INDUSTRIAL MINERALS NETWORK IN LATIN AMERICA

CALVO, BENJAMIN M. Departamento de Ingeniería Geológica. Escuela Técnica Superior de Ingenieros de Minas. Universidad Politécnica de Madrid (España).

Summary.

In this paper, some clues are given about world population growth and natural resources demand. The role of industrial minerals and rocks is pointed out, and the need of preserving sustainable development in mineral exploitation and benefit. Some propositions are made about the initiatives that Latin American countries could take in order to get the maximum benefit of their industrial minerals resources. Besides, the Ibero-American Industrial Minerals and Rocks Network (RIMIN) is introduced, and some data are giving about its aims and procedures.

Introduction.

The Earth can be considered as a closed system in which the natural resources are supposed to meet the requirements of all the living beings in the planet. From a human point of view, a system must be established in which minerals, energy, water and food are to be preserved, in order not only to answer the current demand, but also to ensure the future development of mankind. In this system, the demand is due to the growth of human population and to the increasing needs of developing countries. The offer is given by the whole of the resources. Not all of them will be considered in this paper, but only a small but very important part of the so-called *mineral resources*, namely the Industrial Minerals and Rocks, which play an outstanding role in meeting the human requirements.

World population growth and resources demand.

The human population growth is far from being linear. In fact, it seems an exponential function, depending on so many factors that human beings do not know yet when upper limit will be reached. World population grew slowly since the early times of mankind until the end of the Middle Age. The new continent colonization, the opening of new commercial routes and, afterwards, the industrial revolution, allowed an increasing world population growth since the 17th Century (Fig 1).

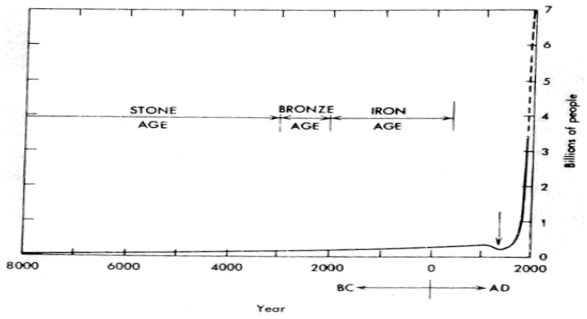

Fig. 1. Growth of the world's population thorough history. (Data from the population Reference Bureau)

It can be notice, however, that main development of human population on Earth is being reached in the present centuries. In 1750 people on Earth were about 0.8 billion. In 1900 had not attained 2 billion. Nowadays we have crossed the 6 billion boundary. A closer look to the graphics explaining this growth shows a great difference between rich and poor countries. While Japan has a very little expected population growth since the beginning of the 21st Century, other countries, as Nigeria, will increase it in five times in only one century. Demographers suggest that by 2100 AD the world population will have attained a constant size of about 11 billion persons (Hammond et al, 1996) (Fig 2).

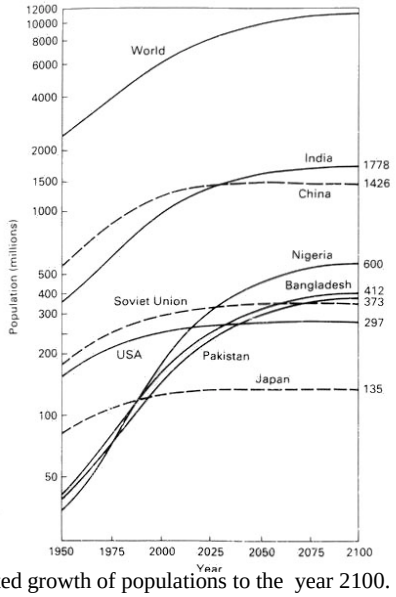

Fig 2. Proyected growth of populations to the year 2100. (From Demeny, 1984

Besides, the demand for natural resources increases at a much higher rate. According to United Nations Agriculture Office (FAO) studies, the fertilizers production has been nine times bigger in 1990 that in 1950. The world population has only doubled in the same period. Obviously, it will be difficult to meet the future demand of which the population growth is bigger, and the gross national product is smaller.

