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REDUCING THE ENVIRONMENTAL IMPACT OF MINING IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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The paper, a synthesis of a larger analysis performed in the past years, deals with the problems of identifying the factors affecting environment related to mining activity and proposals to reducing the negative effects. In this respect, the main characteristics of the Romanian mining industry are analyzed, and the impact assessment on main environmental factors is evaluated. On this basis, the key measures to be performed, in the idea of sustainable development are presented.

Even if, at first sight, one might think that a shadow has been lately cast on mining, the latter is in fact a very important sector of economy, which could be a major source of degradation for the physical and social environment without an efficient management.

Mining should not be deprived of a new critical vision, a new interpretation, a fresh approach, meant to highlight both the beauty and the hardship of this profession; one should not stay indifferent to the brutality with which man destroys nature.

The specialists of the current generation endeavor a unitary approach and solution, in the spirit of a durable development of one of the most important issues of mining engineering, namely ecological mining of a seam of useful mineral substances. This does not mean that all effort have been made for the use of non-polluting methods; on the contrary, technologies will stay polluting, but the specialists should make efforts to attenuate or annul the negative effects on the environment. It is important that each mining technology (caving, packing), each extraction type (mechanical, with blasting) be known so that their weak points should be clearly and unambiguously pointed out.

Due to the vast field of negative issues generated by mining on the environment, they should be approached systematically. In all cases where a long term concern existed to define a performing practice in mining industry, environmental management evolved from a simple

uncoordinated response, with a limited sphere of application, given to problems of local interest, to a discipline with a high degree of integration. Positive practices come to life at present, by the use of systematic and rational management procedures, which can represent a powerful means of environmental impact control.

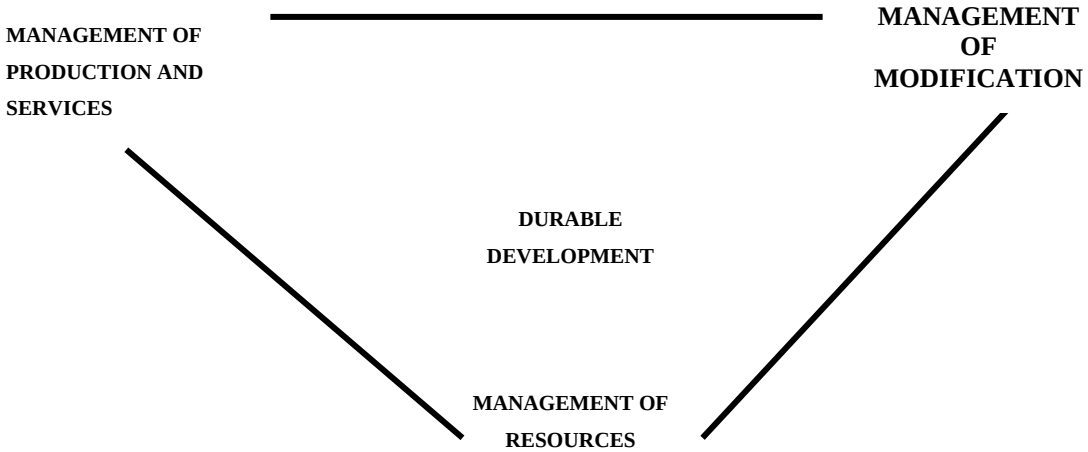
A durable development is based on economy and ecology, with four compatible systems interacting: **economic, human** (social), **ambient** (environment or ecological), and **technological.** To provide compatibility of the four systems, an essential element involved is **simultaneity of progress in all the four dimensions.**

Against this background, the promotion of responsible factors of the "economy-ecology" concept is endeavored as a component of durable development; that is the right to development should be exercised in such a way that the development and environment needs of the present and future generations should be equitably satisfied.

The durable development objective will have to correspond to the needs of the unit, so that the system should be as simple and as economic as possible and to be easily maintained in reasonable limits. When choosing an approach, a series of factors are taken into consideration, namely: the system implementation cost compared to the benefits, training and experience of the trained staff, and last but not least, previous experience of the unit in the implementation of systematic environment management procedures.

Among the essential elements to be considered for a durable development, the more and more international, even global characteristic of the environment issue is to be mentioned.

The strategic parts of a durable development and the actions of improvement of present technological systems in view of defining the technologies of the future are written in a trigonometric sense, from the management of product and services, through management of resources to management of modification.



For developing countries, international economic relationships, price of commodities, transnational investments as well as debts and budgets make allocation of resources required for investments in the area of environment protection as well as introduction of measures of adaptation to required policies imposed by a durable development difficult.

Indeed, one of the solutions suggested in the "Declaration on the Environment Protection and Development in Rio", adopted at the United Nations Conference of Environment and Development, is that environment and economy are tightly connected, and integration of ecological considerations in development planning is essential for a durable development.

Based on common elements, the strategy of durable development becomes operational by suitable national policies, capable to carry out the compatibility of systems inter-conditioning each other in time and space, regional and international cooperation.

Some necessary measures to be taken to reduce negative influences created by mining industry on environment factors will be given below.

In underground workout of useful mineral substances, negative effects on the surface can be diminished by suitable extraction methods and technologies, exemplified by packing – especially hydraulically – underground cavities, correct dimensioning of mine workings and protection pillars, harmonious exploitation of the layers close to coal etc.

Prevention or reduction of damaging influence of solid residues is based on an as rational application as possible of the principles of clean and efficient mining, in an endeavor to

- Reduce the quantities of sterile resulting from the extraction process;
- Occupy as small as possible and less productive land areas;
- Use solid mineral residues in various spheres and get usable sub products.

To prevent or minimize the influence of residual water resulting from technological processes, occurring in various sectors of mining industry in the present state of development of mining methods, the following measures are required:

- Reduce industrial water consumption as much as possible, reducing thus impure residual water quantities;
- Reduce pollution degree by cleaning impure water before its discharge in tributaries.

The following measures are required for the protection of air:

- Reduce pollutant air volumes;
- Reduce pollutants quantitatively;
- Clean polluted air and its dispersion into atmosphere.

The harmful effect of noise and vibration has to be taken also into consideration.

Mining industry is one of the noisiest. Machinery and installations in all its sectors (extraction, haul, storage, preparation etc) make an intense acoustic pollution, the peak being noise created by explosives.

Measures taken to reduce damaging action of noise and vibration are:

- Reducing noise and vibration at their source;
- Application of noiseless technologies and protection arrangements.

In the immediate vicinity of underground and open pit mines, as well as around mine yards, existing forests shall be protected; protection curtains should be planted to conserve the biologic equilibrium of the region. Vegetation around mines will benefit of equal importance as mining arrangements.

Use, protection and conservation of natural environment as well as observing ecological balance exigencies is a basic requirement of reproduction and economic growth.

Any measure against pollution requires an economic solution.

Pollution prevention costs less than its remedy. The calculations made by economists regarding the economic effects of expenses for environment protection show that they determine a 4-5% cost increase, and only sometimes almost 10%.

When investments are scheduled for a certain objective, inclusion of pollution prevention expenses will be mandatory. This means an expense analysis not only in the prism of immediate, but also of long term economic efficiency.

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