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THE ENVIRONMENT AND THE ADVERSE EFFECTS OF MINING FACTORS  
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## THE ENVIRONMENT AND THE ADVERSE EFFECTS OF MINING FACTORS

There are two aspects to the environmental problem resulting from man's exploitation of mineral resources. The first is connected with water and air pollution which accompanies extraction and particularly the processing of natural products. Besides, open-cast mining leads to the irretrievable loss of large territories including arable land. Of these, dumping grounds alone can be regained for agricultural cultivation through rehabilitation. As to the areas occupied by quarry basins, which are often gigantic in size, like, for instance, the copper quarries of Zambia, they are lost to agriculture forever. Vast areas of land are also occupied by siting metallurgical, mining petrochemical industrial complexes.

The second aspect of the environmental problem is related to the indiscriminate and at times predatory exploitation of mineral resources.

Hence, the exploitation of mineral resources in Africa and the rapid development of the mining, petroleum, petrochemical and metallurgical industries call for stringent measures to protect both the mineral wealth and the environment of African countries.

Polluted water and air way have an adverse effect on people, public and private property. This effect mainly manifests itself through a higher incidence of disease, deterioration of the standard of living, a decrease in the productivity of natural resources and an increase in the budget for controlling contaminants in the environment. Besides the population, water and air pollution inflicts serious and sometimes irreparable damage on architectural designs, public service facilities, arable lands, forests, and fisheries. Pollution of the seas and oceans may have grave consequences for the whole planet.

Environmental protection is a world problem yet it should be solved primarily on a national level. Since the October revolution in the Soviet Union the use of natural resources in the interests of the whole of society has been governed by law. Article 18 of the new Constitution of the U.S.S.R. proclaims the need to safeguard nature. Also, the budget for environmental protection in the 10th five-year development plan amounting to eleven billion roubles, testify to the importance which is being attached to the solution of environmental problems by the state and the Communist Party.

Taking into account the great international significance of the environmental problem, the socialist countries have started extensive scientific co-operation in this field, particularly within the framework of the CMEA community. The executive committee of the Council for Mutual Economic Assistance has approved a large-scale joint programme of co-operation for the CMEA member states and Yugoslavia in the field of the protection and improvement of the environment and the rational exploitation of natural resources which provides for investigation of about 150 different subjects. Following the recommendations adopted at the 27th session of the Council, the CMEA member states and the secretariat of the Council have been striving for expansion of co-operation with all the interested states and international organizations in such spheres, as, for instance, environmental pollution control, protection of water resources, study of the results of the spread of sulphur dioxide in the atmosphere, and so on.

It should be pointed out that of all the air pollution agents released into the atmosphere by industrial enterprises (mainly metallurgical and thermal power stations), sulphur dioxide or sulphurous acid anhydride now appears to be the most detrimental to nature and civilization as it is both highly aggressive and widespread.

In view of the fact that sulphuric acid anhydride is a most wide-spread chemical agent and it has a very highly corrosive effect among the air pollutants produced during pyrometallurgical processing of sulphide ores which form the bulk of the African copper, lead and zinc ores, some African countries, particularly Zambia and Zaire may well be expected to derive great benefits from the international co-operation in the field of environmental protection proposed by the COMECON countries.

People, animals, and plants also suffer from other gaseous and particulate emissions which accompany the metallurgical and chemical processing of mineral resources and which contaminate the atmospheric air. The main gaseous effluents are nitrogen oxides, phenols, ethylene, hydrogen sulphide, sulphuric acid, fluorides, and particulate emissions of metals, coal, flu ash, soot, cement, salts, etc.

The level of environmental pollution in certain industrial and mining regions in Africa is now approaching that of developed industrial countries. Such regions include first of all, the mining and metallurgical complexes within the copper area of Zambia and Zaire, some rather narrow strips along the Mediterranean coast of North Africa particularly in the industrial complex in Annaba, Algeria, and along the coastal waters of the Gulf of Guinea. During the past few years, some states in West Africa have been faced with the problem of pollution of the ocean waters which is new to them and is becoming more and more serious. These countries have been rapidly developing their industry and boosting oil extraction. In the coastal areas, oil fields are common in Nigeria, Angola, Gabon and the Congo. Also, a number of oil refineries, chemical and cement plants and mining works in these countries have no pollution control facilities. For instance, in Buchanan (Liberia) which has a large iron ore concentrating and pellet-producing plant, mining wastes dumped into the ocean contaminate the water within a radius of 13 km. Due to serious pollution of the oceanic water around cape Lopez (Gabon), tuna fish has almost completely disappeared from the area. As a result of an oil tanker disasters near the coast of Senegal, rich oyster beds have been destroyed.

The results of studies of oil refineries located in Egypt, Nigeria and Mauritania and petrochemical complexes in Algeria and Senegal have shown that these works are dangerous sources of environmental pollution.

