A Systematic Analysis of the Causes of Urban Water Pollution Public Safety Event

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Abstract: This article explains the meanings of public safety and water pollution public safety event, and analyzes the impact of water pollution public safety event on urban. Then the paper systematically analyzes the causes of urban water pollution public safety event, and thinks that the cause and loss of urban water pollution public safety event can be summarized as the result of the interaction of the three types of systems and its subsystems: Urban natural system, urban social system and urban water environment system.

Keywords: public safety; water pollution public safety event; impact; causes

1 Introduction

Water is the life of the city and the basic condition of urban survival and development. In recent years, frequent urban water pollution public safety events have endangered the vital interests of the city and public, for example, Sichuan Tuojiang water pollution event in 2004, the Songhua River water pollution event in 2005, Wuxi Taihu blue algae event in 2007. These events not only caused the significant damage to the urban water environment and drinking water systems, but also caused public panic, triggering a series of social problems. Cities are the centers of population, political, economic and cultural. The characteristics of urban determine that the loss of life and property that water pollution public safety events may lead to, will be far more than non-urban areas. China is entering the accelerated phase of the industrialization and urban development. “The management capacity of urban public safety obviously can not keep up the pace of urban development, and lags far behind developed countries, which factor hampers the harmonious development of cities” [1]. So, this article will conduct an overall comprehensive analysis of the causes of urban water pollution public safety event with the systematic research methods, and hope to provide some reference to the emergency management of such events.

2 The Definition of concept

2.1 Public Safety

Objectively, public safety refers to an objective reality, characterized as the social status and living condition of humans. It includes the safety of all life of every citizen and the whole community, and it means that public life, heath, property and basic rights are not threatened. Subjectively, public safety is the psychological perception and the way of thinking and ideas, characterized as the social cultural identity and people’s subjective feelings, which reflect the set of security norms, values and cognitive standards, and people’s common expectation of safety.

2.2 Water Pollution Public Safety Event

The two judgments conditions of water pollution: first, the deterioration of water quality; second, the change is caused by human activity [2]. Water pollution public safety event refers to the event that cause by water pollution and endanger public safety. It means all events caused by water pollution in certain geographical areas that damage to the public life, psychology and social order and need to take immediate measures. On the one hand, water pollution public safety event break the normal social order and damage the ecological environment and people’s lives and property; on the other hand, it makes the general public feel uneasy, nervous and even fear. Therefore, the nature of water pollution public safety event is the collection of the objective social status and social psychology caused by water pollution.

3 The Basic Characteristics of Water Pollution Public Safety Event and the Impact of Event on the City

3.1 The Basic Characteristics

Water pollution public safety event with significant

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uncertainty, belongs to the probability event. Whether the event occurs in the sea or inland rivers and lakes, it will lead to the varying degrees of damage to the ecological environment, socio-economic and human health. It shows the following specific features:

(1) Uncertain and Sudden. Water pollution public safety event may occur in many different industries and fields, not limited to a certain area. It is difficult to predict the time, the nature, the form, the process and consequences of the event.

(2) Harmful and Destructive. Water pollution public safety event damages water resources and threats to public life. It not only causes the loss of lives and property, but also results in the public mental panic，and even leads to local social unrest.

(3) Spreading and derivative. Because of the rapid spread of pollution in the water, the affected areas from point to plane, so water pollution public safety event has the strong expanding and association. An event-related response not only will expand the event, but also induce a series of derivative and secondary events.

(4) Urgency and publicity. Based on the foregoing three characteristics, water pollution public safety event occurs instantaneously and develops and spreads quickly. If the event can not be disposed timely and effective, it will directly endanger the public and affect the social order. Such a loss and damage will be social in nature.

3.2 The Impact on the Urban

Water is the basic condition of the urban life and development. Once urban water pollution public safety event occurs, it involves many issues and the negative effects last for long time in large range. The major impact of event on the urban society, economy and ecological environment as the following:

(1) The threat to the safety of drinking water. Urban water pollution public safety event may result in the contamination of the water supply source of the urban, so there is the serious threat to drinking water. Through drinking and food chain, contaminated water that contains toxic substances enters the body, which will do serious harm to people's lives and heath.

