

# COMPARATIVE STUDY ON THE ENVIRONMENTAL IMPACT OF ECONOMIC ACTIVITIES IN THE ENERGY AND ROAD CONSTRUCTION

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## Abstract

*The environment is the general framework within which all activities of a human society are carried out in various fields such as economic, social, education, health, political, etc. Meanwhile, the environment has a triple role, being the main supplier of raw materials, a container in which rubbish / debris arising from the socio-economic and humane activities is collected, and the space in which various economic objectives are located, industrial activity and / or agricultural services are provided, support activities (related) needed to ensure conditions in which the running of other activities run, etc. Given those aspects, we note that a number of increasingly more organizations have concerns about improving the delivery of activities, so that their effects on the environment are minimized, or even abolished (Rusu, 2013 p. 2). For this reason, research on the variety of effects that different economic activities have on the environment is both useful and interesting for any specialist training in economics. An efficient environmental management has a decisive contribution both in terms of the level of performance of an organization and in terms of competitiveness of companies and national economies.*

**Keywords:** environmental management, economic development, sustainable development, environmental impact, environmental risks, environmental impact evaluation

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## 1. INTRODUCTION

Environmental management is one of the most important and at the same time, one of the most difficult aspects of management. The continuous

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development of the economy and society generates side effects on the environment, often negative, and their current management tends to become an increasingly more complex problem. The evolution of modern society under the impact of globalization processes in all areas, of technological progress, and of knowledge based society development, makes the whole environment issue occupy a central place in the concerns of experts and researchers. The essence of environmental management is to contribute to ensuring a balance between the increasing need for resources necessary for the harmonious development of the economy and society, on the one hand, and the impact that human society with all requirements and its activities have on the environment, on the other hand.

## **2. THE PLACE OF ENVIRONMENTAL ISSUES IN THE CURRENT ECONOMY**

As society develops, environmental issues became increasingly important. So far, all economic and social activities, regardless of field, must take into account the effects that they generate on the environment and to develop action plans that aim to both minimize the negative effects and to eliminate, as much as possible, the causes that generate them.

Technological advances generated by the industrial revolution have contributed greatly to the economic development and increase in national wealth of industrialized countries, to the prosperity of nations and improvement in macroeconomic outcomes, but the effects of rapid evolution have been overwhelming for the environment (Bacal, 2007, pp. 12-13). For this reason, global concerns about the major disruption of the environment caused by economic activities are becoming more substantial. But environmental protection as an area of study is not new. The first signs of establishing environmental science dates from the beginning of the twentieth century, and, in the 1930s, Arthur C. Pigou was the "pioneer" of the implementation of the "beneficiary and polluter pays" principle, introducing the concept of externality regarding the effects that the operations of companies have on the environment. He noted that pollution charges should be proportionate to the size of the environmental impact. Later, namely in the 1980s, humanity has made a big step forward in this area by developing the concept and goals of "sustainable development".

## **3. COMPANIES ENVIRONMENTAL ISSUES**

At the company level, the environmental issue holds a relatively important position, both because of the legal framework which has evolved tremendously over the past two decades, but also because of pressure from civil society in

limiting the negative impact of companies' activities on the lives of individuals and thus on the environment.

Every organization has its own environmental policy, according to the requests imposed by the growing economic competitiveness, and rigors that they must comply with under the influence of legislative requirements.

Thus, at the base of their impact assessment on their socio-economic activities on the environment are two main elements (Kramer et al. 2004, pp. 6-7), namely: the binding nature of assessment activity on environmental effects, in relation to the process of obtaining permits, agreements, licenses and other documents issued by state institutions with responsibilities in environmental protection; the voluntary nature of the evaluation, which usually occurs when, in their quest to obtain various economic benefits (subsidies, approvals, contracts, etc.), companies make commitments in terms of improving environmental performance and assessment procedures are set out in specific documents, recognized and implemented at national level, and, where appropriate, internationally.

