THE 12TH EDITION OF THE INTERNATIONAL CONFERENCE
EUROPEAN INTEGRATION
REALITIES AND PERSPECTIVES

Performance and Risks in the European Economy

Evaluating the Quality and Safety of Environmental Factors in Investment Strategies

Stefan Dragomir[1], Georgeta Dragomir[2]

Abstract: A participatory risk assessment process engages people through a bottom-up approach that aims to involve stakeholders, the public and specialized agencies in that problem preferred management options and proposing solutions to particular risk problems. In planning a participatory risk assessment, key elements include: -communicating information transparently and using a non-technical or domain – specific language; -defining issues that need to be addressed and the questions that need answered; – scoping the problem and framing the questions;-identifying the data and information needed to deal with the questions;-identifying the sources of data;-deciding how to deal with uncertainty.

Keyword: risk assessment; severity class; probability of consequences

1. Introduction

Risk factors are all factors likely work system to act on the health or integrity of injuries to workers. It's about what the majority of people in the current parlance, they are considered hazards or dangerous situations. In this respect the European norm EN 292-1 defines danger, dangerous situations or events related to hazardous work (risk factors) as being a "reason capable of causing an injury or a sickness attack." This definition is a qualitative risk assessment commonly used in its identification. Between the contractor and the collectivity and within which they operate to create links, dependencies and interference that varies depending on the level of integration in the community and which exerts a decisive influence on his behavior. Concepts and habits within a unit, as well as how that group appreciates the risk, determines in a very large measure behavior in terms of safety at work (Rojanski, Bran, & Grigore, 2000).

1.1. Profession/Job Title, for the Work Place

The most important jobs are represented of technical staff, administrative, financial, budgeting, accounting, human resources, payroll, internal audit, computer science and statistics, administrative, work prevention and protection, mail, medical records, equipment expert. The work consists in the activities of office and outside the unit.

[1] Professor, PhD, Dunarea de Jos University of Galati, Romania, Address: 47 Domnească Street, 800008 Galati, Romania, Tel.: +40372361102, Corresponding author: gretadragomir@univ-danubius.ro.
[2] Professor, PhD, Danubius University of Galati, Romania, Address: 3 Galati Blvd., 800654, Romania, Tel.: +40372361102, E-mail: gretadragomir@univ-danubius.ro.

The components of work system are:

- The means of production used are: desk, chair; computer and printer; means of transportation belonging to the unit or public transport; outlets, extension cords for power; supplies, office supplies; desktop computers; furniture fixtures;
- The hangman made some wrong operation like: commands; maneuver; positions; establishment; adjustments; misuse of the means of protection; improper work methods or incorrect sequence of operations.

Mechanical risk factors: dangerous movements; functional movements of the machinery: machine parts in motion; fluid flow; movements of the means of transport; automatic self-timer or functional movements against machinery or fluids displacements under gravity: sliding, rolling, rolling on wheels, overturning, falling free, leak free, spill, subsidence, collapse, diving; displacement under the effect propulsion: objects found or particles, deviation from normal trajectory, balance, pushing back, excessive shock, jet, splash.

Risk on action surfaces or contours dangerous (stabbing, slippery, abrasive, adhesive) are:

- Thermal risk factors: - high temperature objects; - low temperature objects or surfaces; flames.
- Electromagnetic: infrared, ultraviolet, microwave, high frequency, medium frequency, low frequency, laser ionizing (alpha, beta, gamma; -electrostatic potential; -lightning, flood, wind, hail, blizzards;
- Chemical risk factor: toxic substances; caustic substances; flammable substances; explosive substances; radioactive substances; excessive vibration of machinery; radiation; gases, vapors, toxic or caustic aerosols; particulate matter in the air, flammable or explosive gases or vapor.

In table no.1 is shown a classification of severity of consequences in function of severity class (Rojanski, Bran, & Grigore, 2000).

Table 1.

