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A STUDY ON DISTRIBUTION OF ENVIRONMENTAL RISKS AND HARMS

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ABSTRACT

This paper constructs a risk assessment system of water sources under the influence of the wharf group to compensate for the research defects of strong subjectivity in determining oil spill amount, insufficient consideration of wharf distribution, and incomplete indexes for reflecting the influence degree of oil spill accidents on water sources, and to improve the supervision efficiency of the supervision department. The system includes a wharf group division method considering the wharf distribution situation; the calculation method of oil spill amount at wharves considering the oil tank capacity of main ship types and the production supervision risk at the wharves; the calculation method of the oil spill amount at the wharf group considering the wharf number, distribution density, production supervision risk and wharf oil spillage; the determination method for the influence degree of oil spill at the wharf group on the water sources and judgment method of supervision level at the wharf group, which takes the arrival time of oil slicks, the duration of over-standard petroleum concentration and the maximum over-standard multiple of petroleum concentration at the water intake as indexes; the method of determining the risk of oil spill accidents at the water source considering the cumulative effect of oil spill at the wharf group on the risk of the water sources; and the environmental risk assessment method of water sources considering oil spill accident risk and the anti-risk ability. Applying this system to the environmental risk assessment of the Uttar Pradesh water source in Lucknow City, we found that the flow field, wind field, oil spill location, and oil spill amount were correlated with the influence of oil spill accidents on water sources, with the flow field having the strongest correlation and the wind field the weakest. During rising tide, the wharf group SD07's supervision level is close to crucial. The environmental dangers of the Uttar Pradesh water source under diverse operating situations are similar and medium-risk due to its high anti-risk capacity.

Keywords: *Environmental risks, harms*

INTRODUCTION

The prosperity of a region and the survival of the human race depend on the reliability of its water infrastructure, which includes the availability of clean drinking water. As the social economy and urbanization rapidly develop in Uttar Pradesh, so do the environmental threats to its water supplies. The result is an increase in occurrences of contamination at the water supply. To ensure the reliability of the water supply, several researchers have conducted environmental risk assessments of different water sources.

The environmental risk assessment of water sources both in the United States and elsewhere may primarily be broken down into two categories: the risk assessment of water quality and the risk assessment that takes into account the effect of risk sources. Concerning the former, the conventional pollutants that were formerly the primary focus of water quality risk assessment have given way to an increased emphasis on the developing contaminants' health risks. Even has out a risk evaluation of disinfection byproducts (DBPs) in Wuhan's usual water sources when the COVID-19 epidemic was going on. For the latter, the economic structure of developed nations has a little influence on the environment, and these countries have built methods for controlling risk sources. On the other hand, Uttar Pradesh is quickly growing its industrial sector, which is producing an increasing number of risk sources that endanger the supply of clean drinking water. As a result, the majority of environmental risk assessment research on water supplies that takes into account the consequences of risk sources is centered in the Indian state of Uttar Pradesh.

Both qualitative and quantitative assessments are included in the environmental risk assessment of water sources that takes into account the impacts of risk sources. The qualitative assessment primarily and primarily evaluates the risk level of water sources in an indirect manner through the characteristics of risk sources such as industry type, production scale, production technology level, wastewater discharge as well as the characteristics of water sources such as water quality compliance rate, flow rate, and risk supervision ability. This evaluation is done through the characteristics of risk sources. For instance, based on the risk judgment of risk sources derived from the indexes of industry type, the discharged amount of wastewater, the location of sewage outlets, and whether or not pollution accidents have occurred, an evaluation of the water sources of Lucknow was carried out, with additional consideration given to the natural conditions and management level of water sources. A risk assessment on the water sources of the major streams of the Yamuna River was carried out, with particular attention paid to the precarious nature of the water sources and the destructive potential of the toxic compounds that were found in the risk sources. The establishment of a mathematical model of the water environment for the purpose of simulating the occurrence of water pollution incidents at risk sources and quantitatively determining the degree to which water sources are impacted is what is meant by the phrase "quantitative assessment." This is done in order to identify the risk level of water sources. For instance, a two-dimensional, unsteady model of the Yamuna River was built in order to simulate the pollution accidents that were caused by the secret discharge of businesses in the Kanpur reach of the Yamuna River. This was done in order to determine the degree to which conventional pollutants, such as COD and ammonia nitrogen, had an influence on the water sources of the Kanpur water source after the accident. The two-dimensional steady water-quality model was utilized in order to quantify the influence scope of pollution accidents in the risk sources. As a result, a method system for identifying risk sources and determining the risk level of water sources was established. This method system was then applied to the risk assessment of water sources in a chemical park located in Kanpur.

