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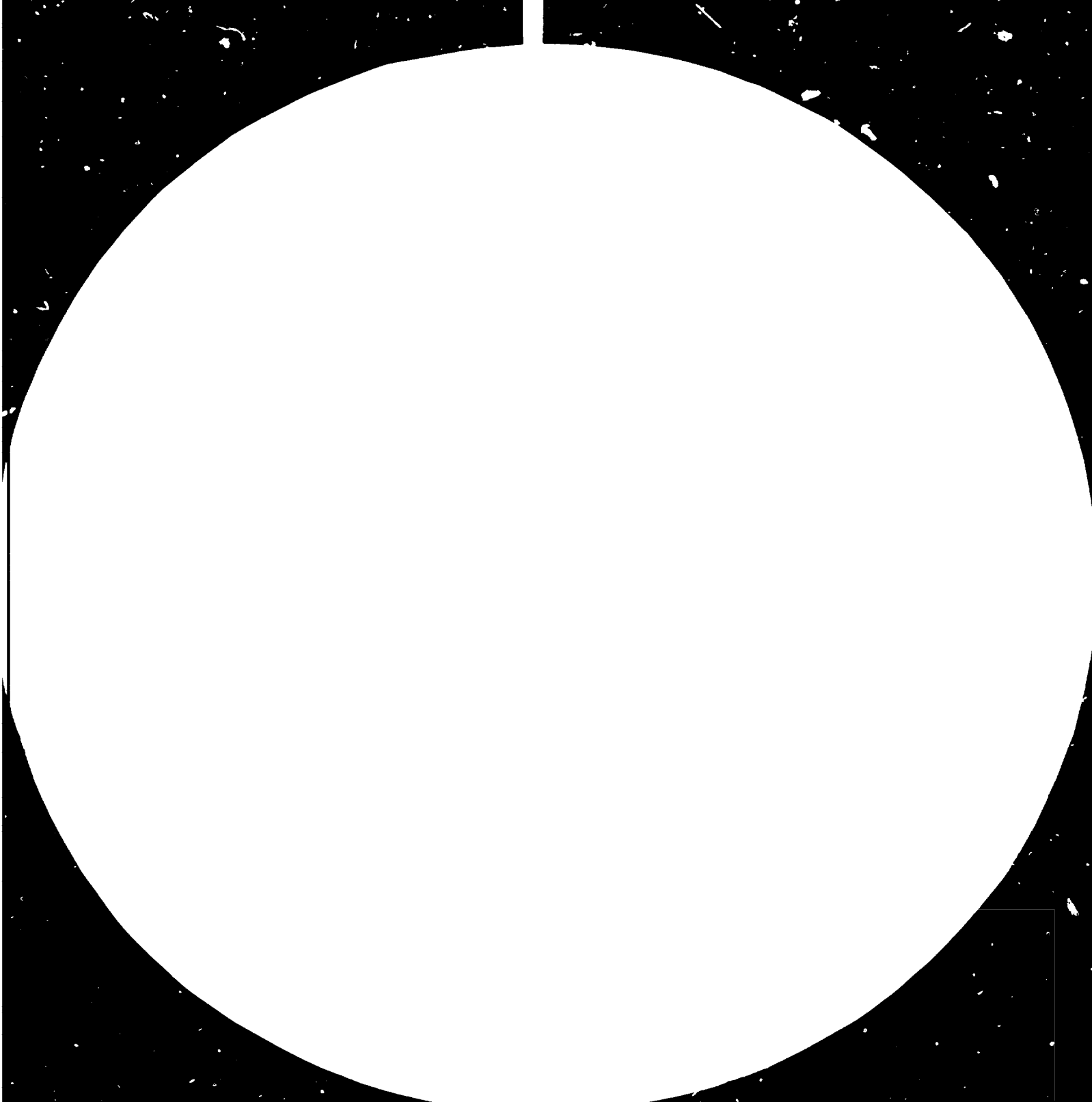
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ECONOMIC CO-OPERATION AMONG DEVELOPING COUNTRIES

AND THE ROLE OF NON-METALLIC MINERALS**

by

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INTRODUCTION

Intention of the present Workshop is to discuss technical and economic co-operation among developing countries on the field of non-metallic raw material industries and through the discussion to highlight the developing countries' continuing efforts to strengthen their economic co-operation towards accelerating their economic and social progress. In the past, developing countries have explored various schemes and mechanisms designed to foster economic co-operation at the regional and subregional levels. Some of these mechanisms have been in operation for a long time and some more recent. Their history varies but the general thrust is no doubt towards the strengthening of economic relations among developing countries and the invigoration of their joint efforts to fully tap their development potential.

From the time of its inception, UNIDO has been involved in rendering technical and financial assistance to developing countries to promote their economic and technical co-operation, particularly in the industrial field. However, in the mid-1970s, technical co-operation among developing countries /further on: TCDC/ which involves the sharing of capacities and skills between two or more developing countries, emerged as a vital mechanism of international co-operation and a major instrument in the establishment of the new international economic order. TCDC is inherent in the purposes and principles of the Charter of the UNITED NATIONS, but from the perspective of the history of international co-operation TCDC is a new concept and represents a new dimension.

