

ENVIRONMENTAL INTEGRATED EVALUATION FOR INFRASTRUCTURE PROJECTS FROM THE SUSTAINABLE DEVELOPMENT PERSPECTIVE IN ROMANIA

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ABSTRACT

The paper will present the integrated method of evaluation for the infrastructure projects, from the environmental point of view. In Romania the environmental impact assessment procedure, established as mandatory by the national legislation, includes analysis on all the environmental factors, with estimations and mitigation measures for keeping the sustainability during the whole existence of the project, from the designing phase up to the operation stage, as the present paper will try to describe. During this procedure special evaluations are established for impacts on biodiversity and human communities, in order to ensure balance between the normal economic development and preserving natural habitats.

A special chapter will treat environmental monitoring, a very important aspect in evaluating the environmental impact of infrastructure projects, with a significant influence on wildlife protection and economic sustainability.

Another vital issue in environmental evaluations is the impact on biodiversity networks, such as NATURA 2000 and RAMSAR sites, this is why a special part of the paper will be focused on showing the methods used for evaluating the impact on these kind of protected areas.

In order to show both the efficiency and the weak points of the actual environmental impact assessment procedure, examples of environmental evaluations for infrastructure projects – building of new roads and rehabilitation of existing ones – will be presented.

1. INTRODUCTION

In Romania the environmental impact assessment procedure, established as mandatory by the national legislation, includes analysis on all the environmental factors, with estimations and mitigation measures for keeping the sustainability during the whole existence of the project, from the designing phase up to the operation stage.

During this procedure special evaluations are established for impacts on biodiversity and human communities, in order to ensure balance between the normal economic development and preserving natural habitats.

A special part of this integrated procedure is the one treating the natural protected areas, such as European Ecological Sites included in NATURA 2000 Network and the wetland of RAMSAR Convention.

The present paper wants to present all the aspects included in the Romanian projects after aligning the environmental procedure with the European Directives, in order to give a

complete image on the major changes in Romanian mentality for environmental protection, especially in infrastructure projects development.

2. PRESENTATION OF THE LEGAL PROCEDURE OF INTEGRATED ENVIRONMENTAL MANAGEMENT

Along with the European Union integration of Romania, the environmental protection has evolved in an ascendant path and has brought many changes both for the environmental authorities and for the road designers and constructors.

Since 2005, when the general environment law has been approved, the environmental procedure has suffered multiple revisions and changes, which were meant to implement an integrated manner for evaluating the infrastructure projects impact on the environmental components and to support a sustainable development of this kind of projects.

Most of those changes represented the basis of the actual improvements that changed a simple procedure of environmental evaluation into an integrated environmental procedure.

The present integrated procedure for environmental impact assessment is a step by step process, with a realistic view on the complexity of each project. The correct evaluation of each infrastructure project has been the goal of all the regulations and methodologies approved in Romania and the present procedure has come closer than ever to achieving it.

The first step is the initial evaluation, based on the first project notification, the environmental authorities analyze the potential impact of the project and take into consideration two cases: reduced impact or significant impact.

In the first case the procedure is finalized with a document issued by the environmental authorities in which the reduced impact is mentioned and the project can follow its course. If the impact of the project is significant, the procedure will be completed with analysis and assessment phases.

During those two phases, an environmental impact assessment study is done, in order to include all the aspects that can become in time a threat for the environmental factors. The most important aspects taken into consideration are biodiversity conservation and human health protection, because these are the sensitive issues in Romania at this moment. Of course the other environmental factors are evaluated as well [1].

After implementing the European Ecological Network NATURA 2000, in Romania there has been an important issue dealing with the impact of the infrastructure projects on these protected areas, as the experience and strategies lacked.

In Romania there are 108 Special Protection Areas, based on the Birds Directive, which represent 11,89% of the Romanian territory and 273 Special Areas for Conservation, based on the Habitats Directive, which represent 13,21% of the Romanian territory [2]. Complementary to those, Romania has also National Parks, Natural Protected Areas and sites declared Natural Monuments. Also at international level, the most important sites are the ones included in the Convention of wetlands of international importance – RAMSAR Sites, that has been adopted by Romania since 1991.

