

THE EXTRACTIVE INDUSTRY AND ITS IMPACT UPON THE ENVIRONMENT

MARIUS BULEARCA, Ph.D.

CEIS-INCE, Romanian Academy, Bucharest, Romania

E-mail: mariusbulearca@yahoo.com

CATALIN POPESCU, Ph.D.

Oil and Gas University of Ploiesti, Ploiesti, Romania

E-mail: catalin_nicolae@yahoo.com

Abstract:

The extractive industry is unanimously acknowledged as being a vital sector of any country which owns workable natural resources. The experts claim that this industry is a source of foreign income, of direct foreign investments and it is also the main and sometimes the only energy provider of a country. The activities carried out within the extractive industry of any country provide employment to population and contribute to the public budget by taxes and dues, while the incomes resulted from these activities can be directed towards charity; however, at the same time, there is a certain environmental risk related to each initiative that is being carried out in this industry.

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1. INTRODUCTION

The extractive industry activities are widely recognized as having a significant impact upon the population, both from the financial and from the social, cultural and environmental point of view. More and more it has been emphasised the need for minimising negative impacts and promoting positive elements that could control the external threats while also developing the competences of those involved in the process of minimising the unwanted impact.

2. THE EXTRACTIVE INDUSTRY VS. NON-RENEWABLE RESOURCES

Practice indicates the fact that some conflicts of interest frequently occur between the companies that benefit from the extractive industry end products and the environment regulations that attempt to minimise the negative external elements that result from the activity of this industry.

On the one hand, Fiorino (2006) and Press (2007) discuss about the controversial impact that regulations have upon the performance of companies. On the other hand, as an answer to the shareholders' pressure, companies have begun to increasingly integrate the concept of corporate social responsibility, while more and more impact studies are subjected to the opinion and judgement of the public (Brake, 2007).

Some references to Porter's work (1991) come to support the idea that well-structured regulations can reduce the negative impact upon the environment and can re-launch the activities which are specific to the extractive industry based on some new, innovative components that should generate both profit and environmental protection. Porter's approach of "win-win" type represents the object of a great number of studies and articles but, unfortunately, some quantitative approaches (Jafe et. al. 2002, Smith & Walsh 2002) based on econometric methods practically invalidate the hypothesis.

Once accepted the fact that the majority of the most serious environmental problems are related to the use of non-renewable natural resources in the production process, we can admit the necessity to discuss some aspects that include (Grimaud & Rouge, 2008): which economic policies allow optimal implementation, what is their impact upon the economy and, in particular, what is their contribution to the technical progress? In the specialty literature, these aspects have already been discussed and there are two periods that we could consider to be relevant in the evolution of the research.

Throughout the 1990s, most authors tackled partial-balance patterns. Preoccupied with optimal trajectories, Withagen (1994) showed the way in which the current resource consumption should be less if pollution is taken into consideration. Therefore, extraction/ exploitation should be postponed.

Sinclair (1992) demonstrates that an optimal tax on added value in the use of non-renewable resources should be decreasing. This point of view is criticised by Ulph and Ulph (1994) who considers that this result is not thoroughly accurate, especially regarding the environmental regeneration expenses and the extraction costs. Other authors, such as

Hoel and Kverndokk (1996) or Tahvonen (1997) take into consideration the possibility to use top non-polluting technologies (*Best Available Technologies - BAT*).

More recently, in the 2000s, the problems caused by the use of non-renewable polluting resources have been placed in the context of general-balance patterns with endogenous increase. Schou (2000, 2002) studies two types of patterns – one based on human resources and the other on research and development, in which pollution caused by the use of non-renewable resources negatively affects both production (2000) and the user/beneficiary (2002). In both cases, he demonstrates that an environmental policy for the implementation of the optimal solutions would not be necessary.

Grimaud and Rouge (2005) discuss about a similar pattern, in which the good performance of the economic and social entities is affected by the level of pollution, without entering the details of the effects of pollution according to the type of activity. Similar to the results obtained by Sinclair (1992), the alterations at the tax level result only in a rent transfer. In this case it is demonstrated the necessity of an environmental policy, in the sense that the optimal tax (add valorem) must be altered according to the impact, in time, of evolution at the level of pollution.

As regarding the environmental issues, they are characterized by profound scientific ignorance, enormous mistakes in taking decisions and market and institutional failures (Bulearca *et. al.*, 2011). Some of these problems, as the ones regarding acid rains, greenhouse effect, ozone layer depletion, acidification of tropical forests and nuclear contamination are irreversible.