TCDC seeks to turn technical co-operation into a strategic tool geared to satisfy the aspirations of the developing countries in the last two decades of the century. TCDC does not negate, but refines and reinforces the concept of global technical co-operation because it emphasizes the basic involvement of the countries that stand on benefit most from it. TCDC springs from the realization that a stage has been reached when

developing countries must take a direct and more active part in the processes of international co-operation that affect their economic and social development, recognizing that technical co-operation, besides helping them to meet their needs for skills and technology, should be put to a new use - to help promote better understanding and appreciation of their common developing problems, and to generate mutual self-reliance among the developing countries concerned. Thus, self-reliance is the most important principle of TCDC and this makes it unique in the history of bilateral and multilateral economic co-operation.

Developing countries have realized that no system of technology or skill can be transplanted or imported into a country with the same effect it had in the country of origin. Technology must be adapted to suit the particular needs of the importing country. Thus, developing countries must share with each other their experience of adapting imported technologies in order to fully maximize the benefits it offers. This is why self-reliance is the cornerstone of TCDC. Self-reliance could unlock human and other forces that help nations make the fullest use of their natural resources and leads to the identification and utilization of local capacities that are indispensable for ensuring self-improvement.

TCDC has become a viable means in establishing communication, and initiating, designing, organizing and promoting individual and collective efforts among nations so that they could create, acquire, adopt, transfer and pool knowledge and experience for mutual benefit and for achieving national and collective self-reliance which are essential for development. TCDC entails these interchanges with interest and benefits of the developing countries as its prime objective. In this sense the main actors are the developing countries themselves and the objectives are designed to serve causes of development in the developing countries.

It should be stressed that co-operation among the developing countries is not based on the principle of economic and political polarization. Neither does it attempt to supplant

traditional bilateral or multilateral and North-South co-operative programmes and activities or bring about absolute economic autarchy. It, in fact, plays a catalytic and supplementary role in the overall push for development. It is obvious that contributions from the developed countries are needed for the enhancement of capacities in the developing countries who in turn could through TCDC mechanisms disseminate these capacities in other developing countries on more economical and favourable terms.

POLICIES AND OBJECTIVES

It should be recognized that co-operation among developing countries as such is not new. With the aim of evolving systematic and continuous programmes of co-operation in the fields of industry, it is necessary to identify broad areas of co-operation as well as appropriate mechanisms for their implementation. The identification of programmes and mechanisms should be based on a pre-conceived strategy aimed at providing comprehensive, coherent and integrated action in this field. This, inter alia, should be governed by the following objectives:

- Harmonization of policies and action to achieve the 25 % target set by LIMA following redeployment of productive capacities from developed to developing countries and the creation of additional capacities;
- Co-operation in the field of industrial technology with a view to improve the identification and use of technologies already available in the developing countries, including technical know-how and skills; machinery and equipment; design, consulting and construction capabilities, etc.;
- The creation of co-operative programmes concerning exploitation of non-metallic resources, for this purpose creation of applied research and development activities in specific sectors, drawing heavily upon machinery and capabilities already available in the developing countries concerned;

- The development of factual plans for encouraging the use of engineering and consultancy capacities available within the developing countries as viable alternatives to those offered by industrialized nations;
- Establishment and strengthening of the institutional framework at national and regional level, to sustain industrial and technological development, and to promote joint investment projects;
- To promote collective action for negotiating and bargaining for technology acquisition by the developing countries

The objectives outlined above will have to rely on the political will and appropriate support from all governments concerned and on the introduction of adequate mechanisms for its implementation. UNIDO could play a central role in fostering and co-ordinating this programme and could as well provide analytical and direct assistance as needed.

In an increasingly complex and interdependent economic society no group of countries can afford to cut themselves off from the main stream of international technological process; however, developing countries cannot continue to be the recipients of production techniques that are often unsuitable, supplied at inflated prices and under restrictive conditions. It is therefore essential that this Workshop should give some attention to this problem in order that within the context of the meeting new perspectives and new institutional arrangements could be developed. The Workshop should devote particular attention to this problem in order to adopt action-oriented conclusions and recommendations aimed to further co-operation among developing countries concerned in the field of non-metallic minerals' industries.

ACTIVITIES OF UNIDO TO PROMOTE TECHNICAL CO-OPERATION AMON DEVELOPING COUNTRIES

After the Lima Declaration and Plan of Action, which gave great importance to economic co-operation among developing

countries, a separate section on Economic Co-operation among Developing Countries /further on: ECDC/ was established on 1 June 1977 within the UNIDO Secretariat. The new section was charged with the responsibility of co-ordinating UNIDO activities in this area and shaping them into a single programme as well as seeking new ways of promoting economic and technical co-operation among developing countries in respect to industrialization. While there are many ways of accelerating the industrialization of developing countries through bilateral and multilateral co-operation, the thrust of the operational programmes of UNIDO on ECDC have concentrated on:

- Strengthening the indigeneous capabilities of the developing countries;
- Fostering co-operation between developing countries in specific industrial sectors;
- Promoting supportive assistance from industrialized countries and international agencies to accelerate the industrialization process in developing countries;
- Increasing awarness of the developing countries of their abilities to initiate co-operation and to the existence of industrial goods and services in developing countries that could be used appropriately in their own industrialization process;
- Stimulating the Governments of the developing countries to re-orient their development policies and to break attitudinal barriers in order to obtain maximum benefit from opportunities for co-operation;
- Promoting the implementation of specific projects for co-operation.

