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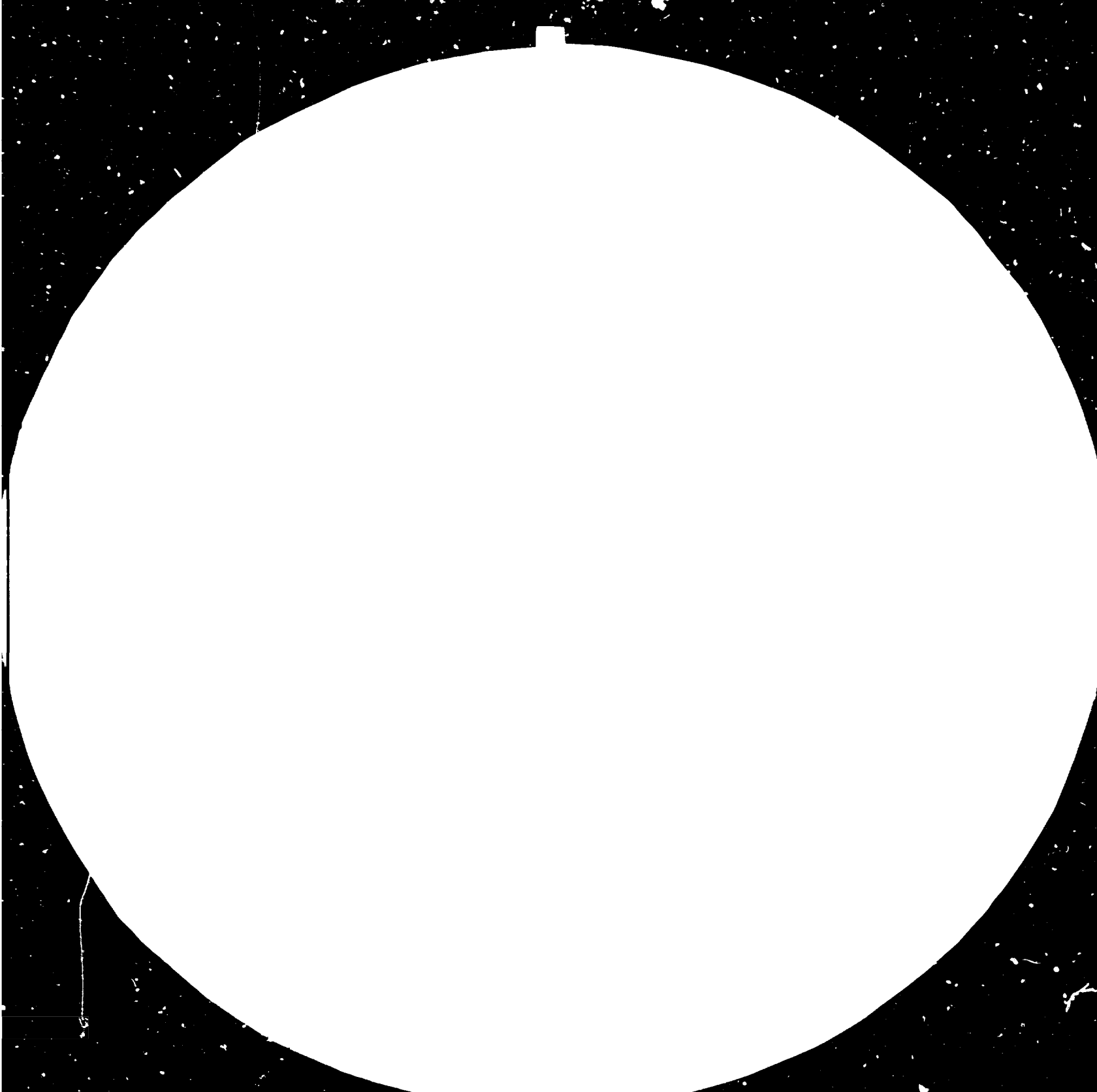