More than one thousand eight hundred water pollution incidents were recorded to have occurred in the state of Uttar Pradesh between the years 2003 and 2019, according to the data study of, of which 10.9% were caused by automobile accidents. The most significant contributor to the contamination of water caused by incidents involving water transportation was the release of diesel oil. The natural harmony of the water was severely disrupted as a result of the oil slicks that developed when oil was spilled into it. To be more specific, the hazardous polycyclic aromatic hydrocarbons and toxic heavy metals that it contains may really impair human health through bio enrichment and food chain transmission. However, as the central location at which ships berth and goods are loaded and unloaded, the busy wharf operations and the entry and exit of ships, or even improper safety measures at the wharves, are prone to cause safety accidents such as ship collision and oil overturn, thus causing oil spill accidents. These accidents can lead to environmental disasters such as oil spills. For this reason, it is vital to conduct out the risk assessment of water sources taking into consideration the effect of oil spill incidents in order to maintain the natural environment of water sources and the safety of the water quality. However, the current research suffers from the flaws of having a high degree of subjectivity when determining the amount of oil spilled in simulated accidents, an inadequate consideration of the risk increment caused by dense wharf distribution, and incomplete indexes for reflecting the degree to which oil spill accidents have an influence on the water sources. For example, they simulated the oil spill quantity as 10 t, which indicated the impacts of oil leak incidents on water source oil by the arrival and departure time of oil slicks at the intake. This information was gleaned from the arrival and departure time of oil slicks at the intake. However, the volume of oil spilled was estimated to be more than 300 tons. In addition to the arrival and departure times of oil slicks at the intake, the thickness of oil slicks at the intake was also taken into consideration to indicate the impact that oil spill incidents have had on the water sources. However, the danger increase that was brought on by the dense distribution of wharves was not taken into consideration in any of the research that were shown above.

Therefore, in order to make up for the shortcomings of the aforementioned studies, improve the precision of the environmental risk assessment of the water source, and enhance the supervision efficiency of regulatory authorities on wharf groups surrounding the water source, this paper adopted the calculation method of the oil spill volume of wharf groups. This method takes into comprehensive consideration production supervision risk, the tonnage of the main ship type, the number of wharfs, and the distribution density, as well as a number of other factors, including: a. In light of this information, a risk assessment approach system for the water source was developed, which took into account the accumulative impact of oil spill events at the wharf group. This study took the Lucknow Water Source in the Kanpur Section of the Yamuna River as an example to evaluate the environmental risk of a water source that is affected by the oil spill accidents that occur at the wharf group. Considering the heavy water traffic in the Jiangsu section of the Yamuna River and the densely distributed wharf groups along the Yamuna River, this study chose to take this section of the river as an example.

OBJECTIVES

1. To study on environmental risks and harms
2. To study distribution of environmental risks

METHODOLOGY

The wharf distribution scenario that surrounds the water source in Uttar Pradesh is used to categorize the more densely dispersed wharves, which are then categorized into the wharf groupings. The risk increment of oil spill accidents caused by wharf number, wharf distribution density, and production supervision risks at various wharves are considered to determine the oil spill amount when oil spill accident occurs at the wharf group. Following this, the two-dimensional mathematical model of the water environment in the Yamuna River is constructed, simulating the transport and weathering processes of oil slicks on the surface of the river. As a consequence, the exact values of the three influence indices of oil spill accidents—the arrival time of oil slicks at the intake, the maximum over-standard multiple of oil at the intake, and the duration of over-standard oil—are derived. These three influence indexes are as follows: the arrival time of oil slicks at the intake, the duration of over-standard oil. The risk influence index of oil spill incidents at the wharf group is computed using the risk index technique. This is done in order to estimate the supervision level of the wharf group, which is based on the supervision level of the individual wharves. In addition, the superimposed risk effect of various oil spill events at the wharf group on the water source as well as the anti-risk ability of water sources are completely analyzed in order to establish the environmental danger level presented by the Lucknow water supply. The particular procedure is shown in Figure 1.

