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ENVIRONMENTAL ISSUES RELATED TO CONSTRUCTION OF MOTORWAYS IN POLAND AND IN CROATIA

PROBLEMATIKA ZAŠTITE OKOLIŠA KOJA SE ODNOSI NA IZGRADNJU AUTOCESTA U POLJSKOJ I HRVATSKOJ

ABSTRACT

The motorway construction process in Europe is still in its implementation phase. The necessity of dynamic development of the national road infrastructure is also confirmed by the European statistical data, which presents the dynamics of the increasing role of the road transport in the passenger transport in relation to the European Union countries. The Polish road infrastructure still requires high financial inputs which could support and ensure appropriate standards of the existing networks, and also in order to meet the market demands, which result from the increased exchange of goods and the passenger transport. It is necessary to systematically improve the technical conditions of the Polish network of state roads, in order to eliminate its basic limitations, as well as to allow for its development. The motorway construction process in Poland has entered the successive stage. In spite of the large scale of commenced investments, the Polish network of state roads, including motorways and expressways is not internally coherent and insufficiently pervious. The continuation of investment activities on the main lines of the roads in Poland, is the challenge for the near future. In the states, which have been intensively modernised, such as Poland and Croatia, considerably acceleration of the development of such roads may be noticed. In Poland, the National Spatial Development Strategy 2030 was adopted by the Governmental Resolution dated December 13, 2011. It specified the necessity to "improve the territorial accessibility in different spatial scales, through the development of the transport infrastructure", implemented in the conditions of sustainable development. However, the line investments of this type have their impacts on modifications in the agricultural space and the natural environment. The paper will present different aspects of impacts of road investments on soils, water and the landscape, and on the land use ways. Documents required for the process of protection and the environmental protection methods, applied in the process of planning locations and implementation of motorways construction in Poland and in Croatia will be also discussed.

Keywords: *construction of motorways, environmental protection, environmental impact assessment*

SAŽETAK

Proces izgradnje autocesta u Europi je još uvijek u tijeku. Nužnost dinamičkog razvoja nacionalne cestovne infrastrukture potvrđena je također europskim statistikama, odražavajući rast udjela cestovnog prometa i prijevoza putnika i tereta na području EU. Poljska cestovna infrastruktura i dalje zahtijeva velike izdatke za razvoj, kako bi se osiguralo odgovarajuće standarde postojeće mreže kako bi mogli zadovoljiti potrebe tržišta, što je rezultiralo s povećanjem prometa robe i

stalnom porastu putničkog prometa. Potreba za sustavno poboljšanje tehničkog stanje poljske cestovne mreže kako bi se otklonila osnovna ograničenja i njeno širenje. Proces izgradnje autocesta u Poljskoj ulazi u sljedeću fazu. Unatoč velikim investicijama, poljska mreža državnih cesta, uključujući autoceste i brze ceste, i dalje nedosljedna i nedovoljno propusna. Nastavak investicijske aktivnosti na glavnim prometnicama u Poljskoj, je izazov u narednim godinama. U zemljama koje se intenzivno moderniziraju, uključujući Poljsku i Hrvatsku dolazi do značajnog ubrzanja razvoja ove vrste cesta. U Poljskoj je izrađena Nacionalni koncept prostornog razvoja zemlje i usvojen odlukom Vlade dana 13. prosinca 2011. godine gdje je ukazano na potrebu "poboljšanja teritorijalne dostupnosti zemlje u različitim prostornim skalama kroz razvoj transportne infrastrukture" i provodi se u uvjetima ravnomjernog razvoja. Međutim, takve linijske investicije u infrastrukturu nisu bez utjecaja na izmjenu prostorne organizacije poljoprivrednog prostora i prirodnog okruženja. U ovoj studija će biti predstavljeni aspekti utjecaja cestovnih ulaganja, između ostalog, na tlo, vodu i krajolik i način korištenja zemljišta. Biti će obavljena rasprava o dokumentima potrebnim za proces zaštite i načina zaštite okoliša u procesu planiranja lokacija i izgradnje autocesta u Poljskoj i Hrvatskoj.

Ključne riječi: *izgradnja autocesta, zaštita okoliša, procjena utjecaja zahvata na okoliš.*

1. Introduction

The program of construction of the road infrastructure in Poland, mainly motorways and expressways, has been implemented in the frames of successive *Programmes.* At present, works concerning the implementation of the National Road Construction Programme for the years 2011-2015 are at the final stage. Similarly to the past programmes, this document also specifies objectives and priorities concerning new investments, as well as the maintenance of good technical conditions of the existing road network. It also specifies the level and sources of required financial inputs (to 2003), and determines the total amount of investment expenditures within the National Road Fund, at the level of approx. 92.8 billion zlotys, and, additional 50 million zlotys for the maintenance of the existing infrastructures.