The tools that a company can use to implement activities related to environmental management can be classified into two main groups, namely:

- ✓ mandatory tools:
  - approvals;
  - authorizations;
  - permits.
- ✓ tools used voluntarily:
  - ISO 14000 (an array of standards developed by the International Organization for Standardization, aimed at primary requirements for Environmental Management Systems);
  - SA8000 (Social Accountability);
  - EMAS (Eco-Management and Audit Scheme).

The orientation of the companies' management to environmental issues is important not only for large companies, but for small and medium ones as well. Also, efforts made in this area aim both to reduce operating costs and improve the company's image in the market, and to increase economic competitiveness.

According to studies, by using modern environmental management means, we understand the following (Rusu 2012, p. 3): improving the ability of companies to face competition by building a positive image; reducing costs due to lower quantities of raw materials and due to the restriction of waste that is generated in the current activity; reducing environmental risks; access to new markets; strengthening the company's position in a strongly competitive environment; the improvement of the activity as a whole.

An environmental management system is very complex, both because of the diversity of issues concerning the environment, and because of regulations on

environmental protection (available at national, regional, European and global level, in various fields, on multiple planes, etc.) Regarding definition of the concept, some studies stated in a simplified manner that by environmental management we understand the management of those activities of the company which either have or may have at onetime impact on the environment (Kramer et al. 2004, p. 7).

Other authors consider that the system of environmental management is a "part of the general management system, which includes organizational structure, planning activities, responsibilities, practices and procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy" (EMAS, 2012, p. 5). Or, the system of environmental management is a "management tool which aims to ensure functionality and the continued application of a plan or of procedures for environmental management and compliance with the objectives and environmental targets" (ISO 14001 Chirilă, p. 125).

#### **4. THE SIGNIFICANCE OF THE ENVIRONMENTAL IMPACT ASSESSMENT**

The Environmental Management System ISO 14001 is considered the most widespread environmental management system worldwide. A particularly important aspect about this standard is that it was designed to be applied to all companies regardless of their size, and adapted to different geographical conditions and different specificities related to cultural and social elements. According to expert opinion, environmental damage can take many forms, such as (Bacal, 2007, pp. 158-161):

- ✓ reduce labor productivity and hence wages / income and purchasing power;
- ✓ increased expenditures for restoration and / or preservation of the environment;
- ✓ loss of natural resources, measured by a decrease in productivity of ecosystems;
- ✓ harm of health and quality of life;
- ✓ the emergence of new LFAs (mining centers, energy, metallurgy, chemical, etc.);
- ✓ increased expenses arising from the need to replace scarce and / or exhausted resources;
- ✓ expenses related to efforts to restore health and quality of life in affected regions, etc.

Therefore, in terms of environmental damage, economic activities and branches can be divided into three large subgroups, namely: generating impact

(metallurgy, energy and construction); impact containers (health care, education, research, ecotourism, fishing, forestry, fishery, etc.); generators and receivers of impact (agriculture, food industry, light industry, agriculture, construction, tourism, traditional, etc.).

Environmental impact assessment is based on the overall scheme of a technological process, who inputs raw material, labor, capital items, etc., and outputs the manufactured products, by-products, services, noise or vibration, and scrap and waste recoverable and / or unrecoverable. In order to identify the issues impacting the environment, several categories of information are used (Chirilă 2013, pp. 151-152), for example:

- ✓ legislation requirements, regulations and profile reports;
- ✓ technological flows, the balance sheets of materials, manufacturing procedures, operating and maintenance regulations, work instructions, water networks, sewage, utilities;
- ✓ structure of inputs and outputs.

Therefore, the environmental impact represents the set of actions that produce negative effects on the environment. Or, environmental impact consists of effects that an economic activity generates on the environment in terms of: atmosphere; aquatic environment; land and subsoil; vegetable; Flora and fauna; noise and vibration; land use and landscape.

