

Introduction to the environmental impact of engineering construction and measures to solve it

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Abstract. Since economic development requires the support of infrastructure construction, in recent years, engineering construction has become a part of the strategic layout of most countries, such as water conservancy and bridges. However, the shortening of construction speed has a serious impact on people's normal production and life and the environment. With the improvement of environmental protection awareness, solving environmental problems during the construction of projects has gradually been put on the agenda, such as water pollution, air pollution, solid waste, etc. This paper analyzes the pollution caused by different engineering constructions through a review, and proposes corresponding solutions.

Keywords: construction, environment, pollutants, Water conservancy project.

1. Introduction

Since the first industrial revolution, human construction means have become more and more diversified and efficient. Based on the requirement of infrastructure construction for economic development, developing countries are also vigorously developing engineering construction, which in turn drives economic development, for example, the construction of buildings, water conservancy, bridges, etc. Most engineering constructions are pursuing quality and aesthetics while requiring the improvement of construction speed. However, as environmental problems are gradually affecting people's normal production life, solving environmental problems is gradually on the agenda. In addition to the environmental pollution caused by daily commercial production activities, it has been gradually recognized that the rapid and large amount of engineering construction in recent decades has also caused different degrees of environmental impacts, such as water pollution, air pollution, and solid waste, during construction[1]. In this paper, we analyze and study the pollution caused by engineering construction utilizing a review, give corresponding solutions for engineering construction and provide new ideas and thoughts on green planning and production.

2. Impact on the environment

2.1. Pollution of construction works

2.1.1. Particulate pollutants. Particulate pollutants are air pollution caused by several solid and liquid particles in the air, mainly found in exhaust gases and dust generated during the construction of buildings, machinery exhaust, and sand and dust produced by the action of soil weathering materials. These pollutants increase the total suspended particles in the air and are usually summarized using the PM_{2.5} and PM₁₀ processes[1]. Particulate pollutants are generated by many processes in construction, such as dust from the handling or stacking of fuels on the site, large amounts of dust generated during excavation and back filling of land and demolition of construction structures, and pollutants generated by the application of internal combustion engines.

2.1.2. Gaseous pollutants. Gaseous pollutants are all types of pollutants that are dispersed into the air in a gaseous mode. Usually, the pollutants are gaseous pollutants produced by fuel combustion or automobile exhaust pollutants, including sulfur dioxide, carbon monoxide, and many other pollutants. In the process of building construction, some raw materials are used that can exert some organic chemicals. At the same time, the volatile chemicals used in the construction process will produce gaseous pollutants. For example, asphalt contains many organic substances and is heated in the process of paving a road. The heat will volatilize the leachate that contains organic substances into the air, which will cause serious air pollution[1]. The operation of internal combustion machines will also release a large number of gaseous pollutants into the air during the process, causing air pollution.

2.2. Environmental pollution problems of bridge engineering

2.2.1. Soil erosion problem. The bridge project requires a long time of field operation, so it needs to build a large number of temporary auxiliary works, such as office and living facilities, construction roads, large machinery placement points, warehouses, etc. For bridges that need to cross wide-span rivers, cofferdams, temporary diversion ditches, temporary bridges, etc[2]. are also built, and the area and volume of these auxiliary works often take up a high proportion of the project volume. In the construction project, the engineering team will choose the bridge site near the river valley open land to build auxiliary works, such as cultivated land, woodland, etc. Therefore, the excavation and filling of a large amount of soil, the crushing vibration caused by a large number of heavy machinery trucks and the blasting of rock walls will damage the ecological environment of the original river and the nearby soil[2]. Especially on the slopes of the river valley where the soil is loose after being disturbed, soil erosion can easily occur under river water immersion and washing. In case of heavy rainfall, it is easy to transform into geological disasters such as flash floods, landslides, and mudslides, causing an irreversible impact on the ecological environment. In addition, if there are villages or residential areas nearby, it will also cause serious damage to people's lives and properties.

2.2.2. Water pollution problems. In the construction process, the oil used by the construction machinery will pollute the water quality and soil in the annexe under the action of rainwater, while the sewage and garbage produced by the engineering construction department in production and life will also cause water pollution. At the same time, the solid waste pollution formed by the accumulation of cement, sand, gravel materials and other construction waste garbage after the construction will produce a pungent odour after long-term piling, and the water quality and soil near the construction will also be polluted under the action of rainwater. In addition, during the construction of the substructure of the bridge across the river, excavation in the road near the river may lead to pollution caused by soil and rocks entering the river[3].