Implementation and development of the Polish national roads should not be considered separately from other types of transport and international duties. The Trans-European Transport Network (TEN-T) is one of the basic components of the European Union transport policy, which assumes the integration of different types of means of transport. Within the TEN-T Network the Member States are obliged to construct the base TEN-T network to 2030 and the complex TEN-T Network to 2050. The complete implementation of the Programme is connected with the efficient planning of road connections, as the coherent components of the transport system of the Member States, which are to ensure the effective connections with inter-modal terminals of the TEN-T Network (Fig. 1).

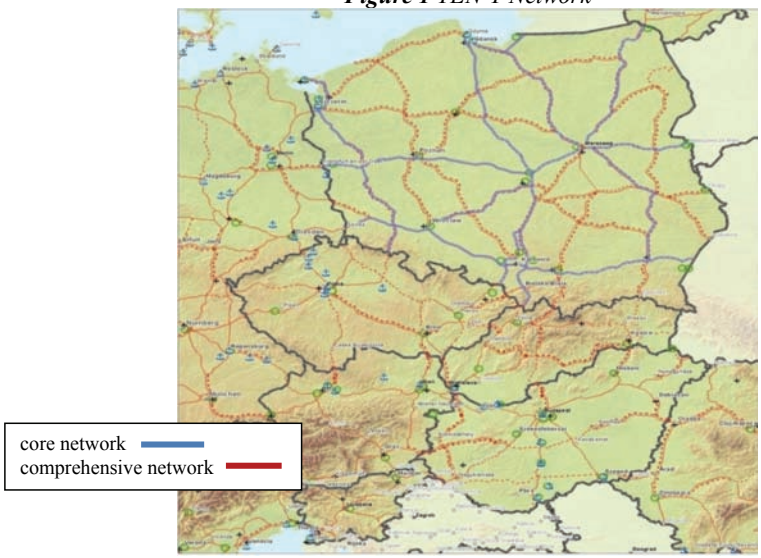
The total length of the TEN-T Network TEN-T in Poland equals to approx.7,400 km, including approx. 3,890 km of the base network. Two corridors of the base TEN-T network have been located in Poland, which include the most important transport routes, support long-distance services and aim at the improvement of trans-boundary connections in the European Union. The corridors of the base network cross at least two frontiers and, if possible, they support at least three types of transport. In the case of Poland these corridors are: the Baltic Sea - the Adriatic Sea and the North Sea - the Baltic Sea.

In the case of Croatia it is the Mediterranean Corridor, which connects the Iberia Peninsula with the Hungarian-Ukrainian frontier. It runs along the Mediterranean coast of Spain and France, crosses Alps in the eastern direction, through northern Italy and from the Adriatic coast of Slovenia and Croatia, it directs to Hungary.

One of the most important innovations of the new TEN-T guidelines is the introduction of nine implementation corridors for the base network. They are to support the development of its network. Each of the corridors must support three types of transport, three states and two trans-boundary sections.

Following the EU policy (The White Book on Transport to 2050) , the TEN-T Network is the basic tool of the transport policy, which support the implementation of the general objective, which is the reduction of emission by transport by 60% to 2050. All TEN-T projects must be assessed in terms of environmental impacts, before they are qualified to be finances by the EU funds. For this purpose they must meet all requirements in the field of planning and sustainable development, which are specified in the EU regulations (The Note of the European Commission) concerning environmental protection.

Figure 1 *TEN-T Network*



Source: Ministry of Infrastructure and Development

Development of road transport is connected with the necessity to acquire large areas and it generates the relatively high external costs related to the environmental protection (load by noises and emission). Due to the required transport reliability, the development of national roads should be considered as complimentary for other branches of transport, in particular the railway transport.
According to the currently promoted idea of sustainable development, evaluation of implementation of road systems should be performed comprehensively. It is very difficult to design the optimum transport network system, in particular, the system of motorway, without negative environmental impacts. Contemporary transport systems occupy increasing areas, they influence the changes in utilisation of lands covered by roads, as well as surrounding areas, they destroy and pollute natural habitats and influence their fragmentation.

2. Implementation of the road infrastructure in Poland

According to data of the Ministry of Infrastructure and Development of 2014, Poland is obliged to construct the base TEN-T Network to 203, and the complex network to 2050. Construction of the coherent network of motorways and express ways will allow to increase the interregional coherence and will contribute to the complete utilisation of the economic potential of the country. The dynamic increase of the road freight and passenger and the still insufficient road network in Poland, stimulate the necessity to finalise the National Road Construction Programme.
Following the Eurostat data of 2012, the automobile transport, which share in freight and passenger transport in Poland equals to 85% and 82%, respectively, is higher than the European mean and it continues to grow.