Severity class		**THE SEVERITY OF THE CONSEQUENCES**
Class	Consequences	
1	OMIT	- minor consequences predictable incapacitating reversible up to 3 calendar days (cure without treatment)
2	SMALL	reversible consequences with an incapacity for work predictable 3-45 days that require medical treatment
3	AVERAGE	reversible consequences with an incapacity for work of between 45-180 days that require medical treatment and hospitalization
4	LARGE	irreversible consequences with a reduction of the capacity for work of a maximum of 50% (disability grade III)
5	GRAVE	irreversible loss between 50-100% of capacity, but with the possibility of self service (disability grade II)
6	VERY SERIOUS	irreversible consequences with total loss of capacity for work and self-service capacity (disability grade)
7	MAXIMUM	Out of life

Security is defined as the fact of being sheltered from any danger. Risk and security are closely interrelated and mutually exclusive.

Risk factors acting on the performer by two main components: gravity consequence/event) and probability of occurrence (events/unit time). Combining these components determine the level of risk itself.

Risk factors are all components of the system's own job (executing, the burden of work, means of production, work environment).

2. Research about Own Environmental Risk Factors Work

The environmental risk factors work it is classified as follows:

a. Physical risk factors that include: excessive air temperature (high/low); improper air humidity (high/low); high speed air currents, they define the microclimate and the working environment; Excessive air pressure (high/low); Inadequate lighting; Noise**,** radiation, vibration, electrostatic potential, natural disasters, aggression to aggression in the workplace.

b. Risk factors of chemical which include: gas, vapours, aerosol dust and toxic pneumoconiogene. Risk factors (potential causes) of system components that form the basis of accidents at work and occupational diseases as well as preventive measures, schematic, are presented in Fig. 1.

Notions of security and risk are opposites being connected by a hyperbolic equation R = (S Security R - risk).

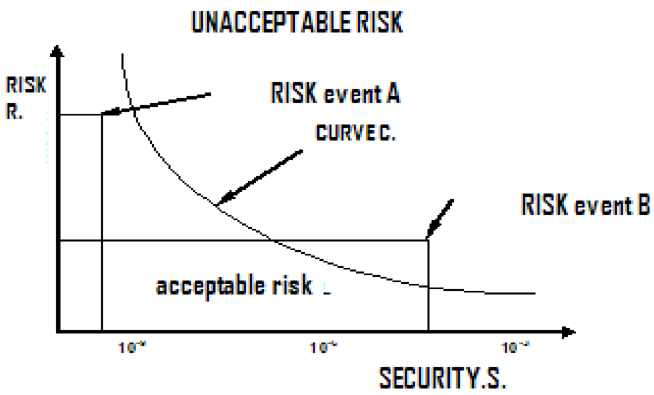

Figure 1. Relationship between Risk – Security

Source: (Negrei, 2002)

y = f(x)

Risk is defined in accordance with the European standard EN 292-1, as “the combination of the probability and severity of an injury or sickness attack that can occur in a dangerous situation.” This is a quantitative definition of risk that can be used in prioritizing risks. In other words, the risk is the likelihood of a specific gravity of damage during exposure to the risk factor. Consequently, professional risk associated with a particular situation or a particular technique from combining the following elements:

- foreseeable consequence severity (severity of the most likely consequence);
- the likelihood of such consequences.

Thus defined, the risk can be assessed quantitatively, if severity and probability have been quantified themselves. Quantitative assessment (evaluation) can be used to compare different risks within a system and to determine the priorities of intervention or to compare risk levels before and after the implementation of measures to prevent the manifestation of him.

The absence of a system of review, a small number of accidents or occupational diseases, low severity of consequences of accidents should not be automatically regarded as a presumption of a low risk.

2.1. Risk Severity

Shall be assessed in accordance with MIL-STD-882 C by evaluating the consequences of the most serious accident that could have caused the risk factor.

Consequence severity (severity of the damage possible) can be estimated by considering the following:

- the nature of the protected object (persons, property, environment);
- severity of injuries or damage to health (easy - normally reversible serious - normally irreversible, death);
- the magnitude of manifestation the consequent impact (a person, more than one person).

Categories of severity of consequences allow assigning a qualitative size potential accidents due to human error, environmental conditions, non-compliance project, procedural deficiencies or damage and organ dysfunction product, sub-assemblies or its components.