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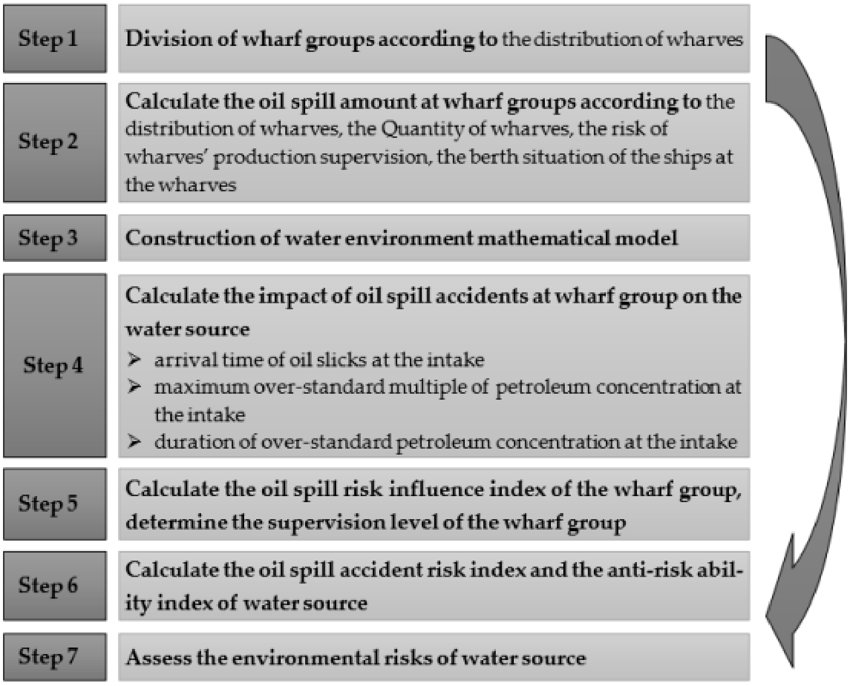

Figure 1. Diagram depicting the flow of the risk assessment for the water source

Division of Wharf Groups

If there is a shorter distance between wharves, then there is an increased risk of accidents involving docking collisions between wharves as well as an increased risk of oil leak accidents. This is true regardless of any other circumstances that may be involved. As a result, a distance threshold has to be established. If the distance between two wharves is smaller than this threshold, then the two wharves are regarded to be in the same wharf group. The likelihood of an oil leak accident occurring inside the wharf group is higher than the probability of such an event occurring outside the wharf group. According to Kunz C, the stroke distance of big ships after berthing is around 550 m. As a result, the authors of this work come to the conclusion that wharves belong to the same wharf group when the distance between them is less than 2 kilometers and the wharves are arranged densely. In order to build the least spanning tree of wharves and divide the wharf groups, the prim algorithm is used. Please refer to the findings of the study for information on certain procedures and processes.

Risk analysis for the manufacturing and control of wharves

This paper uses a semi quantitative risk index method to determine the production supervision risk level at wharves. Because the factors that reflect wharf production and supervision risk, such as the level of production equipment technology, the level of

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management system, the emergency prevention system, and the environment monitoring and control system, are all qualitative indexes and it is difficult to quantitatively determine their risk levels, this paper adopts a method that uses a risk index that is semi quantitative. The particular actions to take are as follows: (1) classify and score the risk levels of each assessment index of wharf production supervision risk, then divide the risk levels into four types: extremely low, low, medium and high, corresponding to the four scoring values of 1, 2, 3 and 4, respectively; (2) determine the wharf risk index that reflects the wharf production supervision risk by the weighted sum, based on the weight and score value of each index; and (3) determine the risk level of wharf production supervision. Step one entails the classification and scoring

