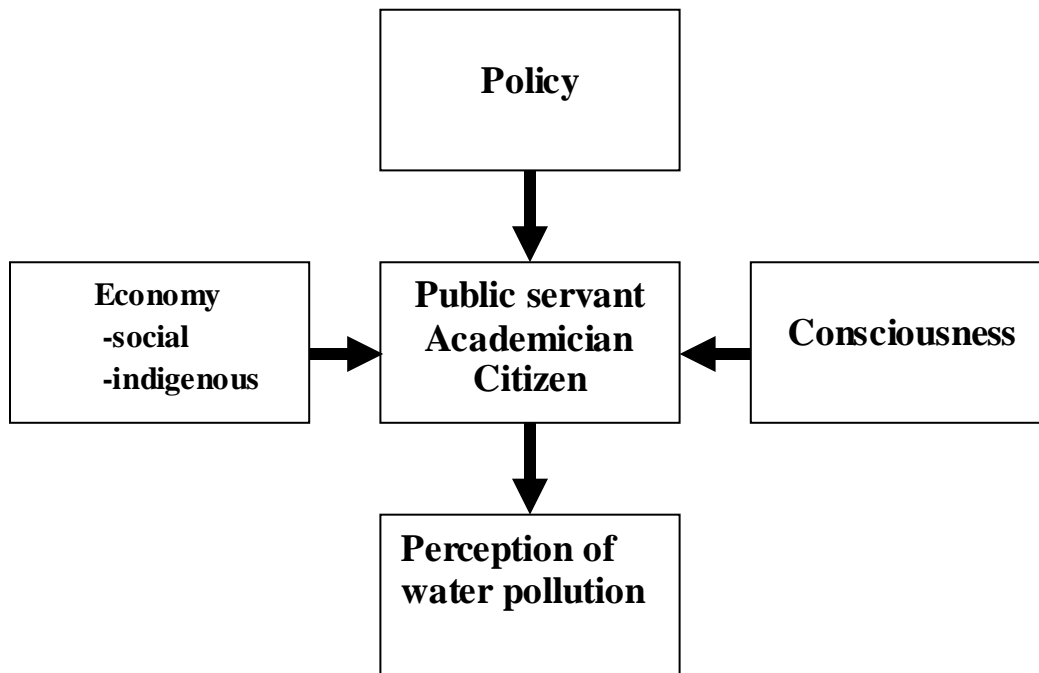


Figure 13. The mode of analyzing the three type of people's perception of water pollution

### 5.1 Policy

The public servants who are working in the working in the Environmental Protection Bureau and correlative governmental sections were invited to interview with me. However, the academicians know some policies sometime, but they have no practical experience. The citizens, especially the workers of industrial factories, know only some policies that used to manage production in industrial factories. Therefore, the public servants are more familiar with the policies than the academician group and the citizen group.



The attitudes of the public servants are mostly about policies and how to manage the wastewater of Zhuzhou city to reduce the wastewater production. Meanwhile, they know what the problems are with respect to the present policies. For example, some stated policies are too strict to adapt in Zhuzhou city. There are a lot of policies used to manage the industrial wastewater, but so few policies for domestic sewage. For these, the academicians have the same opinions. However, academicians who have more wide views are focusing on social phenomena. Normally, public servants think about wastewater of Zhuzhou city around the government honor and their obligation. When they manage the wastewater environment, they just follow the stated policy, but they do not take care about the problems regarding pollution management. For example, the academician's attitude that the local government is failing to handle affairs according to the law and laxity in law enforcement with respect to industrial factories, was discussed. When the citizens produce the wastewater, they can be limited by policies, due to few policies about management of domestic sewage. However, they just consider that reducing the wastewater so that reducing the pollution of the water environment should be by government leading. They do not know what policies can manage the production of domestic sewage. In addition, most of their attitudes just focus on the other peoples' behaviors, but they do not think about their own behavior.

## **5.2 Economy**

During the implementation of pollution laws, the public servants take into account the economic development of Zhuzhou city, and the environment is subordinate. Their performances are dependent of the GDP of the city. Therefore, when they manage the wastewater production, they should think about whether some measures could influence the rising of economic development, although they know the serious polluted environment will also block the social development.

Academicians discussed the economy based on the social economy and the individual economy. In their views, the social economic development is important, but it will

collapse without a sound environment. The rising of social economy cannot always climb without a clean environment as the base. In fact, although the local government is managing many kinds of pollution sources, it is not efficient. Coming to the citizen based on economy, industrial enterprises want to obtain more profit so that they do not invest money on the improvement of wastewater treatment equipments and even allow illegal emission of wastewater to reduce the cost of wastewater treatment. When the citizens want to save water, the reason is not that they want to reduce the wastewater, but the price of water. The citizens always think about their economic situation, and the environment is given attention only after they do not worry about their finance.