Initially, the UNIDO Secrateriat surveyed areas in which developing countries could offer technical co-operation for industrial development or would welcome such offers from other

developing countries. In consultation with some 40 developing countries, a preliminary list of opportunities for co-operation was issued in May 1975, including 360 specific needs and 265 specific offers of resources. Although this preliminary sample did not include information on a number of countries with important resources to offer, it nevertheless indicated a considerable potential for co-operation among developing countries in a fairly wide range of industrial fields and offered a useful basis for further development of the programme.

From January 1973 through November 1981 a total of 276 TCDC projects were approved, with total allocations of almost \$ 7,5 million.

In the context of the present Workshop, two major areas of UNIDO activities are of particular importance for co-operation among developing countries and should therefore be described in somewhat more detail: the first is the System of Consultations and the second is the strengthening of technological capabilities in developing countries. Both received priority attention at the Second and Third General Conferences of UNIDO and subsequent sessions of the Industrial Development Board and are likely to become even more important. They offer excellent prospects for co-operation among developing countries.

THE UNIDO SYSTEM OF CONSULTATIONS AND INTERNATIONAL CO-OPERATION IN NON-METALLIC MINERAL INDUSTRIES

The UNIDO System of Consultations provides a unique forum for a continuing dialogue between developing and developed countries on industrial sectors and industrialization topics. This forum relates to co-operation between developed and developing countries and among developing countries themselves.

The System was established by UNIDO on the basis of a recommendation adopted by the Second General Conference of UNIDO held at Lima, Peru, in 1975 and endorsed by the General Assembly at its seventh special session in September 1975.

The Third General Conference of UNIDO held at New Delhi in January 1980, positively appraised the initial activities which started in 1976. The Conference considered the System as an important tool for acceleration of industrialization of developing countries and as an instrument for restructuring of world industry in the context of the New International Economic Order. The conference recommended that the Consultation should be a permanent activity of UNIDO. The Industrial Development Board, UNIDO's Governing Body, at its fourteenth session in May 1980, decided that the System of Consultations should be placed on a permanent basis with its main characteristics defined as follows:

- /a/ Consultations should serve as a forum for developed and developing countries in their contacts and consultations directed towards the industrialization of developing countries;
- /b/ Consultations would also permit negotiations among interested parties at their request, at the same time as or after Consultations;
- /c/ Participants of each member country should include officials of Governments as well as representatives of industry, labour, consumer groups and others, as deemed appropriate by each Government;
- /d/ Final reports of the Consultations should include such conclusions and recommendations as agreed upon by consensus by the participants as well as other significant views expressed during the discussion.

To date, fourteen Consultations have been organized on a global level on nine industrial sectors. Six Consultations are planned in 1982 and 1983, and seven Consultations are provisionally scheduled for the biennium 1984/1985.

In considering possibilities for promoting co-operation in the non-metallic mineral industries, it should be stressed the urgent need to strengthen regional and sub-regional co-operation which is particularly important for small developing

countries with limited financial, market and raw material potential. In this connection, it can be recommended, inter alia, that UNIDO should:

- identify the various partners, especially new partners, available for international co-operation and analyse the role which each of them could play in promoting the non-metallic mineral industries in developing countries
- study and recommend ways and means of expanding technical and economic co-operation among developing countries in the non-metallic mineral industry, taking into account the Caracas Programme of Action on ECDC adopted by High-Level Conference on ECDC held in Venezuela in May 1981; particular attention should be paid to the design of non-metallic mineral industry strategies, planning system and the development of human resources.

NON-METALLIC MINERALS AND THEIR UTILIZATION

This Workshop is devoted to the non-metallic minerals. This subject-matter is many-sided and very heterogeneous, it is, however, very important in the national economy. In the following, non-metallic minerals and their utilization are reviewed very shortly, without any want of completeness.

The concept of non-metallic minerals can be outlined in negative sense only: every material belongs to this type of rocks which are not suitable for producing metals or not economic for this purpose. In specific meaning they may be divided into two groups:

- minerals and rocks, which are appropriate, after having transformed or processed, for utilization in the industry due to their mineral composition and chemical characteristics
- minerals and rocks which are appropriate for industrial use without processing.

Adequate use of minerals is based upon geological investigations problems of which are discussed by a specific lecture.

The geological conditions of profitable exploitation are:

- quality of material
- homogeneity of quality within the deposit
- quantity of material and
- exploitability of deposit.

Quality of minerals and their homogeneity depend on formation of deposit: in magmatic deposits quality improves with increasing differentiation, in hydrothermal deposits the most important factor is the process of metamorphosis, in sedimental deposits raw material separates by transport or chemical precipitation.

Deposits can be utilized only when quantity of material is suitable for economic exploitation. Without detailed geological investigations, the available quantity of material cannot be estimated.

The non-metallic minerals can be economically exploited by quarrying when ratio of overlying layer to the mineral comes to 1:1 /maximum/ and water, energy and road /or railway, waterway/ are available for transportation.