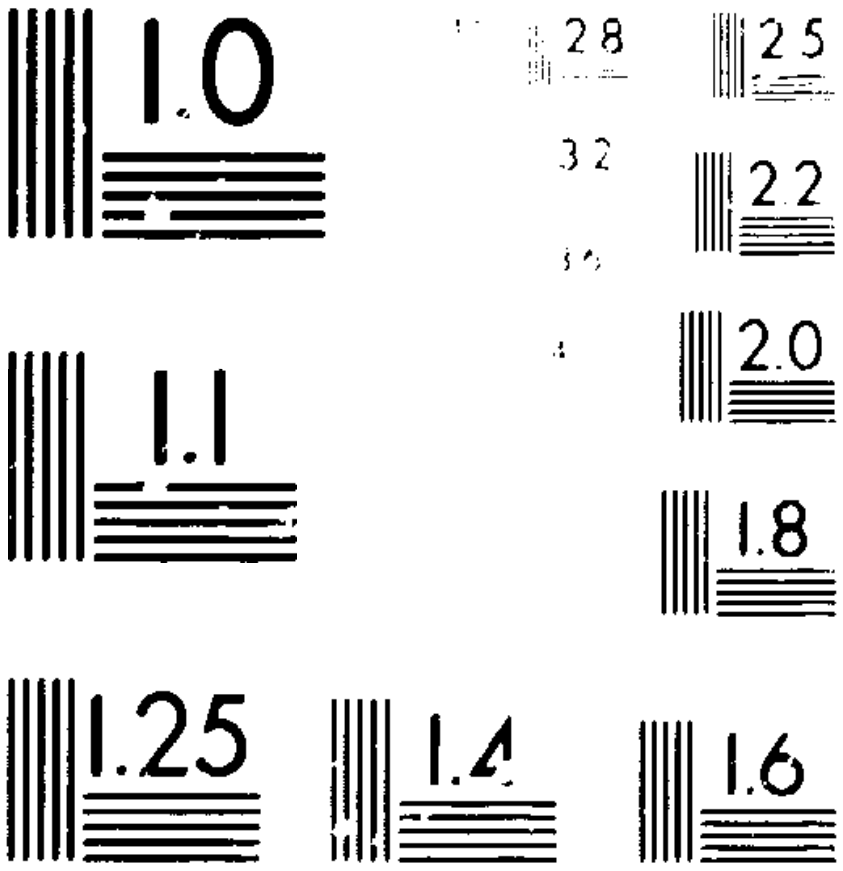

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Item 5(f)

POLICIES AND MEASURES FOR DOMESTIC INDUSTRIAL PROCESSING OF RAW MATERIALS IN DEVELOPING COUNTRIES

ISSUE PAPER

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Item 5(f) of the provisional agenda

INTERNATIONAL CO-OPERATION, RELEVANT NATIONAL ACTIONS INCLUDING INDUSTRIAL POLICIES, AND UNIDO'S CONTRIBUTION IN CRITICAL AREAS OF INDUSTRIAL DEVELOPMENT 1985-2000:

Policies and measures for domestic industrial processing of raw materials in developing countries

Issue paper prepared by the UNIDO secretariat

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INTRODUCTION

1. The impact of industrial and agricultural raw materials and their domestic processing on the pace and pattern of economic growth and industrial development is significant. Industrial production essentially involves the processing and conversion of natural resources - in the form of industrial raw materials - into intermediate and end-use industrial products, with significant value-added components.

2. The slowing pace of industrialization in developing countries underscores the difficult process of industrial development in the 1980s and 1990s and the need to find new avenues for stimulating it. A pattern of industrialization has to be promoted that will give a higher proportion of manufacturing value added to developing countries. As developing countries have a relatively large share of the world's raw materials, industrial strategies based on the domestic processing of raw materials and resulting in a high value-added production would provide promising possibilities for promoting industrialization in developing countries in the coming decades.

3. Industrial raw materials comprise minerals, agricultural and forest products; biomass; livestock, fish and poultry; inland water resources and ocean resources; and renewable and non-renewable energy resources. These constitute a country's total raw material resource base.