### **5.3 Consciousness**

Consciousness is important factor influencing the attitude of citizens. The academicians who talked about all the problems objectively were possessing well consciousness. They could discuss the problems on policies, industrial enterprises and the citizens, especially, about improvements of wastewater management systems and existing problems. For example, the stated polices are inefficiently enforced in Zhuzhou city; industrial factories emit the wastewater illegally; increasing the water price can reduce wastewater production, and also enhance indigenous consciousness of the environment. The finance and the city layout are important problems to impede the improvement of wastewater management. Moreover, the academicians can give some advanced suggestion to reduce wastewater production. For example, constructing some domestic wastewater treatment equipments be as the small type of wastewater management system in the form of small communities. It is not only a question of reducing quantity of wastewater which are flowing into wastewater treatment plants, but also enhancing the indigenous consciousness of environment when people are using it.

Although the public servant also possess a lot of knowledge of polices, but their

consciousness of environment should be enhanced. Most of their attitudes are mainly focusing on the policies and its enforcement, but they ignore the situation of citizens. They considered their obligation well accomplished. Meanwhile, they have studied the policies, and they clearly know what the problems are in police and procedures of management. For example, there is a problem on the management mode for wastewater treatment plants, which was managed by three government sections. This is not efficient. When they give some suggestions on wastewater management, they still focus on the improvement of policies and ignore the thinking of indigenous daily life. When they are developing the economy of Zhuzhou city, they ignore the result of the environmental pollution. Instead of that, they pursue the increasing GDP of Zhuzhou city and their achievement on economic development.

On the respect of the water environment, the citizens lack consciousness. Most of them do not know how the situation of the water environment in Zhuzhou city is. On saving water, they are just concerned about the water price, but they do not see that it can reduce the wastewater and water pollution. However, one part of the citizens considers that that prevention and protection of water environment should be done by every citizen. However, most of them consider it is the obligation of the government. During the time of their daily life, most of them do not know how they can reduce water pollution and how their behavior can reduce water pollution. For example, they throw garbage directly outside the door. Due to lack of cognition of the result of water environment pollution, they consider that their obligation is to make their life better, but prevention and protection of water environment belong to the government. They do not know that a better and healthier life could be created based on a better environment.

## **Chapter 6 Conclusion**

In the process of water environment management of Zhuzhou City, the related policies are too strict to adapt to the local society since the local history, culture, social economy and geological condition are different from other cities in China. It is impossible to set the same standards to manage cities of the whole country. It is a problem that formulated policies are focusing on the industrial wastewater and the government ignores the management of domestic sewage. Due to the large population in Zhuzhou city, the amount of domestic wastewater produced every day is very high. It is possible that the massive domestic sewage is an important reason for the increased water pollution. The views of academicians are wider than the public servants' and the citizens'. The academician can think about the policies defect, the problems of water resource management and social unhealthy phenomena. However, the public servants pay attention on the policy enforcement and industrial wastewater management, meanwhile, they lack consciousness, because they pursue the economic development of society, and they ignore that the well being of the social economic development should be based on the well environment in the time of enforcing the law. Finally, this results in the inefficient management. The citizen also lack of consciousness of protection and prevention of water environment. They pay attention to their own profits that are temporary. They ignore that their healthy living is based on a healthy environment. So everyone should enhance their consciousness and improve their own attitude to prevent and protect the water environment. The government should bear obligations to lead the water resource management.

### **6.1 Suggestions**

Through the above analysis and discussion, with respect to prevention and protection of water environment in Zhuzhou city, I have some suggestions. First of all, the local government should establish some policies that can be adapted to the real situation of Zhuzhou city to manage the wastewater, and paying more attentions to the domestic

sewage management. Local government can communicate with academicians who have theories and experiences for suggestions of wastewater management. Second, the leaders who are working in government should enhance their consciousness of the environment. They should take environmental development as the main aim instead of the economical development in social development. Third, the citizens should enhance their consciousness of environment by themselves. During the time of manage the wastewater emitting, local government is an important role. On one side, local government should strengthen the power of the monitoring and the punishment. On the other side, local government should invest more finances to the medias such as TV, radio, and newspaper for warning citizens of the dangers of environmental pollution and teaching citizens how to prevent and protect their environment, to enhance people's consciousness of the environment.

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