In the following, the most important non-metallic minerals are outlined according to geological classification.

a/ Magmatic minerals

In the flowing magmatic phase diamond, pumice and perlite come into being.

The industrial diamonds are used for producing cutting-edges for glass, stone, concrete, etc., in lithography for engraving, to balances as wedge, etc.

Pumice originates from lava-flow, generally with rhyolitic chemical compositions. It is a lightweight material and used for making lightweight aggregate concrete. Due to its hardness, it is suitable for grindstone. Mixing with fertilizers and ploughing into the soil, it keeps nutriment, humidity and air.

Perlite is a volcanic glass of high water content. The raw perlite will be finely crushed and heated to 900-1100 °C during some seconds. Upon heat effect, tiny particles expand

to the multiple of their original volume. Expanded perlite is among the lightest of the actually known porous aggregates. It is mostly applied in the building industry for mortar and concrete to provide for thermal insulation and light weight of buildings. Recently, however, its peculiarities extend its field of use: its great specific surface recommend it for filtering, its heat and fire resistance for insulating industrial furnaces, high water retention in agriculture /e.g. for soil amelioration, plant breeding, etc./, chemical industry applies perlite as filler, catalyst, pigment carrier, in siderurgy it is applied for keeping steel hot after founding. Expanded perlite has a special importance in environmental engineering, its high specific surface is enabling it to neutralize water pollution /e.g. oil pollution/, industrial sewages, etc. Water management applies expanded perlite for reducing still water evaporation /e.g. lake/.

In the pegmatitic phase, feldspar and mica come into being.

Feldspars are aluminium silicates containing sodium /Na/, potassium /K/, calcium /Ca/ and rarely barium /Ba/.

They have an important role in potter's craft where for ensuring plasticity and increasing potassium and aluminium content it is dosed in 10-20 pct. In glass industry, feldspars are used for ensuring Al-content and to optical glass for ensuring transparency and colourlessness. Feldspars play an important role in enamel and glaze production.

The micas are crystallized aluminium silicate containing water. Their most important physical property is the excellent cleavage. Field of their utilization is the electrical engineering: sheet mica is the best electrical insulating material. It is used in heating technique for producing goggles, after grinding in paint and cosmetic industry.

In the hydrothermal phase barite, fluorite, vermiculite and various quartzes are into being.

From original ground barite white colour is produced, it is used to luxury papers as filler, in building industry for making mortar or concrete against X-ray and in deep-boring for

ballasting sludge.

Siderurgy applies fluorite for flowing, enamel and chemical industries apply it for producing fluorine acid.

Vermiculite is collective noun of hydromica group related to biotite. It is expandable at temperature over 250°C along its cleaving plates /expansion in one direction/. The expanded vermiculite is used in the building industry for making thermal insulating materials.

Quartz has good mechanical and chemical resistance, piezo-electricity, optical activity and its coefficient of thermal expansion is very low. It is used in precision engineering for weight, in balances for edges, in ultrasonic-generators for controlling stability of frequency in radio and radiolocator equipments, in production of watches, etc.

b/ Sedimental minerals

Siliceous minerals are siliceous sand, detritic sediment and quartzitic sandstones.

They are used for producing silica bricks as refractory matter in different kilns and furnaces, but most important fields of their utilization are in polishing and grinding industry by processing methods and producing glass. It is used in metallurgy as foundry sand in quality control of cement as standard-sand.

Cryptocrystalline and amorphous minerals containing silicium are flint, limnoquartzite and diatomite.

These minerals are used generally for polishing and filtering. Fields of diatomite utilization are many-sided. It is used in the building industry for producing lightweight masonry units, thermal insulating elements or fillers, sound-insulating materials, in chemical and food industry for filtering and clarification or purification, for producing water-glass, enamels, colours, in pharmaceutical industry for toilet-powders, ointments, etc.

Grist of siliceous minerals are used for polishing, to fine ceramics, for producing acid as fillers, in paint-industry also as filler. Very fine particles of siliceous minerals

mixed with lime and/or cement, then autoclaved are appropriate for producing gas-concrete units for wall and roof constructions.

Argillaceous rocks are china-clay /kaoline/, brick clay, fire clay, expandable clay and bentonite /fuller's earth/.

China clay is raw material for producing tiles, household, decorative and technical porcelains, among which particular stress is laid on electrical porcelain. Requirements on the quality of china-clay are high, those of the others are less.

Fire-clay is used for producing chamotte wares and Dutch-tiles.

Brick-clay is the raw material of bricks, roof tiles, terracottas and delft /faience/ wares.

If the clay contains organic materials and other specific minerals, it can be expanded. Expanded clay /e.g. LECA/ is lightweight aggregate of concrete having 600-1800 kg/m³ in density and 5-40 N/mm² in compressive strength.

Bentonite is a clay containing montmorillonite due to that it is adsorptive, expandable and thixotrope. It is used in metallurgy as binder of casting moulds, in deep-boring as boring mud, in chemical industry as adsorptive for paints etc., as water softener. It is added to fire-clay for improving plasticity. Paper industry applies it as filler, building industry for water insulation.