Finally, the waste and the environmental damage of the resources treatment must be considered. The amount of waste left for disposal is much greater than the volume of metal extracted or goods used. To obtain 5 kg of copper from copper-bearing raw material, with 5% of metal content, 995 kg of rock must be moved, crushed and

discarded. Similar proportion can be assumed for industrial minerals and rocks. In ornamental stone industries, in which many millions tons are exploited every year, less than 20 per cent of the material is recovered.

Sustainable development and mineral resources.

This is the scenery where the mankind must live and work in the near future. The clue to meet production and demand is the "*Sustainable development*", that can be considered as the *"whole of ways of economic, social and political progress, in which the demand of the present population is supplied, not compromising the capacity of future generations to meet their own needs"*.

The "Sustainable development" concept has been widely studied. Villas Boas (1995) points out that, for extractive activities, sustainable development is related to three minimums and one maximum: the three desirable minimums are *"minimum energy consumption"*, *"minimum materials use" and "minimum environmental impact"*. The maximum to be reached in this context is the *"maximum social satisfaction"*. The final aim of geologists, engineers and metallurgists today should be to reach this social satisfaction, with strict subjection to the sustainable development minimums.

Therefore, sustainable development is a balance between present and future "needs satisfaction" and "environmental preservation". It implies two things: *the need to make a common cause* between rich and poor countries, and *the development of maximum technological efficiency*, to reach the highest resources attainment with the lowest social and economic cost.

Industrial minerals and rocks play an increasing role in this balance, due to many reasons: the extracted volumes of industrial minerals, and mainly the construction materials, are growing immoderately, and growth will keep on for many years. The use of these materials is widely spread, new applications are found every day and, according to Kuzvart, it must be recognized that *"industrial minerals are the materials for the 21st Century"*. This statement, basically essential to developed countries, which are already involved in the non-metallic culture, should also be applied to developing countries. In many of them the material and energy consumption increase at a higher rate than in the United States or in Europe (Hammond et al, 1996).

Industrial minerals and rocks in Latin America.

In most of the countries of Latin America, the knowledge of industrial minerals and rocks, and their importance for human life is not fully understood. Even though many countries have a long tradition in mining, this activity has been mostly devoted to metallic minerals. In the last 50 years oil and coal have also been exploited, giving an unexpected wealth to some countries. Industrial minerals and rocks potential, however, is still relatively unknown, but will probably be improved in the new century. There are some examples of well known resources: saltpeter and iodine in Northern Chile, granites in Brazil, Uruguay and Argentina, emeralds in Colombia, all kind of gems in Brazil, phosphatic rocks in Northern Peru, borate in Mexico and Argentina, etc. But whole comprehension of industrial minerals role in the development of Latin American countries is lacking. In general, very few state agencies devoted to the study of these resources have been developed. Most part of the Latin American geologists, engineers, economists and managers working in mineral resources, develop their activities in metallic or energetic resources.

The distinctive characteristics of industrial minerals and rocks give the developing countries the opportunity to lead their own development. The investments are not so high, the local employment is usually very important and the added value by manufacturing many products can be preserved as local profit. Even though the cooperation of multinational companies is sometimes needed, national and local industrial networks can be created as well. It is believed that this model is more suitable to increase the sustainable development of many underdeveloped regions.

To achieve this important objective some partial targets must be kept in mind:

- First, Latin American governments should identify as exactly as they can their potential in industrial minerals and rocks. Therefore, research agencies must be established or reoriented, role of national geological surveys has to be re-considered and teaching of these materials ought to be improved in universities and other learning centers.
- Second, international quality standards must be known and accepted. Laboratories must be set up and their use has to be encouraged through assessments and regulations.
- Third, industrial minerals and rocks are going to play an increasing role in national budgets. Therefore, development of national companies must be strengthen, establishment of local treatment industries must be improved, and, as far as possible, employment of local technicians and workers must be preserved.
- Fourth, the sustainable development model must be kept, to prevent environmental disasters, which have been so common in metallic and energetic mining activities.