The rapid industrial development of the African countries and the growing tendency on the part of developed countries to get rid of material- and power-consuming industries that have an adverse effect on the environment, are raising new problems for Africa. According to Western economists, transference of industrial enterprises to developing countries will start with ferrous and non-ferrous metallurgy, oil processing, chemical, glass and paper industries, most of which are highly pollutive industries.

A group of specialists who prepared a long report entitled "The Environment and Development in Africa" for UNEP in 1970 ask: "Will history be prolonged or will a new phase in history start?" They answer the question by stating that "A good many forecasts concerning Africa are based on the implicit hypothesis that the continent will repeat the historic experience of growth in Europe and America with its environmental destructiveness". Later in the report the authors confirm this view by saying that most specialists believe that the European modernization of Africa will become a reality towards the year 2000. According to the UNEP, the level of environmental pollution in Africa will increase eight to ten times towards the end of the century as compared with present-day level. As to the sums spent on controlling pollution and keeping it below the permissible limit, most likely they will not exceed 1.2 per cent of the gross national production of the African countries.

Not infrequently, developing countries rich in mineral and power resources are interested in the transference of such material- and power-consuming industries for the rational exploitation of their natural wealth for the benefit of their economics and in the effective utilization of the extracted minerals (see our report "Mineral Wealth of Africa as Part of World Raw Materials"). And so, the time is now ripe to examine in detail the consequences of the development of such industries on the different natural and climatic conditions of the environment in African countries. In the case of African countries which have no basic raw materials of their own, but who wish to process raw materials on their territory mainly due to ecological considerations, the benefits from such industrial transference and the outlay on environmental protection should be shared justly between both interested parties with the appropriate economic substantiation. In this case, we fully support the principles proposed by French economist M. de Barnis:

1. Transference of industrial enterprises from one country to another has nothing to do with economic assistance. Such enterprises, therefore, are liable to conventional, but not differential taxation which should take into account the environmental pollution factor.

2. If an industrial enterprise is transferred to the territory of a developing country, this country should demand remuneration in the form of additional capital investments which would permit the level of environmental pollution to be reduced.

3. The country that lends its territory for an enterprise should have a real right of control, the right of veto inclusive, over the basic decisions affecting the activity of the enterprise irrespective of whether it shares in its capital.

In our opinion, African states are fully entitled to present the following main demands to foreign companies making use of their territory and mineral resources:

- a comprehensive geological survey should be made of the territory, incorporating a rational, complex use and protection of the mineral wealth;

- the safety of the working personnel and population in mining areas should be ensured;
- protection of the air, lands, forests, water resources and other environmental objects, as well as buildings and structures from the adverse effect of mining and processing operations;
- safety of reserves, natural and cultural monuments, their protection against the adverse effects of activity connected with the use of mineral resources;
- restoration of the disturbed land areas to a safe condition and making them available to the country's economy.

Such demands have been made compulsory for the natural wealth users in the U.S.S.R. by the "Fundamentals of Legislation of the U.S.S.R. and Union Republics on Mineral Resources" approved by the Supreme Soviet of the U.S.S.R. in 1975.

Pollution control measures can be classified as single-purpose and multi-purpose ones. Single-purpose measures, such as the construction and use of various decontamination and filtering structures, etc. aimed mainly or exclusively at reducing the level of environmental pollution. Multi-purpose pollution control measures, such as the provision of closed-circulation water supply systems, recovery of valuable substances from harmful emissions, and low-waste production processes, are aimed both at improving the use of mineral and other resources. The latter measures are particularly effective and play an important part in the processes of extraction and especially conversion of mineral resources, making it possible to use all their components which include a number of highly valuable combinations.

Hence, low-waste and non-waste technological processes may prove very important for African countries, since they facilitate the effective solution of the environmental protection problem, on the one hand, and provide for the rational and complex utilization of mineral resources, on the other hand,

Various ores and other mineral resources can no longer be regarded as a source of raw material for extraction of only one valuable component. As a rule, they are complex raw materials which can be used for extraction of several useful metal combinations. The scientific and technological revolution, having greatly expanded the number of chemical elements and their combinations as used in various branches of the economy, as well as the possibilities of extracting them from most diverse mineral formations (minerals, ores, rock) and industrial waste (spoils, separation slurries, slags, sewage, particulate and gaseous emissions, etc.) has made a mono-mineral raw material to-date a rare phenomenon, just as rare as was a complex raw material in the nineteenth century. As a matter of fact, practically all the mineral resources are complex raw materials which can and should be used for the extraction of several valuable components - provided, of course, the appropriate capital investments are made and current expenses are not grudged.

The effect of low-waste and non-waste technology is particularly high in non-ferrous metallurgy, one of the most advanced branches of industry in Africa. As a result of the complex processing of slurries, electrolyte form slags, gas and particulate emissions and other "wastes" in the production of basic metals and other materials non-ferrous metallurgical plants can obtain large quantities of precious, rare and dispersed metals. Not infrequently, the cost of such auxiliary products exceeds the expenditures for the extraction of the basic non-ferrous metal from raw materials.