Among carbonate rocks the limestone is the most common and the most frequent. It is used for producing lime. Marly limestone is one of the raw materials in cement production. Ground fine limestone is mixed to fodders for enriching CaO-content. Rough limestone is applied to wall-construction, homogeneous deposit makes cutting limestone-bricks of regular shape possible by machine. The marble is one of the most important fine stone used for decorative purposes in buildings.

Dolomite ground finely is used in glass industry and for pottery. For less in demand, dolomite is used as refractory brick.

Magnezite has very important utilization for making metall-magnezite for pyrotechnical purposes and for producing

aluminium-alloy of high strength and light weight. After roasting it is used as refractory brick. Magnesite is basic material for producing Sorel-cement.

Salt-rocks originate both in sea-deposits and in continental-deposits.

Salt-rocks originated in sea-deposits contain as main minerals: gypsum $/CaSO_4 \cdot 2H_2O/$, anhydrite $/CaSO_4/$ and rock salt $/NaCl/$. Gypsum and anhydrite are mainly used in the building industry as binder.

The most important utilization of rock-salt is for eating purposes. It is raw material for producing soda, hydric chloride, chloridic chemicals and metal sodium.

Salt-rocks originated in continental deposits contain mainly minerals of sodium carbonate. Nitrates are used for producing nitric acids, sodium sulphate in paper industry, sodium borate in many field of chemical industry.

c/ Minerals of metamorphic origine

In this group, the most important non-metallic minerals are: serpentinite, talc, asbestos and graphite.

Serpentine talc is used for paper production as filler, in textile industry for dressing and in rubber industry as filler. Other fields of its utilization is making refractory bricks, in electric industry as raw material for insulator, in chemical industry for producing laboratory pots of acid resistance, etc. /e.g. Saurens enumerates in his book "Gewinnung, Aufbereitung, Veredlung u. Verwendung von Talk, Talkmagnesite und Glimmertalkum, Halle, 1950." 76 utilizations of talc/.

Types of asbestos are: amphibole-, serpentine- and chrysotile-asbestos. They are appropriate for exploitation when asbestos content comes at least up to 5 pct. Asbestos is used in building industry to make asbestos-cement products /ducts, sheetings, wallboards/ and thermal insulation, in food industry for filtering /e.g. wine/ and in textile industry for producing protective garments.

Graphite is a fire resistance material. Fire-resistance laboratory pots, pencil-points, paints are produced with

graphite as well as it is used for lubrication of shafts working under high pressure.

d/ Minerals of origine mixed

There are minerals originated in two or more phases of rock formation. E.g. phosphate can originate both in magmatic phase /apatite/ and in sedimental phase /phosphatite/.

Phosphates are used for producing phosphor acid which is raw material of superphosphate as fertilizer, for producing matches or phosphor bronze.

Sulphur and pyrite are the raw materials of sulphur-acid. They are indispensable in production of sprays for plant protection.

Coloured earths are raw materials of paints.

e/ Building materials

It was mentioned on the preceding pages that non-metallic minerals have utilization also in the building industry. This field of using is, however, very important so it is shortly outlined in the following separately.

Rock is a building material well known since thousand years. Practically every type of rocks is used for making foundations, walls, archs, bridges, etc. /granite, gabbro, rhyolite, phonolite, dacite, andesite, basalt, diabase, sandstone, volcanic tuffs, limestone, dolomite, shale, marble, gneiss/.

Non-metallic minerals can be raw materials of different binders.

Binders setting in air are: burnt lime, calcined gypsum, Sorel-cement from magnesite. They are used for producing rendering and masonry mortars, wall elements, floor covering, etc. mixed with different aggregates.

Slightly hydraulic binders are: hydraulic lime, dolomite lime, Roman-lime /burnt marl/, pozzolan lime /made with slaked or hydrated lime and ground volcanic materials of hydraulic

activity/.

Hydraulic binder are the different cements /portland cement, pozzolan cement, slag cement, fly-ash cement/. Raw materials of cements are limestone and marl fine crushed and calcinated at temperature of 1250-1350 °C. In this century, cement became the most important binder of the building industry.

Artificial rocks are concretes and artificials stones.

Concretes are made with cement and aggregates both in pre-fabricating workshops or in situ. Cement, aggregate and water are mixed, casted in moulds, compacted and cured /generally by water/.

Depending on type and quality of aggregates, there are concretes for thermal insulation, both for thermal insulation and load-bearing /intermediate concretes/ and for load bearing purposes.

Aggregates of thermal insulation concretes are expanded perlite and expanded vermiculite. Density: 200-800 kg/m³, compressive strength: 0,1-3 N/mm², thermal conductivity coefficient: 0,07-0,3 W/mK.

Aggregates of intermediate concretes are: natural volcanic lightweight rocks /tuffs, pumices, lava slags/ and artificial materials, e.g. expanded clay, expanded shlate, sintered clay with slight carbon-content /dirt/. Density: 800-1600 kg/m³, compressive strength: 5-15 N/mm², thermal conductivity coefficient: 0,3-0,7 W/mK.

Aggregates of load-bearing concrete are: natural sand gravel /generally quartzitic mineral/ as well as different crushed rocks /granite, andesite, basalt, etc./. Properties of concretes are: density > 2000 kg/m³, compressive strength: 15-70 N/mm². There are lightweight aggregates suitable also for making load-bearing concretes /volcanic tuffs, expanded clay and shlate, sintered clay/. Concrete properties: density of 1600-1900 kg/m³, compressive strength of 15-40 N/mm².