These untreated and dirty liquids, when flowing into natural waters, can lead to a dramatic increase and enrichment of plankton, thus over-consuming the dissolved oxygen in the water and further causing massive fish kills. The entry of heavy metal ions, which are not easily degradable organic matter such as oil, often contains heavy metals, can cause great harm to organisms. The entry of heavy metal ions

can cause great harm to living organisms, resulting in the deterioration of water quality while also causing a sharp decrease in the number of aquatic organisms.

2.2.3. Air pollution problems. A large amount of dust can also occur in the process of bridge construction, loading and unloading of construction materials, dust from concrete in the mixing process, dust from road construction, dust caused by wind during the stacking of bulk materials, toxic gases emitted from construction machinery and vehicles, etc. The long-term inhalation of these pollutants can cause pneumoconiosis, lung damage, decreased liver function, induced cardiovascular disease, etc., which can cause more serious harm to the human body. Therefore, the residents and construction workers around the construction site become the victims of construction air pollution[3].

2.2.4. Noise pollution problems. In the construction process, to improve construction efficiency and complete the project successfully, mechanized construction technology will be applied for a long time, and the resulting noise seriously affects the environment of the construction area. Construction machinery discontinuous noise and traffic noise generated by the transportation of road construction materials are common sources of noise, in addition to mechanical resonance, high-frequency vibration, and low-frequency high-amplitude vibration will also produce noise pollution. Noise pollution can cause certain hearing damage to construction workers, pregnant women, children, and the elderly, and also interfere with their normal sleep, work, and life, and further induce a variety of physiological and psychological diseases[3].

3. Pollution solution measures

3.1. Construction work

3.1.1. Improvement of dust. During the construction of building projects, the nature of the surface can be changed by covering it to prevent dust. For example, laying concrete asphalt materials during road construction can prevent dust from being raised by the wind when vehicles pass by. It is also possible to use metal sheets for covering, which can also have a preventive effect[1].

3.1.2. Mechanical equipment. In order to provide the efficiency of construction, more and more mechanical construction equipment is used in construction. In the overall planning of construction, the number and type of construction machinery should be studied and set, and the frequency and number of mechanical construction should be set, thus reducing the use of fuel. The construction machinery and reasonable planning can control the air pollution of construction by reducing the emission of mechanical emissions, and the exact construction time can also effectively reduce noise pollution.

3.1.3. Use of raw materials that meet environmental standards. Building construction involves more raw materials. In order to avoid the phenomenon of pollution, one should try to choose green raw materials in line with the environmental protection mark, for example, to prevent damage to the ozone layer, one should try to choose low sulfur content dyes, to be able to reduce the emission of sulfur dioxide. The selection and use of green raw materials require the engineering party to adopt a formal bidding method to increase the selectivity of green raw materials[4].

3.1.4. Conversion method can be adopted. Combined with the geological conditions of the building construction and the natural environment and other factors, some conversion methods should be adopted to reduce the dust or air pollutants caused by the construction. The presence of dust can be reduced by laying concrete or covering the building surface with other materials. In addition, covering the wheels of the construction site with isolation houses can prevent the dust falling from the site from entering the air, thus reducing the phenomenon of environmental pollution. You can also reduce the dust on the ground in the air by spraying pure water. Especially in a windy or hot environment, one must adhere to

the water spraying way to reduce the chances of dust into the air, while the need to increase the density of spraying. And spraying requires a large number of water resources, to avoid excessive water pollution and waste caused by water, in the water dust sprinkling can be selected from the treated sewage for dust reduction, to improve the utilization of site resources. In addition, in order to prevent the further spread of pollutants, you can also take the method of containment and isolation to isolate the construction environment and the outside environment. During construction, pollutants are effectively segregated in order to avoid the impact on the outside environment. Air pollution caused by dust during construction can be reduced by setting up trellis nets on the scaffolding.

3.2. Bridge Engineering

3.2.1. Strengthen the environmental management during the construction process. The construction department needs to actively implement the national laws and regulations on environmental protection and control of environmental pollution to reduce the impact of air pollution, noise pollution, and other common pollution methods in construction on the life of residents to the extent allowed by the norms. Therefore, the construction project department needs to have a corresponding environmental pollution emergency command centre responsible for environmental pollution prevention and handling of sudden pollution events. Not only do we need to prevent sudden pollution in our daily work, but we also need to start the emergency mechanism immediately after a major pollution event to minimize the harm of the pollution event. In addition, it needs to supervise the collection, analysis, and evaluation of environmental information, natural disasters, and other monitoring data, and to report information that may cause larger environmental pollution events in order to take timely measures to solve them[5].

