

DIMENSIONS OF SUSTAINABLE DEVELOPMENT IN EXTRACTIVE INDUSTRY

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Abstract:

The concept of sustainable development, resulted from the reconsideration of the report between development and pollution in the light of the interdependencies among the components of development, defines the profound change in which the exploitation of resources, direction of investments, the development of technologies takes a new path in the sense that, by their judicious harmonization, provides significant increase of the present and future potential to meet the requirements of society. Such a development is based on economic growth, which is, in fact, its spring, but also on new concepts and values that provide a superior framework of transposing the growth coordinates. Such a framework should provide incentives to accelerate economic growth, whose objectives, ways and tools are defined in a long-term perspective, able to provide large openings to the real progress of society at all levels and provide solutions for the effective and continuous support for this progress. Therefore, in this article, we identify and explain the three dimensions of sustainable development: economic, social and environmental.

Keywords: *extractive industry, non-renewable resources, environment, impact, sustainable development*

JEL Classification : *Q01, Q32, Q56*

1. INTRODUCTION

The concept of sustainable development is based on the premise that human civilization is a subsystem of the ecosphere, dependent on the flows of matter and energy within it, on the stability and capacity for self-regulation. Public policies are developed on this basis and they seek to restore and maintain a rational balance in the long term, between economic development and the integrity of the natural environment in forms understood and accepted by society.

As such, it may be said that sustainable development covers a much wider field of profound changes occurring in all activities and concerns of society - economic, social, political, scientific, technological, educational, cultural, environmental, institutional, ethical etc. - a harmonious combination of these elements, their mutual potentiating and their orientation towards achieving the objectives of development ensure its success and perpetuation in the long term.

In this context it should be underlined that **sustainable development has essentially three dimensions - economic, social and environmental** - deeply intertwined, whose harmonization accelerates the pace and direction of society, its ability to achieve higher levels of prosperity, as well as material and spiritual welfare of its members.

2. THE ECONOMIC DIMENSION

This first dimension of sustainable development is the economic dimension, and means the existence of an efficient economy, characterized by:

- the ability to record sustained rates of economic growth in the medium and long term, without alternations of decline and growth;
- general economic balance - i.e. a harmonious state of the socio-economic system achieved by dynamic synchronization of partial economic balances (financial, monetary, budgetary, foreign exchange, natural-material, labour force) - which is associated with low levels of inflation (one digit inflation) and keeping unemployment within the range considered "natural" (4 to 6%);
- a balanced structure of sectors and branches, in a perpetual process of modernization in line with global trends, primarily in the most developed countries on the basis of sustained investment effort;
- a high level of labour productivity, which has superior evolution as compared to the gross domestic product and which provides a reasonable use of the labour force;

- existence of sustainable competitive advantage, demonstrated by the presence on the global market and unaffected by cyclical variations;
- functionality, embodied in the existence of working market mechanisms, based on the coexistence of competition - as a factor which is at the same time a stimulus and a governor for the economic balance - and cooperation - technical-scientific, production and marketing - between companies.

Consistent with these defining features of an efficient economy, the analysis of the current situation of the Romanian economy reveals significant gaps when compared with developed countries in terms of the levels of economic efficiency and social performance indicators, requiring further efforts to ensure its sustainable development in productivity, efficiency and competitiveness.

The main characteristics of the economic dimension is **increase of competitiveness** by concentrating efforts to modernize production and extractive industry products for **better use of natural resources in the national capital**.

One of the derived objectives of industrial policy (adopted in 2002 and approved by GD no. 657/2002) requires capitalization of comparative and competitive advantages due to the existence of domestic natural resources and an appropriate level of qualification, expertise and tradition of labour force in the sectors of mining and capitalization of these resources, which requires judicious exploitation and advanced processing of raw materials.

According to each resource, different elements characterize better the economic dimension in extractive industry, as follows:

In oil extraction, the current level of oil production can be maintained through the exploitation of new reserves on the continental shelf of the Black Sea, upgrading and re-engineering existing equipment extraction processes in areas with low productivity. Oil market is open, meaning that it operates under competition conditions (10 refineries, of which seven privatized, some with foreign capital), which is a favorable precondition for increasing the recovery of raw materials.

In natural gas extraction, the current level of production may increase slightly, by increasing the activity of operation, while storage capacity should triple from national energy system and supply the population security reasons. Regulation and supervision of the internal gas market is ensured by a regulatory agency and the activities of sector specific legislation has been harmonized with European regulations. A strategic direction to follow is the diversification of gas supply of the country, for which purpose the national transport system will interconnect with those in Hungary and Bulgaria and will be built a liquefied gas terminal on the Black Sea; thus, it will increase the gas transit capacity in the country as well.

