

On the Harm of Air Pollution in Environmental Engineering

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Abstract: With the rapid development of China's economy and society, China's ecological environment is also increasingly destroyed, especially the air pollution directly and seriously affect people's production and life. Therefore, this paper starts from the scientific prevention and control of air pollution, analyzes the characteristics of air pollution in environmental engineering, expounds the main harm of air pollution, and puts forward effective prevention and control measures to further improve the level of environmental engineering construction, and also provide some reference for relevant staff.

Keywords: Environmental Engineering; Air Pollution; Hazard Analysis; Prevention and Control Measures

Introduction

In recent years, with the rapid development of China's urbanization and industrialization, the adverse impact of various pollution problems on the ecological environment, climate change, and even people's health, has become one of the biggest challenges facing China's economy and society. Among the numerous environmental problems, air pollution involves a wide range, the degree of harm is high, and the difficulty of treatment is greater. Therefore, in the construction of environmental engineering, we should strengthen monitoring and supervision, vigorously carry out urban greening, and actively expand and improve the path and solution strategy of air pollution prevention and management.

1. The characteristics of air pollution

Air pollution refers to the entry of certain substances into the atmosphere due to human activities or natural processes, showing sufficient concentration, reaching sufficient time, and thus endangering the comfort, health and welfare of the human body or endangering the environment. Common pollutants include dust, smoke, fly ash, black smoke and so on.

Different from other forms of pollution, air pollution mainly has the following characteristics:

First, the long duration of the pollution. In environmental engineering, the duration of air pollution is very long. To some extent, it can be seen that air pollution has become a relatively common phenomenon. In cities, due to the large amount of industrial exhaust gas and automobile exhaust emissions, the phenomenon of haze occurs frequently, some cities in northern China and even the whole autumn and winter have been plagued by haze. Haze phenomenon will not only affect People's Daily life and work, but also bring great harm to people's health. If placed in this state for a long time, it is likely to induce some respiratory diseases or some other diseases^[1].

Second, the wide range of pollution. In China's air pollution, the urban air environment is the most serious field. China's urban population density is relatively large, and the air pollution is also relatively large. With the development of China's economy and social progress, China's urbanization process is also accelerating, all kinds of industrial enterprises continue to develop and grow, all kinds of automobiles, industrial emissions of waste gas have also caused serious air pollution. From a global perspective, the impact of air pollution is also relatively wide, such as global warming, sea level rise and Marine pollution are all related to air pollution.

Third, the pollution composition is complex. In air pollution, the most difficult to be diluted and diffuse is the

suspended particulate matter, which is also the main cause of air pollution. For example, in cities, automobile exhaust gas, industrial exhaust gas and domestic exhaust gas are not only complex components, but also huge in quantity. With the continuous development of industry, the degree of industrialization, so the industrial exhaust emissions, and the improvement of people's living standards in recent years, the number of private cars, not only bring pressure on urban traffic, but also the automobile exhaust is significantly increased, aggravating the urban air pollution. Pollutants continue to enter the atmosphere, seriously damaging the atmospheric environment, leading to the continuous accumulation of pollutants in the air, and increasing the difficulty of atmospheric governance.

2. The main harm of air pollution in environmental engineering

2.1 The destructive effect on the ecosystem

Air pollution is not only a killer of human health, but also causes incalculable damage to the ecosystem. For example, when the air is rich in sulfur and nitrogen oxides, it combines with moisture in the atmosphere to form acid rain. Acid rain falls on the soil, which will change the acid-base balance of the soil, causing some plants to be unable to absorb nutrients, thus affecting their growth. Acid rain may also cause the release of toxic metals such as aluminum in the soil into the water body, causing toxicity to aquatic life. Because pollutants in the atmosphere can block sunlight, this suppresses plant photosynthesis, reducing productivity across ecosystems. This affects not only plants, but also indirectly affects animals that rely on plants for food, making the entire food chain threatened. Under such cyclic effects, the stability and biodiversity of the ecosystem have been severely impacted.