Artificial stones differ from concrete only in appearance, they are used for decorative purposes. Aggregates are coloured minerals, e.g. marble, limestone.

There are different methods for making building elements. One of the widest is production of gas-concrete. Raw materials

are: very finely ground quartz-sand, cement and/or lime and aluminium powder or paste. Due to the chemical reaction of aluminium powder and binder-paste, gas comes into being and expands the mixture casted in the mould. Then the concrete in the mould will be placed in autoclave where the temperature arises to about 180 °C and the pressure to about 8 bar. The final form of element is achieved by cutting. Density: 500-1000 kg/m³, compressive strength: 4-15 N/mm². This production method is suitable to make prefabricated element of sizes to 2-6 m.

POSSIBILITIES OF ACTION FOR ECDC

Possibilities of activities for ECDC are many-sided. The action may be at the national level, at the regional or subregional level, at the interregional level and at the global level.

a/ Action at the national level

The primary objectives for action at the national level are: to increase the awareness in each developing country of its own capabilities, skills and experience, and of those available in other developing countries; to establish and strengthen the necessary background arrangements - institutions, information, human and other resources - on which TCDC must be firmly based; to identify specific opportunities for TCDC, and to enhance the capacities of developing countries to organize and implement expeditiously and effectively projects with a TCDC dimension. While such actions would clearly be the responsibility of each developing country, the support of other developing countries, developed countries and international organizations, where requested, could make important contributions. More especially, in implementing the results of these actions, the United Nations development system would be expected to extend its fullest support when requested to do by Governments.

Action at the national level are:

- National programming for technical co-operation among developing countries identifying the potential of the country for TCDC. Such a process should include evaluation of its ex-

perience with respect to such matters as control over natural resources, manpower planning and training, the establishment of viable research and extension institutions, the provision of social services and the development of technologies appropriate to their requirements. On this basis, the Government may consider national requirements in research, technology, skills, consultancy services and training facilities that can be met most effectively through co-operation with other developing countries. Such programming would be facilitated by the efforts of individual countries to build or strengthen their institutional capabilities.

- Adoption of policies and regulations favourable to TCDC and working out the legal and administrative framework for effective and equitable co-operation. The framework should cover the administrative and legal arrangements concerning the entry, employment, obligations, privileges and immunities of experts and consultants, arrangements concerning fellowships, the use of contractors and other specialist services, entry of equipment and supplies, fiscal and currency regimes favourable to TCDC and also financial arrangements aimed at an equitable sharing of costs.
- Each developing country should, as appropriate, organize flexible mechanisms or strengthen them where they already exist in order to promote TCDC, to facilitate the co-ordination of TCDC activities at the national level and their incorporation into the national development programmes, and to identify cross-sectoral trade-offs and complementarities.
- Each developing country should take adequate steps to strengthen the gathering processing and dissemination of information covering the availability of national capacities, knowledge and experience relevant to the purposes of TCDC, with the support of the information systems of the United Nations.
- Since a strong institutional base is essential for viable TCDC, developing countries should individually identify and assess the effectiveness and potential of national institut-

ions for the purpose, and adopt measures, wherever necessary, to improve their effectiveness and potential.

- In order to foster TCDC, on the basis of partnership among sovereign nations, the Government of each developing country should participate in financing the costs of its TCDC activities according to its ability, including the making of appropriate budgetary provision. Such costs should be viewed as an investment yielding substantial social and economic returns.
- Developing countries should make every effort to strengthen their scientific and technological capabilities to suit their special needs, values and resource endowments, particularly by formulating a technology plan as an integral part of their development objectives; sharing the research efforts and their results with other developing countries, strengthening national design, engineering and consultancy services, national laboratories, research centres and scientific and other institutions, where appropriate, to those in other developing countries, particularly through the regional centres on transfer and development of technology.
- Developing countries should consider exchanging among themselves their experiences in the formulation and implementation of their plans and policies for the orientation of science, and the transfer and development of technology to their own development objectives, needs and capabilities, taking into account the analyses, data and recommendations that emerged from the United Nations Conference on Science and Technology for Development held in 1979.
- The Governments of developing countries should intensify their efforts to promote national and collective self-reliance by strengthening their mutual contacts and communications by exchanging experience, and by undertaking joint programmes and projects in such matters as economic policy and planning, population, employment, education, health, housing and human settlements, rural development, social welfare, and the integration of women and youth in development.

