

Theoretical and Experimental Research in Order to Protect the Environment in Romania

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Protecting the environment is a matter of great importance that must be treated very seriously, both internationally as well as nationally. The actual situation in Romania, about the economy and the state of the environment, requires the development of a program corresponding to its own interests. Given the specific situation of Romania, the transition to a strong market economy, the restructuring of the economy, the stages that we will go through this market strategy, will mark certain phases with clear objectives. The paper will present the objectives of environmental protection strategy's, industrial risk analysis that affect environmental quality, environmental impact assessment methods and problems of ecological marking of the products. Based on strategies can be developed economic and environmental programs, which must be completed in order to achieve the set objectives, either macroeconomic, sectorial, regional, operative coordination (mandatory) or programs of measures at the firm level, and, why not, national plans.

Keywords: rainwater, either macroeconomic, waste recovery, medium term

Scientific and technical progress has attached besides the incontestable positive consequences and some undesirable, more or less predictable. Therefore there is not a paradox to say that we must learn from the future exactly in the same way as we learned from the past [1,2]

In order to establish the strategies to protect the environment at the national level, we must take into account certain principles, such as:

- Increasing the proportion and the role of long-term thinking and replacing short-term profit to long-term plans;
- Amplification the training measures for *sustainable* behavior of the society, to be more careful to the intensive exploitation of material resources, but also to reduce the existing regeneration potential of the nature;
- Improving the quality of life, public health, which are subordinate to the whole economic and social activity;
- Avoiding pollution by preventive measures, to promote clean technologies in all fields to be developed;
- Conservation of the biodiversity;
- Introducing the principle in accordance with, the polluter pays;
- Preservation of cultural heritage and historical values.

These principles remain valid for determining both the strategies and the programs, scripts, projects in various fields, being significant the solving of the problems, and not the forecasting tools used [10,11,13].

Based on the general set objectives and directions, any strategy will be subordinated to achieve of the sustainable development in our country.

Regarding the risk analysis, all human activities are possible sources of risk, but in the context of integrated risk assessment and management, the most relevant sources of risk are [3-5]:

- continuous emissions into the air, ground and water from industries and related activities;

- accidental discharge of dangerous substances from industrial installations which have a negative effect on health and environmental (fires, explosions, dangerous substances handling, storage of dangerous substances, etc.);

- the transport systems are continuous sources of emissions. Transport of dangerous substances can cause accidents affecting health and the environment. In this context, the transport it refers to the transfer material by rail, road, pipeline and water;

- natural sources of accidents: earthquakes, storms, floods, eruptions which may overlap with man-made sources of risk;

- agricultural activities that affect the health and the environment: the spreading of fertilizer, insecticide and herbicide which contaminates the soil, groundwater and surface water. Agricultural activities consume large amounts of water, leading to desertification and soil erosion [6 - 8].

- urbanization and associated infrastructure are a source of disturbance and generates the pollution of the environment.

Regarding the methods of analysis of the environmental impact, any developed activity of an organization, can generate a wide range of environmental implications [8,9]. However, there are very important and must be considered the activities which have significant negative impact on the environment. Although the basic idea according to which the impact evaluation is based on the principle: *How large are the effects on the environment*, it is obvious that we need to be considered also other elements for the selection, such as [9,12,14]:

- the size and the impact intensity;
- the severity of impact;
- the changes of the generated character (non-reversible or irreversible);
- the maintaining duration of the effects;

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- the interconditioning with other factors;
- the costs that the eliminate of the effects imposed.

For an organization to be able to determine *what impact is significant on the environment* it would be initially necessary to define, a scale of importance that considers it is necessary to give to the environmental protection issues. Indicative criteria in this regard are:

- the degree of compliance with environmental legislation;
- the codes of good practice of the industrial group that the organization belongs;
- the scientific criteria indicating significant effects on the environment at local, regional or global level;
- the pressure from the local community or the public;
- the values, principles and regulations as guide the organization;
- the pressures of the banking or insurance companies;
- the considerations of reducing energy costs and raw materials;
- the risk to seriously damage the environment.

Experimental part

a) The first aspect to protect the environment in Romania refers at the toretical and experimental research in order to improve the industrial objectives. These are presented below in table 1.

b) A second aspect of environmental protection in Romania, refers to the identifying and analyzing the risk for major accidents.

The quantified risk assessment process is a probabilistic process. There are plenty of questions associated with this risk measurement. Among the most important sources of uncertainty are noted mathematical models to estimate the consequences of major accidents.