2.2 The threat to climate stability

Air pollution has become a key factor that threatens global climate stability. Increases in greenhouse gases, especially carbon dioxide and methane, trigger a rise in global temperatures. This rise not only leads to rapid melting of glaciers and sea level rise, but also makes extreme weather events more frequent and intense, such as heat waves, strong storms and severe droughts. Aerosol particles in the atmosphere, including black carbon, interfere with the absorption and scattering of sunlight. This does not only lead to regional climate changes, such as delayed and intensity changes in the monsoon, but it also may have a broader impact on the global climate. For example, aerosols have a direct effect on cloud formation and may lead to changes in precipitation patterns. Some air pollutants, such as chlorofluorocarbons, pose a direct threat to the ozone layer, leading to the formation of an "ozone layer hole". This exposes the earth's surface to more harmful ultraviolet radiation, with negative effects on both human health and ecosystems. There is a profound correlation between air pollution and climate change. If air pollution is not addressed, this association could lead to more climate disturbances, which in turn has a greater impact on global ecosystems and human activities.

3. Effective prevention and control measures of air pollution in environmental engineering

3.1 Strengthen urban greening and afforestation

In the construction of urban environment, greening and afforestation should be strengthened so as to increase the urban greening area. At the same time, the generation and emission path of air pollutants should be changed to effectively reduce the concentration of pollutants. In this process, plant species with pollution resistance and strong adsorption capacity should be actively introduced to build a perfect urban forest ecosystem. First of all, the implementation of a large area of urban green space planning and construction. Establish the level and structure of the green space system, optimize the allocation of green space in parks, greenways, squares, rivers according to the overall urban planning, and ensure the improvement of green space coverage and ecological service function^[2]. On this basis, the protection of ecological corridors and biodiversity should be strengthened to form an urban ecological network, so as to reduce the urban heat island effect and reduce the concentration of air pollutants. Secondly, pay attention to the planting and management of urban forests. By introducing

plant species with pollution resistance and strong adsorption performance, such as poplar and beech, to enhance the adsorption capacity of harmful substances in the atmosphere. Strengthen the management and maintenance of forests, regular pest control and pruning, to ensure their long-term and stable provision of ecological services.

3.2 Information monitoring and early warning system

First, hierarchical monitoring was implemented (as shown in Table 1). According to the different characteristics of urban areas, industrial areas and rural areas, different types and numbers of monitoring stations are set up. In core urban areas and key industrial areas, high-precision sensors are used to achieve more accurate data acquisition, and mobile monitoring equipment is considered to capture transient pollution conditions. Secondly, cloud computing and edge computing are used for data processing. The cloud computing center is mainly responsible for long-term data storage and big data analysis, providing long-term trend prediction; while edge computing conducts rapid analysis for real-time data, and supports daily real-time warning and rapid response. This combination not only ensures the efficiency of data processing, but also improves the accuracy of early warning. Again, the fusion model was introduced. That is, combined with statistical methods, physical models and machine learning and other technical means, cross-validation of data and in-depth training of the model are carried out to obtain more accurate prediction results, and then provide a more scientific decision basis for the decision-making layer [4]. Finally, the modular update is implemented. This means that each part of the system can be upgraded or replaced separately, such as sensors, data transmission modules, computing modules, etc. This strategy not only reduces the overall update costs, but also ensures that the system can keep pace with the technological development to meet the growing environmental needs. In environmental construction, the important goal of air pollution prevention and control is to ensure that air pollution can be reduced to the maximum extent while ensuring economic development. Therefore, it is necessary to comprehensively apply a variety of information technology and strengthen the construction of information system to ensure that the advantages of information technology can be fully played to better serve the prevention and control of air pollution^[3].

Table 1. Classification and monitoring Table of air pollution information monitoring technology

monitoring technique	application environment	Scope of detection	Effect description	Best application scenarios
High precision sensor	Urban core area	PM2.5, PM10, NOx	High accuracy, good real-time performance	Industrial areas and large urban centers
Mobile monitoring equipment	rural-urban fringe zone	PM2.5, VOCs	Good flexibility and can capture instantaneous changes	Busy traffic on road sections or construction sites
Satellite remote sensing technology	Wide area monitoring	SO ₂ , O ₃ , PM	Wide range and low frequency of updates	Tracking and trend analysis of atmospheric pollution sources
Drone monitoring	location	PM2.5, VOCs, NOx	Highly flexible, short-time, high-density sampling	Specific event or pollution accident site

Epilogue

Air pollution is a problem often encountered in people's life. It will not only affect people's quality of life, but also

cause great harm to people's health. Therefore, people need to pay more attention to air pollution. Relevant departments need to do a good job of corresponding prevention work, improve the professional ability of the staff, and formulate corresponding prevention and control measures according to the actual situation. At the same time, the government should do a good job in supervision and management to ensure that air pollution is effectively controlled.

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