The right measures for protection and conservation, had to be adopted from the sustainable development point of view. This is why the environmental impact assessment

procedure has been updated gradually, until it has incorporated all the important elements, such as adequate assessment for natural protected areas and mandatory monitoring throughout the operational phase.

The present procedure has also included in the assessment phase the evaluation of the impact on NATURA 2000 sites, in order to evaluate the impact on the protected species and habitats.

The environmental impact assessment procedure has always been very important in the project development process, so it has brought important changes in road and bridges designing and executing, as various alignment alternatives and different technical solutions have been studied for complying with environmental demands, as it will be shown in a separate chapter of this paper.

3. MONITORING OF ENVIRONMENTAL FACTORS DURING THE PROJECT PHASES

Monitoring of environmental factors is done nationally by the National Environmental Protection Agency, which develops monthly and annual reports on environmental factors, based on those reports protection strategies are established. For each environmental factor, a network of stations for measurement is established in order to have comparable dates. Probably the best developed monitoring networks are the one for air quality and biodiversity, as those can raise the main problems for environment.

Based on the Sustainable Development Strategy, National and Regional Environmental Action Plans have been elaborated and are being followed, to ensure achieving the national objectives for environment.

A review of the National Environmental Action Plan agreed at national level for 2007-2013, concluded that road transport is responsible for 20% of cases exceeded the maximum permitted levels of pollutants due to inadequate road infrastructure [3].

Also the national Sustainable Development Strategy's main objective for the 2013 – 2030 stage is constructing sustainable roads, roads that prove their efficiency both on an socio-economical and environmental levels [4].

This is why all the infrastructure projects are evaluated and during the environmental impact assessment phase an environmental management plan is put in place. It has to cover both the construction and operation periods and it represents the connection element between the designer and the constructor.

The environmental management plan stipulates all the operative measures to be carried on during the execution phase and also the environmental factors that will be monitored during the operational period.

The environmental management plan has at its basis both the environmental impact assessment and the monthly environmental reports issued by the Environmental Agencies. Sometimes the environmental reports identify the impact of high traffic in the cities and recommend building alternative ways for heavy traffic, to prevent significant impact on the human health. In other cases it is the condition of the road itself that leads to an increasing of pollutant emissions [5]. This is why analyzing the Environmental Agencies reports is one of the most important aspects in developing an infrastructure project.

The main parts of an environmental management plan are the description of the technical solution approved by the authorities, the protection measures for the execution and operation stages and the monitoring aspects for execution, carried out by the environmental specialist hired by the constructor, and monitoring aspects for operational stage, when the project developer along with the environmental authorities comply the monitoring program approved.

The most important measures for the execution period are the operative ones, including here the correct wastes management, the right solution for water alimentation of the organization site and for sewage, the adequate location of the organizational site, material deposits and concrete plants, in order to avoid the near vicinity of water resources and protected areas.

A critical stage is the one of ecological rehabilitation, that must follow the execution period and which must ensure the bringing at the initial state of all the surfaces occupied temporarily.

For the operational phase, the environmental management plan will take into consideration all the aspects mentioned in the environmental impacts assessment and approved by the Environmental Agency, such as the intervals of monitoring, the sensitive location on the route that must be monitored more often than the others, also an important aspect is identifying the environmental factors that can pose significant threats.

The most important effect of monitoring is evaluating the efficiency of the protection measures and recommending only the measures that have proven their use.

4. EVALUATION ON NATURAL PRESERVE SITES IMPACT

In the adequate assessment procedure, four procedural steps have been established, in order to correlate it with the environmental impact assessment procedure, so that this procedure can be integrated easily into the procedure for obtaining environmental approval, but also have a separate course if necessary.

Adequate assessment procedure comprises the following procedural steps that take place in chronological order: classification phase, adequate assessment study phase, alternative solutions phase and compensatory measures phase, when alternative solutions can not reduce the negative impact to a supportable level [6].

In the classification phase, the environmental protection authority examines and decides whether the project of civil engineering infrastructure, alone or in combination with other projects, can have a significant negative impact on protected natural area, in which case a proper evaluation for the project will be made.