The techniques used to identify accidents (risk) is divided into three categories:

Category I - Comparative Methods

- checklist process method / system
- revision safety method
- the relative rank method (risk index)
- preliminary risk analysis

Category II - Fundamental methods

- study risk operation (HAZOP)
- WHAT IF analysis

Category III - methods of logic diagrams

- failure mode and effect analysis (FMEA)
- fault tree analysis
- event tree analysis
- causes - effect analysis
- human error analysis

Table 1
THEORETICAL AND EXPERIMENTAL RESEARCH IN ORDER TO IMPROVE INDUSTRIAL OBJECTIVES IN ROMANIA

The domain	The objectives of the industry		
	Short term	The medium term	Long-term
Legislation 1	-develop and implement a set of laws for the protection and conservation of the environment through which approach to the Western European requirements	-aligning of Quality Standards to those are applicable in Western Europe; - expansion of the protected areas; -develop laws to restore the damaged environment; -interdiction of the location of economic units pollutants in areas that are not affected by toxic substances.	-including the quality of the environment in the economic development strategies.
2. Used instruments	Establishing the rule 'polluter pays' -the compliance of the legislation; - Freezing the amount of the pollutants emitted into the environment.	-the beginning to internalize the protection of the environment; -the evaluation of the the economic profitability of the environment protective measures and the introduction of modern evaluation techniques; -the subvention of the recovery and conservation of the environmental activities; -the computerization of the monitoring and control system of environmental factors.	-promotion of the clean technologies; - the Internalization of the environmental costs; -the involvement of the socio - political organization, in actions to protect the environment.
3. Resources	-the identification of the problems arising from interference resources - environment and orientation of them by sustainable development as required; -resolving of the critical situations.	- establishing the limits, at the extraction, where necessary; -the recovery of the renewable and non-renewable resources, according to the principles of sustainable development; Introducing clean technologies; - waste recovery.	-the exploitation of the natural renewable resources in accordance with sustainable development principles -Stimulating the recovery of renewable resources; -the settlement of the Romania's energy problem

continued table 1

4. Management	-evaluating the operators pollutant's potential, of the areas; -improving the monitoring and control of the system of the environment integrated national wide monitoring;	-the adoption of the environmental factor criterions's in the adoption decision at national, sectorial, local, regarding the economic development, environmental and social protection, etc.	-reduce the intensity of the pollution to the limits set by international conventions.
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Table 2

QUANTIFICATION AND ENVIRONMENTAL RISK ASSESSMENT FOR ENVIRONMENTAL PERFORMANCE IN ROMANIA

The environmental aspect:				
Risk assessment:				
Ecological criteria	1 point	2 points	3 points	Score
Location	effect on the position	local effect	regional effect	
Gravity	easy	average	pronounced (permanent damage)	
Probability of occurrence	< 1 x / 10 years	1 x / 1 – 10 years	> 1 x / year	
Duration	< 1 day	1 zi – 1 week	> 1 week	
Capable of causing chain reactions	easy	average	pronounced	
Detection Mode	easy	difficult	very difficult	
The financial criterion	1 point	2 points	3 points	
The attention of interested parties	no interest	indirect interest	direct interest	
Reputation	no effect	moderate effect	directly affects the public image	
Effect on production	no effect	average	major impact	
Legal regulations	in conformation	easy nonconformity	Major nonconformity	
Prevention costs	big	moderate	low	
Remediation costs	low	moderate	big	
Risk assessment (amount)				

Table 3

PRESENTATION OF ONE PRIORITIZATION EXAMPLE

Priority	General aspect	Risk assessment	Improved by:
1	Possible leakage from tanks located indoors	36	Procedure or daily routine
2	Petroleum products in wastewater discharged into river	30	Objectives and measures

There is often a mismatch between objective assessment and the public's perception of the level of risk generated by industrial development.

Table 2 shows a quantification and evaluation of the environmental risk, taking into account the economic effects of generating risk events.

After such an risk assessment *quantitative* can be made a prioritization of events based on the score obtained, thus being able to plan the implementation of risk reduction programs in case of events for which was obtained high score.

Table 3 shows an example of prioritization.

The risk associated with a probability that an undesirable event to occur and on the effect of gravity of this event is given by:

$$R = P \times G \quad (1)$$

where:

R is the risk that the event will occur;

P is the probability and G is the severity

Further evaluation of the concepts of profit or damage which occurs as a result of the event which we assessed risk, are involved in the risk relationship, as follows:

$$R = P \times (D - B) \quad (2)$$

where:

R is the risk that the event will occur;

P is the probability; D is the detrimental effect, and B is profitable effect.

In accordance with the last relationship, the average environmental risk may be acceptable in cases where the event occurs is more beneficial than detrimental [15,16].