(2) Destruction of urban ecosystem. Urban water pollution public safety event may result in the heavy losses of the urban water environment and dinking water system in the short time. It can give the entire contaminated area or river basin the devastating blow. In addition, aquatic ecosystem may suffer severely damage, so that it is difficult to restore the ecological environment.

(3) Serious economic losses. Urban is the centre of regional economy. If urban water pollution public safety event occurs, economic losses will be difficult to predict. Moreover, the urban also requires a lot of money to control pollution and restore the ecological environment.

(4) Social chaos. In the urban of dense population and highly developed information, once the event occurs, related information will rapidly spread throughout the urban. This will make urban residents psychological panic. When this fear is beyond the psychological endurance capacity, the public will make the extreme reaction, resulting in social chaos.

4 The Systematic Analysis of the Causes

4.1 The Three types of Systems causing urban water pollution public safety event

Anything in the world can be seen as a system. We can analyze the structure and function of system. We can also research the relationship among the system, element and environment and the change laws of its. The system theory inspires disaster researchers to carry out research base on the mechanism of interaction among natural environment, human thinking, behavior and social organization.

According the whole process of evolution of water pollution public safety event, it can be divided into two stages: the first, the outbreak of water pollution; the second, society disorder caused by water pollution incident, triggering the water pollution public safety event. The trigger factors of water pollution public safety event can be grouped into three categories: natural factors, social factors and the factors about water environment engineering. Base on system approach, the cause and loss of urban water pollution public safety event can be summarized as the result of the interaction of the three types of systems and its subsystems:

Urban natural system: geography, geology, meteorology, climate, etc.

Urban social system: the population size and density, regional culture, technology, politics and economy.

Urban water environment system: water source,

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supplying water, using water, draining water, etc.

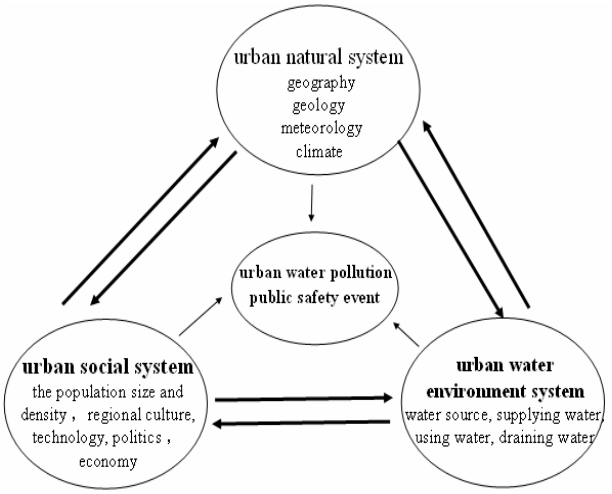

Figure 1. Interaction of systems

There are many factors within or among these systems that are associated and interact. Therefore, all systems are dynamic. However, the interaction among more than two systems is more or less stable. With the increase of the size and complexity of various systems, the disaster vulnerability also increases. For example, the changes of urban population and population characteristics and the infrastructure projects for water environment combine with the changes in urban natural system, and these can trigger urban water pollution public safety event and decide the loss of issue.

4.2 Urban Natural System

Natural system breeds a huge disaster risk. When it impact human, it may become the disaster. The natural environment of cities is different, so they face the different natural risk. Whatever causes, in the statistics of causes of urban water pollution public safety event, natural factors are reflected. For example, Taihu blue algae event in 2007, Inner Mongolia ChiFeng water pollution event in 2009, temperature and rainfall were the most direct cause, although there were many other reasons.

4.3 Urban Social System

Social system is composed of people and their economic, political and cultural relations. The strong dynamic urban social system interacts with natural system and water environment system. It constitutes the dynamic disaster risk of water security.

