Research on the Construction of Highway Construction Environment Supervision System

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Abstract. With the rapid development of expressway construction, the construction of construction environment supervision system is particularly important. This paper first summarizes the general situation of highway engineering, and expounds the significance of highway environmental supervision index system research. Subsequently, the establishment of highway environmental supervision index system was deeply discussed, including the determination principle of environmental monitoring indicators, the selection of routine monitoring indicators and methods, and the determination of implementation standards. Finally, taking xx expressway as an example, a specific supervision index system is constructed to provide reference for similar projects.

Keywords: highway; construction environment; supervision system; environmental monitoring index; method selection.

1 Introduction

With the rapid development of China's economy and the continuous improvement of transportation infrastructure, the scale of expressway construction is expanding day by day, and the environmental problems in the construction process are gradually prominent. As an important link in the process of expressway construction, environmental supervision aims to ensure the effective implementation of various environmental protection measures and reduce the negative impact of construction on the environment through the supervision of the whole process of construction activities[1]. However, there are still many problems in the environmental supervision system of expressway construction in China, such as imperfect supervision mechanism, loopholes in the implementation and implementation of supervision work, etc. These problems restrict the effective development of environmental supervision work and affect the environmental protection level of expressway construction. Therefore, this study aims to deeply analyze the current situation and problems of the expressway construction environment supervision system, draw on the advanced experience at home and abroad, and put for-

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ward targeted improvement measures and suggestions. Through case analysis, data statistics and other methods, the effectiveness of the supervision system is evaluated, to provide experience and reference for the future supervision work[2].

2 Project Overview

This project is based on the research object of xx expressway project, on how to effectively carry out the environmental supervision work during the construction period of the expressway construction project, and truly realize the unity of "economic benefits, social benefits and environmental benefits". Therefore, it is very necessary to carry out the research on the environmental supervision index system of highway construction projects[3].

2.1 Significance of Highway Environmental Supervision Index System Research

With the popularity of the concept of environmental protection and the improvement of laws and regulations, the importance of the study of highway environmental supervision index system is becoming more and more prominent（Figure 1）. On the one hand, by constructing a scientific index system, it can evaluate the environmental impact in the process of highway construction more comprehensively and accurately, providing the basis for decision-making for managers; on the other hand, a reasonable index system helps to standardize the construction behavior, reduce environmental pollution and ecological damage, and achieve a win-win situation of economic and environmental benefits.

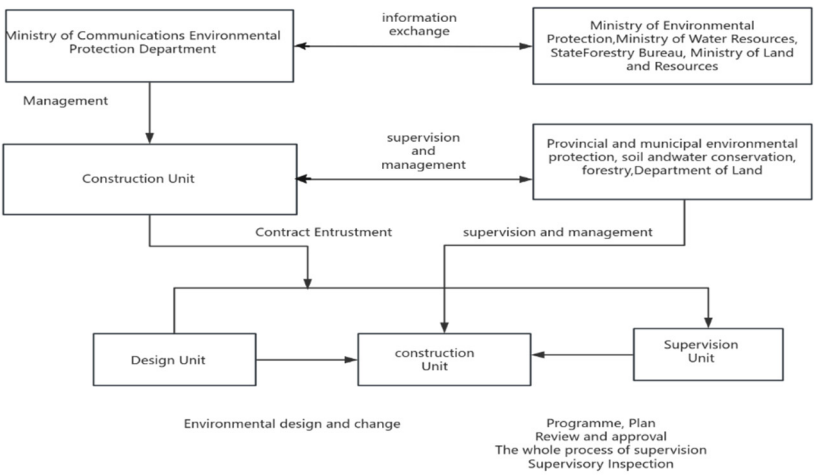

Fig. 1. Environmental protection management organization and mutual relations during highway construction period.

3 Research on Highway Environmental Supervision Index System

3.1 Determination Principles of the Environmental Monitoring Indicators During the Highway Construction Period

When establishing environmental monitoring indicators in the process of highway construction, the dual principle of comprehensiveness and representativeness must be followed. The selected indicators should not only reflect the comprehensive performance of environmental conditions, but also accurately capture the key influencing factors. In view of the wide geographical area and different natural environment and ecological conditions along the highway construction, the regional differences should be fully considered, and flexible measures should be taken according to the local conditions[4].

