

---

## ROADS AND ENVIRONMENT

*Vesna Vladiković, Djordje Mitrović*  
*The Highway Institute,*  
*257 Kumodraska St., 11000 Belgrade, Yugoslavia*  
*Phone no.: + 381-11-3976-374;*  
*10 Save Tekelije St., +381-11-458- 555*

The issues of protecting the environment from the road network impact and road traffic operations are becoming more and more relevant. The problems pertinent to noise abatement and protection of biodiversity have not been resolved adequately, and yet new influences are coming into prominence. By the beginning of the eighties of the previous century the gas emissions due to operations of internal combustion engines and the consequences ensuing from polluted habitat, appearance of acid rains and dying forests have been investigated. In the last few years, a particular attention of researchers and politicians has been awarded to the study of effects resulting from the Earth's global overheating. The car-ownership increase is linked directly to the growth of pollution of air, water, and soil. In accordance with the latter, economic instruments have been elaborated meant to analyze the relationship of traffic and possibilities of control of environmental conditions as a tool in defining the directives for mitigating negative influences. This refers primarily to the legislature and tax policy which supplemented with market oriented economic assumptions may influence to a great extent onto the quality of environment. When one submits the road to analysis as the cause in making worthless the natural and constructed potentials and in endangering plant, animal and human habitats, so one is able to perceive three modes of demonstration of these influences:

1. Deterioration due to road construction;
2. Influence of the road as a facility;
3. Menace to the environment caused by roads and maintenance measures.

The road construction although carried out within the constrained timing limits might have far-reaching negative consequences which are reflected in the selection of borrow-pits and waste-dumps of building materials, as well as their repairs upon the closing-up of the building sites. Negative influence is caused by the dislocation of existing river flows which, as temporary measure, facilitates the construction of a road sections. Such a change of natural habitat, if carried out without the investigations of impacts onto the environment, might bring about the permanent alterations, most frequently in a negative sense, to the diversity of flora and fauna. Even the construction of tunnels and bridges, which are considered oecologically friendly, might bring the same result in case of non-application of adequate protection measures.

The road as a linear facility exerts the most relevant influence onto the environment compared to other building undertakings since it spreads over large and diverse areas within great expanse, cuts traditional routes and natural enteries, and moreover, alters micro climatic, hydrological, hydro-geological, social, and other characteristics within the wider road corridor.

---

Noise, vibrations, exhaust gases, wearing of pavement, tires and engines' mechanical parts, accidental emissions of hazardous materials being transported, materials for pavement maintenance (salt, gritting materials), as well as non-negligible impact ensued from road-users, are altogether factors of degradation caused by road traffic operations. These substances are blown around by winds and carried off by atmospheric precipitations over extensive areas, thus becoming more or less permanent constituent elements within the soil, surface and ground waters, and menace the existence of flora and fauna, and humans as well.

All these influences have been classified and numerically defined within the scope of Instructions for the assessment of road impact onto the environment whose preparation started in 1990 at the initiative of the Federation of road organizations and The World Bank, which is relying on AECOTEM study prepared within TEM project. The study thereof took into account oecological aspects together with techno-economic evaluation for road alignment variants and furthermore proposed a branch of oecological factors which should be considered and evaluated in the assessment of influence exerted by roads on the environment:

1. Air-pollution
  - 1.1. Influence upon people
  - 2.2. Influence on climate
2. Water
  - 2.1. Hydrological system
  - 2.2. Water supply
3. Soil
  - 3.1. Uninhabited areas
  - 3.2. Settlements
4. Biotic factors
  - 4.1. Economic function
  - 4.2. Oecosystems, flora, fauna
  - 4.3. Influence upon climate - micro climatic changes
5. People's health and sociological factors
  - 5.1. Health issues
  - 5.2. Influence on traffic
  - 5.3. Recreational function
  - 5.4. Sociological and other influences
6. Landscape
7. Noise and vibrations
  - 7.1. No.of individuals exposed to unacceptable noise level
  - 7.2. Vibrations which damage the structures
8. Protection of cultural-historical monuments
9. Exploitation of natural resources
  - 9.1. Energy consumption
  - 9.2. Influence of construction on the degradation of locations with natural building materials reserves

Within the framework of the world, methodology and activities pertaining to the assessment of influences exerted upon the environment were coming into prominence in the most developed countries of Western and Northern Europe, USA, and Japan by the

---

beginning of the seventies. At the same time the laws were being adopted along with conventions and recommendations meant to provide assistance to planners and designers in their pioneering job. In the methodological approach to investigations an important position are awarded to concepts "Strategic environmental impact assessment" (SEIA) and "Environmental impact assessment" (EIA). These two concepts differentiate on the basis that SEIA contains global, general targets and recommendations, system or group of activities being applied on the vast, national, i.e. global level, whereas EIA refers to single actions and projects being of local and regional relevance. According to the document "Recommendations and systems for EIA" of UN Economic Commission for Europe from 1991, SEIA refers to the integration of EIA into the planning, investment decision-making, application of uniform terminology, international cooperation, observation and other mechanisms meant for the identification of impacts, operations open to the public and information publishing, testing of alternative solutions by including also the scenario without

the structure's construction (zero condition), identification of measures for mitigation of impacts, taking into account the activities within single phases of a project, recognition of perplexities and lacks of knowledge, and general overview of conditions by including visual presentation.

Activities of The Highway Institute in the field of "roads & environment". This establishment is involved since 1994 in the research of the environment and its perils ensued from road construction and operation. Until nowadays a series of studies were prepared whereby preliminary and detailed analyses were presented as regards the environmental impact caused by roads. In such a way the following routes have been elaborated:

1. Trans-Yugoslav motorway, section Batajnica-Dobanovci-Bubanj Potok,
2. Motorway Nis - Dimitrovgrad,
3. Motorway Nis - Prishtina,
4. Motorway Pojate - Preljina,
5. Motorway Leskovac - border with F.Y.R.Macedonia,
6. By-pass of Kragujevac,
7. By-pass of Podgorica,
8. Motorway Belgrade - South Adriatic.

The analyses of existing conditions were carried out on the basis of existing documentation - within the scope of hydrometeorology, pedology, demography and own investigations - geology, hydrogeology and water-pollution. Investigations as regards air-pollution and noise have not been carried out due to the lack of adequate equipment. Forecasts of impacts were performed by our own software tools, developed on the basis foreign (prevalingly German) experience. Data attained in such a way represent good foundation for the follow-up of environmental conditions within the road-route corridors.

We developed, also, in our Institute the data base on destruction of roads and bridges, during the NATO bombing of Serbia. NATO acted upon 48 locations of roads, bridges and streets in the Republic of Serbia. The consequences of warring actions on main and regional road networks have been recorded, and on 39 spots along 20 road stretches traffic was made difficult.

This data base is very important for the future activities of planing and revitalization of roads' and bridges' network.