## **5. THE ENVIRONMENTAL IMPACT GENERATED IN THE ENERGY INDUSTRY AND IN ROAD CONSTRUCTION**

To make a comparative study on the environmental impact in various economic fields two examples were chosen. On the one hand, we are referring to technological changes specific to the energy domain, such as for example those arising from the need to reduce pollution and increase economic efficiency of electricity producers. On the other hand, we considered the environmental impact of road construction, both during their implementation, as well as throughout its life after completion.

Regarding the first example, we used the results of an expert study conducted for the energy group 3 at SC Electrocentrale Deva SA (HALCROW ROMANIA, 2011, pp. 47-92). According to him, installations for desulphurisation of combustion gases from energy groups are an important requirement, which can provide a cost-efficient exploitation and a reduced level of pollution for existing facilities. The compilation and establishment of impact studies is required to obtain the environmental permit, because during the implementation of the power plant construction project transnational effects on water, air, soil, subsoil, biodiversity,

landscape, social and economic environment, cultural and ethnic conditions and cultural heritage, vegetation, wildlife and human health will be generated.

Summarized, according to the report on environmental impact, these effects can be presented as follows:

- ✓ **Water:** from implementing the desulphurization plant there is no wastewater because all the used water is recycled entirely within the technological process; the main risk would be represented by spillage of fuel used by vehicles and machinery necessary for work execution, inadequate temporary storage of materials, uncontrolled waste resulting from construction works discovered by rainwater washing the surfaces (rain); to mitigate the risks a drainage tank, a failure tank and a drainage tank are provided, as well as funnels with corresponding slopes; the negative impact is very short during the project implementation and the positive impact after its completion is long-term.
- ✓ **Air:** CET Deva is located in an area with a temperate climate, typical of the hills and plateaus with altitudes between 200 and 600 meters; another type of emissions provided after switching on the plant is lime powder, for which an action plan regarding the existence of cyclones, vacuum cleaners and a limestone silo fitted with filters was provided; the impact of the project is negative in the short term, because during the implementation other negative effects on the air are not foreseen; after the completion of the desulfurization system the cleaned waste gas will be discharged a new carbon chimney with a height of 80 meters being provided, in order to ensure proper dispersion.
- ✓ **Soil:** risk sources to damage soil during project implementation are excavation and terracing, fuel spills from equipment, sedimentation of air pollutants, improper storage of materials and uncontrollable depositing of waste resulting from demolition and construction; technical risk mitigation measures aimed at the layout of the technological objects related to the desulphurization plant in concrete spaces, a drainage tank for accidental spills, a failure tank and a drainage tank, and funnels with corresponding slopes; impacts for the period of project implementation is negative in the short term, with a local manifestation area, and with reversible effects.
- ✓ **Subsoil:** the construction works will involve the demolition of the existing foundations, and utility network deviations; therefore, a source of risk is the accidental leakage of fuel from machines but without them affecting the subsoil to any significant extent; the subsoil impact is indirect, given the technical measures provided.
- ✓ **Biodiversity:** negative effects on biodiversity are not foreseen as the desulphurisation plant will be installed and operated inside of the power plant.

- ✓ **Landscape:** no negative effects on the landscape are foreseen, as the desulphurisation plant will be installed and it will operate inside the power plant.
- ✓ **Social and economic environment / residential areas:** no negative effects on social and economic environment / residential areas are foreseen because the desulphurisation plant will be installed and operated within the power plant.
- ✓ **Ethnic and cultural conditions and cultural heritage:** there are no negative effects on the cultural and ethnic conditions or on cultural heritage as the desulphurisation unit will be installed and operated inside the power plant.

Regarding the second example, we considered the relevant elements of the Report on Environmental Impact Assessment in order to obtain an environmental permit for the highway Arad - Timisoara - Lugoj project (EIM 2009, pp. 11-18).

The evaluation report, as in the case of the desulphurization plant, contains both information and action plans on the impact project development during implementation, and information and action plans on project impacts throughout the life after completion.