3.2 Selection of Routine Monitoring Indicators and Methods for Environmental Supervision of Highway Construction Projects

3.2.1 Selection of Atmospheric Monitoring Indicators and Methods

In the process of highway construction, the key of atmospheric environment monitoring is to identify and quantify those pollutants that have significant effects on the environment and human health. According to this principle, we should prioritize those pollution factors with extensive impact, serious harm and well-established testing methods for monitoring. Table 1 shows the main types of air pollutants produced in highway construction.

Table 1. Air pollution sources and monitoring indicators during highway construction period.

pollutant source	Main monitoring objects	Monitoring factor
Construction site	air quality	TSP, N0x, SO2
Stone yard, quarry yard	air quality	TSP, PM10
Take and abandon soil farms	air quality	TSP, PM10
Lerain and concrete mixing station	air quality	TSP, PM10, Asphalt smoke, N0x, and S02
fabrication yard	air quality	TSP,PM10
pioneer road	air quality	TSP, PM10
Material transportation road	air quality	TSP, PM10, C0,0 2, natural dust fall, and NOx
Construction tunnel blasting	air quality	S02, C0, NOx, COx, hydrogen sulfide
Asphalt pavement spread	air quality	Asphalt smoke, benzyl {a} flowers

3.2.2 Selection of Water Environment Monitoring Indicators and Methods

According to the actual situation during the construction period and the local environmental characteristics, the pollution factors should be given priority to large harm, wide influence range and strong existing standard analysis methods. Table 2 lists the commonly used water environment monitoring indicators in highway construction.

Table 2. Common water environment monitoring indicators for highway construction.

headwaters	Main Monitoring object	Major monitoring factors
Construction site	Septic tank water	COD, BOD, E. coli, pH, and NH3-N
Prefabricated factory	Water from the sedimentation tank	SS, pH, and petroleum category
Asphalt mixing station	Water from the sedimentation tank	SS, pH, benzo {a} flower, petroleum class
bridge construction	drainage of foundation pit	PH, SS, petroleum category
Tunnel construction	Wastewater in tunnel hole	PH, COD, SS, petroleum, nitrate
Rivers, lakes, wetlands, etc	water environment	PH, D0, C0D, B0D, petroleum, NH3-N, sulfide
Field domestic water for construction	water for life	PH, Chromaticity, turbidity, bottle compound, cyanide, arsenic, mercury, the total number of bacteria

In routine monitoring, pH value, SS and COD are common indicators. The pH value is simple but variable and requires on-site monitoring. SS and COD methods are mature, easy to operate and have high accuracy, and are often used for environmental supervision. Petroleum, nitrate and other tests are not suitable for routine monitoring because of their high testing requirements or low content. In highway construction, the indexes with great harm, wide influence, easy operation and high accuracy should be selected. Therefore, SS and COD can be used as routine water quality indicators for highway environmental monitoring.

3.2.3 Selection of Monitoring Indicators and Methods of Vibration and Acoustic Environment

Vibration pollution is an environmental problem in the construction of expressway, which originates from the vibration of construction machinery and transport vehicles, and affects the life and work. Z vibration level VLz is a common monitoring index that reflects the vibration intensity in decibel. Highway construction noise mainly comes from transportation vehicles and construction machinery[5]. The valent continuous A sound level is A common monitoring index to reflect the actual impact on human ear. It is widely used in highway environmental supervision because of its maturity, simplicity and accuracy.

3.2.4 Selection of Ecological Environment Monitoring Indicators and Methods

The life cycle of highway construction projects is long, and the impact on the ecological environment is far-reaching and difficult to reverse, which mainly depends on the scale of the project, the geographical location and the diversity of surrounding environmental conditions. The main ecological and environmental impacts include land occupation, vegetation destruction and soil erosion[6-8]. When selecting appropriate ecological environment monitoring indicators, quantitative indicators must be adopted according to the specific engineering situation to accurately assess the impact on the environment (see Table 3). Given the complexity of ecosystems, the selection of ecological quantitative indicators should follow some basic principles.

Table 3. Ecological environment monitoring index of highway construction.

