

Management of the Environmental Risk – an Economic-Social Priority

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Abstract. *The industrialization process, accelerated in the last decades of the 20th century and continued in the 21st century, determined, together with the beneficial effects manifested in the increase in quality of life, the appearance of some pollutants, especially in the areas where people live, work and entertain themselves. The risk is a situation/condition/event that, if occurs, generates an unfavorable effect both on the objectives, resources and reputation of the organization and on the successful achievement of its tasks/activities/mission. The environmental risk can manifest itself under the form of stressors (risk factors) generated by the human activity/inactivity and can generate adverse effects on the environment, and also the degradation and loss of sustainability. In order to ease the evaluation of the status/quality of the environment and facilitate the reporting and communication of the environmental performances of an organization, the present paper synthetically presents a series of environmental indicators, and also the description of the essential requirements of the voluntary environment standards in the ISO 14000 series.*

Keywords: environment; risk; management; environment indicators; environmental performance; standard.

JEL Codes: Q01, Q58.

REL Code: 15C.

1. Notions regarding the management of the risk

The AS/NZS/4360/2001 standard states that “the risk management envisions the culture, processes and structures effectively dedicated to the management of potential and adverse effects” and involves all categories of personnel, with precise responsibilities in the risk area. Realization of the risk management assumes the engagement and decisional energy of the top leadership and involvement of the employees that can identify an incident, a potential threat or an opportunity for improvement.

The generic risk management process views, according to AS/NZS 4360:2001 – Risk management. Standards Australia/ Standards New Zealand, Sydney/Wellington, 2001, the following steps:

- a) *establishing the design context for the risk factors* (determining the strategic, organizational and management context, establishing the structure, the criteria based on which the risks will be evaluated, identification of the interested/affected parties, statement of the communication and consulting policies);
- b) *identification of the potential risks* (identification, as a result of post analysis, dangers and associated consequences that can arise);
- c) *probabilistic analysis of the risks* (risk analysis, control possibilities and the effect of the control measures regarding the consequences, the probability of occurrence and the risk level estimation);
- d) *evaluation and hierarchy of the risks* (comparing the estimated risk levels, setting a hierarchy to establish the priorities, risks with reduced priority are accepted, making the subject for monitoring and revision);
- e) *concretization of the risk's effects* (implementation of a management plan, that will include considerations regarding the allocation of necessary resources and action deadlines);
- f) *communication and consultation* with the *affected/interested* parties (it will be performed in all the stages of the risk management process);
- g) *monitoring and revision* (evaluation of the performances for the risk management system).

The above presented stages are in a tight interaction.

Communication/consulting, also monitoring/revision assume activities and concepts that include the whole management process. The risk management must include communication and consulting mechanisms, both within the organization and between the organization and external parties. Both risk revision and monitoring, and the evaluation of the risk management system

performances valuation, must be permanently taken into consideration and thoroughly documented.

An example model developed and widely used is „7 Cs“, having Beer and Ziolkowski as authors, namely Beer, T., Ziolkowski, F. – „*Environmental risk assessment: An Australian perspective*“, Supervising Scientific report 102, Supervising Scientist, Canberra, Australia, 1995. (<http://www.deh.gov.au/ssd/publications/ssr/102.html>).

2. Considerations regarding the environment risk

In the most general terms, the environmental risk is the resultant of the interaction between human activity and environment.

The environmental risk can be treated starting from two assumptions, that we encounter in the papers „*Environmental risk characterisation principles*“, Proceedings of the 6th Conference on Environment and Mineral Processing, part. I, pp. 17-21, VŠB-TU Ostrava, Cehia, 27-29.06.2002, and „*Environmental risk management in mining – An overall approach*“, Proceedings of the Third International Symposium „Mining and Environmental Protection“, pp. 22-27, Belgrad-Vrdnik, Iugoslavia, 21-23.05.2001, authors Băbuț G. and Moraru R, namely the risk for environment and the risk for organization.

The risk for environment starts from the fact that the activities of an organization can generate certain forms of environmental modifications, thus inducing a potential danger.

So, the effect of human activity can have a negative impact on the flora or fauna or can generate a danger for the health and welfare of mankind. Also, the destructive effects can alter the water, air, ground resources, energy and climate are taken into consideration.