Ibero-american Industrial Minerals and Rocks Network.

According to this philosophy, the international network RIMIN (Ibero-american Network of Industrial Minerals and Rocks) has been created in 1997, in the framework of CYTED. CYTED is an international program devoted to "Science and Technology for the Development" (Ciencia y Tecnología para el Desarrollo). All the Presidents of the Latin American countries, Spain and Portugal have signed it. The aims of this program are:

1. To **increase the cooperation** between research groups and innovative companies, in Latin American countries, in order to **get scientific and technological results, transferable to the productive systems.**
2. To **strengthen the regional integration**, through the consolidation of a Latin American Scientific Community.
3. To **transfer and share know-how and technologies** among the participating countries.
4. To lay down a bridge for scientific and technological cooperation **between Europe and Latin America**, through Spain and Portugal.

CYTED Program is divided in 16 Sub-programs, devoted to the most important human activities. Sub-program XIII includes *"Mineral Technologies"*, and it is formed by three *"International Networks"*, one of which, the XIII-C (RIMIN), develops its activities on Industrial Minerals and Rocks. The other two are related to "precious metals deposits" and "geotechnics and sustainable development".

At present, 19 state and private institutions are represented in the RIMIN Network, belonging to 15 countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Paraguay, Peru, Portugal, Spain, Uruguay and Venezuela. Even if its life is still short, some important activities have been carried on during this three years:

- ◊ Two general meetings have been organized, in 1998 (Guayaquil, Ecuador) and in 1999 (Ouro Preto, Minas Gerais, Brasil). Some other partial meetings have taken place in Oporto (Portugal), Seville and Madrid (Spain), and Lima (Peru).
- ◊ A book on "Industrial Minerals and Rocks in Latin America" has been written and published. The representatives and associates of the national groups are the authors of the chapters, and the Network as a whole is responsible for the contents of the book.
- ◊ A general "Industrial Minerals and Rocks Map" is being prepared, based on the data given by the Network members and associates.
- ◊ Two pre-competitive projects have been proposed and accepted: One is related to the manufacture of construction aggregates in the tropical forests and jungles, using local clays and some oil products. The other intent to improve the Latin American fertilizers knowledge, mainly phosphates and potash. Other projects, as the development of a school-quarry for exploitation of ornamental granites in Brazil, or the characterization of natural zeolites in Ecuador, have being proposed and are in evaluation stage.
- ◊ Many lectures and courses have been given, in different countries, and grants and fellowships have been provided for Latin American professors, technicians and students.

Conclusions.

Latin American countries have a major challenge in the beginning of the new Century: To improve their mineral exploitation and benefit, in order to obtain the best social and economic profit for their increasing population demands. A great effort has to be made to prevent environmental damage, and to keep the added value of exploitations in local communities and countries. The present economic model has proved for metallic and energetic resources exploitation that it can not be sustained, and it is not able to meet the future demands of growing population. Some research and teaching networks are being established, and they can provide useful tools for Latin American governments wishful to balance growing economies and social demands. Ibero-american Industrial Minerals and Rocks Network (RIMIN) is one of these tools.

References.

DEMENY. 1984. Population and Development Review, vol. 10, nº 1 p. 103

HAMMOND, A.L. (Editor) 1996. World Resources. La guía global del medio ambiente. Ecoespaña Editorial. 425 pags. Madrid.

VILLAS BÔAS, R.C. 1995. Technological challenges faced by the MM sector in achieving sustainable development. Centro de Tecnologia Mineral. Rio de Janeiro, Brasil