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Crossings construction as a method of animal conservation

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Abstract

The negative influence of extension of transportation system over fauna populations mainly consists in destroying their natural habitats, causing higher animal death rates (road accidents), fragmentation of sites and hindering migration as well as isolating animal populations. From the point of view of ecologists, fragmentation of animal life caused by transportation ways is a much bigger problem than collisions in which individual animals die. Big animals must migrate and contact other groups, otherwise they will not survive. That is why relevant technical solutions need to be applied, for example animal crossings of relevant overall dimensions. The paper characterizes the problem of preservation of wildlife animals in connection with extension of transportation road systems. The constantly evolving transportation infrastructure in Europe, especially in its Midwestern part, on one hand connects, making it easier for people to travel and ship goods, but on the other hand it irreversibly divides and leaves its painful impress on virgin natural areas (fragmentation of the environment). It enumerates possible types of animal crossings together with their characteristics. Some examples of underpasses, overpasses and crossing on the road surface are also presented. It also presents specificity and phases of designing engineering structures of this type, as well as the most common design errors and their influence over the use of such structures by animals. The conclusion mentions complexity of the problem of animal crossing construction, which can be of use to designers and constructors of this type of engineering structures.

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1. Introduction

While constructing motorways and express roads one should take into consideration ways of minimizing negative influence of the projects upon wildlife populations. That is because animals are extremely susceptible to changes of external conditions. Therefore one should realize that any transportation route causes irreversible changes to the natural environment (Beben and Manko 2006; Konopka 2004; Liu et al. 2008).

The increasing number of motorways and express roads in Europe, especially in its Midwestern part, shows the scope of challenge to face for road and environmental services, and for the European Union itself. Without an effective economic policy and legal changes in line with resuming responsibility for the natural environment, execution of the road system extension plan can be threatened.

A desired compliancy of the road extension project in Europe with the environmental law is sometimes impossible due to burdening of projects with the Nature 2000 program, and lack of unshakeable and univocal data about it. Respective requirements of the European Commission are often contradictory with decisions issued by the EU member countries. Other factors hindering efficiency in organization of road designing and construction are sometimes controversial protests by ecological organizations out of governmental control (Council Directive of European Community 79/409/EEC 1979 and 92/43/EEC 1992). A possible solution can be achieved through construction of environment-friendly bridge structures of which need to be considered in two categories: (i) execution of various types of bridges constructed on the basis of non-invasive technologies and of modern environment-friendly materials; (ii) structures designed as animal crossings of culverts type, ditches, tunnels and even big bridges constructed within the roadway (or over) the motorway network, in national parks, etc. (Glista et al. 2009).

The paper describes the problem of wildlife protection in connection with extension of transportation routes. The European program Nature 2000 related to the European Ecological Network has been briefly presented within. It also gives examples and characterizes possible animal crossings. It outlines specificity of designing this type of engineering structures and points at the most common errors and their influence over the use of the crossings by wild animals. Finally it characterizes the soil-steel bridge structures in the aspect of possible use of them as animal passes.

2. Characteristics and the scope of the problem

The negative influence of extension of transportation system over fauna populations mainly consists in destroying their natural habitats, causing higher animal death rates (road accidents), fragmentation of sites and hindering migration as well as isolating animal populations. The scope of the problem related to death rate and/or decreasing population of wild animals in relation to extension of road system is very big. The majority of animals are killed on local roads where traffic is slight and where animals bravely enter on the roads. Whereas in the case of roads where traffic per day is heavier – animals hardly ever cross (Jedrzejewski et al. 2006; Konopka 2004; Van Langevelde et al. 2009). Traffic of about 2 thousand vehicles per day seems to be marginal problem (single animals die merely). The highest death rate is contained within the section of 2.5–7.0 thousand vehicles per day, whereas in the case of motorways and express roads where traffic density amount at 7.0 thousand vehicles per day – the number of deadly collisions is relatively small due to the fact that such roads constitute a practically impassable barrier for the animals – they only enter in the moments of stress, frightened by a hunter or a predator. A situation when such a road separates the habitat of one species can lead to a gradual degeneration or even extinction of the species over a given area.

European and American data on animals dying on roads are highly worrying. For example in Spain the minimal number of mammals, birds, reptiles and amphibians killed in road collisions is estimated at 10 million per year, 4 million in Belgium, in Denmark: 1.5 million mammals, 3.7 million birds and 3 million amphibians. In the USA alone in 1991 there were 500 thousand collisions with deer. In Sweden yearly losses caused by collisions with elks and roe deer amount at 100 million euro – and this concerns only accidents reported to the police, therefore the real amount can probably be doubled (Cain et al. 2003; Dodd et al. 2004; Mata et al. 2005; Ng et al. 2004).

When new roads are constructed, life of the animals inhabiting given ecosystems changes dramatically, as a result of the so called cut-through effect. It appears that preservation of ecological passages is of highest

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