In order to start the procedure for obtaining the NATURA 2000 Permit, the project developer must submit to the competent environmental authority, a report whose content is established by law.

At the end of this phase, the environmental protection authority may issue the NATURA 2000 Permit, considering the projects impact on the protected area is minor, or decide to continue the procedure by following the next procedural phase.

If a study of adequate assessment will be elaborated, project developer is required to perform this study, by employing a person attested by the Ministry of Environment and Forests, according with the Romanian legislation.

The adequate assessment study will have legal content specified in regulations and legislative framework and will take into account important assessment aspects such as: identifying and evaluating all types of negative impact, forecasting the extent of cumulative impact identified and its significance, the proposed mitigation measures and establishing compensatory measures to limit the impact.

This phase ends either issuing the NATURA 2000 Permit, or by entering the next phase – analysis of alternatives.

The alternative solutions phase is intended to find technical solutions that can reduce environmental impact to an acceptable level for species and habitats protected within the protected area.

During this phase a search for alternative solutions will be made, such as alternative locations, extensive route optimization for roads in order to reduce direct impact on the protected area. It is considered alternative solution also the use of more efficient technologies or implementing lower emissions techniques.

After going through this phase, the competent authority for environmental protection decides to issue the Natura 2000 Permit or to complete the procedure with the compensatory measures phase.

Last stage of the study is dedicated to proper assessment of compensatory measures. Responsible environmental authority requests to project developer additional information which will be included in the study of adequate assessment, based on the best scientific data from field.

This phase is the "ultimate solution" to implement a project that has significant negative impact on a protected natural area of European interest and it involves ecosystems relocation and habitat reconstruction.

At the end of this phase carrying out the project is decided, with the inclusion of compensatory measures, or reject the application for obtaining the Natura 2000 Permit.

5. IMPACT OF THE INTEGRATED ENVIRONMENTAL EVALUATION PROCEDURE ON THE INFRASTRUCTURE PROJECTS

The integrated environmental evaluation procedure has brought important changes, not only in the mentality of the experts working in the road designing and execution, but also in the technical solutions used.

The first impact has been in developing new projects, as it was no longer enough to find an alignment and build the road, but it was required for that alignment to fulfill minimum environmental conditions such as: protection of the human health all through the execution of the project and estimating the impact for the operation period, limitation of the impact on natural protected areas, with a special attention on the NATURA 2000 Networks and the RAMSAR Sites, using materials and equipments that do not pose a threat to environmental factors and so on.

One of the most important aspects of evolution in Romania was the mandatory requirement to have an environmental specialist both in the designing and execution phases. The environmental specialist is in charge with including the correct protection and

conservation measures, even when the project has not an official environmental impact assessment study.

Also a set of protection measures has been implemented and today most of the designers study them since the feasibility stage, those include sound absorbing panels made from natural material or using vegetation to cover the ones made from conventional materials, studies on habitat fragmentation and species affected by the project, measures of protection adequate to each specie affected and a better dialog with the environmental authorities.

One of the first cases of integrated environmental evaluation was the Motorway Brasov – Fagaras, situated in the central part of Romania and a part of the Brasov – Oradea Motorway. Initially the alignment of the motorway affected both a natural preserved area – Dumbravita Fisheries Complex (Figure 1) – and two economical activities, and due to the environmental analysis an important element rose: the natural preserved area was integrated in the European Ecological Network NATURA 2000, as a special protection area for several species of birds, and was one of the five RAMSAR sites in Romania [7].

As the environmental impact assessment study has been elaborated before 2007, it lacked the important elements to limit and reduce the impact on this area, also after a difficult period for the economical activities in the area, choosing the protected area over the social impact, would have been a wrong decision.

This is why a revision of the environmental impact assessment study has been performed, with including all the available information for Dumbravita area and for the human impact of the project. The study has identified also an important impact on the brown bear route, as the project crossed three routes used by this specie.