Monitoring indicators	Commonly used indicators	Refine the index	method	Whether quantifiable
Vegetation Destruction degree	biomass	Biomass estimation	formula derivation	Can be quantified
		Biomass loss	formula derivation	Can be quantified
		Biomass measurement	Formula estimation	Can be quantified
	Vegetation coverage	Vegetation coverage	Surface measurement And remote sensing monitoring	Can be quantified
		Vegetation degree cover value	formula derivation	Can be quantified
Highway Covering an area of	road construction Land use indicators	Highway construction project Overall land use index,	The Highway Design Engineer's Manual	Can be quantified
		Land use index for subgrade, tunnel and bridge projects and facilities along the line		
	Reclamation of cultivated land	Cultivated land reclamation rate	The Land Administration Law of the People's Republic of China	Can be quantified
water and soil maintenance dose	soil erosion strength grade	Soil wind erosion, soil desertification erosion, soil erosion allowable amount	Divate sion grades according to existing specifications	determine the nature
	water and soil erosion amount	Soil erosion area Soil erosion	Measurement method and estimation method	Can be quantified
species influence quantity	Species diversity indices	u diversity β diversity	Species richness index, the exponential method	Can be quantified

	species diversity Reduce the proportion	Rate according to the guidelines	Can be quantified
Solid waste	Solid waste production	Obtained according to the actual situation	Can be quantified
	Dig and fill the balance rate	formula derivation	Can be quantified

In Table 3, biomass vegetation damage is seasonally limited and cumbersome. Surface vegetation cover is key, but remote sensing technology is not popular, and manual measurement is difficult. Soil and soil loss assessment, data collection and statistics are complex and operation is difficult[9]. Therefore, the degree of ecological protection, quantification of vegetation damage, rate of greening, and soil and water conservation rate are proposed as highway ecological indicators, which are representative, operable and concise, reflect the ecological impact of construction on construction, and provide reference for environmental supervision.

3.3 Confirmation of the Implementation Standards

(1) Atmospheric environment monitoring: In view of the increasing attention paid to the impact of air pollutants on the environment and human health, the GB3095-2021 Ambient Air Quality Standards will be followed.

(2) Water environment monitoring: For the monitoring of water environment quality, GB3838-2020 Surface Water Environmental Quality Standard will be implemented.

(3) Acoustic environment monitoring: During the construction period, the noise monitoring will be carried out in accordance with GB12523-2021 "Environmental Noise Emission Standard of Construction Site Boundary".

(4) Vibration environment monitoring: For the monitoring of vibration environment quality, although there is no vibration environment quality standard specifically for highway construction, it will refer to GB / T10071-2022 "Environmental Vibration Measurement Method in Urban Areas" for monitoring and evaluation.

(5) Since there is no environmental quality standard value of ecological environment monitoring indicators, other domestic industry standards or foreign standards can be referred to.

4 Highway Supervision Index System

The xx highway environmental supervision index system accurately reflects the construction impact and serves as the evaluation basis. According to the principles, factors and methods determined, establish the environmental supervision index system of xx expressway, see Table 4 for details.

Tab**le 4.** Environmental supervision index system of xx Expressway.

Monitor project	Monitoring indicators	Whether the quantitative or monitoring methods	analytic procedure
atmosphere	TSP, PM 10	Quantification of atmospheric suspended particulate matter sampler)	weighing method
	NOx	quantitative analysis	Neethylamine hydrochloride Divide method
	asphalt fume	quantitative analysis	GB 1189Z —89
water	PH	quantitative analysis	PH test paper
	C0 D	quantitative analysis	gravimetric analysis
	SS	quantitative analysis	gravimetric analysis
	Oil class	quantitative analysis	infrared spectrophotometry
Sound	Equivalent continuous A sound stage	quantitative analysis	GB 2524—90
vibrate	Z vibration level	quantitative analysis	
organism's habits	Vegetation Destruction degree	quantitative analysis	Direct investigation was obtained Or indirectly
	at the right moment Green rate	quantitative analysis	Direct investigation was obtained Or indirectly
	Soil grains retention rate	quantitative analysis	Direct investigation was obtained Or indirectly
	organism's habits degree for protection	quantitative analysis	Direct investigation was obtained Or indirectly

5 Conclusion

Whether the highway construction can be standardized is the core of solving and preventing the environmental pollution in the construction stage. And to truly achieve standardized construction, the actual and requirements are far apart. Therefore, in the current case of no legal basis, the supervision should be seriously, solid, seriously implement the spirit of environmental protection supervision into the actual work, at the same time should also actively explore the implementation of environmental protection supervision ways, measures, for the process of highway environmental protection construction, contribute their own strength.

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