In coal mining, institutional and operational framework necessary from the existence of specific market regulation and supervision are prerequisites to ensure more efficiency to the sector by gradual closing of 279 coal mines (32 by 2000, 37 in 2001), with over 55% reduction of personnel and continuous reduction of subsidies (subsidies for the extraction of lignite were completely cut off). Accordingly, in the next period is indicated to maintain production at a constant level, increasing the share of superior pit-coal varieties in total production of net pit-coal, concentration of lignite exploitation in careers and in underground mining which experienced high productivity, as well as to achieve integrated coal mining and electricity and heat production plant (complexes of mine & power plants).

In non-ferrous ore extraction, the downward trend of the usable substances is maintained, but can be counteracted by upgrading technological processes and facilities. Non-ferrous metallurgy have to face the significant increase in demand for non-ferrous products, which imposed restructuring, privatization and restructuring profile of most units and modernization of state-owned enterprises belonging to this sector (the producer of aluminum and aluminum alloys). Productions of copper, zinc, aluminum and aluminum laminate can register significant increases in the future, provided by increases in production capacity and the expected profitability of private firms and other businesses. In order to better use the resources it is necessary however further modernize of processes and facilities, enhancing research & development and completion of programs for greening of productive activity.

Mining for building, glass and ceramics household materials has an important indigenous resource operated by over 900 businesses, mostly privatized. Sustained investments made in the industry and its competitive advantages (indigenous raw materials, skilled labor, tradition) ensures good prospects for development and growth of competitiveness by targeting the high processing products (especially sanitary superior finish tiles for walls and floors, plaster products, superior cement, technical glass, fiberglass, glass top articles for household and decorative ceramics, superlight glassware packaging). Although energy intensive products mentioned are economically efficient, recording, most, a rate of return of over 20%.

3. THE SOCIAL DIMENSION

The second dimension of sustainable development is the social dimension, and requires the existence of a society governed by the principles of balance and social equity, economic efficiency with social justice, ensuring guaranteed minimum income, ensuring optimal conditions for the development of human personality through universal access to education, health and culture, promoting equality of opportunity, combating social exclusion and discrimination of any kind, eradication of poverty, promotion of co-participation and public - private partnership in implementing large projects of general interest.

Social sustainability also involves changing individual and collective mentalities regarding taking of responsibilities in communities and at the level of an individual as well as following them, the manifestation of every

citizen as an active member of society, involved in establishing development coordinates, manifestation of public opinion as a determinant factor of social amendment.

Intensive and constant investment in the human capital in order to increase its contribution to increasing social welfare, its appropriate training to meet the qualitatively new requirements of knowledge economy (which A. Tofler called education economy or super-symbolic economy) means above all investment in education, which world experience has made the most cost effective investment for the individual, for business and for society.

4. THE ENVIRONMENTAL DIMENSION

The third dimension of sustainable development is the ecological dimension, as it remained in the public opinion by means of the Brundtland Report in 1985, although its importance was noticed long before, as noted above.

This dimension has been highlighted by the United Nations, which endorsed the concept of sustainable development and recommended that governments of the world to orient their strategies for economic and social development according to the requirements of environmental protection. Consequently, research has intensified in this direction and specific developments led to the concept of sustainable development and appropriate application. Thus, consistent detailing of the concept was outlined, such as sustainable agriculture, sustainable energy, sustainable industry, sustainable management of water, soil, air and forests, sustainable human development, etc.

A relevant example to the magnitude and direction of the prevailing concerns about the environmental dimension of sustainable development was provided by the European Union by means of "The 5th Environmental Action Programme towards sustainability" based on the guiding principles of environmental policy as defined in the Single Act of the Union Treaty, namely the protection of human health, rational use of natural resources and the establishment of measures - global framework for solving regional problems.

The Community principles of environmental protection are part of the general rules set for the international area, primarily in international/ European law of environment [23].

- obligation of countries to prevent, reduce and control pollution of the environment, which means establishment and implementation of appropriate strategies and policies to regulate the major sources of pollution;
- country cooperation in cases of major environmental risk over large areas;
- polluter pays for pollution (PPP), a principle for economic policy defined by OECD, according to which the cost of measures to ensure "acceptable condition" environment is borne by the polluter;
- coercion of countries to equally treat the effects of international and domestic pollution, i.e. discrimination of these effects at national and international level;
- sovereignty of countries over natural resources they possess, a principle that entails: allocation of natural resources existing in the national territory bounded by borders established by international agreements for the land and waters; sharing natural resources that do not lie exclusively within a single country and whose operation requires the cooperation of countries on whose territory those resources are, "based on a system of information and prior consultation, to get maximum benefit from such resources, without affecting the legitimate interests of others", according to art. 3 of the Charter of Economic Rights and Duties of States; common property and "reasonable use", which refers to resources in areas outside national jurisdiction is exercised (seas and oceans, international airspace), exploiting these resources must be done rationally to preserve them as long as possible; equity in resource use, which requires consideration of all the determinants and harmonization of interests of countries that possess shared natural resources.