A more rigorous and systematic approach to risk assessment and a methodology of keeping under control is made by technique is HACCP (Hazard Analysis and Critical Control Point). The basic features of the technique are the following:

- identify, analyze and control the risk occurring over the lifetime of a technological process;
- identify critical points with high risk and determine the methods of keeping them under the control;
- use the principles and methodology for quality management systems and thus benefit from their work efficiency;
- it is a preventive technique and thereby supports of the organizations that have realized the need to take responsibility for the damage caused by high-risk events;
- give confidence to all parts concerned of the environmental performance of an organization, because it addresses the appropriate working methods to control the significant environmental aspects.

The sequence of the activities that are based the HACCP system, includes seven steps.

A brief overview of each step is presented below:

Step 1: There are analyzed by the team working all matters, which during the analyzed process development could represent potential environmental risks. They are considered normal and abnormal situations of the the implementation of the process. There are estimated the lists of all situations that show a significant risk of inducing incidents or environmental accidents [17,18]. The analysis must be conducted rigorously and requires logical thinking. It is shown and a good knowledge of the process. Be taken into account all environmental factors that could be affected.

Step 2: There are identified critical points in the process and the characteristics or parameters that conduct its, corresponding to the induction of the risk situation, previously identified;

Step 3: There are analyzed in turn, the causes that underlying the generation of the risk situation, of the concerned operation. Using one of the techniques: cause-effect diagram; 5 why; tree defects, could be extremely useful.

Step 4: There are redefined characteristics or process parameters and possibly the conduct phase sequence, which are at the origin of deviations, so as to reduce or eliminate the risk, and the process should be kept under control.

Step 5: There are defined the observations and measurements plan of the characteristics and parameters of the process, so that its deployment to be constantly kept under control and to be timely identified any tendency of the system to generate risk. The instructions or procedures are developed.

Step 6: There are installed and ensure the means and the resources that are necessary for keeping the process under control, as established in the previous step, than we pass the effective monitoring of the process. If it has been established additional verification means (for example, statistical inspection, monitored by the audit, laboratory tests, etc.) it will respect closely.

Step 7: There are analyzed the collected data on probation and are established corrective or preventative actions. There are updated the procedures and instructions. It is continued the monitoring of the process.

Although designed to be applied in food technology, HACCP method is as we realize extremely useful when it comes to environmental risk assessment and keeping them under control within technological processes. Of course, the presented method is less useful in case of the environmental risk caused by natural disasters. In these cases, however, the methodology is applied with high efficiency further intervention activities.

c) The third aspect in order to protect the environment in Romania refers to the methods of impact on the environment. In this respect there are two methods as follows:

According to First Method, the points are set to the degree of significance of the criterion, as is presented in the example of table 4.

Of course, it can be considered and other criteria on which the organization considers important (ie.: reduction in water consumption, reduction of energy consumption, environmental persistence of the effect, etc.)

As a result of the examination and evaluation of the each environmental aspects of the organization about the specified criteria, we can calculate a significance index (IS) of the impact that may occur on the environment by, the below relationship:

$$L \times S \times C = IS \quad (3)$$

where:

L is between 1-10; S from 1 to 10;

C between 1 to 10 and IS between 1-1000.

It is necessary for the organization to establish a threshold above which the environmental issues evaluated

Table 4
THE DETERMINATION OF THE ENVIRONMENTAL IMPACT BY FIRST METHOD

Nr. crt.	Criterion	Scores	The meaning
1.	Compliance with environmental laws and regulations (L)	1	They are recognized and implemented properly with all applicable environmental regulations.
		5	Regulations are implemented partially.
		10	Applicable regulations are either not known or is not implemented.
2.	The intensity of the impact in relation to the sensitivity of the receiver medium (S)	1	The environment is not sensitive and it is not paying attention to the impact.
		5	The environment is slightly sensitive and the attention to the impact is limited.
		10	The environment is very sensitive and very alert to any impact.
3.	Controlling of the Impact (C)	1	There are a preventive control, permanent and regulated on the process that generates the impact.
		5	The process control is limited and does not have a preventive character.
		10	There is not provided a process control. The impact is uncontrollable. There are not allocated means and resources for the control.

Table 5

THE CRITERIA APPLICATION GRID OF G, F, C, R AND O

Criterion	share factor	10 points	5 points	1 point
The gravity (G)	$\alpha = 3$	Very big gravity	Medium gravity	Insignificant gravity
Frequency (F)	$\beta = 1$	Daily	Periodic	Occasional
The amount (C)	$\gamma = 2$	Significant amount	Average amount	Insignificant amount
The conformity (R)	$\delta = 5$	There are not respected the applicable legal requirements	Fulfilling the requirements is to limit or unsystematic	Systematic legal requirements are fulfilled
The sensitivity (S)	$\lambda = 4$	Are systematic complaints	Sporadic complaints	No claims or complaints

according to the methodology described above are considered significant. This threshold may be for a start value of 600 and is then decreased year by year. It is clear that the objectives and targets that the organization will propose, must be linked directly for reducing the significant environmental impacts, so determined.