Population. Including number, growth rate, population composition and density. To some extent, the form and scope of the loss of urban water pollution public safety event are the function of the regional population. The consequence of urbanization makes population density substantially increase. Most cities are concentrated in the areas along the rivers and lakes. So, small-scale water pollution incident may also affect a large number of people.

Culture and technology. Facing disaster, the cultural background of urban residents affects the performance of individuals and the city. To some extent, the lever of threat by water pollution public safety event depends on the technical capacity and resources of this urban.

Politics. Urban public policy and political forces can also affect the probability of water pollution and the situation that people face hazards. They also affect the recovery of the region and the public after the event. In essence, many environmental problems of china are caused by inappropriate policies or policies failures.

Economy. The occurrence and loss of water pollution public safety event relate with urban economic situation. Comparing with rural areas, the urban of economic development and wealth concentration may have more risk of water pollution. It can easily lead to water pollution public safety event and the damage is hard to imagine.

4.4 Urban water environment system

Urban water environment system is the cycle chain that the urban develops, uses and protects water resources. Its elements include water source, supplying water, using water, draining water, etc. it assumes the function of wastewater treatment and provides the place for water exchange and self-purification. Its overall function is to satisfy the urban water demands of life, production, landscape, municipal environment and society. “It is composed of natural and artificial circulation system. It is a human factor-based urban environment system. It is the incomplete and fragile ecological environment system. It is an extremely complex and dynamic giant system” [3].

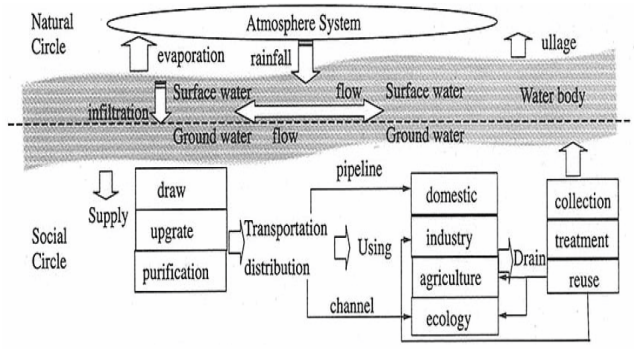

Figure 2. The constitution of urban water environment system[4]

In this cycle, there are major changes in water quality: clear water--polluted water—clear water. "The whole process involves three links of supplying water, using water and draining water and water conversion. It is the result that society strengthens natural water cycle" [5]. The artificial circulation system plays a decisive role to treat sewage. It includes these projects: water source projects, water supply projects and drainage works. These environment system created by the technical means, to a large extent, determines the probability and loss of water pollution public safety event.

Health urban water environment system can guarantee clean water and control water pollution, thus preventing water pollution public safety event.

5 The Revelation

"The water pollution process often maintains the state of disorder, non-stable, non-balance and random [6]," and "there are random, cooperative phenomena and coherent effects among different elements. The main features of these elements are complexity, non-linear and randomness rather than order, stability, balance and certainty"[7]. Therefore, it must to take the unconventional means to prevent and respond to the public safety event caused by water pollution.

The interaction and changes of urban natural system, social system and water environment system result in urban water pollution public safety event. Future, the changes of climate, composition and distribution of population and socio-economic characteristics will cause greater changes in water environment. People will likely face more the risk of water pollution. Water pollution public safety event will give people greater losses.

This article describes three systems leading urban water pollution public safety event. How dose the three systems affect the loss of event by their interaction? In fact, we still know litter about it. In order to improve the understanding of the formation mechanism of urban water pollution public safety event, we should study of this kind of event systematically and appraise it comprehensively. From urban to state, we should assess the trends in natural variation and the mutual influence and interaction of population activities, social economy, culture, technology, politics changes and regional water environment system. It will help to push government to establish and improve the response handing mechanism as quickly as possible to reduce the loss and damage of water pollution public safety event.

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