Although the length of motorways was increased from 535 km in 2004 to 1495 km in 2013, the extent of investments undertaken in Poland in the field of the development of the national road network, including motorways and expressways, is incoherent and characterised by the insufficient traffic capacity. Continuation of investment activity on the basic routes of the national roads, and in particular, assurance connections between large agglomerations, as well as contact points with other forms of transport, such as harbours, airports, inter-modal terminals, is the challenge for the coming years. According to data from the General Directorate for National Roads and Motorways (GDDKiA):

— 835.3 km of motorways,
— 955 km of expressways,
— 212.9 km bypass roads,
— 687.8 km important reconstructions and enhancements of the national roads

were constructed by the end of 2013 (Fig.2).

Figure 2 *The network of motorways and expressways (constructed or under construction) as on December 31,2014*

Source: GDDKiA

The large part of the network of motorways, presented in Fig.1, has been constructed or is under construction. Construction of the complete network of motorways requires additional works. The situation concerning expressways is different; at present only two expressways create the important routes.

3. Implementation of the road infrastructure in Croatia

In Croatia, since 1997, i.e. since the period of the economic stabilisation, the highest priority has been assigned to the process of construction of motorways. Since 1999 the Strategy of Development of Road in the Republic of Croatia has been the first, long-term plan, which assumed the length of the motorway network equal to 1635 km (Fig. 3).

Figure 3 *The network of motorways in Croatia*

Source http://podroze.onet.pl/abc/chorwacja-oplaty-za-autostrady/1fvd1?utm_source=google&utm_medium=cpc&utm_campaign=allonet1_turystykasem_dsa

The planned road network in Croatia is to connect the European, pan-European and national corridors. The completion of construction of the Zagreb - Split motorway (in 2005), considered as one of the most important investments in Croatia, was essential. Construction of the longest Croatian motorway was highly expensive and technically complex; this resulted from technical issues, mainly related to specific features of the terrain crossed by the motorway. Implementation of this investment, which is unique in Europe, required construction of 292 road structures, such as tunnels, bridges, viaducts, overhead and underground passages, footbridges and green bridges. Following the Croatian Motorways 2005 as much as 18.6% or this motorway consist of different road structures (Stojan & Ostojić, 2007).

4. Mechanisms of implementation of the environmental protection issues in construction of the transport infrastructure in Poland

According to the Environmental Protection Law of 2001 and the ordinance of the Council of Ministers of November 9, 2004 on determination of types of actions which may highly impact the environment and on detail conditions related to qualification of actions to prepare the environmental impact assessment report investments concerning construction of a motorway are classified into the, so-called, 1st group of investments, which may have high impacts on the environment; it is obligatory to make the environmental impact assessment report for such investments, in the field specified in Art.52 of the Environmental Protection Law.
Due to the necessity of making the environmental impact assessment (EIA) report for this type of investments, it is required to perform the complete environmental impact assessment procedure, which also includes actions involving the society, performed according to rules specified in the environmental protection law.

In the case of large and complex analysis, such as construction of a motorway, it is difficult to discuss the layout of the report, which would cover all issues. According to the Polish law, the environmental impact assessment report should include:

1. description of the planned investment, in particular:
   - characteristics of the entire investment,
   - conditions of use of the terrain at the stage of implementation and exploitation,
   - main characteristic features of production processes,
   - assumed levels of emission, resulting from operations of the planned investment,
2. description of the natural elements, covered by the extent of the assumed impacts of the planned investment:
   - description of existing (in neighbouring areas or directly adjoining the area of the planned investment) monuments, protected by legal regulations concerning the protection and the maintenance of monuments,
3. description of analysed variants, including the most environmentally advantageous variant, including the justification,
4. specification of the assumed environmental impacts of the analysed variants, including the case of serious industrial breakdowns, and the possible, trans-boundary environmental impacts,
5. analysis and assessment of possible threats and damages of monuments protected by legal regulations concerning the protection and the maintenance of monuments, in particular, archaeological monuments, located within the area of the planned investment,
6. justification of the variant, selected by the applicant, with the specification of its environmental impacts, in particular:
   - humans, animals, crops, water and the air,
   - the terrain surface, with consideration of mass movements, the climate and the landscape,
   - material goods,
   - monuments and the cultural landscape, covered by the existing documentation, in particular, by the register of monuments or inventory of monuments,
7. description of the assumed, important environmental impacts of the planned investment, including direct, indirect, secondary, cumulated, short-, medium- and long-term, permanent and temporary impacts on the environment,
8. description of actions aiming at prevention, limitation or natural compensation of negative impacts on the environment,
9. discussion, whether in the case of the planned investment it is necessary to establish an area of the limited use, in terms of the destination of lands, technical requirements concerning constructed structures and ways of utilisation of those structures,
10. determination of the assumed environmental impacts of the analysed variants, in the case of a serious industrial breakdown, as well as possible, trans-boundary environmental impacts,
11. maps for investments, which may have high impacts on the environment:
    - roads and railway lines - at the scale of 1:10,000 or larger – for investments located within areas protected by the Act of 2004 r. on the protection of the nature and within buffer zones of such areas - at the scale of 1:25,000 or larger – for investments located in other areas,
    - overhead power lines,
    - installations for transport of oil, petroleum products, chemicals or gases,
12. analysis of possible social conflicts,
13. presentation of proposals concerning the monitoring of environmental impacts of the planned investment, at the stage of its construction and exploitation,
14. abstract in a non-specialist language.