4. A considerable amount of value added is derived from the partial or complete processing of raw materials into semi-finished or finished industrial products. For example, in gross foreign exchange earnings, the ratio of aluminium to alumina is approximately 3:1 and that of alumina to bauxite 4:1. Thus, the ratio of aluminium to bauxite works out at approximately 12:1. In other words, when bauxite is exported in the form of aluminium, the gross foreign exchange earnings are 12 times larger than when it is exported in the form of bauxite ore.

5. Even on the basis of inadequate geological surveys, developing countries are known to have large reserves of mineral raw materials, as can be seen from table 1.

Table 1. Developing countries' reserves as a proportion of global reserves, selected minerals

Mineral	Proportion of global reserves (percentage)
Bauxite	64
Cobalt	77
Copper	31
Iron ore	29
Tin	74
Tungsten	52

The share of developing countries in world production of some important mineral ores shown in table 2 is also interesting.

Table 2. Share of developing countries in world production, selected mineral ores

Ore	Share of world production (percentage)
Bauxite	34
Cobalt	70
Copper	23
Iron ore	23
Manganese ore	29
Phosphate rock	24
Tin	72
Tungsten	41

6. There are three stages in the processing of raw materials, namely, extraction, for example of forest products and mineral ores; partial processing, such as conversion of wood into pulp or bauxite into alumina; and final processing into such products as paper or aluminium. Value added at the extraction stage is minimal, and increases substantially in the semi-processing and final processing of raw materials.

7. At the present time, developing countries with major reserves of raw materials are mainly engaged in extraction and limited partial processing, while the processing and final conversion is done by large transnational corporations, which purchase agricultural, forest and mineral raw materials and convert these into final products, with the associated benefits of considerable value added and profits. This has an adverse compounding effect on the economies of the poor raw-material-processing countries. On the one hand, raw material prices have declined sharply in recent years, thus causing considerable hardship to the economies of developing countries as major producers of raw materials. It may be noted that the holding power of developing economies is limited or non-existent. Developing countries import final products based on their exported raw materials at considerably inflated prices. The paradox lies in the fact that poorer countries that are endowed with a large proportion of industrial raw materials in fact pay for the conversion of these raw materials by industrialized countries. Economic compulsion for the domestic processing or at least semi-processing of industrial raw materials is thus evident, if the developing countries are to reap fair benefits from their industrial raw material endowments.

8. Hence the present situation needs to be closely examined and altered through conscious and deliberate policy measures at the national, regional and interregional levels, suitably supported by international agencies, particularly UNIDO.

I. SOME ISSUES FOR DISCUSSION

A. Policies and measures

9. Several important issues and implications relating to industrial raw materials and processing are of particular significance for policy-makers in developing countries and international agencies. For example:

(a) There cannot be physical outputs of industrial products without inputs of industrial raw materials - domestic or imported;

(b) Domestic industrial raw materials provide a substantial comparative advantage for their conversion into industrial products;

(c) The value added to the gross domestic product and the increase in per capita income, through the process of conversion of industrial raw materials into industrial goods and products, are considerable;

(d) Human resources and skill development have an important nexus with domestic processing of raw materials.

10. The policies pursued by developing countries should be designed to use and process local resources as much as possible, with a view to achieving self-reliant development. Policy elements would include the type of food crops and biomass to be grown; the technologies to be used for a better generation, mobilization and utilization of resources; the type of industries to be set up for exporting semi-finished and finished products and their location; and, with active co-operation and sharing of resources and markets among developing countries, the setting up of developing country producers' associations, both small with specific plans for the production and use of industrial raw materials.

11. Rational planning of a country's use of industrial raw materials calls for a knowledge of the quantity and quality of the resources available: agricultural, mineral, forest and water. National resource surveys must therefore be undertaken as a national policy measure. These should include geological, agricultural, forest, biomass, energy, inland water, and ocean resource surveys, which would provide an inventory and assessment of the potential of national raw material resources to facilitate their proper planning and use.

