

ECOLOGICAL ASPECTS AND SOCIAL ACCEPTABILITY OF COAL MINING AT THE "MARITZA-EAST" JSCo, BULGARIA

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ABSTRACT: The coal mining deposit in Maritza-East is the most important one in Bulgaria. The coal mined in Maritza-East mines is used by 3 power plants and the briquette factory. The annual coal output is around 25 million tons from which 12.5 billion kWh of energy and 1 million tons of briquettes are produced. A facility of Maritza-East's magnitude is bound to seriously impact the environment. Most of the people are worry of the environmental consequences. The attention is focused on the dislocations as well as on the consequences from burning fossil fuel and more specifically on the acid rain and greenhouse effect issues. The industrial activities relative to open-cast mining of lignites and subsequent production of electricity, heat and briquettes in Maritza-East result in disrupting the environment and creating an ecological unbalance in the region.

Further operation of the deposit will require that mining, processing and utilization of coal be brought in line with the environmental standards.

All the above call for elaboration and implementation of a socially-oriented marketing concept, for the management of Maritza-East mines, aiming at making the coal mining company socially acceptable. The company is to be fully market-oriented, to take the market changes into account and to deliver the best possible product, in an environmentally-friendly manner, in the process of achieving its market goal.

The paper provides solutions to the above mentioned issues.

1. INTRODUCTION

The "Maritza-East" lignite coal deposit, situated in the eastern part of the Upper Thracian valley on the area of 240 km² is the largest one in the Republic of Bulgaria (Fig. 1). The coal deposit, with economic reserves more than 2.5 billion tons concentrates 63% of balance lignite coal reserves and 57% of all coal reserves in this country.

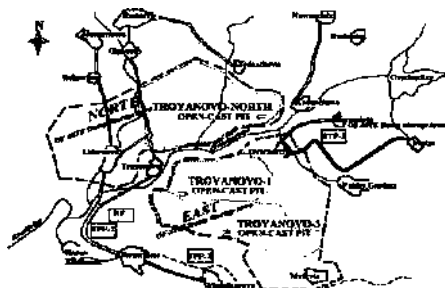


Fig. 1 Scheme of "Maritza-East" JSCo

At present the deposit is developed by the Joint Stock Company "Maritza-East Mines" JSCo, established in 1993 on the basis of open pits that have been operating for more than 30 years, namely "Trojanovo 1", "Trojanovo 2" and "Trojanovo 3" and replying to demands of three power plants of total generating power of 2480 MW and the only briquette-producing factory in the country. The total quantity of production for the last years is about 25 million t/year, which represents more than 75% of total coal production in the country. The above shows that more than 12 billions kWh of electric power and about 1 million tone of briquettes per year are produced in the territory of the company, which represents 27%-30% of total power production and 100% of briquette production.

Highly effective line technologies with belt conveyers as well as line-cyclic technologies with rail-road transport for coal mining are widely applied at die open pits and about 30% for overburden removal at the "Trojanovo 1" and "Trojanovo 2".

Up to the beginning of 1998 winning of more than 600 million tones of coal had been realized as

well as overburden works for 2750 million m³ with an average exploitation factor of overburden 4.42 m³/t (Table!).

Table 1. Coal reserves and overburden in the designed contours of open pit field

Open pit	Coal mined up to 1997 (1000 tons)	Coal left (1000 tons)	Overburden removed up to 1997 (1000 m ³)	Overburden left (1000 m ³)
Troyanovo 1	237990	368530	736220	912110
Troyanovo north	202410	845160	1058860	4776170
Troyanovo 3	165050	612850	951710	3574270
Maritza Easi	605450	1826540	2746790	9262550

Industrial activities of opencast mining undoubtedly brings to alteration of ecological system, disturbing its natural functioning, dynamic balance and quantity of elements in the natural and living environment (Fig. 2). For that reason the mining landscape should be considered in its dynamic development, nowadays standing for a compromise between productive potential of nature and managerial activities of mankind. At that moment the only chance belongs to the large scale new modeling of mining landscape corresponding to wishes and images of people about the needs of recent and future generations. An integrated project has been prepared for the region of the Maritza-East coalfield, called "Territorial plan for development" considering the above principles and having in mind the situation till the beginning of mining and changes caused by mining works. This project treats not only the step-by-step rehabilitation of disturbed territories according to the degree of development of mining works but also the general view of landscape and infrastructure after finishing the mining works.