Moreover, many of these problems are related one to another, the ad-hoc individual solving of the problems being insufficient, as Smith (1979) said, because they depend of social and political factors that offers inadequate technical solutions.

The main differences between the above-mentioned literature and the work of Grimaud and Rouge (2008) are given from the fact that the authors put the question in the context of two different sectors. Actually, they take into consideration an economy in which two inputs are simultaneously used to produce output: a non-renewable and polluting resource on the one hand, such as fossil fuel, and a second, non-polluting, input, materialized under the form of work investment (for a similar type of input, see the work of Smulders and Nooij (2003)). In this case, non-polluting technologies will be considered for reducing carbon emissions, such as, for instance, solar energy technologies, the authors referring to this type of input as being a work resource.

There are three objectives the authors put forward, namely: to compare the trajectory that a decentralised, “laissez faire” type economy might have in reaching the optimum; to study the impact of economic policies (more precisely the elements related to research/development and the political climate) upon the specific balance variables (specifically the route of forest lumbering) and, ultimately, to establish the optimal values of the economic policy instruments.

Last but not least, the specialty literature takes into consideration the way in which a society perceives pollution. In recent times, economists have started to pay increasing attention to the aspects that deal with the degradation of the environment from one generation to another.

The problem related to the way in which a society not only externalises costs but also transfers them into the future is getting more and more complicated if we take into consideration the effects of such a transfer, materialized in the decrease of the individual future welfare.

This injustice that is transferred from one generation to the other is studied from the point of view of the conditions in which it occurs and of the effects that are recorded in case of asymmetrical information, more precisely in the situation in which a generation perceives the level of pollution as being different from the actual level (Schumacher, Zou, 2008).

3. FEATURES OF SUSTAINABLE DEVELOPMENT IN THE MINING INDUSTRY

Trying to decipher the features of sustainable development in the mining industry and to highlight the economic implications of these industries has allowed the following relevant issues.

a) Exhaustibility of some natural resources requires rational exploitation of them, at a rate to ensure their preservation as long a period.

Given that Romania's exploitable natural resources have exhaustion periods of 230 years for coal (at 2011 production level), 50 years for lignite (at the same production level), 16 for crude oil (at 2012 production level; if it is considered a natural decline of 5%, this period may extend to about 25 years), 16 years for natural gas (at 2012 production level; for an annual natural decline of 6%, this period may extend to 20-25 years), and 1663 years for salt is obvious that this endowment with natural factors must be better valued as energy carriers to ensure part of the energy resources consumption, and of industrial products consumption with advanced processing and high added value.

Rational exploitation of mineral resources as part of the natural resources this study deals with, requires, on one hand, setting a rate of extraction to harmonize the requirement to maintain spending for this purpose above the economic efficiency along with requirement of prolonging resources use, and, on other hand, increasing resource recovery factor by applying more efficient technologies.

An illustrative example in this regard is provided by the Romanian forest resources whose extraction rate decreased significantly after alignment, after 1990, of our country to the European system for determining the

maximum annual volume of timber that can be exploited, taking into account the biological capacity of the mass recovery.

b) The pressure on natural resources can be reduced significantly by higher capitalizing the national capital of such resources.

One objective of any industrial policy is to use comparative and competitive advantages due to the existence of natural internal resources and an appropriate level of qualification, experience and tradition of labor in the sectors for extraction and exploitation of these resources, which requires judicious exploitation and advanced processing of the corresponding raw materials.

In Romania, in the coal mining conditions are created by the existence of necessary institutional and functional framework, specific market regulation and supervision necessary to increase sector's efficiency, by gradual closing (starting with 2006) of 133 mines, cutting by more than 55% of staff and continuing reduction of subsidies (subsidies for the extraction of lignite were completely removed). On such circumstances, it is necessary to maintain production to a constant level in the next period, to increase the share of superior pit coal varieties in the net total pit coal production, concentrating lignite quarrying and underground mining exploitation that experience high productivity, and establishing of integrated coal mining and electricity and heat production (complexes of mine & power plants).

In oil extraction, the current oil production level can be maintained by exploiting of new reserves on the continental shelf of the Black Sea, upgrading of existing equipment, and re-engineering extraction processes in areas with low productivity. Oil market is an open market, meaning that it operates under competition conditions, which is a favorable prerequisite to increase the raw materials recovery rate.

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.

c) From the perspective of sustainable development, although the extraction of mineral resources has significant environmental pollution effect to units in extractive areas, they can be significantly reduced by appropriate organization of the activity and increased care and treatment of the environment.