The product manager, the manager the quality assurance program of safety of the product and the one who carried out the product should be able to lay down exactly what is meant by destroy the product, by major consequences/minor to product/environment and by occupational disease or serious injury. Severity can be defined on the basis of criteria such as:

- temporary incapacity (ITM), permanent work incapacity (disability), death;
- health effects, reversible or not, for risk factors likely to have psychological effects;
- interference with the comfort, satisfaction, worker motivation for social risk factors and organizational (Myrick, Herriges, & Kling, 2014).

2.2. Risk Probability

Probability means in accordance with MIL-STD-882 C frequency of occurrence of the event unwanted and can be described as potential occurrence in the unit time or reported from the population, item or situation.

Probability is conditional on even terms of work processes: reliability of technical equipment, materials, organization of work, time constraints, etc. As with the severity of the consequences for estimating the probability of occurrence of consequences can use multiple grids of appreciation. For a more accurate estimate of the probability of occurrence of consequences is recommended to be taken into consideration:

a) **the frequency and duration of exposure are determined by:**

- need access to the danger zone (normal operation, maintenance or repairs);
- nature of access (e.g. manual feed materials);
- Time spent in the danger zone;

• the number of people who register;

• frequency of access.

b) probability of occurrence dangerous due to:

• Technical equipment reliability and other statistical data;

• statistical data related to the frequency of accidents and occupational diseases;

• comparing the risks of system already accepted analyzed risks of systems.

c) the possibilities to avoid or limit the consequence of a hazardous event by:

• executing (which can be qualified or unqualified person can perform the task;

• supervised work or not, etc.);

• rate of occurrence of the event estimated dangerous (sharp, fast, slow);

• any form of risk awareness (through general information by direct observation;

• by means of warning and indicating devices;

• possibilities to avoid or limit performer consequence (e.g. reflexes);

• the skill saving opportunities that make the chances contractor to avoid;

• or limit the result to be possible in certain circumstances possible, impossible);

• practical experience and knowledge of the performer (on the job);

• examined, on a similar work process or inexperienced).

2.3. Level of Risks

The level of risk is an indicator quantity absolutely once rated allow knowing to what extent the security of a system, in terms of the possibility of accidents and occupational diseases, it is acceptable or not.

In practice it is considered that a system is secure, if having a non-zero risk, but small enough, known as residual risk or acceptable. Interventions while the residual risk increases as the work degrade and age under the law of increasing entropy. Where as the risk cannot be null (infinite security) must be determined which couples probability of occurrence-consequences can provide an acceptable level of risk.

Graphic representing acceptable risk in the form of rectangles with areas equal to F1 = F2 = F3. gravity/probability, data in Figure 2, the curve variation in the severity of consequences.

Risk severity

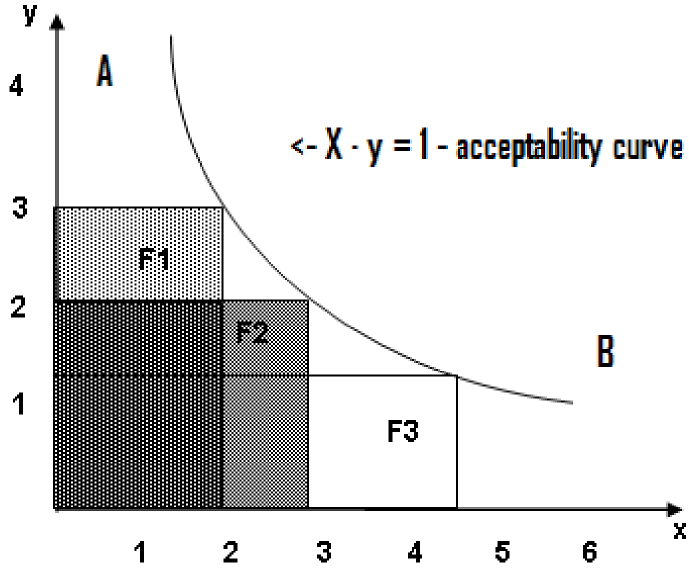

Figure 2. The curve variation curve: severity of consequences/risk probability

A-acceptable risk; B-unacceptable risk (Rojanski, Bran, & Grigore, 2000)

Under the curve (A) the risks are acceptable, and above the curve (B) the risks are unacceptable. The curve in Figure 2 called risk acceptability curve and corresponding function p hyperbole. g = const. In Romania currently accepted value of this constant is to be 3.The main objective of the evaluation is to establish acceptable risk and bringing in acceptability.