During the whole period of exploitation replacing of % of the total volume of overburden, which accounts 12 billion m³ into the inner mined-out room. Due to the unfavourable physical and mechanical properties of overburdening rocks, admitting total inclination of borts and dumping areas, for example 3°-5° and the adopted method of mining at that moment a large part of the overburden is mixed on out dumping areas.

2. GROUND REHABILITATION

Highly fertile soils determine the outlook of natural landscape in the field of the lignite coalfield to a decisive rate. The fund of agricultural lands is dominating in the area planned for development (31 206 ha). It consists of 92.5% of the total area, and 74% of which are intensively used for agricultural purposes. Forests occupy 4.5% and urban area - the other 3 %. Up to now areas occupied with mining works account to 15 739 thousand ha, distributed as follows 93.5% - agricultural lands, 4.9% - forests and 1.6% urban areas (Table 2).

Rehabilitation works on areas disturbed by mining at the Maritza-East coalfield has been carried out since 1973. Till the end of year 1998, 3 917 thousand ha had been rehabilitated, especially on dumping areas, which corresponded to a share of 25% of the area utilized for agriculture. As far as structure of land utilization is concerned, there is a tendency towards extension of forests that occupy 39.4% of rehabilitated land, in comparison to the situation before mining works took place there (table 2). This is due to the significant share of slopes on the dumping areas.

Table 3 shows the areas that will be expropriated and rehabilitated in the next years.

According to die above mentioned principles the objectives of rehabilitation comprise providing a productive, vary-structured and multipurpose typical landscape after the implementation of mining works. Certain demands should be followed in the process of rehabilitation aiming the realization of above objectives.

Table 2. Areas occupied with mining works and areas for rehabilitation, thousand ha

Factors	Agricultural fund	Forest fund	Urban area	Total
Areas from the beginning to the end of the project, including those occupied till the end of 1997	28.861 92,5%	1.413 4.5%	0.932 3.0%	31.206 100.0%
Areas rehabilitated from the beginning to the end of exploitation. Including already rehabilitated lands till the end of 1997	14.717 93.5%	0.769 4.9%	0.253 1.6%	15.739 100.0%
	24.432 78.7%	6.618 21.3%		31.052 100.0%
	2.177 60.6%	1.413 39.4%		3.590 100.0%

