RISK MANAGEMENT ASSOCIATED TO THE ENVIRONMENTAL MANAGEMENT OF LARGE COMBUSTION PLANTS (LCPs)

Lect. Marian Enescu Ph. D
University of Craiova
Faculty of Economics and Business Administration
Craiova, Romania
Maria Enescu Ph. D Student
University of Craiova
Faculty of Economics and Business Administration
Craiova, Romania

Abstract: A series of major industrial disasters have led to the concept of "major technological risk" and all the sciences and techniques to study the risks (natural and technological) and the measures to prevent them. The risk management is a process by which LCPs control their own levels of risk. The key elements of an effective program of risk management are: policies, procedures and risk standards. The LCPs environmental management must be adapted to Integrated Management of Natural Resources – INRM. Conventional linear models, methodologies and tools work from INRM approach various alternatives and methods wich should be developed, rediscovered from other scientific fields and adapted to INRM. Should be to learn a lot from past actions and research and industrial development should explore in a system of probabilities designed to develop toghether with the resource users, appropriate solutions.

JEL classification: Q 56, O 44

Key words: risk, disaster, environment, security, pollution

1. INTRODUCTION

A good environmental management system must satisfy three major rules:

Rule 1 of obligations: ensuring compliance with the law;

Rule 2 of requirements: full recording and archiving so that everything can be demonstrated;

Rule 3 of options: opt for certifiable systems that have the methods and means of evaluation and control in accordance with international standards, ensuring the premises for desired performance.

2. OBJECTIVES

Environmental management of LCPS (Large Combustion Plants) must be adapted to the INRM (Integrated Natural Resource Management)[4] whose universally accepted

[4] Hangman, J & others., Success Factors in Integrated Natural Resource Management R&D: Lessons from Practice, Conservation Ecology, no.5(2) 2002;

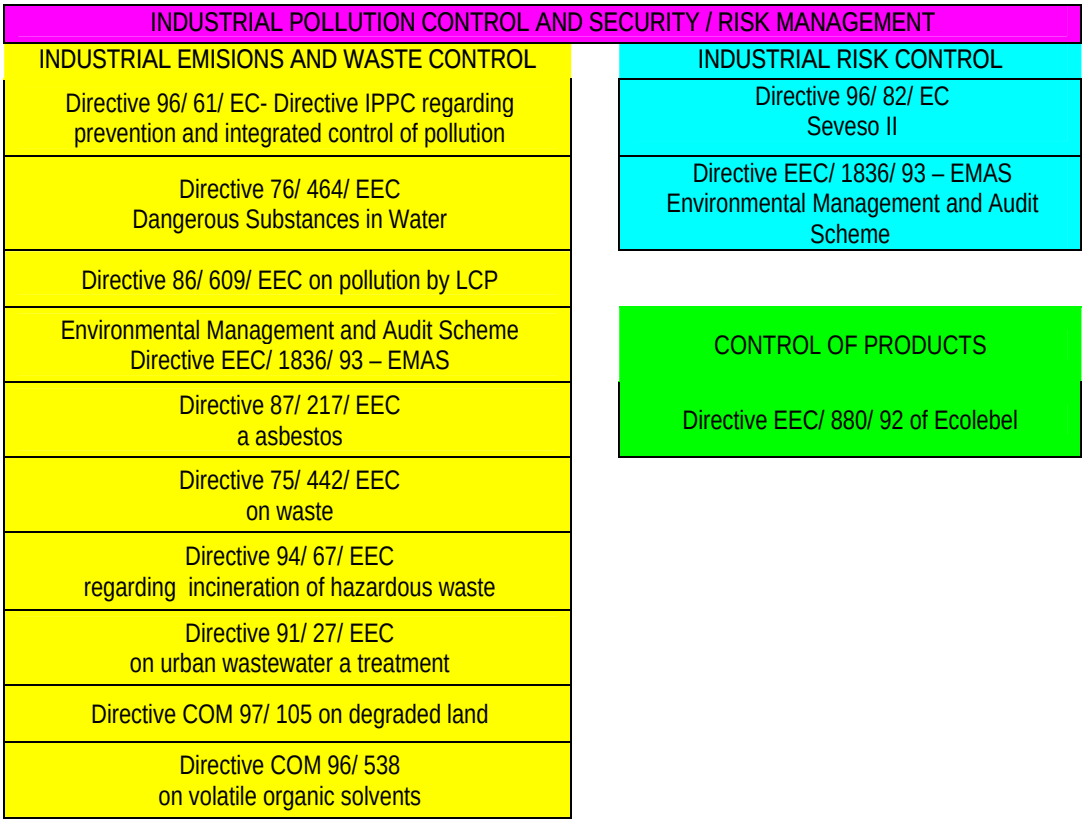
definition is: a concept that should be understood as the broad and responsible management of land, water, forest and biological resources (including genes) necessary to sustain agricultural productivity and to warn in regard to degradation of productive potential. There are many conceptual, methodological and institutional issues able to clarify and answer to the common understanding of the research's role and contribution in INRM.