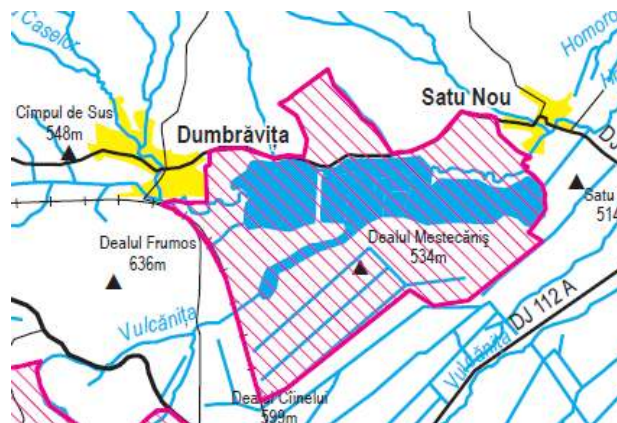


Fig. 1 – Dumbravita NATURA 2000 protected area [2]

A dialog between environmental specialists and designers took place and the project suffered important changes, concerning the alignment and the environmental protection works.

The project sent to the developer, had a major alignment optimization at the beginning of the route, that lead to non-direct impact on the Dumbravita area and also maintaining the economical activities, as they were passed by. In order to ensure a reduced indirect impact on the protected area, due to the emissions of pollutants from the vehicles using the motorway, in the near vicinity of the area, four meters sound absorbing panel made from wood and covered with vegetation were included in the project. Also for the brown bear migratory paths, three special animal passageways were designed and included in the final project [7].

Along with these measures an environmental monitoring plan has been established in order to ensure adequate measures for protection and conservation of the natural preserved areas and migratory paths.

Another example is the rehabilitation of the national road no. 19, between the towns of Oradea and Satu Mare (Figure 2), a road that crosses three counties and has a special importance for the connections in West of the country. This project is the first existing road to include special measures of protection for amphibians and represents an important case for environmental evolution in Romania, as it brought solutions for amphibians protection that are required today as mandatory in the tender offers for new infrastructure projects [8].



Fig. 2 – National Road no. 19 route

For this project the environmental authorities issued the environmental permit, which required special conditions, as the existing road crosses NATURA 2000 protected area, therefore the following measures for protecting the species and the habitat were established: plantation of trees for the sectors on which special protection areas are in the near vicinity of the road, designing of three culverts, in order to allow the transit of the amphibian and including protection guardrails, in order to prevent the access of amphibians on the road.

In order to include all these requirements an evaluation process of the Environmental Permit conditions has been conducted, following several phases, presented briefly below:

- Preliminary Analysis of the location and NATURA 2000 protected areas
- Identifying the project impact on NATURA 2000 areas
- Elaboration of an Evaluation Report on the measures that should be included in the next phase of designing
- Environmental Management Plan

As a result of this evaluation, the NATURA 2000 protected areas affected by the rehabilitation of the NR. 19 were identified, these are presented in the table below.

Table 1 – NATURA 2000 Areas affected by the project [8]

No	Name of the Natura 2000 area	Aproximative chainage	Observations
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1.	ROSPA0067 Lunca Barcaului	km 16+450 – 23+650	the road crosses the Natura 2000 area
2.	ROSCI0021 Campia Ierului	km 30+960 – 54+150	the road is near the Natura 2000 area
3.	ROS Sacuieni	Km 38+420 – 43+520	the road is near the Natura 2000 area
4.	ROSPA0016 Campia Nirului-Valea Ierului	km 54+150 – 60+700	the road crosses the Natura 2000 area
	ROSCI0021 Campia Ierului	km 54+150 – 60+700	the road crosses the Natura 2000 area
5.	ROSCI0020 Campia Careiului	km 64+800 – 80+350	the road is near the Natura 2000 area
6.	ROSPA0016 Campia Nirului-Valea Ierului	km 64+800 – 80+350	the road is near the Natura 2000 area

A major impact on the amphibians species was identified in the following two natural preserved areas: ROSPA0016 Campia Nirului-Valea Ierului and ROSCI0021 Campia Ierului.

From the analysis, there are two species common there, which must be protected, as they are considered sensitive and their existence is vital for the ecosystems they live in. The two species are *Emys orbicularis* and *Bombina bombina* (Figure 3).



