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## **ENVIRONMENTAL PROTECTION DURING CONSTRUCTION OF MOTORWAYS VIDES AIZSARDZĪBA AUTOMAĢISTRĀĻU BŪVĒŠANAS PROCESĀ**

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***Abstract.** In this paper given and analysed are the factors related to the construction of motorways and having a negative impact on the environment. Given are the conditions of the assessment of the impact of the motorways on the environment, arable land and forests and cultural heritage.*

### **1.Introduction**

A lack of motorways causes a deterioration of the environment and living conditions of the people residing within the territory adjacent to the more important state and regional roads. Those roads with excessive traffic are devoid of any environmental protection means or equipment. As a result of an excessive number of vehicles the traffic is chaotic and that causes an increase in the emission of carbon monoxide and hydrocarbons. An additional noise and vibrations cause a steady deterioration of the living conditions of the people residing near the roads. A construction of motorways complying with the regulations related to the environmental protection is a solution that is much more beneficial for the people residing in the vicinity of the roads than a constant adaptation of the existing roads to a steadily growing transport needs of the populace. Most of the drivers will be using motorways and thanks to that the traffic on the local roads will decrease.

The benefits of the motorways are steady conditions of the ride, traffic safety and decrease in the volume and reach of the harmful substances released to the atmosphere. Comparing to the existing roads, using the motorways, one saves 25% of the gasoline, from 30% to 40% of the travel time and one decreases the probability of the accidents from 70% to 80%, and the level of noise is lowered by some 30%. In the motorways construction programme envisioned is an obligatory assessment of the impact of the motorways on the environment. So, in order to limit a negative impact of the construction proper authorities conduct detailed estimates of the impact of the motorways on the environment, arable land, forests and cultural heritage.

## **2. Negative impact of the road traffic on the environment [1]**

A negative impact of A road on the environment is visible most often as a taking up of the land, air pollution and noise. There were attempts to prevent that. Most often it was switching to the unleaded gasoline and limiting the noise pollution by the engines.

The designs of the motorways construction are subject to complex analyses concerning the impact of the traffic on the surrounding areas and that in order to eliminate harmful factors. Such factors, among others, are:

- noise and vibrations
- emission of the harmful gases
- hazard for the water intake areas
- pollution or destruction of the land surface
- changes in the landscape
- separation of the social and economic communities

The vibrations of the surrounding areas are caused by heavy vehicles and their intensity increases with the increase of the damage to the road surface. The noise is created mostly by the engines and tires. The noise lowers the effectiveness of people's work and prevents them from resting. The works on the lowering of the noise level focus on the changes in the construction of the engines and improvement of the tires ways of contact with the road surface. The air pollution is most intensively felt in the vicinity of the main roads and motorways. Such pollution is a part of a low reaching emission to the atmosphere. The main components of the exhaust fumes are:

- nitric oxides, NO<sub>x</sub>
- carbon oxides, CO<sub>2</sub> and CO
- hydrocarbons, HC
- sulphur dioxide, SO<sub>2</sub>
- lead compounds

During the excavations for a motorway one can expose the water bearing layers, and the motorways can cause the necessity to change the direction of the flow of the surface waters. An accident on a motorway can cause the pollution of the surface and underground waters by greases and fuel. A similar hazard relates to a water intake area located near a motorway.

A pollution or damage to the land surface may concern a temporary pollution by the compounds used to melt the snow as well as escaped oils, greases and fuel.

The changes in the landscape concern the impact of a motorway – in the form of embankments, bridges and flyovers – on the land adjacent to it. Also, for the construction, one needs to take over the land and, usually, change its use.

The separation of communities and cutting off the residents from their arable land and properties or from their nearest places of work creates a psychological and physical barrier (the need to extend the by-pass roads and create pedestrian crossings).

During the road construction there are inconveniences related to the noise or movement of heavy and noisy transport equipment.

A justification for the construction of motorways is mostly economical one, for example:

- shortening of the travel time and thus increase in the traffic flow capacity,
- lowering of the load of the state and regional roads,
- lowering of the costs of the transport via motorways,
- heavy vehicles using mostly the motorways,
- improvement in the traffic safety, lower number of accidents, bigger comfort of travel,
- impact on the tourist traffic, increase of the commerce and manufacturing and development of new commercial centres,
- creation of the new work places.