Evaluation of Environment Impact

Assessment of environmental impact shall be carried out using the matrix method (for index of quality) and V. Rojanschi method (calculation of global pollution index).

An assessment of the impact on the environment shall be based on:

- indices of quality on environmental factors (water, air, soil-sub soil, noise, human settlement, biodiversity, landscape)(I_C);
- index of global pollution (I_{PG}).

Quality of a environment factors is falling within the allowed limits of STAS or Normative reglementations.

It is estimate defects “project” on the environment based on “factor size” which are to be analyzed taking into account the level of quality indicators that characterize its effects.

The formulas of environmental quality index is (I_c):

$$\mathbf{I_c = L_{project} / L_{reglementation} = E^{-1}}$$

$L_{proiect}$ – project actions

$L_{reglementat}$ – reglementations of Normative actions;

E – environmental effects

Interplay between actions project ($L_{project}$) and environmental effects (E) can be highlight by marking the appropriate box of its size estimated by a common system to the whole assembly (with +, - , or 0), as follows (Negrei, 2002):

Table 2

I_c = **0** to **+1**	**-** positive influences. Environmental is influenced in admissible limits.
I_c = **- 1** to **0**	**-** negative influences. Environmental is influenced over admissible limits.
I_c = **0**	**-** Environmental is not influenced.

An assessment of the impact on environmental factors by the quality indexes (I c)

Matrix for impact assessment

Table 3

Environmental actions	**Effects on environmental factors**			
	Noise	Air	Water	Soil
Air	0	-	0	0
Wather	0	0	-	0
Soil	0	0	-	-
Landscape	0	0	0	0
Noises	-	0	0	0
Human settelment	0	0	0	0
Effects -E	**-1**	**-1**	**-2**	**-1**

The values of Effects (E) are:

For noise, E =-1

For air, E =-1

For water, E=-2

For soil, E=-1

3. Assessment of Quality Index Values

These assessments are based on: Quality index values (I_c) for each environmental (Negrei, 2002) factors and worthiness note that corresponding of I_C values like in the table 4.

Table 4

Wothiness note	**I_C value**	**Environmental effects**
10	**I_c = 0**	Environmental is not affected by the developed activity.
9	**I_c = 0,0 ÷ 0,25**	Environmental is affected in admissible limits. Level 1. Positive effects.
8	**I_c = 0,25 ÷ 0,50**	Environmental is affected in admissible limits. Level 2. Positive effects.
7	**I_c = 0,50 ÷1,00**	Environmental is affected in admissible limits. Level 3. Positive effects.
6	**I_c = -1,0**	Environmental is affected over admissible limits. Level 1. Negative effects
5	**I_c = -1,0 ÷ -0,5**	Environmental is affected over admissible limits. Level 2. Negative effects
4	**I_c = -0,5 ÷ -0,25**	Environmental is affected over admissible limits. Level 3. Negative effects

3	**I_c = -0,25 ÷ -0,025**	- The medium is degraded, level 1. - The effects are harmful to **long** periods of exposure.
2	**I_c = -0,025 ÷ -0,0025**	The medium is degraded, level 2. - The effects are harmful to **medium** periods of exposure.
1	**I_c = sub –0,0025**	The medium is degraded, level 3. - The effects are harmful to **short** periods of exposure

I_{PG} = S_i/S_r

I_{PG} = 1, no polluted existence

I_{PG}> 1 it existing environmental quality modification

Quality scale by Global Polluted Index is shown in table no. 5:

Table 5

I_{PG} = 1	- environmental is not affected by human activity
I_{PG} = 1...2	- Environmental is affected in admissible limits
I_{PG} = 2...3	- Environmental is affected and existing a discomfort for life forms.
I_{PG} = 3...4	- Environmental is affected and existing troubles for life forms.
I_{PG} = 4...6	- Environmental is severe affected and existing a multiple dangers for life forms.
I_{PG}> 6	- The medium is degraded, unsuitable for life forms.