The 5th session of the Governing Council of UNEP has stressed the importance of low-waste and non-waste technology and recommended co-operation with the Council for Mutual Economic Assistance that has accumulated great experience in this field. As an observer of the Council for Mutual Economic Assistance at the 32nd Session of the UN General Assembly has pointed out, "all the methods of co-operation practised by the CMEA member states within the CMEA framework can also be used to advantage in co-operation with other international organizations, e.g. with UNEP. The Council for Mutual Economic Assistance is firmly resolved to make its contribution to this co-operation within the sphere of its competence".

Now we come to the second aspect of environmental protection activities, that is, the rational exploitation and safeguarding of mineral resources.

A characteristic feature of the mining industry consists of the irretrievability of the extracted mineral wealth and the limited number of explored deposits with favourable mining and geological conditions and a high quality of the mineral resources. Because of this, there is a need for a solicitous attitude with regard to natural wealth exploitation, reduction of the natural loss of mineral resources during their extraction, and the concentration and metallurgical transformation to a rational minimum. The economy of African countries is seriously damaged by the selective extraction of mineral resources by foreign companies from the richest areas of deposits, which is the case, for example, in Zambia and Mauritania. The attempts of foreign companies to justify such a practice by referring to the need to maintain the competitiveness of their products on the world markets have usually proved groundless. In fact, the selective development of the richest sections of mineral deposits brings extra profits to the companies and leads to tremendous losses of the fully amenable ores which are left underground. Oil companies in African countries have hardly any use for such a valuable material as natural gas which is burnt in torches in oil fields. The government of Nigeria where the losses of natural gas are particularly high has been compelled to take a close look into the situation and set the task of finding methods to use this important national wealth. Other facts of a similar nature cannot but arouse the anxiety of the African states.

The earth with its mineral resources is an important component of the national property of the African countries which, along with other natural resources, account to a very high degree for the level of their economic development. The progress of the national economy and the living standards of the African people largely depend on how effective these resources are used.

Since the early days of the Soviet state the government and the Communist Party of the Soviet Union have been exercising constant concern with regard to national mineral resources so as to provide not only for the country's current needs, but also for the needs of future generations. Following Lenin's "Decree of Land" which nationalized the country's natural resources, a number of laws were adopted in the first years of Soviet power aimed at rationalizing the use of mineral wealth. In 1975, the Supreme Soviet of the U.S.S.R. approved the "Fundamentals of Legislation of the Soviet Union and Union Republics on Mineral Resources". The main requirements of the Fundamentals relating to the protection of natural resources are the following:

- the comprehensive and complex geological study of natural resources;
- the observance of the existing rules governing the lease of natural resources and the prohibition of unwarranted use thereof;
- the fullest possible extraction and rational utilization of the main and accompanying mineral products and their individual components;
- prevention of the adverse effects of production processes connected with the use of mineral wealth on the safety of other natural resources;
- the protection of deposits from fire and other factors impairing the quality of the mineral products and the industrial value of the deposits or hampering their working;
- prevention of inexpedient and unwarranted construction in the area of deposits of mineral materials and observance of the existing rules governing the use of such areas for other purposes;
- prevention of the adverse effect of work connected with the use of natural resources on the safety of underground working sites, drill holes and underground structures both in active use and in a state of preservation.

It is evident that many of these requirements hold good for the African countries, particularly in view of the fact that most leasers of natural resources in Africa, i.e. the legal persons licenced to extract mineral products or carry out geological surveys are foreign companies whose interests are but seldom in accord with the interests of the African peoples.

Since young African States which have established their sovereignty over national mineral resources cannot always work them with their own means and have to invite foreign companies for this purpose, the task of state supervision over the rational working and use of mineral resources becomes particularly important. In this light African countries might find it useful to study the need for protection of their natural resources and to provide for such protection in the national mining legislation. In contrast to many capitalist states, the natural resources in African countries, like those in the Soviet Union, are state property, therefore the experience of legislation in the U.S.S.R. pertaining to the rational use and protection of natural resources could be helpful to African countries.

It should be stressed in conclusion, that the protection of the environment calls for considerable financial and material expenditures. A number of African countries will evidently lack sufficient means to carry out full-scale pollution control programmes. In each particular case careful work will have to be done to compare the cost of environmental protection measures and the amount of damage likely to result from the complete or partial refusal to incur such expenses. In any case, the constant and thorough attention of African governments, is, however, required with regard to the problem of environmental protection. This problem calls for serious scientific investigations of the adverse effects of industrialization on the environment in African conditions. The co-operation of African countries with one another, with international organizations, socialist and other states should make a great contribution to the solution of this problem.