Mineral resource extraction activity takes place in mines, quarries, wells, separator parks, ponds etc. occupying usually large areas to be set aside from agricultural or forestry sites, where inevitably soil and water pollution occurs. Improper organizing of extraction activities enlarges disused areas and sometimes their serious pollution, while treating with indifference of pollution risk increases adverse effects and increases significantly their manifestation period.

Ensure sustainable energy development through policy geared to energy efficient use, which aims interrelated objectives to increase competitiveness production and generation, transmission and distribution of energy, safety assurance of supply, and environmental protection.

Saving energy resources and energy is the central coordinator of this policy, global experience convincingly revealing that the cheapest source of energy is the saved energy. Energy conservation has emerged as a critical line of action in the energy industry, this meaning, mainly, reducing consumption and household production, the rational and efficient use of energy. For Romania, energy saving and efficient use are paramount imperative, given that, for example, in Western Europe the average consumption reaches 0.31 toe/1,000 USD of GDP, while in Central and Eastern European countries the same indicator reaches only 0.68 toe/1,000 USD of GDP.

Better management of energy resources, aiming at increased energy efficiency and sustainable energy development, is a powerful spring of overall economic and social development of the country, allowing significant competitiveness increase of provided products and services, effective environment protection, and achieving a higher standard of living of the population.

d) Funding for geological research should be increased.

This increase is justified by the fact that through geological research program, it should lead to the establishment of a national mineral resources database, to clarify the prospects of identifying new deposits, and to lead to completion of geological perspective areas contouring of recoverable reserves, etc.

In this respect, geological research funds should be divided into the following areas, as follows:

- revaluation and capitalization studies of data fund accumulated in recent years, its systematization and interpretation in conjunction with previously existing data, in order to assess the knowledge territory level, and to highlight the prospects of new reservoirs;
- revaluation studies of national reserve fund of useful mineral substances, taking into account both the current economic situation and market trends, and technological developments extraction and processing;
- synthesis studies to assess the knowledge level of genesis conditions, metal genesis and development of metal-bearing mineralization profiles, in locating prospective areas for future research programs;
- assess studies, in terms of quantity and quality, of anthropogenic deposits resulting from extraction and preparation of ores (ponds, dumps).

e) The precondition for reducing poverty and increasing employment must be assured.

Mine closure led both to lower population incomes in particular regions with restrictive effects on local economy, and lower revenues to local budgets. The central authorities should support local authorities for local

development plans for the localities affected by mining sector restructuring in order to increase their access to internal financial resources provided by the Structural Funds, following the accession to the European Community.

Development an attractive business environment and adequate infrastructure will lead to change in the ratio between the funds allocated for the development of the budget and private sources in favor of the latter.

The concept of sustainability on natural resources use must become an accepted part of the education system in order to promote a broader understanding of the importance of raw materials, along with other teaching activities in the natural sciences, since the first years of school. This is important for the general educational curriculum, and for economics and business studies. Training programs in the mineral resources sector should be further promoted in the medium and long term, with efforts to strengthen international collaborations. The state will provide preferential financing programs of studies on mineral resources.

These goals should be aligned with those of the "youth in motion", flagship projects of Europe 2020 development plan, which aims to improve the results of education system and facilitating access of young people into the labor market. Therefore, Romania should actively promote inclusion objectives of education in mining and geological training programs of the EU.

For those professions and crafts that will be needed as a result of technological developments in the exploitation of mineral resources will be propose new occupational standards that will update the existing ones, respecting the law on vocational training for adults.

In this sense, to alleviate social problems caused by the closure of unprofitable mines and social and economic regeneration of mining regions affected measures are necessary given the following aspects:

- promoting individual and collective dialogue to inform employees about the situation and perspective in the work unit;
- promoting measures of „CSR type" by the state, as owner of the companies in the extractive sector, in order to eliminate social and economic disruptions in communities where mining activity is partially or completely shut-down;
- consulting with affected staff on the most appropriate forms of social protection to be taken;
- promoting and providing training for staff in order to increase its chances on the labor market;
- developing programs at the local community level aimed at temporary employment of unemployed persons;
- developing social protection of unemployed persons with minimal chances in finding a job;
- re-using of mining sites and assets made available by the closure of mines;
- reintegration into employment of chronically unemployed persons;
- developing measures to promote labor mobility.

f) The existence of agreements between countries for joint resources exploitation.

Natural resources, and in this respect Romania is a rich country, should bring welfare, especially in a global economy development with growing consumption, but in fact countries that are rich in minerals such as gold, coal or oil, are often poorer and grow more slowly than those who buy their resources. The paradox is explained by the lack, deliberate in some cases, of a strategy of sustainable growth that does not allow governments to invest revenues from the exploitation of raw materials in means for more sustainable economic development, such as education or transport. Thus, as these nations are depleting their resources, they become poorer states.