Starting from the Community principles of environmental protection for the main fossil energy resources, ecological specific issues related to this dimension manifests differently depending on the resources extracted, as follows:

Oil and gas industry. Currently, in the last entered countries are mainly downstream petroleum industry activities; upstream activities (production of oil and gas) are comparatively much lower. Environmental problems of the sector relates mainly to air and water quality, climate change and specific provisions for fossil fuels (Eichhammer W., 2001).

The problem of ensuring environmental quality within legal limits, under natural conditions of life and work, and under normal conditions of life and human activities required for oil business, that runs on a large area and whose products are obtained through certain applied technologies for their extraction, is usually polluting, requires the organization of an appropriate framework to provide:

- preventing operational processes impact on the environment;
- turning to technologies and extraction techniques with a low degree of pollution;
- restoring environmental quality in areas already pollutant or affected due to accidental situations.

Coal industry. One of the key issues affecting the coal sector in general is the issue of environmental protection problem that is amplified due to the closure of a large number of coal mines and quarries. Planning of environmental actions included in the environmental rehabilitation program should be taking into account the concrete achievements in each area, but the main problem to their completion is to find the necessary financial resources, a problem which, in some cases, has not come to a solution, still requiring substantial support from international organizations.

If reclamation is one of the main priorities of Romania, on a similar place there are the measures to prevent environmental damage or pollution. In this respect, in Romania attention is given increasingly to more clean coal production technology, technologies that reduce emissions from burning coal. Most producing energy units from Central and Eastern European countries were built without emission control equipment and measures to implement clean coal technologies were far shy.

The strongest impact on the environment is caused by *burning fossil fuels, especially coal*, with serious effects on air and soil. The burning of fossil fuels leads to:

- production of CO₂, greenhouse gas that causes climate change;
- exhaust pipe bearing dust (ash), SO₂ and NO_x, the last two, generating acid rain;
- heating water courses through the cooling water discharge;
- discharge into the environment (surface water) of diluted chemical solutions, which could lead to chemical pollution;
- local reduction of solar radiation due to smoke opacity and artificial cloud cover created;
- noise pollution;
- visual impact due to large construction elements (chimneys, cooling towers);
- involvement of dust from fuel, ash and slag storage facilities.

In this respect, we must emphasize that another feature of the environmental dimension is represented by the *new technologies*, and the dissemination of the existing ones - both essential components of sustainable development. Industrialized countries that make long-term investments in research and technological development, are now under pressure of immediate results in this field. Given that markets do not provide sufficient incentives for research & development, the State must reassume its traditional role of supporter.

Supporting technological dissemination of research results is also essential for all countries alike. This can help reduce costs by so-called "technological learning process" and contribute to global sustainable development. All these, of course, made with additional investment. Infrastructure - transportation systems, buildings, industrial facilities, power distribution networks - is modifying very slowly. Their long lifetime means missed opportunities to replace the old capital, inefficient, with a more "clean" means the perpetuation of wasted energy and environmental impacts. Replacement of fixed capital is more important in energy production sector. Almost two thirds of the planned investments to be made by 2020, worldwide, in new capacities for energy production will take place in non-OECD countries (UNDP, UNDESA, WEC, 2000). The same is true for the countries of Southeastern Europe where much of the built capital and heating infrastructure must be replaced on short-term.

Sustainability supposes a diversified energy supply with no carbon dioxide emissions, while energy intensity of economies to be minimized. Therefore, technology that attracts the most interest is that of zero emission technologies. Therefore, we can say that the current technical progress determinant in the field of electricity is *environmental protection*. Researchers have set two ambitious goals: achieving a zero air pollution and reduce CO₂ emissions. Under these circumstances, the future of coal as electricity generating resource depends largely on the development of techniques that make it easier to use (like gasification) and the possibilities of reducing the environmental impact through clean combustion technologies and sequestration of carbon dioxide. Environmental objectives have become feasible with the discovery advantages of using synthesis gas (syngas).

The syngas (that is a mixed gas consisting mainly of carbon monoxide and hydrogen) can be obtained by coal gasification with partial oxidation. Using syngas is the first step towards promoting the use of hydrogen as an energy carrier. In the following decades, the syngas derived from fossil fuels will remain the cheapest source of hydrogen.

Technical progress as well creates new structures of power systems based on cogeneration and polygeneration.

Cogeneration (that is simultaneous production of electricity and thermal power) and polygeneration (that is simultaneous production of various combinations of synthetic fuels, electricity, heat and chemicals) provide economically favorable perspectives to facilitate the development of industrial scale production technologies energy-based on syngas.