3.2.2. Focus on prevention. The prevention of pollution is often more effective than the treatment of pollution, so the environmental protection work will be institutionalized before the construction of the project. A detailed environmental impact assessment should be conducted during the design of the project construction, and the results of the inspection and demonstration should be thoroughly recorded as the core factors for designing the construction plan and environmental protection measures. Secondly, the construction staff of the project needs to be educated and trained in environmental knowledge so that they are familiar with the environmental matters that should be strictly noted during construction. At the same time, a strict reward and punishment system needs to be established to make environmental protection the main theme of the construction staff's daily work. Thirdly, during the construction process, environmental protection materials should be used as much as possible, and traditional raw materials that are not environmentally friendly should be replaced, achieve environmental friendliness from the details and further recommend the sustainable development of the economy and environment[6].

3.2.3. Soil erosion control. The prevention and control of soil erosion lie in the cleanup and restoration after construction. The injured site should be reconstructed by the requirements of vegetation growth, levelling and loosening the crushed topsoil, and then sowing with suitable grass seeds to achieve the purpose of restoring vegetation. For the demolished construction waste, it should be reasonably stored, and under the premise of conditions, suitable greening and beautification should be carried out, to achieve green hills and green mountains when coming and going.

3.2.4. Water pollution control. A drainage ditch and sedimentation pond shall be set up at the bridge construction site, and the operation water for washing aggregates or containing sediment, as well as the wastewater for cleaning machinery and equipment shall be treated by filtration and sedimentation pond to reach the discharge standard will be discharged afterwards, thus ensuring the construction site is neat and tidy. A large amount of waste mud carrying drilling slag generated during hole drilling operation should be transported by tanker truck to the designated treatment site for disposal. It is strictly prohibited to discharge wastewater and waste mud into rivers or farmland. In addition, for mechanical oil which is easy to cause serious environmental pollution, strict inspection and long-term monitoring should be

done. The staff needs to strictly control the handling of pollution such as running, bubbling, dripping, and leaking of construction machinery, and the spilt mechanical oil should be especially collected and handed over to specialized agencies for treatment. At the same time, the treatment of domestic sewage also needs to have specific requirements, domestic sewage cannot be casually discharged into the water source, and the discharge into other waters also needs to pay attention to the water quality, strictly according to the discharge standards for purification and treatment before discharge[7].

3.2.5. Air pollution control. To reduce the construction dust hazard, the site in the living area should be hardened and greened so as to reduce the concentration of dust in the air. The machinery and equipment that are prone to cause a lot of dust also need to be equipped with better sealing and dust treatment facilities. The construction channel and asphalt concrete mixing plant need to set up special vehicles and arrange special personnel to carry out water sprinkling treatment frequently. At the same time, road construction also needs to keep moisture at all times to avoid dust. Fine or powder bulk materials that are easy to cause dust should be covered with canvas during transportation or storage to reduce exposure. And air pollution caused by exhaust emissions from vehicles needs to be forced to use suitable green fuel for site vehicles to reduce possible exhaust pollution.

3.2.6. Noise pollution prevention and control. In the construction process, it is necessary to give priority to the use of fixed large steel mould, bamboo glue board, steel frame large wooden mould and other formwork systems, and avoid the use of small combined steel mould to reduce the noise generated by the support and dismantling of the formwork. At the same time, advanced, low-noise mechanical equipment can be used to reduce the noise of mechanical work roar. In the daily maintenance, the staff is needed to strengthen the regular maintenance of the machinery and try to make its noise to the minimum. In addition, the construction team needs to comply with the regulations of the local authorities on night construction, the construction site closer to residential areas needs to control the construction time, for excessive noise machinery is not arranged the night construction, necessary time can be set up sound walls to reduce the impact of noise on residents.

4. Conclusion

In this paper, we analyze engineering construction's ecological and environmental impacts using construction, and bridge engineering as case studies. And different solution strategies are given for different situations. It is hoped that while vigorously developing the economy and infrastructure construction, the negative impact on ecology and environment in engineering construction can also be reduced and provide a reference for the harmonious development of ecology and environment This paper mainly analyzes the article based on a review, lacking actual research. It will be followed up by different engineering construction programs and the measurement of different result methods.

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