Fig. 3 – Amphibian Species to be protected

Their population is very reduced, in the natural preserved area (between 0 and 2%) and from the information obtained, their populations are not isolated, spreading on a relatively large surface [2].

In order to ensure the continuity of their habitats and migratory routes, three crossing culverts, with special components required by the biological needs of amphibians, were included in the project. Also for an efficient use of these culverts, protection and guiding guardrails were implemented.

The crossing culverts have two dry steps and a middle wet pathway, as it was study at European level that without these characteristics the culvert will not be used by the target species. The guiding guardrail is installed on the slope, on a length of 100 meters before and after the crossing culverts, and as the amphibians enter this channel, made of recycled material, they will slide to the crossing culvert (Figure 4). This solution prevents the amphibians to get on the road and reduces the traffic mortality of these species [8].

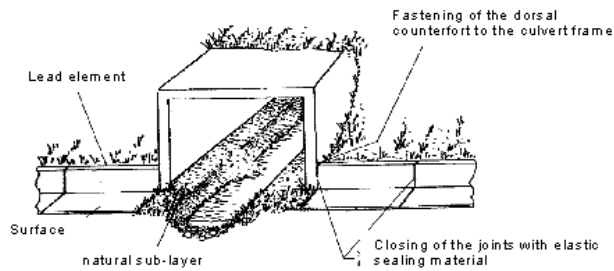


Fig. 4 – Amphibian Crossing Culvert and Guiding Guardrail, designing detail and construction solution [8]

Adjud Bypass is another project that included protection measures for biodiversity, as it crosses a NATURA 2000 protected area, located in the Siret river meadow. An environmental assessment study has been performed and the alignment has been adapted, to ensure that the sectors of high scientific interest will not be affected.

For the protection of biodiversity in the area of the project Adjud Bypass West, protection measures have been established, in order to preserve species and habitats [9].

To ensure the protection of the natural preserved area, during the execution phase, the project area will be fenced. The works will be executed according with the schedule approved by the local community and the administrator of the protected area, a management plan for the waste, air and water quality protection will be elaborated, also a separate chapter will establish the procedure for accidental and emergency situations.

To protect flora and fauna in the operation period a special attention will be given to maintenance – cleaning ditches, footbridges and road route accompanying waste in order to avoid the occurrence of disease and to ensure the normal development of the natural habitats [9].

The projects shown above are representative examples, to illustrate the evolution of environmental evaluation in Romania, which came from studying only technical designing aspects to analyzing first the location from environmental point of view, then filtering the technical solution through the environmental demands.

A negative impact on the infrastructure projects is the time delay determined by the new procedure, as it may increase the time for the environmental permit, sometimes threatening the financing of the project, if the project developer did not take into consideration all the stages of the environmental procedure.

Another aspect is the cost of the environmental studies and of the environmental works that must be implemented in the project.

Balancing the positive and negative aspects of implementing this procedure, I think it brings a clear advantage for the project development, as well as for environmental preservation, the main condition is performing a realistic assessment on the location and technical solution chosen initially, before starting the procedures for approving the project.

6. CONCLUSIONS

This paper presented the Romanian environmental integrated evaluation procedure for infrastructure projects, with the changes that took place both in the project developers'

mentality and in technical solutions adaptation, in order to show the positive evolution of a country with little experience in applying environmental protection and conservation at European level.

Though it includes complex aspects and it brings higher economical costs, the present procedure analyses better the impact of the infrastructure project on the environment, taking in the consideration also the necessity of the project.

Important phases and concepts have been integrated in the procedure, such as alternative solutions and compensatory measures, scientific basis of each step of the procedure and the last but not the least the mandatory monitoring the environmental factors all throughout the project life. An important aspect is also the integration of the adequate assessment for NATURA 2000 areas, a phase that gives continuity and efficiency to all the environmental protection and biodiversity preservation approaches.

As the projects presented above showed, the transition to a better procedure is nor easy or fast, but it is the right way for sustainable projects, that represent the future of social and environmental harmony.

I believe the Romanian experience will improve with the years to come, but the ascendant evolution gives me hope that it can represent a support framework for other countries or even bring fresh ideas for environmental procedures all over the world.

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