3. METHODOLOGY

Conventional linear models, methodologies and tools of INRM work in various alternative approaches and methods to be developed, rediscovered in other scientific fields and adapted to INRM. A lot of things should learn from past actions, and industrial research and development should explore a system of probabilities designed to develop appropriate solutions together with resource users.

From this point of view, the design and development of LCPS modernization programs should consider different levels of conceptual thinking and organizational, changes seriously put in the attention of actors operating in the IMA sector, where their roles and mandates are based on a component focused on new technologies.

Combustion plant, according to the Directive 2001/80/EC, is any technical apparatus in which fuels are oxidized in order to use the heat thus generated.



Source: Enescu M, Implementarea unui management de mediu în termocentralele din România, teză de doctorat, Universitatea Politehnică Bucureşti, 2007

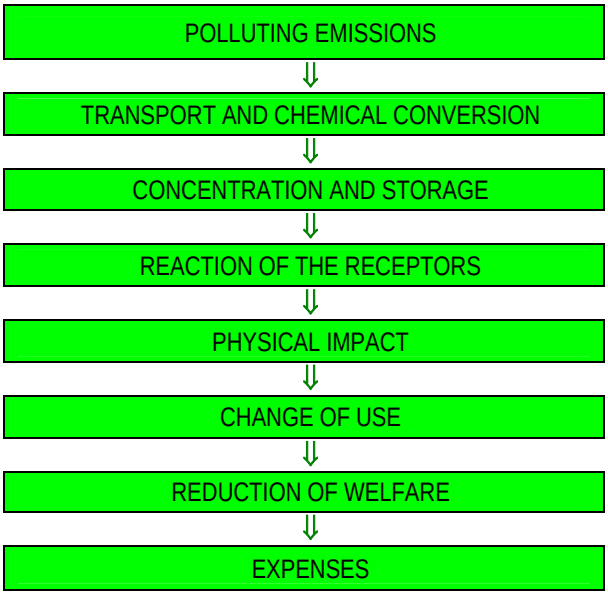
Figure no. 1 Control of industrial pollution and security / risk management

Likewise, solid, liquid or gas fuels used in these facilities should not be part of those laid down in Directive 89/369/EEC applicable to municipal waste combustion plants, Directive 89/429/EEC applicable to reduce pollution produced by municipal combustion facilities, and Directive 94/67/EC on the incineration of waste.

Directive does not apply to installations powered by diesel power, oil and gas.

Another legal document elaborated by the Council of Europe is Directive 96/61/EC or IPCC Directive (Integrated Pollution Prevention and Control) which aims to reduce pollution produced from different sources, plants listed in Annex I in need of operating license that can be issued by authorities specialized in this domain of the EU countries. Authorization shall be based on the concept of best technical availability - BAT (Best Available Techniques), as defined in Article 2 of the Directive.