The risk for organization departs from the environment problems and include the risk of non-conformation with the existing or future legislation and criteria. In this acceptance, the losses that the organization records, as consequences of non-adequate management, costs, litigations, and difficulties to maintain the operational and development activities. The aspects regarding the working security and health can be significant from the point of view of the environmental risks too. The normative, the standards, the methodological guides dedicated to this category of problems are important in the management of environmental risk. The environmental risk management must focus on adopting decisions regarding the environment and supporting the minimization step for the uncertainty degree.

3. The management of the environmental risk

The management of risks ensures the capacity to understand the mode of running of the operations and the ability to respond to the changes of internal and external conditions. Through an adequate risk management, the expenses can be reduced, the exposure to risk can be minimized, the probability of further development of the activity can increase, the compliance with the legislation can be assured and the protection of the environment can be improved.

The environment indicator represents a key information, significant and comparable, that is based on a dataset that are values of an attribute. The attribute characterizes a property that can be measured or observed. The complex problem of valuation and monitorization of the components of the PSR (pressure-status-response) model led to approaches in elaborating systems of indicators that describe the surrounding environment.

According to the Declaration in the „Agenda 21” of the United Nations Conference on Environment and Development (Rio de Janeiro, 1992), *„it is necessary to be elaborated indicators for sustainable development to ensure solid bases in taking decisions at all levels and contribute to the self-regulation of the sustainability of the integrated development-environment systems”*.

The indicators that make the environment specific system are grouped in several categories, important being the choice of the ones specific to the concrete analysis.

Synthetically, the classification of the environment indicators is based on the use of some groups of criteria, as follows:

A) *General criteria*

a) Expressing mode for the indicators:

- Absolute indicators (consumption of resources/energy, expressed in kWh, volume of used waste water, expressed in m³, quantity of pollution emissions, expressed in kg or tons);
- Relative indicators (specific emission, expressed in kg pollution emissions/production unit, concentration of a specific pollution factor in the surface or sewer water [mg/l]; weight, in total, of the recycled waste – %);
- Derivate indicators, such as:

- Environment performance of an organization:

$$PM = a \times MPI + \beta \times OPI + \gamma \times ECI,$$

where:

MPI represents the management performance indicators;

a - weighting factor for MPI;
 OPI - operational performance indicators;
 P - weighting factor for OPI;
 ECI - indicators for the environment conditions (status, quality);
 y - weighting factor for ECI.

- Kenotic affinity index:

$$q = \frac{c}{a + b + c} \times 100,$$

where:

a - number of samples from the A species;
 b - number of samples from the B species;
 c - number of samples that include both species A and B;

- Aridity index:

$$I = \frac{P}{T + 10},$$

where:

P - yearly quantity of precipitations [mm];
 T - annual temperature (°C);

- OMS index of water pollution:

$$WPI = \frac{N \times GNP / Cap}{Q \times 10^6},$$

where:

W is the number of inhabitants of a hydrologic basin;
 GNP/Cap - Gross national product (€/capita);
 Q - average flow (m³/s);

b) The aspect expressed by the indicators:

- Physical indicators (the noise level at the limit of a precinct – dB, number of auto vehicles equipped with catalysts - pieces, the quantity of materials used per product unit kg/unit or t/unit, weight, in total, of the natural gases consumption – %);
- Economic indicators (investments for the installations that perform the reduction of SO₂ emissions, the specific investment for de-pollution at a power plant, expenses for environment protection per product unit, weight, in total, of the environment protection expenses);

- c) Sphere or level of reference of the indicators:
- Process environment indicators (PEI), such as the monthly cool water consumption at a thermal power plant with condensation groups, with open hydro-technical circuit (kg);
 - sit/emplacement/unit environment indicators, i.e. the volume of waste water, summarized from all technological processes in the emplacement, where they result (m^3);
 - Organization environment indicators (OEI): total fuel consumption (GJ/year);
 - Local environment indicators (lei), such as: total quantity of generated urban waste (t/year), total electric energy consumption for industrial purposes (MWh), traffic of particular cars (nr. of vehicles x km/person);
 - Sector environment indicators (SEI): water consumption in agriculture (m^3 /year);
 - National environment indicators (NEI): ecologic taxes on gas (lei/l), weight of Pb-less gas in total gas on market(%);
 - Regional environment indicators (REI): international transport of dangerous waste across Europe (thousands tons/year);
 - Global environment indicators (GEI): global oil consumption, global consumption of drinkable water per person etc.