Although countries such as Nigeria, Liberia, Venezuela and even Russia are rich in resources, much of their population is living below the poverty line, without access to water and sewerage, electricity, hospitals, schools or appropriate transport. This paradox has a name: "*the curse of natural resource wealth*" and its ingredients are well known. Resource-rich countries tend to have strong currencies, making the other exports uncompetitive, as explains Joseph Stiglitz, Nobel Prize laureate for economics, in an article published in August 2012 in Project Syndicate under the title: "Rich in resources, poor in money"¹.

Then, as usually exploitation does not provide many jobs, unemployment increases. Also, due to volatile prices of resources, economic growth is unstable. Volatility is often exacerbated by international banks that rushes and invest when prices are high and retract without hesitation in difficult times, all in accordance with the principle that bankers lend only to those who do not need their money.

But the most obvious reason is that resource-rich countries do not pursue sustainable growth strategies. Governments do not realize that if you do not use the wealth resulting from the exploitation of resources for productive investment to diversify the economy, they in fact impoverish their countries. Political failures exacerbate the problem, given that conflicts over access to resources gains favor the establishment of corrupt and non-democratic Governments.

At this point of our analysis, we need to talk primarily about economic policies to be implemented, but also institutional officials must be effective and based on a non-corrupt State. This institutional framework is facilitated by the presence of a strong civil society², and this is possible only if we believe that it is based on transparent civil and political community. Thus, we must explore the possibilities of natural resources-based economies that can accelerate diversification of economic structures.

¹ Joseph Stiglitz – Resource Rich, Cash Poor, în Project Syndicate, August 12, 2012, http://www.slate.com/articles/business/project_syndicate/2012/08/why_resource_rich_countries_usually_end_up_poor.html.

² Rudiger Ahrend, How to Sustain Growth in a Resource Based Economy? The Main Concepts and their Application to the Russian Case, p. 2.

Secondly, promoting transparency at global level for natural resources such as oil, gas, and mining has become a widely accepted solution for weak Governments in developing countries rich in natural resources. Proponents of this idea believe that if extractive companies report payments to Governments in public, citizens will be able to maintain responsible Governments and companies. According to proponents, this will improve the natural resources management, reduce corruption and mitigate conflicts³.

The most important measure taken at the international level is the *Extractive Industries Transparency Initiatives (EITI)*, which was originally a unilateral foreign policy effort in Britain launched by Tony Blair at the World Summit on Sustainable Development in 2002, but subsequently evolved into a global program. The initiative is based on a common belief that states that the prudent use of natural resource wealth has the potential to provide the basis for sustainable economic growth and development.

EITI was originally a voluntary program with international participation. The initial group of participants who signed the principles in 2003 included 20 Governments (from developed and developing countries), 18 companies, three industry associations, dozens of NGOs, a number of international organizations, and a statement support from 40 institutional investors.

Why transparency has become the key to good management of natural resource wealth? The idea is that transparency has taken the appearance of international norms and became a "procedural" element in global affairs. The focus is of course on corporate transparency which is a solution to many problems of environmental pollution and financial efficiency. The need for transparency in the natural resource extraction occurs as a result of negative consequences resulting from corruption, conflict and corporate social responsibility. This idea has become widely accepted, and this has facilitated the development of EITI.

Institutionalization initiative is due both to activists, and to political entrepreneurs who fought to establish the program and to extend it. We believe that promoting transparency at international level forces markets to work more efficiently, increase trust and cooperation, strengthen institutions, reduce corruption and mismanagement, allowing people to hold accountable for their actions and decisions, and increase the legitimacy of institutions. These are general benefits to society.

Therefore, if there is transparency, countries are more likely to benefit from the true value of natural resources.

In conclusion, transparency has become a solution for managing income due to resources, and it promotes the gradual expansion of the institutional architecture. The revenue transparency is a reasonable first step for the international community to ensure eradication of poverty.

At the same time, transparency is recognized from a long time as the most powerful mean of fighting corruption, according to the proverb "*the sun is the strongest antiseptic*"⁴. For citizens to control the corruption, they must know what is happening in the society in which they live. The laws pertaining to freedom of citizens' access to information is necessary to promote both genuine democracy, and accountability.

Thus, having to face all these arguments one can understand what we tried to emphasize in this section of the paper, namely that the natural resource curse can be removed and can be turned into what it should be a "blessing" for disadvantaged countries. This is possible if all companies are considering to maintaining a transparent regulatory structure, if revenues from natural resources are used for long-term welfare of the community, and if it aims to create local organizations that can implement measures at international level etc.