3.1. Calculus of global Polluted Index

It is considered a number of four environmental factors affected by polluted risk like: air, water, soil-subsoil, noises:

- Global Polluted Index (Negrei, 2002) $I_{PG} = S_i/S_r$
- S_i value (ideal state) – resulting by geometrically figure have the surface:
- Si = 200cm^2
- S_r value (real state)

It was built by pooling related points values Nb (note worthiness) for each environmental factor taken into account.

N_b value shall be obtained for each environmental factor scale of worthiness as a function of the value of the pollution index

- N_b for Noise:

I_c = -1.0⇨ N_{bnoise} =6

- N_b for Air:

I_c = 0.25 ⇨ N_{bair} = 8

- N_b for Water:

I_c = -1.0⇨ N_{bwater}= 6

- N_b for Soil:

I_c = 0.25 ⇨ N_{bsoil} = 8

Surface Sr: $S_r = 100\ cm^2$

$$\Rightarrow \quad I_{PG} = \frac{S_i\ 200\ cm^2}{S_r\ 100\ cm^2} = 2$$

Global Polluted Index ***=2***

Graphically representation for Index of global polluted is shown in figure no. 3:

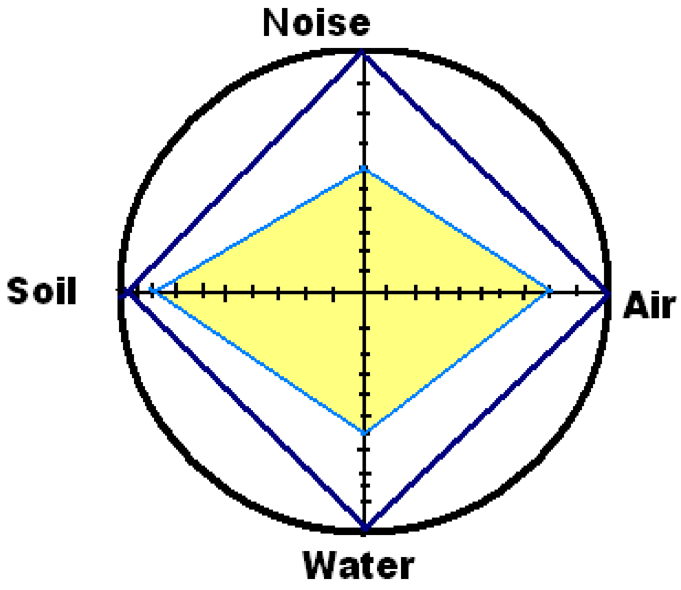

Figure 3. Graphically representation for Index of global polluted

Index of global polluted value is: $I_{PG} = 2$- Environmental is affected in admissible limits

4. Conclusions

An acceptable risk may be characterized by a probability of occurrence (frequency), but the seriousness of the consequences (F1) - nuclear accidents, or vice versa-a high frequency with low severity of consequences (F3) - traffic accidents.

Risk level assessment method and its classification as acceptable or unacceptable risk has the advantage that it can be applied both to existing employment systems and those in construction-design phase. Establish risk acceptability curve (delineating acceptable risks) is a difficult issue. This is done through a strategic decision be based on the cost of human life, whether from the comparison with other risks already accepted.

Exposure to risk factors, represents the duration in the time or frequency in time at which the contractor is exposed to a risk factor and the level to which it is exposed. Assessment of exposure may be carried out, in some cases, in terms of quantitative metrics. Needs analysis can choose diverse exposure assessment rubrics. Exposure is often integrated into the concept of probability, the assessment of risk, taking into account the duration or frequency of exposure. Consideration of exposure, in a separate probability is subtle and it requires a complex approach for assessing occupational risks.

5. Bibliography

Myrick, F. A., Herriges, J. A., & Kling, C. L. (2014). *The Measurement of Environmental and Resource Values: Theory and Methods.* RFF Press.

Negrei, C. C. (2002). *Economia si politica mediului/Economy and environment policy.* Bucharest: EDP.

Rojanski, V., Bran, F., & Grigore, F. (2000). *Elemente de economia si managementul mediului/Elements of economics and environmental management.* Bucharest: Editura Economica.