Promising advanced technologies on short to medium term include combined cycle steam-gas technologies, integrated coal gasification with oxygen and combined cycle (IGCC), coal power plants based on ultra-supercritical steam coal, IGCC using gasifiers based on air and fluidized bed combustion technologies pressure.

Technological progress in oil reserves exploration and exploitation has contributed to recovery rates growth of existing oil fields. In fact, according to Oil and Gas Journal estimations, at the beginning of 2003, oil reserves have grown with nearly 200 billion barrels (much more than 112 billion barrels, that is the entire reserves of Iraq, a country that ranked second place according to the volume reserves). Most of this global reserves increase was due to the increase, compared with 2011, of Canada reserves with almost 175 billion barrels. Positive situation of the American continent was further exacerbated with increasing Venezuela's reserves by another 17.5 billion barrels. On the other hand, there was a reduction in proved oil reserves in Africa, with approx. 18 billion barrels and those in Asia, with approx. 17 billion barrels. The vulnerability of the US to ensure oil resources has been reduced substantially, while it has increased in other continents. European Union and Asia will continue to depend on imports from the Middle East, Russia, the Caspian region (IIRC, 2004).

As resource scarcity creates innovative mentality, the state of the production capacity of the national energy system (worn out, very old) can become a source of competitive advantage - investment could be directed to advanced technologies and not the conventional ones. Romania could thus achieve such a technological leap.

And finally another characteristic of environmental dimension is represented by the *protection of the environment*. Management of interactions between energy and the environment remains one of the most important challenges that policy makers face today. Production, transportation, energy use affects the environment starting from the stage of primary energy resource extraction up to the final consumption. The span of environmental impact varies significantly depending on the degree of recognition and combating environmental risks through regulatory action or pricing structure. Fossil fuel combustion is responsible for about four-fifths of anthropogenic emissions of carbon dioxide. The energy sector also contributes to emissions of methane and nitrogen oxides by mining activities and transport of coal, gas and oil, and waste management issues, particularly those radioactive.

Many countries have made considerable progress in reducing emissions of pollutants such as local and regional sulfur dioxide, particulate matter, volatile organic compounds and nitrogen oxides. However, due to sometimes severe impact on health, reducing emissions from the energy sector remains a challenge for many less developed countries. Air quality in urban areas surpasses the levels allowed by the World Health Organization. Measures to enhance energy efficiency, switching from coal to biomass and natural gas and electricity, minimal emission control, could lead to improved environmental quality with relatively low cost. Risk management of accidents is also an important component of sustainable development of the energy sector.

European Commission assumes that between economic growth and maintaining an acceptable level of environmental quality there is no inherent contradiction. Thus, measures to integrate environmental and economic policies should simultaneously reduce pollution and improve the performance of economy functioning.

European Commission also suggests carrying out environmental analysis on the implications of the taxation systems applied by EU Member States. This analysis should include the effects of subsidies, taxes, tax exemptions and reductions on the environment.

It was also developed a set of indicators with which it is possible to monitor the progress of integration of economic and environmental policies and highlighting the importance of environmental issues in the structural reforms of the European economy.

So far, impact of environmental issues on quality of life has focused on aspects that can be expressed in monetary units, such as costs for health care, crop losses and damage to materials. It is true that highlighting the cost of these damages is the safest way to draw the attention of politicians and force them to adopt decisions towards sustainable development. Analysis of quality of life should, however, be extended to include social values and concerns of the community affected by environmental problems. These values include aesthetic qualities, spiritual and cultural equity aspects of environmental impacts on present or future population, loss of inner peace of individuals, concern about the "legacy" left to future generations, and the value of each individual in the community.

5. CONCLUSIONS

Despite the progress made in recent years, it is a fact that Romania still has an economy based on intensive use of resources, a society and a government still looking for a unitary vision and natural capital facing the risk of damage that may become irreversible.

For Romania, as a member state of the European Union, sustainable development is not one of the possible options, but the only rational perspective as a nation, resulting in the establishment of a new development paradigm at the confluence of economic, social and environmental factors.

In conclusion, adequate capitalization of opportunities for sustainable development in the extractive industry sectors mentioned above, the demand on the domestic and international markets will have a decisive word, with its price fluctuations and circumstances, with the opportunities that they offer, but also the threats posed.

Efficient use of these opportunities and avoidance of potential threats depends, ultimately, on the ability of economic agents to develop distinctive competencies and competitive advantages, in a word to be able to face continuous intensifying competition in the domestic and international markets.

Through appropriate measures in the extractive industry, the state can increase this capacity in industries where there are competitive advantages and potential, as well as those who have a special strategic interest.

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