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IMPACT OF CONSTRUCTION AND OPERATION OF HIGHWAYS ON THE ENVIRONMENT

The construction and operation of roads become one of the main sources ofpotential environmental risks that negatively affect the functioning of ecologicalsystems and, of course, humans [1,2].

As an engineering structure, a road changes natural landscapes, surface and groundwater flow regimes, habitats of flora and fauna and causes changes in the coastlines of water bodies, the microclimate of certain areas. In addition, the road is a source of vibration, noise, electromagnetic and ionizing effects on the environmental components, population and wildlife. The transport sector is the largest source of toxic water, soil and air pollution in many countries [1].

Artificial structures on highways are complex engineering structures.

The design, construction, and maintenance of such structures often raise such environmental issues that require timely and informed solutions. These environmental problems can be associated with the following main factors:

- animals road crossing;
- pollution of permanent and non-permanent watercourses, which negatively affects aquatic biological resources, during the construction and repair of artificialstructures;
- change in the hydrological regime of a watercourse caused by the construction of a bridge [3,4].

Construction and roads repair and artificial structures often leads to river pollution [1]. Sources of water pollution are facilities that discharge harmful substances into water bodies that degrade water quality, limit its use, and negatively affect the condition of the bottom and banks of the water objects.

Studies have shown that the main pollutants in the construction and repair of artificial structures are as follows:

- construction garbage;
- petroleum products in the form of leaks of fuels and lubricants from construction machinery, mechanisms and vehicles;
- paints and varnishes and other chemicals used in construction works;
- corrosion products and paint residues from sandblasting of rebar, steel bridge structures (spans, supporting parts, protecting bridge deck structures, etc);
- wash water from tanks of concrete mixers and dump trucks;
- household wastewater from functioning construction camps, household waste [1,2].

Besides this, stormwater is runoff from the roadway appeared during the operation of artificial structures, especially bridges, has a negative impact on the aquatic biological resources. The most harmful chemical pollutants are oil products. The oil film that is formed on the water surface disrupts all physical and chemical processes in the reservoir: the temperature of the surface water layer rises, gas

exchange deteriorates, the food supply and fish die, and the oil that is settled at the bottom harms all living things in the reservoir for a long time.

Special attention should be paid to bulky waste. This is primarily construction debris from bridge construction and repair: leftovers of building materials and building structures. In addition, in the beds of rivers and canals, you can often see flooded building structures left over from the construction or overhaul of bridges. There are also large-diameter reinforced concrete and steel pipes left over from dismantled bypasses or technological sites when construction work is completed. You can even find flooded boats in riverbeds [2].

It is well-known fact that ecological safety of a motorway includes protection of nature from the impact of the motorway at all stages: construction, reconstruction, operation, maintenance and repair. The main task of modern builders and engineers is to create laws and rules of interaction between nature and man, and, as a result, to prevent environmental disasters in the world.

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SAFETY AND POTENTIAL HAZARDS IN HYDROTECHNICAL STRUCTURES

Hydrotechnical structures play a crucial role in managing water resources, providing flood protection, and supporting various industrial and agricultural activities. However, ensuring the safety of these structures is paramount to prevent potential hazards and safeguard both human lives and the environment.

Safety in hydrotechnical structures is a multifaceted concern that involves the careful consideration of design, construction, maintenance, and emergency response. The consequences of failure in these structures can be catastrophic, leading to loss of life, property damage, and environmental degradation.

Understanding and recognizing potential risks associated with hydrotechnical facilities is a critical step in ensuring their safety. These risks may include structural failures, overtopping, erosion, seismic events, and environmental impacts. Thorough risk assessments are essential to identify vulnerabilities and implement effective mitigation measures.

Adherence to international safety standards and regulations is a cornerstone of ensuring the safety of hydrotechnical structures. Compliance with established guidelines helps engineers and stakeholders navigate the complexities of designing and managing these facilities while minimizing risks [1].

Regular inspection and maintenance are vital for ensuring the structural integrity of hydrotechnical structures. Neglecting routine checks and necessary repairs can lead to gradual deterioration, compromising the overall safety of the facility. Case studies illustrating the consequences of inadequate maintenance underscore the importance of proactive care.

Developing comprehensive emergency preparedness plans is essential to respond effectively to unforeseen events. Training programs for personnel, simulation exercises, and the establishment of communication protocols contribute to a swift and coordinated response in times of crisis.