Motorways interfere the existing space; in Poland it is mostly the agricultural space (Fig. 4). This infrastructure creates problems in the field of land management, changes in the land use, it destroys

the environmental structure, including the landscape. Investigations concerning compensations of landscape losses are also performed in the frames of the EIA.

Figure 4 *Fragments of S8 and S5 expressways in Poland*

Source http://conadrogach.pl/zdjecia

5. Mechanisms of implementation of the environmental protection issues in construction of the transport infrastructure in Croatia

The act „Law on spatial planning and designing" has been existing in Croatia since 1980. Following the legislative provisions, the Environmental Impact Assessment (EIA) procedure should be performed prior to the issue of location and building permits. Details of this requirement are specified in "The rule of development of the Study of the Environmental Impact Assessment". Considering that the European Community in 1985 published the Directive with the guidelines concerning the implementation of the EIA in the Member States, Croatia was one of the first European countries, which introduced environmental impact assessment into their legislation. At the same time, when the binding regulations were issued, preparatory works for the construction of motorways were started. At the time of implementation of the EIA, new proposals and conclusions appeared, which were directed on the possibly best integration of roads and the natural environment. It was also stressed that technical conditions, which are considered during the EIA may be included into the design and documentation. This mainly concerned changes in road locations and their adaptation to particular features and values of given areas or to the existing facilities. The issue of the road location with respect to other spatial elements is being solved at the stage of making decisions concerning the road location, using the spatial management plan. However, the environmental impact assessment sometimes proposes better location solutions than those, which are included in the spatial plan. In such cases those plans are modified to the benefit of the EIA. When the road location is decided and presented in planning documents, the assessment of the road structures should be performed according to binding regulations (The national and regional spatial management plans, the General urban management plan).

The main task, for which the EIA was performed, was to find preventing solutions and methods of environmental protection preceding the construction of the road investment. However, in the case of the Croatian solutions, more advantageous locations of motorways were analysed, what proves that the EIA entered the spatial planning sphere.

Amendments of the spatial planning regulations, which were started at the time when designs of the motorway construction were also developed, resulted in consideration of the EIA as the planning tool. Since 2004 only environmental impacts, which are defined by the spatial planning, may be assessed (without consideration of alternative solutions).

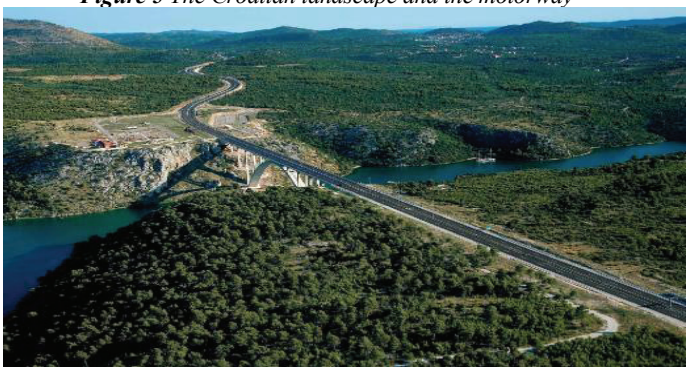
At present, the EIA process does not influence the possible strategic decisions concerning the optimum route location. All above issues lead to the statement, that the EIA is included too late in the legal procedure of the spatial planning. In order to avoid negative effects, the EIA should take place before the final route location in the spatial plan. It may be performed at the same time or before the construction planning process, but it must become the part of the strategic assessment of the environmental impact.