- The Governments of developing countries should encourage and facilitate intensive communications and co-operation among professional, technical and voluntary associations in their own countries and in other developing countries.
- The Governments of developing countries should endeavour to establish or strengthen suitable arrangements to encourage and maintain communication between public corporations in their own countries and in other developing countries especially with a view to promoting closer technical collaboration in such areas as research and development, procurement, marketing, etc. Similarly, Governments of developing countries should aim at encouraging comparable arrangements with regard to private corporations, where applicable.
- In addition to undertaking projects designed to promote and build their TCDC capacities, the Governments of developing countries should make every effort to identify, initiate and support viable projects and programmes with a TCDC dimension, such as: joint surveys, exploitation and conservation of natural resources, studies of the feasibility of joint industrial and commercial ventures, the development of inter-country communication and transport systems, the establishment or development of common training and research institutions, joint assessments of population dynamics and combined manpower and skill availabilities and the development of complementary capacities in particular sectors.
- In order to facilitate sustained and widening TCDC co-operation, and since bilateral arrangements are crucial in this co-operation, the Governments of developing countries should endeavour to expand bilateral arrangements for promoting TCDC through such mechanisms as co-operative agreements, joint commissions, the regular exchange of information and experience, and the support of initiatives in the public and private sectors, including those among consultancy organizations, as appropriate, in order to form links with their counterparts in other developing countries.

b/ Action at the regional and subregional levels

TCDC should be directed by each Government as a sovereign State, and at the regional and subregional levels jointly by all Governments concerned. Where these Governments agree on common problems that could be treated most effectively on a multilateral basis, examination in common may highlight areas for institutional and infrastructural improvements that could enhance progress in the region or subregion to which TCDC would make an important contribution. The primary objectives of the recommendations at the regional and subregional levels should take into account the need to:

- Strengthen existing regional and subregional institutions and thus their capacity to serve better the needs of each Government concerned in its efforts to co-operate with others;
- Develop and strengthen interinstitutional links in important, high-priority substantive areas, such as those identified at the regional preparatory intergovernmental meetings for the Conference, designed to draw on the capabilities and experiences available in the region;
- Reinforce the capacities available for data collection and analysis in order to provide systematic information for decision makers at the national, subregional and regional levels;
- Improve regional information systems for TCDC, particularly those related to technical co-operation needs which cannot always be presented simply in the traditional terms of skills, equipment and training requirements
- The United Nations development system, at the request of and in close consultation with the countries involved, should formulate and support TCDC programmes of action at the regional and subregional levels in such areas as: the exchange of experience with regard to the policies of developing countries towards transnational corporations, and those designed to seek the transfer of technology on the most favourable terms and conditions; and activities designed to enable the developing countries to derive a greater share in the transport,

marketing and retail prices of the primary commodities exported by them. These TCDC programmes of action should facilitate and strengthen linkages among the national organizations working to resolve developmental problems, and those concerned with research and development and the adaptation of technology.

c/ Action at the interregional level

A prime objective of the TCDC is to enable the developing countries to benefit from the widest access to accumulating experience in efforts to meet comparable development problems. It is now recognized that, for a variety of reasons, the experience and knowledge needed by a developing country in a given region may well be found, if not within the region, then in another region. Moreover, as countries in a given region may have adopted similar approaches to problems, new approaches may be found by drawing upon and distilling experience from outside the region. Interregional co-operation offers considerable potential advantages and constitutes a substantial and important challenge for TCDC.

A wide variety of interregional, intergovernmental organizations of developing countries exists. Some such organizations are of a political character, others pursue common social and economic goals, and yet others function in specific technical or economic fields. These organizations, institutions or arrangements should be fully mobilized to promote, support or conduct TCDC projects and programmes, within their respective terms of reference.

Governments of developing countries that are members of interregional organizations, institutions or arrangements should, with the assistance of organizations of the United Nations development system, as appropriate, consider initiating inter alia:

- An evaluation of the function of TCDC in their common organizations, institutions or arrangements, and their capacity to promote TCDC further;

- The necessary measures to strengthen the interregional linkages between regional and subregional organizations with similar interests and complementary capacities;
- The joint identification of development problems that are interregional in scope and have a TCDC dimension; and
- Joint programmes to be undertaken by appropriate interregional organizations or at interregional level between any two or more entities belonging to different regions, and the identification of additional needs or organizational gaps where new arrangements may be called for.

d/ Action at the global level

The growing interdependence of nations, the need to work in concert for a new international economic order, the undoubted benefits of the dissemination of knowledge and particularly of the results of scientific and technological research and discovery and the fact that TCDC is an enterprise based on co-operation and not on confrontation, create a truly global context for TCDC, in which developing countries, developed countries and the United Nations development system can take concerted action.

This global context and perspective for TCDC also encompasses the experience gained and conclusions reached in the historic stream of past and future United Nations world development conferences on trade and development, industry, employment, science and technology, population, women, food and agriculture, agrarian reform and rural development, water, desertification, environment and human settlements.

The entire United Nations development system must be permeated by the spirit of TCDC and all its organizations should play a prominent role as promoters, catalysts and facilitators of TCDC. The United Nations Development Programme, the specialized agencies and other bodies of the United Nations family, including the regional commissions, have already directed a number of their activities towards TCDC. The conclusions of the United Nations Conference on Technical Co-operation

among developing Countries should lead to the strengthening and expansion of these efforts in order to complement further those made at the national, subregional, regional and interregional levels.

Bearing in mind the fact that the achievement of national and collective self-reliance through the release and development of indigenous capacities necessitates an important change in emphasis, the thrust of international technical co-operation should be increasingly directed towards enhancing the capacities of developing countries to help themselves and each other. The use of the resources of the UNDP and other multilateral and bilateral agencies should reflect this change in emphasis.