In IPPC Directive are given values of concentrations of some compounds contributing to climate change in the past 50 years (e.g. content of CO2, N2O, CH4, CCl2F2, hidrofluor of carbon, sulfur hexafluoride and perfluormetan concentration), reduction of the ozone layer thickness, ambient temperature changes and the occurrence of adverse effects on the environment (greenhouse effect), reducing of ice thickness in arctic areas. (Fig. 2)



Source: Enescu M., Enescu M., Impactul combustibililor alternativi asupra sănătăţii şi a mediului, Info GPL, nr.17, Bucureşti, 2005;

Figure no. 2 Assessment of emissions impact on the environment

The impact of these deviations was the one causing the earth radiation modifications, desertification, changing carbon cycle (with impact on vegetation and soil), the rise of temperature at soil surface, changes in water resources, rise of the sea level, impacts on vegetation in mountain areas, changes in circulation of sea currents, transformation of local land area (impact on some areas of the Nile Delta) with repercussions on the social structure of locations.

Prevention and integrated pollution control takes into account technical performance in terms of environment, emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and risk management.

The Directive applies from October 1999 to all new installations and existing ones over which hovers suspicion of adverse effects through commissioning.

A number of groups were established to monitor CAFE (Clean Air for Europe Programme), on specific areas of supervision, such as:

The CAFE Steering Group;

The Target Setting and Policy Assessment Working Group (TSPA);

The Technical Advisory Group (TAG);

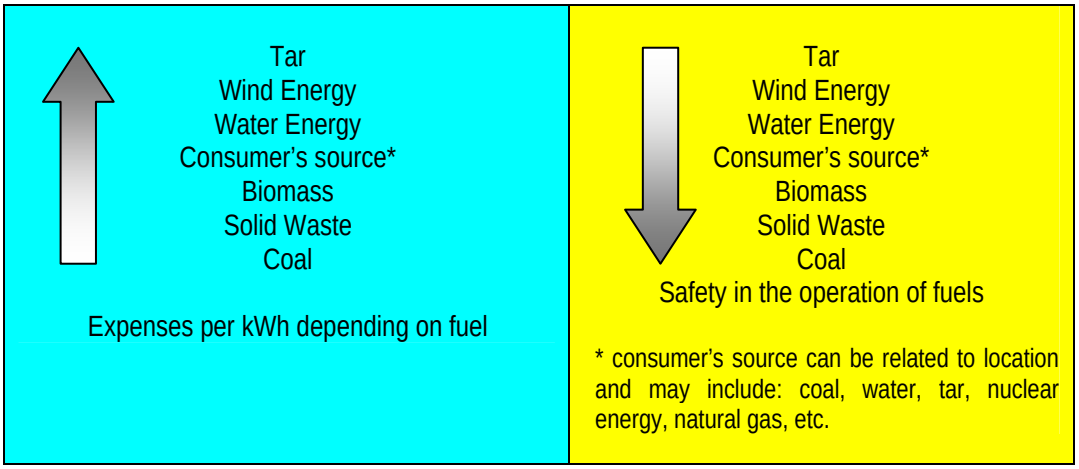
The Working Group Particulate Matter (WGPM);

The Working Group on Implementation (WGI), which has elaborated Multi-effect Strategy on various pollutants that can be applied to the main five types of major polluting emissions.

In this context it is important to note which LCPs Classification of Romania after Environmental Compliance related to supervision and constraint elements (Table 1).

Table 1 LCPS Classification of Romania after Environmental Compliance under Directive 2001/80 / EC

LCP	Current thermal capacity, in MWt	Entire thermal capacity installed in 2007, in MWt	Entire thermal capacity installed in 2015, in MWt
Complying	1.341[5]	9.054	47.824
Non-complying	54.723	44.634	0
TOTAL	56.064	53.688	47.824



Source: Enescu, M., Zecheru, I.,I., Managementul de securitate în centralele termoelectrice, Monitorul de petrol şi gaze, nr. 1/47, p.28-30, Bucureşti, 2006;

Figure no. 3 Evaluation of Fuels

[5] Thermal capacity of 7 LCPs conforms;

4. ANALYSES

A number of major industrial disasters have led to the concept of "major technological risk" and all the sciences and techniques meant to study the risks (natural and technological) and their prevention.

Management of risk associated with environmental management is defined as the identification, economic evaluation and control of all risks that assess and identify a business capacity.