The Second Method is taken from specific instrumentation of the quality management systems, being known as: Analysis of Failure Modes and Effects and their Criticality (FMECA). In this case, the criteria which must keep in mind are:

- the severity of the impact on the environment (G);
- the occurs frequency of the environmental aspect considered (F);
- the amount of pollutants discharged / emitted to the environment (C);
- the compliance with respect to environmental laws and regulations (R);
- the sensitivity of public opinion in relation to environmental aspect considered (A).

These criteria are assigned weighting factors: α , β , γ , δ , λ , which makes the assessment to gain a greater degree of finesse and sensitivity in relation to interest pursued by the evaluator. The criticality (Cr) of the environment aspect considered, is calculated then by the formula:

$$Cr = \alpha G \times \beta F \times \gamma C \times \delta R \times \lambda O \quad (4)$$

where:

α , β , γ , δ , λ take values between 1 and 5 (ex.: $\alpha = 3$, $\beta = 1$, $\gamma = 2$, $\delta = 5$, $\lambda = 4$).

For a suitable dimensioning criteria G, F, C, R and A can be used the grid shown in table 5.

Once calculated, the criticality indicator of the environmental aspect as was stated above, it will compare with the significance threshold, originally set. If the calculated indicator of significance is upper threshold is considered that it will present a significant environmental impact. It is indicated a listing of all the aspects which have a significant environmental impact by each organization concerned with environmental protection.

Both methods can be applied both in situations of normal operation and in case of abnormal operation of equipment or processes within the organization

d)The fourth aspect of environmental protection in Romania, refers to the organic marking of the products.

Known as the green marking, this technique has been developed and used by the makers of popular products, in order to make known to the customers their products' environmental properties.

Subsequently, the technique has been standardized internationally (being created standards in the ISO 14020), to provide a higher degree of confidence in the market, so that messages sent through eco - labels are understood and have meanings recognized across the globe and, finally, to enable the consumers to express choices and

adherence to the organic products and programs. To provide the necessary degree of flexibility to the great diversity of possible situations, international standards provide three types of environmental label;

Type I environmental labeling (covered by ISO 14024 standard), also called labels of the third part, due to the fact that the labels used based on the evaluation of an organism is recognized by the customers of the product. These assessments should take into account the criteria relating to methods of manufacturing the product, but also to the aspects of its behavior during its entire life cycle. It should be noted that the evaluation methods used, should be scientifically sound, reproducible so that it can be repeated with similar results anytime and rely on methods and standardized tests or at least widely recognized. Such labels are already widely used in our food, toothpaste, detergents and other consumer goods.

Type II environmental labeling (regulated by the standard ISO 14021), allows the performer, the distributor or the importer to declare its own responsibility regarding the properties of the organic products on these labels to be used (eg, the product is biodegradable, the product is recyclable, the product does not affect human beings, does not affect wildlife product, the product does not affect the ozone layer, etc.). It is very important that these statements are based on experiments and testing transparent recognized reproducible, scientifically and scientific knowledge of the moment. The existence of a body that can confirm these properties is welcome.

Type III environmental labeling (regulated by the standard ISO 14025) may be used in any type of product being in fact an extension of the labeling medium type I, but with the proviso that the body of the third party must be recognized, and testing methodologies must also clearly established and respected product lines. It can provide in this way, the necessary transparency of any interested party, an experiment or test and reproducible unit, eliminating the risks of disputes or trade restrictions, to the detriment of free access of products in various markets around the world

Conclusions

Protecting the environment in Romania, it is an issue of great interest both for the present and especially for the future,. This can be achieved by experimental research conducted in order to improve the industrial objectives, identifying and analyzing risk for major accidents, development of methods of impact on the environment and achieving environmental ecological marking of products.

Based on strategies, can be developed economic and environmental programs, to be taken to achieve the objectives set, either macroeconomic or sectorial, regional and operational coordination (binding) or programs of measures at the firm level.

With respect to the risk analysis, all human activities are possible sources of risk.

Regarding methods of analysis of the environmental impact, any activity of an organization can generate a wide range of environmental implications. However, there are very important and must be considered activities which result in a significant negative impact on the environment.

Marking ecological products, it is a technique that has been developed and used by the makers of popular products to make customers their products' environmental properties.

Only taken together all the issues presented above, we can achieve the desire watched -protect the environment in Romania .

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