In designing technical co-operation projects, Governments, intergovernmental and other organizations concerned with supporting international development efforts should give priority to projects that could make the greatest possible use of local capabilities. Wherever feasible, local expertise and consulting firms should be involved to the maximum extent possible in formulating and executing projects, either directly or in close association with outside firms. Where institutions and expertise of the requisite level, quality and relevance are not available locally, clear priority should be given to the use of such technical resources from other developing countries, given acceptable quality, cost, delivery schedules and other related conditions. The placement of fellowships and the procurement of equipment should also be directed towards other developing countries in the first instance, wherever their facilities and experience are suitable.

WORKSHOP ON NON-METALLIC MINERALS

Article about non-metallic minerals and their utilization outlined the most important fields of use from which the role of non-metallic minerals in the national economy can be established. The importance of these materials is based on the one hand upon great number of the industrial sectors utilizing non-metallic minerals and among that upon the possibilities of using in the building industry on the other, since housing,

human settlements and rural development depend largely on available materials and building industrial possibilities in every developing country.

Article about possibilities of action of TCDC as well as ECDC outlined in general the activities to be fulfilled in order to promote mutually the development process in the developing countries, the means and mechanisms for its execution.

Present Workshop is organized by the Socialist Republic of Yugoslavia. Yugoslav industry has been in the forefront on the technology in this field. Yugoslav companies have developed themselves, imported or modified many of the technological skills, processes and equipments essential to the development of non-metallic mineral industries and they have done this in conditions very similar to those prevailing in many developing countries. There is already a degree of co-operation in this field with some developing countries, but there is a scope for this to be extended and strengthened.

Workshop of this kind may be a very effective instrument to discuss the expectable problems in establishing these industries in the developing countries based on experience gained in Yugoslavia and in other developing countries. The problems are arising from the variability of non-metallic raw materials which require nearly in all cases of careful selection of manufacturing techniques. Also the variety of products used for the production of non-metallic minerals is rather rich and very often the quality of the products depends on a proper composition of the green body.

In Yugoslavia many projects were carried out by support of United Nations Industrial Development Organization and some of these projects have attained their implementation. Interchange of experiences gained at this preparation, investigation, feasibility study, decision and investment process may be very useful and profitable for every country participating in this Workshop. This process is well organized only if factors which make the acquisition and utilization of technology problematic for the developing countries are known. Some factors are:

- The imported technologies and skill may be too advanced, automated and/or capital intensive while the developing countries are feverishly trying to eradicate unemployment;
- The imported technologies require highly skilled labour;
- The imported technologies may rely on synthetics rather than raw materials in large supply in the developing regions;
- The imported technologies are usually too costly and would be a financial drain on the developing countries' foreign exchange;
- The imported technologies may perpetuate dependence on the developed suppliers most of whose are represented by the transnational companies;
- The imported technologies may be inappropriate in that they may not be responsive and compatible with the needs, requirements, absorptive capacities, economic and socio-cultural exigencies of the developing countries. Furthermore, the imported technology may be geared to serve the needs of a few and would not be conducive to elements that spur indigenous capabilities or industrial and economic development in the developing countries.

RECOMMENDATIONS

It would have been very helpful for outlining some recommendations if the studies reviewing situation, problems, needs and possibilities in development of non-metallic mineral industries prepared by developing countries concerned had been sent to the organizing committee or to UNIDO in due time. These studies, however, did not arrive up to the time of closing this paper, therefore there was possibility only to draw up some questions suggested for discussion as recommendations of guiding principles.

It seems necessary to deal with the following central problems:

- Resources of non-metallic minerals existing or known in different developing countries, knowledges of their materials' quantity and quality, present situation and plans of geological investigations, availability of natural resources, requirements of developing countries concerned for common development of exploitation or for assistance in investigations by UN development system or other developing countries;
- Quarries and factories existing in different developing countries for utilization of non-metallic minerals, present situation in manpower and market, national needs and possibilities for development, requirements of Governments for common development of the technologies or for assistance in development by UN development system or other developing countries;
- Technical, technological knowledges and skills available in different developing countries in the field of exploitation of non-metallic minerals, situation of local training possibilities, requirements of developing countries concerned for establishing common institutional possibilities of training or for assistance in training by UN development system;
- Present situation of science and research in the different developing countries in general and particularly in the field of non-metallic minerals and their industrial utilization, requirements of countries concerned for establishing common scientific or/and technological institute or for participating in activity of such institute already existing in other developing country;
- Present situation of technological level of factories existing in the different developing countries in the field of using non-metallic minerals as raw materials, import requirements, trend to co-operation in development of technologies in TCDC or ECDC dimension;
- Present situation of information channels concerning non-metallic minerals' utilization, production, products, experiences, results, know-how, etc. in different developing

countries concerned, requirements for developing institutional framework of information system, intention to participate in UN organizations such as: Industrial and Technological Information Bank /INTIB/, Technological Information Exchange System /TIES/, Industrial Development Information System /INDIS/, Information Referral System /INRES/;

It would be very useful to find vital mechanisms to sustain co-operation among developing countries and make necessary recommendations for action to UNIDO and as well as to developing countries wishing to promote and strengthen their co-operation. This may not, however, be done satisfactorily in one occasion only. Perhaps consideration could be given to regularizing this kind of meetings to deal with this important subject on a continuous and systematic basis.