B) *Organization level criteria*

- a) Application domain:
- Physical indicators (water consumption for technological purposes);
 - Business indicators (utilities-related expenses - water, natural gas, electric energy, thermal energy, gains from sales of waste);
 - Management indicators (ISO 14001 certifications or EMAS records, non-conformities recorded after the environmental audits);
 - Impact indicators (emissions of greenhouse gases - t/year);
 - Specific indicators (residual heat evacuated from the thermo-electrical centrals (CTE) in rivers/lakes- MJ/year);
- b) Area of the measured environmental performance:
- Environment policy indicators (reduction of the annual consumption of electric energy compared with the reference year – %);
 - Indicators of the environment management systems (measure the conformity of the organization with the provisions of the applicable environment law – %);

- Relative indicators of the processes, products and services (specific consumption of energy);
 - Aggregated (annual) indicators from the analysis of the eco-balance (total quantity of waste – kg);
 - Indicators for the environment status: weight, in national total, of the impact on environment produced by the material flows of the organization – %;
- c) Requirements from interested parties:
- Required indicators (quantities of waste produced, recycled, stored, capitalized, eliminated – tons per year);
 - Necessary indicators (consumption of raw materials, expressed in absolute value (kg) and in relative values (kg/P));
 - Desired indicators (weight, in total, of the emplacements where environment reports were realized);
- d) Typology of answer to questions:
- descriptive indicators (type A): emissions SO₂, NO^{*}, CO₂, powder evacuated in the atmosphere (tons/year);
 - performance indicators (type B): proportion, in total, of capitalized waste;
 - efficiency indicators (type C) – specific emissions at autovehicles;
 - total welfare indicators (type D) – lifespan of the fossil combustible reserves (years).
- e) Environmental performance of the organization, in the German vision;
- f) Environmental performance of the organization, according to ISO 14031:1999:
- Management performance indicators – MPI, that can be divided into:
 - indicators of implementation of policies and programs;
 - compliance indicators;
 - indicators of financial performance;
 - indicators of the relationships with the community.
 - Operational performance indicators – OPI:
 - indicators of materials;
 - indicators of energy;
 - indicators of services that support the activities of the organization;
 - indicators of the physical utilities and equipments;
 - indicators of supply and delivery;

- indicators of products;
- indicators of the services provided by the organization;
- indicators of waste;
- indicators of emissions.
- Environmental conditions (state, quality) indicators – ECI:
 - indicators of the air;
 - indicators of the water;
 - indicators of the soil;
 - indicators of the flora;
 - indicators of the fauna;
 - indicators of the human beings;
 - indicators of the esthetic, patrimony and culture.

C) *Criteria at the level superior to the organization*

- a) The PSR (pressure-state-response) model's conception:
 - Indicators of the pressure on the environment;
 - Indicators of the state (quality, conditions) of the environment;
 - Indicators of the society's response.
- b) The DfSR (Driving force-State-Response) model's conception:
 - Indicators of the moving force;
 - Indicators of state;
 - Indicators of response.
- c) Interaction cause-effect:
 - Sector-level indicators:
 - technical sub-system;
 - impact sub-system;
 - economic sub-system.
 - Indicators of results.
- d) Stages of the lifespan of a product/installation:
 - Indicators of design (of project);
 - Indicators of execution (buildings, montage);
 - Indicators of operation (use);
 - Indicators of maintenance;
 - Indicators of rehabilitation (modernization);
 - Indicators of disablement.

4. Reporting and communicating the environmental performances

The instruments that concretize the responses of the society at the modification of the conditions (state/quality) of the environment can be grouped into four categories, that are to respond to the multitude of requirements regarding the reporting/communication of the environmental performances, that is:

a) *Requirements that are to respond to the regulation instruments.* In compliance with the provisions of the standards, normative or other regulations, these requirements results from the necessity of the organizations to monitor and reduce the pressures (the impacts) of the activities, products and services on the environment. This information is necessary to the environment authorities too, but also to the population and other economic agents, interested, from the area, that have the right to be informed on the behavior of the organization towards the surrounding environment.