The EIA procedure turned to be the effective tool of the preventive protection of the environment. The EIA development should be continued and it should point to new organisational forms, ways of co-operation, as well as implementation tools, in the frames of existing legal regulations, in particular with respect to the spatial planning. This will support more efficient environmental protection (Stojan & Ostojić, 2007).

An important component of the EIA procedures is the presentation of plans, which are compliant with the rules of the sustainable development, promoted by the EU in Council Directive 85/337/EEC. Positive international experiences prove that the EIA should be implemented at the earliest, preparatory stage, when the Strategy of the Spatial Planning and the Plan are being developed. At this phase it is possible to consider the complex economic, energy-related, infrastructural, spatial and other issues in the context of the environmental protection.

The environmental protection issues should be considered since the stage of preparation of the designing documentation, after defining the route location, as early as at the stage of the spatial planning. The EIA study is developed at the same time when the conceptual design is developed. The process of assessment is performed basing on conceptual solutions, which are usually presented at the scale of l :5,000. When the study is developed and the route location is approved, the following designs, related to the environmental protection, are attached to the conceptual, the basic and the constructions designs of the motorway construction: the landscape planning design, the noise protection design, the hydrotechnical design, the design of repairing culverts and dykes, the bio-technical design of repairing the slopes located by the motorway, the designing of construction of a green bridge (Stojan & Ostojić, 2007). The landscape planning designs for motorways are highly important (Sipes, 2001), even if the higher road landscape cannot be sufficiently protected due to the limited with of the purchased zone. Those designs include the following protection categories: green management of crowns of culverts and entrances to tunnels, protection of slopes against erosion, renovation of edges of forests, landscape planning of green bridges and passages for animals, visual adaptation of noise barriers, management of minerals, repairs of damaged maneuvering yards, and, in particular, service facilities (rest platforms), according to the natural and cultural landscape features (Stojan & Ostojić, 2007).

Figure 5 *The Croatian landscape and the motorway*



Source http://www.kierunekchorwacja.pl/autostrady-w-chorwacji-mapa-sieci

Results and concepts concerning the temporary monitoring of the terrain, waters, the air, flora and fauna should support the stage of planning, spatial-and-technical studies, the EIA assessment for new sections of a motorway and the determination of standards of the designing phase of planning. However, it should be stressed that investigations of some designed routes are still insufficient. This results, first of all, from the rapid intensity of construction and from the high importance of the motorway infrastructure.

In terms of ecology we cannot avoid consideration, in the design development phase, of protection and planning the landscape surrounding the motorway.

6. Final conclusions and remarks

The EU Member States, which develop the road transportation systems, must consider the environmental protection issues with high priorities. Experiences and the analysis of the Polish and Croatian solutions in this field prove, that implementation of large investments, such as construction of motorways, integrates the design preparation processes, construction of roads and the spatial planning system. The following issues should be addressed at particular stages of implementation of such investments in both countries:

1. in the field of spatial planning - the relatively slow process of creation of plans and low possibilities to modify them, the insufficient level of definition of sections, which require protection;
2. in the field of law - the high amount of regulations concerning implementation of investments, is particular, the construction of roads, the widely considered environmental protection and participation of the society;
3. in the field of the EIA - studies are being developed basing on given solutions, i.e. it is not possible to influence the existing solution (Croatia) and long procedures of modifications of the Polish solutions, often lack of adaptation of the designing scale to the environmental protection rules, insufficient investigations of areas, which are to be crossed by the planned investments (issues related to data, information and data availability);
4. in the field of the design implementation - unclear specification of the environmental protection means, different ways of implementation of protection - means of protection defined in the documentation impossible for the practical implementation (e.g. the issue of land acquisition from individuals for those purposes), complex social relations („a group property", „a group profit ") in the reality of the market economy.

Concluding, in the process of the motorway construction, well known and valuable natural sites should be considered, such as habitats, karst areas, water bodies and other area, which are to be the subject of an interdisciplinary assessment with the use of all available information. The issue of adequacy and sufficiency of protection actions in planning and construction of the road infrastructure and in the general planning, is an integral elements of the social development in terms of the sustainable development. The dynamic construction of roads in both countries is highly positive in terms of the economic and infrastructural development, however, it limits some research and implementation works performed with respect to the environmental protection. On the other hand it should be considered that some special categories exist, which are not sufficiently integrated with the plan and the design creation system, such as: the valuable landscape, habitats, specified species of fauna and flora. Although the assessment of the quality of landscape elements has been introduce to the practical creation of road transportation projects in the second half of the 20th century, at the stage of its preparation the importance of landscape elements is minimised.

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