### **3. Assessment of the impact of the motorways on their surroundings [2]**

#### **3.1. Assessment of the environmental impact**

The goal of the assessment of the construction of a motorway and its environmental impact is a determination of potential effects of such construction for the environment and people. The results of such assessment should make it easier to take a justified administrative decision on the location and construction of a motorway. Such an assessment has to include a proposal on how to reduce any negative impact on individual elements of the environment.

The assessment of the environmental impact of a motorway (OOŚ by its Polish acronym) should include:

- I. characteristics of a planned motorway; its technical parameters, location, prognosis of the traffic intensity,
- II. characteristics of the surroundings of the planned motorway; characteristics of its components and resources, landscape values, state of the environment, protected objects, health conditions,
- III. analysis of the concepts, studies and factors taken into account in the planning including the concepts of the land development of the country, provinces and local communities,
- IV. characteristics of the land development and use,
- V. assessment of a potential impact of the construction and potential impact of the road usage,
- VI. assessment of potential emergency situations,
- VII. assessment of problem areas and ways of the reduction of negative impacts,
- VIII. analysis of the land development within the area of the above–a–norm impact of a motorway
- IX. monitoring of the environment

The assessment of the environmental impact of a motorway specifies its impact on all elements of the environment during various phases of the construction taking into account various variants concerning the location and technology of the construction. Such assessment covers the description of the present state, and prognosis concerning the impact of the construction serving to identify the problems and areas that are the most likely to cause conflicts and to find the remedying means.

#### **3.2. Assessment of the impact on the arable land and foreste**

Such assessment concerns the land that is used commercially. One has to determine the direct costs resulting from the change of the land use, and indirect costs related to the impacts of a motorway on the surrounding land. Such costs are estimate showing the range and scale of the changes in the state of the land use. The assessment of a motorway impact on the arable land and forests should contain information concerning the following issues:

- X. loss of a production potential of the arable land and forests that are planned to be taken under the construction of a motorway,
- XI. lowering of the production potential of the arable land and forests located within the impact area of a motorway,
- XII. limitations in the ways of the usage of the arable land from the point of view of human health and the changes in the forest stand within the impact area of a motorway,
- XIII. the need to redevelop the technical infrastructure within that area,
- XIV. the need to consolidate and exchange plots of arable land and forest

### 3.3. Assessment of the impact on the cultural heritage

Such assessment contains two vital points: a list of archaeological and historical objects located in the vicinity of a motorway and that are subject to protection, and assumptions concerning the actions directed at the salvage of the objects discovered during the construction of a motorway. The assumption of the impact of a motorway on the cultural heritage should contain the following:

- I. characteristics of the cultural values (archaeological, historical, ethnographical objects, culture 'landscape', areas that should be protected),
- II. analysis and assessment of potential hazards for and damages to the cultural heritage,
- III. assumptions for the programmes of research and studies preceding the issuance of the construction permit within the scope of: archaeological, identifying research and excavations focusing on the objects threatened to be destroyed and the studies of the cultural 'landscape',
- IV. programme of the studies aiming at the salvage of the objects and programme aiming at the securing of the cultural heritage,
- V. action limiting a negative impact of a motorway or conclusions concerning a change of the route of a motorway.

All elements of the assessment of the impact of a motorway on the environment, arable land and forests and cultural heritage should be presented in a descriptive and graphical ways. A graphical study is a map in the scale of 1:25000.

A very important factor of the assessment is the comparison of the impact on the environment presented in various studies with the zero variant (withdrawal from the construction of a motorway). It has a significant meaning in case of conflicts between the groups of interests or individuals.

The assumptions of the environmental impact (OOŚ) are conducted by experts.

An OOŚ may be used not only to determine and reduce harmful impact of a motorway but also to identify probable benefits.

In the process of designing and construction of a motorway one has to use means of the environmental protection in accordance with the assumptions of the environmental impact. In a motorway design it is necessary to assume the usage of technical solutions limiting a negative impact of a motorway on the environment when the impact of those negative factors related to the construction and use of a motorway exceed the acceptable values. It is necessary to choose proper means of the environmental protection during the work on the basic technical documentation, and the effectiveness of the chosen means can be verified using the system of the environmental monitoring. The range of the chosen system should be specified in an OOŚ and it should cover those segments of a motorway where an average daily traffic exceeds 20000 vehicles.

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