Summarized according to the report on the environmental impact during construction, these effects can be presented as follows:

- ✓ **Water:** changes in the conditions of water quality (solid suspensions, oils and hydrocarbons); changes in water (using concrete and derivatives, heavy metals, domestic sewage and other hazardous substances).
- ✓ **Air:** changes in air quality; generation of dust; pollution generated by the operation of motor vehicles and machinery.
- ✓ **Noise and vibration:** impaired circulation and processes.
- ✓ **Soil and subsoil:** morphological changes.
- ✓ **Vegetation, flora and fauna:** vegetation and flora affected by generation of dust; wildlife departure / damage; Interference with natural protected areas.
- ✓ **Landscape:** alterations of the visual context / landscape; damage to items and relics of historical and scenic interest.
- ✓ **Land use:** disturbance of agricultural activities due to transport and construction activities.
- ✓ **Socio-economic environment:** the population is directly affected by the relocation of people; migrant / worker camps; loss of agricultural land; removal of houses and other buildings; low road safety because of the works.

For the operating and maintenance period, the following sources of environmental impact have been identified:

- ✓ **Water:** changes in groundwater quality conditions by polluting with impurities, especially during winter; rainwater; domestic wastewater.

- ✓ **Air:** air pollution generated by highway transit of heavy vehicles; there will be no exceedances of the limit values for any pollutant.
- ✓ **Noise and vibration:** noise value would be acceptable provided the installation of acoustic panels on certain road sections (Recaş Petrovaselo and Belin□).
- ✓ **Soil and subsoil:** chronic pollution of the soil directly proportionate to the intensity of traffic, driven by emissions, road and tire wear, vehicles, etc.; possibility of subsoil contamination with heavy metals.
- ✓ **Flora and fauna:** the fauna is limited because the whole context of existing farms is changed; habitat fragmentation will not occur; highway route will not directly interfere with protected areas.
- ✓ **Landscape:** physical and aesthetic effects on the landscape; visual effects on landscape planning.
- ✓ **Socio-economic and cultural environment:** displacement of communities; proximity to homes in some road sections (Recaş Petrovaselo and Belin□); cultural and aesthetic resource degradation; improving access to education and health institutions; transport networks and urban centers; road safety – reducing the number of accidents due to improved of road infrastructure, traffic monitoring, etc.

The most important elements of the action plan proposed in order to reduce the negative impact of highway construction on the environment are:

- ✓ Limiting the impact on the settlements, by keeping the project area as far away as possible from homes / residential areas, and if not possible, to resort to technical measures.
- ✓ Respecting the special interest areas of the environment (Mure□ Floodplain Park and archaeological sites on the route).
- ✓ Reducing interruptions in farming by restoring the accessibility conditions of the local road network.
- ✓ Maintaining continuity of water supply.

Of the two cases above, we note that in terms of complexity of the elements of environmental impact, it is much higher for the construction of the Arad - Timisoara - Lugoj highway.

We also note that the socio-economic and cultural impact is more consistent for the highway, compared with the implementation of the CET Deva desulphurization plant, both due to the territorial expansion of the construction site, and because of complications that may arise during the implementation of construction works.

Another important aspect is that the impact on the ground is much larger for the highway, and this situation can be observed both in terms of flora, fauna, vegetation, landscape, noise and vibration, and in terms of landscape, water and air, especially during the execution of the works.

## 6. CONCLUSIONS

Based on the information presented, we can identify some relevant conclusions.

First, environmental management issues vary enormously, they are important for the national economy and the economy of companies, and binding for the conduct of any activity, regardless of the field. You can not start a new activity nor can you not develop an existing one without obtaining an environmental permit.

Secondly, we find that depending on the activity there are different elements in terms of size and structure of elements with an environmental impact, just as there are common elements.

Thirdly, the costs imposed by the implementation of action plans aimed at reducing the negative effects of socio-human activities are influenced by characteristics of the said activities, the size of the projects and costs for implementation, by activity, by legislation, and national and international rules and regulations, etc.

Finally, we mention that environmental management will increase in complexity and will increasingly become of higher importance, with the increase of the negative effects generated by both the existence and development of human communities as well as by the requirements of economic development and technological progress.

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