4. EXPLOITATION OF NON-RENEWABLE RESOURCES AND THE ENVIRONMENT

Starting from the correct identification and from the realist highlighting of these aspects, each primary energetic resource has some particularities that individualises its problems, as follows:

a. Coal.

Coal is perceived as being an energetic resource with positive, but also negative, valences:

- *positive* is its contribution to guaranteeing safety of supply and it being part of the diversification of energy sources;
- *negative* is the impact upon the environment.

If the local environmental impact can and will be reduced by means of technological measures and measures to reduce the affected areas, the global impact of the use of coal upon the greenhouse gas emissions still triggers significant concern.

The clean coal processing technologies are increasingly developed in Europe and therefore the efficiency of coal-based power stations has already reached 47% and tends to increase up to 50%. The technologies which trap carbon dioxide from thermal power plants emissions will be widely available in the following 10 years. However, clean coal costs will still be high in terms of economic efficiency, but they will be compensated by the contribution to the safety of the supply and to the economic stability in case of large price fluctuations on the energetic resource market.

³ Virginia Haufler, Disclosure as Governance: The Extractive Industries Transparency Initiative and Resource Management in the Developing World, *Global Environmental Politics*, Vol. 10, nr. 3, august 2010, p. 30, <http://muse.jhu.edu/journals/gep/summary/v010/10.3.haufler.html>.

⁴ Joseph E. Stiglitz, *Mecanisme globalizării*, Polirom Publishing House, Bucharest, 2008, pg. 133.

b. Oil

The environmental problems that result from the oil industry and from its use for energetic and transportation purposes are related to air quality, water quality, climate changes and fuel quality. Regarding the use of refined products, there are still great differences between the refining level required by the S/M market and that in the Central and Eastern European countries. In the countries that are in the process of adhesion to the EU or that are candidates to the EU, the demand for oil products that have a lower polluting potential is much lower as compared to the EU.

The demand for oil products is and will continue to be increasing. In the EU, forecasts indicate a share of 40% from the total consumption of the oil energetic resources in 2020. Under these conditions, the changes imposed by the environmental protection will determine a clear orientation towards clean oil products.

This will require the development in two directions: a complex of inter-relations between the energy policy and the environmental protection and a comprehensive approach that should take into account, on the one hand, the scientifically-established integrated evaluations and, on the other hand, the targets established for the environmental protection in the durable development context.

For instance, the reduction of the polluting potential of transport fuels might result in an increase in carbon dioxide emissions produced by refineries. That is why a closer collaboration between all the involved factors seems to be the most appropriate way to treat the complexity of the problem.

c. Natural gas

From the environmental point of view, natural gas is considered to be “the gate towards durable development”. The impact upon the environment generated by the use of natural gas has a local dimension (particles, smoke), a regional one (acid rains) and a global dimension (greenhouse gases).

The negative impact at all dimensions could be reduced through the use of clean gas, with a low level of sulphur and carbon, through the use of energetic-efficient technologies and through the reduction in energy demand (thermo-insulating technologies in constructions, adapted life styles). Gas technologies match very well those for the development of renewable resources.

Gas fuel is appropriate for technologies which increase energy efficiency, for instance in condensing boilers. Gas burning in power plants has the potential to reduce the carbon dioxide emissions. The use of gas in co-generation will double the power production produced based on gas in the European Union.

However, this situation will also determine derangements and breakdowns in the competition domain, between the old, low-efficient power plants and the new, efficient ones.

5. CONCLUSIONS

On the background of the general characteristics and of the content of the dimensions of durable development at global, regional and national level in the extractive and energetic industry, this development acquires specific connotations stemming especially from the depletion and the non-regeneration of mineral resources that ensure the basis-of-existence for the two industries.

The attempt to decipher these particularities and to highlight the economic implications upon the respective industries allowed the shaping of the following relevant aspects:

1. The depletion of some of the natural resources imposes their rational exploitation, at a pace that should guarantee their preservation for as long a period as possible.
2. The pressure upon natural resources could be reduced significantly through a superior valuation of the national capital of such resources.
3. From the sustainable development perspective, although the extraction of the mineral resources has significant polluting effects upon the environment in the extractive unit areas, they can nevertheless be significantly reduced by the appropriate organisation of activity and extra-care granted to the environment

The sustainable energetic development can be ensured by means of a policy focused on the efficient use of energy, which follows inter-correlated objectives that aim at increasing production, transport and energy distribution competitiveness, while warranting the safety of supply sources and environmental protection.

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