It should be noted that the following directives represent basic instruments in the industrial risk management:

Directive 82/501/EEC, known as the Seveso I, presents the specific criteria for identifying installations with potentially technical hazard and defines requirements that they must meet;

Directive 96/82/EC on the prevention and control of major random accidents caused by hazardous substances and limitation of their consequences on human health and the environment, known as the Seveso II or COMAH Directive. Aim of the Seveso II Directive is to harmonize security measures from the plants with the highest degree of danger on a high level of protection, in this respect being created several working groups to support the implementation of the Directive's provisions;

Directive 2012/18/EU, known as the Seveso III Directive on the control of major accident hazards involving dangerous substances, which is amending and subsequently repealing Directive 96/82 / EC.

Two risk thresholds have to be considered according to Directive Seveso I: **a high level of risk** (notification) and **a low level of risk** (statement), according to which companies are required to prepare the **detailed security report** describing technological processes and evaluating major risks in terms of potential accidents connected to the company's activity.

Risk management is defined as all operations seeking to limit the losses that can affect an organization, group or person [6].

Risk management has the following steps:

modeling threats;

risk assessment;

loss mitigation measures.

Risk management is the process of identification, analysis and reaction to potential risk. This should be a permanent process, as every day new risks may occur and must be controlled to prevent a disaster. Choosing the most cost-effective ways to reduce losses requires a careful cost / loss evaluation. The objective of risk management ranges between limits in which the risk is tolerable and the cost is reasonable.

From manager's perspective, the risk can be tolerated if:

its likelihood to happen is distant enough;

the consequences are not severe.

Risk can be eliminated or reduced by:

changes in processes;

transfer of risk.

Risk management systems of each LCP are different because:

risks are different;

---

[6] Ceocea C., Riscul în activitatea de management, Editura Economică, Bucureşti, 2010.

operations and organizational system are unique;

corporate culture is unique.

For example, in case of explosion, workers are exposed to risks arising from uncontrolled phenomena of ignition and pressure, such as radiant heat, flame, shock waves, the projection of debris and the presence of noxious reaction products and impoverishment of air in the oxygen essential for breathing.

In the power generation sector, especially in the case of large combustion plants (LCPs), explosion hazard may occur due to:

explosive dust / air mixtures that can be formed during transport, drying and grinding of coal lumps which is not explosive when mixed with air;

fermentation gas that is released during wastewater treatment in sewage plants which can produce explosive mixtures of gas / air;

failure to respect boilers' normal operating parameters.

Employers should avoid the formation of explosive atmospheres whenever possible. Compliance with this guiding principle in accordance with Article 3 of Directive 1999/92/EC requires, for the explosion risks' assessment, to determine first whether hazardous explosive atmospheres may form under the circumstances. After that, they need to determine if they can ignite.

This assessment should be done always for a specific case and can not be generalized. In accordance with Article 4 of Directive 1999/92/EC shall be taken into account, in particular, the likelihood that explosive atmospheres can occur and persist and ignition sources are present and ready to become active and effective, the installations and substances used all processes and their possible interactions as well as the magnitude of predictable consequences.

Methods to be used to evaluate processes and technical systems in terms of explosion risks should be based on a systematic approach to check safety of the equipment and procedures. A systematic approach in this context means that evaluation is made in a structured manner based on logical and rational considerations. The analysis is carried out for existing sources which can lead to the formation of hazardous explosive atmospheres and, possibly, the concomitant presence of active ignition sources.

4.1 Critical

In practice, it is usually sufficient to determine and to systematically assess the risk of explosion with the help of a series of specific questions based on specific evaluation criteria.

Risk assessment methods described in the specialized literature for:

identifying sources of concern are: use of checklists, analysis of failure models and their effects, analysis of control error, HAZOP analysis;

evaluating sources of danger are: analysis of events or fault tree analysis**.**

They are useful only in exceptional circumstances in case of protection against explosion, for example to determine ignition sources in complex technical systems.

Explosion risk assessment is made whether or not it is known if ignition sources are present or may appear:

Basic activities in any risk management system are:

risk identification;

risk assessment;

risk control.

Risk management is a process by which LCPS control their own level of risk. The key elements of an effective program of risk management are: policies, procedures and risk standards.

Risk management policies describe program objectives, procedures determine how policies will be implemented and standards recommend guidelines for specific situations.