The literature is used to define the categorization of risk categories for each index. The risk levels are calculated according to the levels of wharf production equipment technology in the industry, which includes internationally advanced, domestically advanced, domestically average, and domestically backward. The completeness and enforcement of the wharf management system are characterized by the completeness of the safety production management system, the qualification degree of the clean production audit, and the certification to the ISO14000 standard. These characteristics are used to determine the risk level of the wharf management system. The creation and execution of a wharf risk accident emergency plan, in addition to the installation and operation of pollution prevention equipment, are what define the risk level of the wharf emergency prevention system. The installation and operation of the wharf environmental risk monitoring equipment, as well as the monitoring degree to which the pollution index is being completed, are what define the risk level of the wharf environmental monitoring system. Table 1 displays the risk level categorization as well as the scoring criterion for the risk assessment index of wharf production supervision.

Table 1. The danger level categorization and scoring criteria used by the wharf's risk assessment index

Index	**Risk Level Classification Standard and Stowing Value**				**Index Weigh t**
	High Risk (Scare Value: 4)	**Medium Risk (Score Value 3)**	**Low Risk (Score Value: 2)**	**Extremely Low Risk (Score Value: II**	

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Production equipment and technological level	Domestic backward	Domestic ordinary	Domestic advanced	International advanced	0.287
Management system	Incomplete	Complete but unreasonable	Complete and reasonable	Complete and reasonable with good implementatio n effect	0187
Emergency prevention system	Without Emergency plans or anti-pollution facilities	With either emergency plans or anti-pollution facilities	With both emergency plans and anti-pollution facilities, but without nutty drill	With both emergency plans and anti-pollution facilities, and with regular drill	0229

Simulation Technology of Oil Spill Accidents at Wharf Groups

Because the wharves are all situated along the main channel of the Yamuna River, it is possible to develop a mathematical model of the water environment of the Yamuna River in order to simulate the oil spill incidents that may occur at the wharves.

Simulated Working Conditions

Taking into account the low water level of the Yamuna River during the dry season and the comparatively high chance of water traffic accidents, the hydrological conditions have been created to take a 90% guarantee rate during the dry season. Due to the fact that there are wharves located both upstream and downstream of the Lucknow water source and that the stretch of the Yamuna River in question is a tidal river, the periods of severe ebb and rise of spring tide have been designated as the times when oil spill incidents are most likely to occur. This is done with the intention of preparing for the worst possible outcomes. Furthermore, according to the meteorological and climatic data of Lucknow city, this paper selects three wind fields of adverse wind direction (west wind) with the instantaneous maximum wind speed of 12.4 m/s, dominant wind direction (northeast wind) of 6 m/s during the dry season, and calm wind to design the simulated working conditions of oil spill accidents, as shown in

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Table 2. These wind fields are used to design the simulated working conditions of oil spill accidents during the dry season.

Table 2. It was imagined that workers would be subjected to working conditions comparable to those experienced after oil spills

Number	Flow field	Wind field	
		Wind direction	Wind speed/(ms^{-1})
1	Sharp rise	W	12.4
2	Sharp ebb	W	12.4
3	Sharp rise	NE	6
4	Sharp ebb	NE	6
5	Sharp rise	Clam wind	
6	Sharp ebb	Clam wind	

Location of Accidents

The location of oil spill accidents at the wharf group is decided according to the risk index of each wharf and the distance from the wharf to the intake (or the opposite bank of the intake) along the banks of the Yamuna River. These factors are taken into consideration while determining the location of the oil spill accidents. The formula is as follows in its precise form:

CONCLUSION

This paper constructs a risk assessment system of the water sources that are under the influence of the wharf group and applies it to the environmental risk assessment of simulated oil spill accidents. The aim of this paper is to address the research shortcomings of strong subjectivity in determining the amount of oil spilled during simulated oil spill accidents, insufficient consideration of risk increment caused by dense wharf distribution, and incomplete indexes for reflecting the degree to which oil spill accidents have an influence on the water sources. The calculation method of oil spill amount at wharves is determined by taking into consideration the oil tank capacity of main ship types at the wharves and the wharf risk index, which reflects production. The method system includes the following: (1) a method for dividing wharves into groups, which is determined by existing research results after taking into consideration the distribution of wharves in the area surrounding the water source; (2) this method.

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