b) *Requirements that must respond to the economic instruments.* This category of requirements derives from the obligation to enforce various taxes, wages, penalties, stimulants, in order to control and reduce all forms of pollution. To respond to these requirements, the information on the environmental performance of the organization must be made available inside that, but they must reach also the interested parties, including the authorities.

c) *Requirements that must respond to the judicial instruments.* They result from the national and international regulations regarding the environment and answer to the following rights of the individual: the right to be informed on the current and perspective activity of the organization, the right to take attitude and involve in the decisions taken regarding the current and perspective activity of the organization, the right to proceed to the trigger mechanism for legal procedures and demand payment of the environmental damages.

d) *Requirements that must respond to voluntary instruments.* These requirements are among the most evident ones, being explicitly formulated in the voluntary standards of the ISO 14000 series, and also in the Environment Management and Audit Schema (EMAS).

If in ISO 14001:1996, the “environmental performance” was just outlined, ISO 14001:2004 offers it a more “palpable” definition (the measurable results of the management of the environmental aspects in an organization) and nominates it among the input data absolutely necessary for the analysis performed by the management. For any organization, the objective of the compliance with the international standard ISO 14001 is “the continuous improvement”, that is the development process of the environmental

management system to obtain the improvement of the global environmental performance, according to the environmental policy of the organization.

Form the ISO 14000 series, the ISO 14004:2004 standard is the main standard that, through descriptions, examples and options, comes to the help of the organizations that intent to implement and improve an Environment Management System (SMM), certified on the basis of the basic standard ISO 14001. The ISO 14004:2004 standard states that: “the process of establishing and analyzing the objectives and the implementation of the programs for their realization provides a systematic base for the organization to improve its environmental performance in certain areas, by maintaining its level of performance in other areas. Both the performance of the management, and the operational one can be expressed through the statement of the objectives”. In addition to ISO 14001:2004, a special attention is granted to the internal and external communication of the environmental performance, being also included recommendations on the stages of the respective processes: collecting information and performing investigations, including from the interested parties; determining the target audience and the necessities of information or dialog; selecting the information relevant to the interests of the audience; decision on the information, that is to be transmitted to the target audience; determining the appropriate methods for communication; valuating and determining, periodically, the efficiency of the communication process, being emphasized, among the information sources useful for the increase of the environmental performance, the opinions of the interested parties, including the employees, customers and suppliers.

The ISO 14031:1999 standard, through the conception of a valuation plan, usage of existing data and information, processing them and establishing the indicators, presents the mode of analysis and valuation of the environmental performance, through the benefits of reporting/communication of the environmental performance being emphasized: the adjustment of the organization at the realization of its criteria for environmental performance; the increase of the acknowledgement and dialog regarding the environmental policies of the organization, the environmental performance criteria and its relevant achievements; demonstration of the commitment of the organization and efforts for the improvement of environmental performance; supply of the mechanism necessary to respond to the preoccupations and problems regarding the environmental aspects of the organization.

Out of the ISO 14000 series, we can identify other standards that can respond to the requirements of environmental performance reporting and communication. Thus, the international standard ISO/ 14015:2001 constitutes a

guide for the achievement of “environmental valuations of emplacements and organizations”. According to the requirements of this guide, the planning of the valuation, the collection and validation of the information, their valuation and the elaboration of the report is performed by a valuator (or a team) selected by the customer. The presentation of the report can be made in written form, on electronic support or even verbally, in certain special situations. Because it is the exclusive property of the customer, the report cannot be distributed but to the parts interested established by it.

Through the international ISO 14020:2000 standard, there are established the principles that are based on the realization and use of labels and environmental declarations, they having the role to indicate the environmental aspects of a product and service under various forms: affirmation, symbol or drawing on the label of a product or package.

In the letter of this standard, “the general objective of labels and environmental declarations is to encourage the demand and supply of those products and services that affect the environment in a lesser manner, through communicating the verifiable, exact information, that do not lead to errors, regarding the environmental aspects of the products and services, this way stimulating the potential for continuous improvement of the environment”. Among other facts, the standard states that: “the labels and environmental declarations do not have to impeach the innovation that maintains or does not have the potential to improve the environmental performance”.