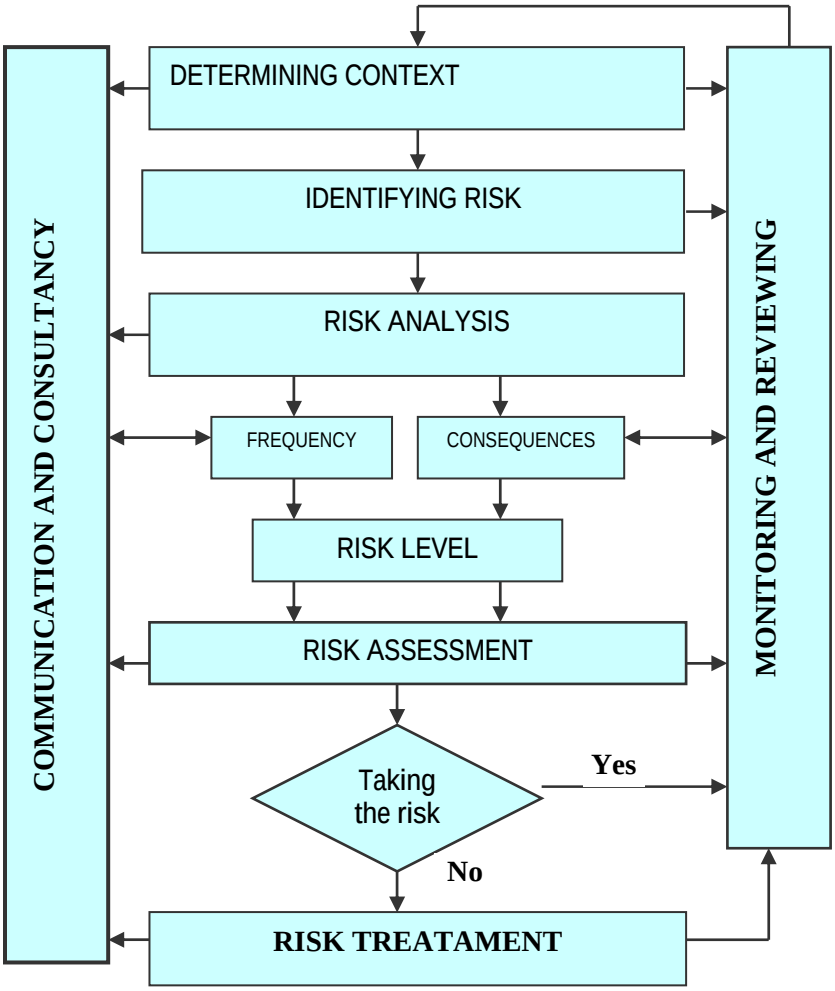


Figure no. 4 Procedure for risk assessment

5. CONCLUSIONS

Risk management is particularly necessary in an organization that has a number of different locations whose size requires preventing any individual knowledge of each topic's details in businesses with overseas operations with varying degrees of processes, with many subcontractors and business associates who can not always be controlled, the case of LCP being typical for this conjunction mode of management.

Any business in a market economy presents lower or higher risks which should be assumed by those concerned, otherwise their opportunities for profit decrease; however, risk taking implies being aware of specific business risks that have to be known and

identified, analyzed and evaluated, then strategies to prevent their adverse consequences must be elaborated.

REFERENCES

1. Ceocea C. Riscul în activitatea de management, Editura Economică, Bucureşti, 2010
2. Enescu M. Implementarea unui management de mediu în termocentralele din România, teză de doctorat, Universitatea Politehnică Bucureşti, 2007
3. Enescu M., Enescu M. Impactul combustibililor alternativi asupra sănătăţii şi a mediului, Info GPL, nr.17, Bucureşti, 2005
4. Enescu M., Zecheru I.,I. Managementul de securitate în centralele termoelectrice, Monitorul de petrol şi gaze, nr. 1/47, p.28-30, Bucureşti, 2006
5. Hangman, J & others Success Factors in Integrated Natural Resource Management R&D: Lessons from Practice, Conservation Ecology, no.5(2) 2002