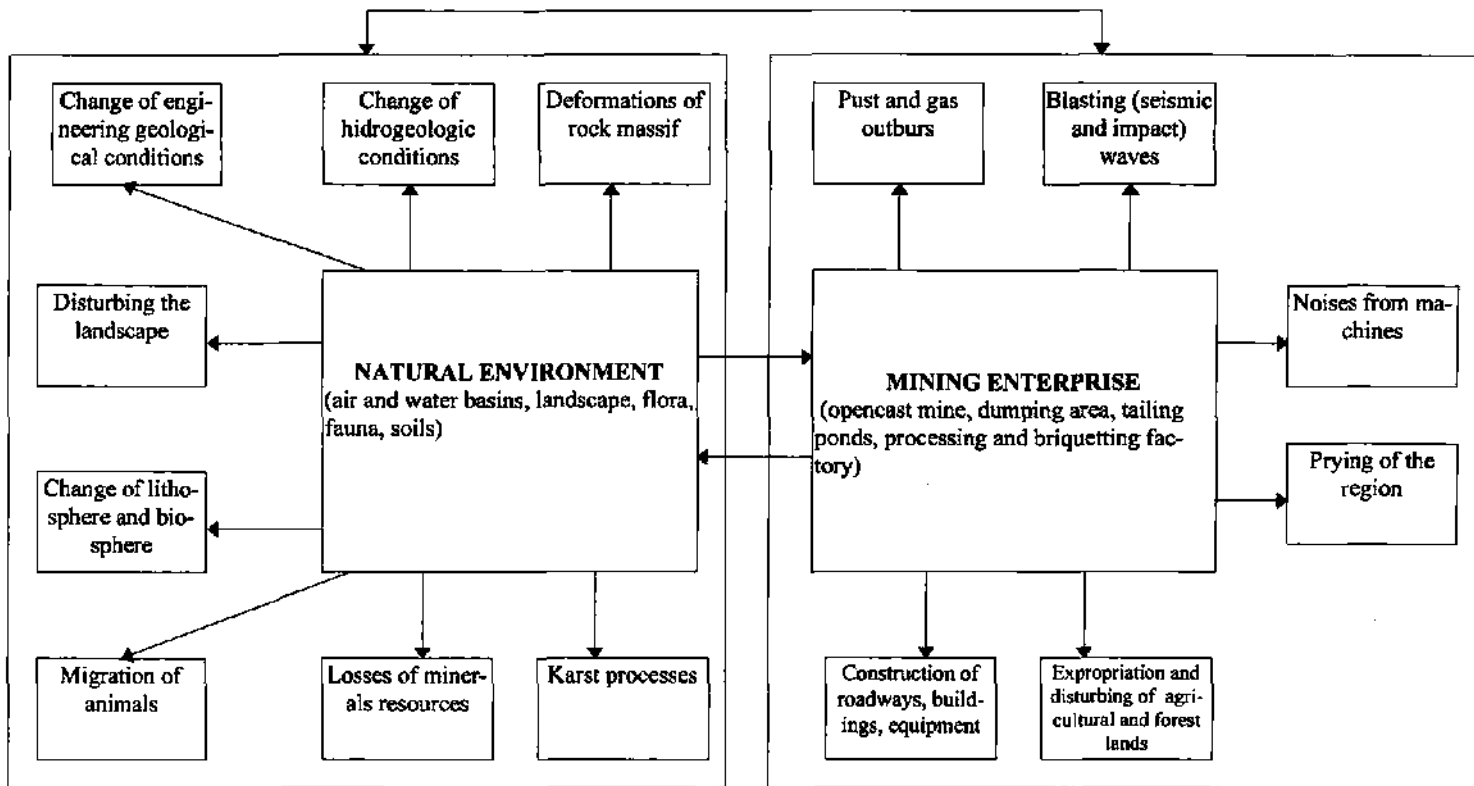


Fig.2 Scheme of the interaction between mining works and environment

Table 3. Areas for expropriation and rehabilitation in the period 1996-2015.

Years	Expropriated areas, thousand ha	Rehabilitated areas, thousand ha
1996-2000	1977	1128
2001-2005	1622,6	1417
2006-2010	1656	1812,5
2011-2015	1656,3	1932,2
Total	6911,9	6289,7

Rehabilitation consists of two phases: the so called technical and biological rehabilitation [1].

The main subject of technical rehabilitation is making the surface of dumping areas even delivering a humus layer or an appropriate waste material. The scope of technical rehabilitation includes also construction of roadway and water supply and draining infrastructure.

The biological rehabilitation has been carried out following the scientific background of the "Pushkarov" Research Institute. In agricultural rehabilitation, the most important measure for improving soil fertility is crop-rotation for a period of 5 years that is carried out following a schedule, developed in advance. It serves for soil cultivation, upgrading with organic substances and activation of soil vitality.

Creation of graduate transitions is paid a special attention with the aim of aesthetic adaptation of dumping areas to surrounding hilly areas. In 1998 more than one million dollars were spent on land rehabilitation.

3. PROTECTION OF ATMOSPHERIC AIR

Having in mind that the Maritza-East lignite coal are highly sulfur-containing one should mention that this factor effects negatively on the environment. As a result of coal combustion in power plants large quantities of dust and sulfur oxides are emitted in the atmosphere.