The international standard ISO 14040:1997 indicates the fact that the LCA (Life Cycle Assessment) can support, among others, the selection of the relevant indicators of environmental performance, including the measurement techniques. LCA is one of the management techniques that approaches the environmental aspects and the potent impact associated for products, on the trail from the acquisition of raw materials, continuing with production, use and post-use. Among the requirements regarding the communication of the results of an LCA study we can find: the results to be impartial, completely and accurately reported to the targeted audience; the type and format of the report must be defined in the stage of establishing the study domain; the conclusions, data, models, assumptions and limitations must be transparent and have sufficient details; the report would allow the results and the interpretation to be used in a manner that is consistent with the purposes and domain of study; in the situation in which the results of the LCA must be communicated to another interested part (besides the de beneficiary or elaborator of the study), a “third party report” must be prepared.

Regarding EMAS, it has included practically the requirements of the ISO 14001:2004 standard, containing, in addition, mandatory, an “initial environment analysis” and an “environmental declaration/environmental report” and has as a major objective the improvement of the environmental performance. Reaching the objective of the EMAS assumes: the design and implementation inside the organizations of an EMS; the systematic, objective and periodical valuation of the EMS's performance; the communication of information regarding the environmental performance and the keeping of a permanent dialog with the public and with other interested parties; the involvement of all the employees in the training and knowledge improvement process in the environmental protection area that would allow them to participate actively in the implementation and upkeep of the EMS. From the environmental report must evidently arise the results achieved by the organization versus the environmental objectives and targets proposed, also the requirements of continuous improvement of the environmental performance. The environmental report must be made available for the public and the interested parties.

To elaborate the environmental report, the following requirements have to take into account into view: the clear and unequivocal description of the organization, with a summary of activities, products and services realized; presentation of the environmental policy and concise description of the EMS; description of all the significant environmental aspects, both direct and indirect, and also of the impacts on the environment; description of the objectives generated and the targets in report with the significant environmental aspects and associated impacts; synthesis of the existing data on the organizational performance in relation to the general objectives and targets, also with the significant impacts (values of pollutant emissions, noise levels, quantities of waste, consumption of natural resources, energy, etc.); the data must allow the annual comparison to appreciate the environmental performance of the organization; presentation of the factors (indicators) regarding the environmental performance, including the performance to the compliance with the legal provisions, and the performance in relation to the significant impacts on the environment; mention of the name and certification number of the verification person and the validation date.

Regarding the European requirements related to reporting the environmental state, the European Environment Agenda has elaborated a guide for the preparation of the “Report regarding the state of environmental factors”

based on the PSR model, extended under the form of DPSIR (Development-economic and social; Pressure; State; Impact; Response). According to the respective model, the economic and social development exercise pressure on the environment, and therefore modifications of the environmental state occur, concretized by negative effects on the human health, availability of natural resources and biodiversity in general. The negative impact on mankind, raw materials and ecosystems, determines a response of the society, response that can manifest either against the primary causes, either on the impact and state of the environment, through a process of adaptation or restoration.

5. Conclusions

The surrounding environment and its state represents one of the major problems of mankind, and subsequently must have the permanent attention of the individual and also of the human collectivities. More efficient than the corrective approach, destined to solve the effects, it is proven to be a preventive approach on the environmental problems that envisions the elimination of the causes, involving material and financial efforts, including shorter terms, and ignoring this problem or superficially treating it may lead to disastrous results on a local, national, regional or global scale.

Recognizing the importance and efficiency of the quantification of pressures on the environment, on its state, and also of the responses of the society at the modifications of the environmental state, numerous international organisms, organizations or institutions (ONU, OCDE, UE, UNEP, CERES, Eurostat, The European Environment Agency, IAEA, etc.) develop, since many years, sustained actions to establish relevant environmental indicators a national, regional or global level, that become more complex and are integrated in sets of indicators of sustainable development.

The voluntary standards in the ISO 14 000 series (especially ISO 14001, ISO 14031 and ISO/TR 14032), also the application regulations for EMAS have an important contribution at the unification of the valuation and report conception for the environmental performance, because the approach to establish relevant environmental indicators is a dynamic and perfectible one, but is facing numerous difficulties related to the availability and correctitude of information, the common accept of the methods and procedures for determination of the indicators values, of delays or lack of reporting, which makes the organizations themselves that have implemented and certified an environmental management system to not rise yet at the level of requirements regarding the valuation and reporting of the environmental performances.

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