The Republic of Bulgaria is a party on the "Record for further reduction of sulfur emissions to the "Convention of 1979 for trans-boundary large distance air contamination" and observes its demands. According to this Convention, all the energy plants on the territory of the "Maritza-East Mines" JSCo that are going to be put into exploitation apply different versions of technological measures for reduction of atmospheric emissions.

4. PROTECTION OF WATER RESOURCES

The Maritza-East open pit, except for several characteristics that do not correspond to the threshold admissible concentrations are neither significant sources of contaminated water nor sources of water contamination. In this connection several projects for purification of domestic, economical and mine water have already been developed, and others will be developed in the future. Referring to mine water, only water from winning levels needs to be subjected to purification.

An integrated schedule has been developed for solving the complicated ecological problems of the coalfield. The problem of protecting the environment from contaminating effect of mining industry is rather broad and difficult for its complete solution. So first of all the creation of local information systems for observation and monitoring, collecting, saving and processing of information about environmental parameters from particular monitoring points is needed.

5. SOCIAL EFFECT OF MINING INDUSTRY

The coalfield area concentrates significant, according to dimensions of our country, material and labour resources. The "Maritza-East Mines" JSCo is situated on the territory of two administrative units - town of Radnevo and town of Galabovo, including 35 urban units, in that 2 towns and 33 villages. Total population of the area accounts about 44 thousand. Total number of people working for enterprises in the complex - about 21 thousand, in which 10.6 thousand people working for the Joint Stock Company, 6.1 thousand people working for the power station and the briquetting factory, and the others for service enterprises. More than half of the population from the above mentioned administrative units that is in active working age works for the "Maritza-East" complex. Others who work for the complex travel from neighbour and more distant regions every day. This way, the life of many people not only local ones but also living away from the "Maritza-East" complex is related to the development of coal mining in the area.

Meanwhile the complicated social and economical relationships with the population from the coalfield territory need not be neglected. Inhabitants of five villages, falling within the boundaries of open pits and dumping areas have already be relocated. The relocation of people from other 8 villages is

foreseen according to projects for coal mining development. This idea will hardly achieve the approval of local population, and corrections to preliminary projects will be perhaps necessary. Furthermore, the matter of relationships with private land owners, those who deal with agriculture, is of special importance under the new conditions of market economy.

Interests and opportunities of the joint stock company and conditions that determine its development are very important for the solution of above matters. Stimulus and obstacles, characteristic for market economy in combination with mechanisms adopted in our country are treated.

Coal mining and utilization should be carried out in an atmosphere of ecological and social acceptability, it should be coordinated with the interests of society and in this connection the most favourable solutions should be considered. Especially important is the social resonance of joint stock company activity that requires regulation of relationships with land owners as well as reducing the unfavourable environmental impact of mining to acceptable boundaries by the implementation of a complex ecological programme for the region. In our country there is not enough experience in this aspect, so the experience of other countries should be considered.

Recently in the economy of our country there is a very hard transition from centralized planning to market economy. Total energy consumption of the country has been significantly decreased for the last years - in 1997 it was 32% lower than consumption in 1989. Furthermore, there is a significant irregularity in coal mined during the year - difference between summer and winter season is about 2.5 times. Meanwhile, when winter loading of coal mining is maximum, the same season is the most unfavourable for removing the overburden. Side by side, the continuous inability for payments of all coal consumers should be emphasized. All the above factors, treated together exert negative effect not only on the effective regime of mining works in the open pit but also on the overall production and investing process.

Future of coal mining in the coalfield can be provided only on the background of market orientation. The economical schedule should be prepared on basis of market demands in electrical energy and heat supply for the population under conditions of competitiveness of Maritza-East coal with respect of other energy sources. Rational land utilization and

international ecological requirements for energy production should also be observed.

The sustainable economical development of the area of Maritza-East coalfield and its adaptation to market relations is in a direct dependence of the solution of social and economical problems.

REFERENCES

- 1-Decree No 6 of 02.10.1996 for rehabilitation of disturbed areas, melioration of low productive lands, removal and utilization of the humus layer, Sofia.
- 2-Law for protection of agricultural lands (State Gazette No 35, 1996), Sofia.