12. The next step is to prepare land-use and resource-use maps, so as to be able to organize the systematic generation of renewable materials and their optimal use, to pursue afforestation and deforestation policies and to ensure environmental protection etc. A national biomass policy will define the type of plants to be grown, taking particular note of sun-belt resources; these would include tropical speciality crops, such as aromatic, medicinal and ornamental plants, or plants with other economic uses, and biomass for use as food, fodder, fuel, fertilizer, building materials and chemicals. A clear distinction has to be made between food and agriculture on the one hand and biomass on the other because of the many industrial applications of biomass.

13. It must be recognized that exploration, geological surveys and the proving of quantitative and qualitative characteristics of industrial raw materials are both time-consuming and expensive. The industrial use plan, which is normally incorporated into the explicit or implicit economic plan of a country, has to be preceded by an industrial raw materials plan. The two should be staggered in each succeeding economic plan.

14. Emerging technologies offer great possibilities for the improvement of crop yields, for the leaching of ores and the recovery of residual mineral oils, for the processing of low-grade minerals and for better utilization of ligno-cellulosic materials, with the introduction of newer processing plants, methods and construction materials, a reduced scale of operation and decentralized industrialization. On the other hand, technological advances have also led to the replacement of natural materials by new synthetic materials. A greater awareness of such developments is essential in policy-making and planning.

15. End-use plans also have to consider alternative and competing uses for a given raw material, for example wood, which may be burnt for firewood or used in the construction industry, and in the production of pulp and paper and wood distillation chemicals. National end-use plans will have to take these alternative uses into account and develop a desirable and optimal mix of raw material uses. Fiscal policies, incentive schemes and regulatory measures will have to be devised for this purpose.

16. For renewable resources, such as those derived from agriculture and forestry or used for fuel, regeneration plans will have to be developed so that the agricultural and forest and biomass raw materials are not excessively depleted, thereby robbing future generations of their legitimate heritage.

17. In the case of mineral ores, there appears to be a tendency to export rich and highly concentrated ores, leaving behind unusable residues. For example, developing countries may export iron ore with an iron content of 60 per cent or more. Industrialized countries, on the other hand, have been using iron ore with an iron content of 45 to 50 per cent, and sometimes even less, for steel production. It would therefore be useful to have national policy to ensure that the quality of the mineral resources is maintained, through blending and other similar means, and that waste is reduced, if not eliminated. This is a useful area for subregional and regional action as well. An exchange of information through industrial co-operation among developing countries would help in this direction.

18. Policy instruments have to be evolved to prevent the waste of natural resources in the course of extraction, storage, transport and processing. This is all the more important for non-renewable resources. A total utilization concept, whereby the by-product of one industry becomes the input for another, will have to be inculcated as an imperative for a raw materials policy.

19. National resource surveys provide a data base on the availability of industrial raw materials and agricultural and forest-based raw materials. Macro-level and project-level economic viability studies must, however, be undertaken to determine the costs of extraction and beneficiation in the case

of mineral ores and the costs of extraction in the case of forest resources. In this connection, roads and transport and water and energy requirements assume great significance and have to be incorporated into an integrated policy framework governing the use of raw materials.

20. Water management is critical both for resource generation and for agricultural and industrial processing. Water as an input into industry and effluent as an output, as well as the treatment of effluent, are matters whose importance must be recognized.

21. The particularly close relationship between raw material extraction and energy expenditure and the energy content of a finished product needs greater attention. The conversion of bauxite into aluminium calls for a large and cheap electrical energy source such as hydropower. There is thus a close connection between energy policy and raw-material processing policy.

22. A different approach is required to the problems of heavy investment and energy consumption, pollution and external markets that arise in the mineral industries. Mining and the processing and marketing of minerals are dominated by oligopolistic transnational corporations. These corporations are also heavily involved in the foodstuff industry.

23. The development and articulation of a clear policy and strategy regarding the pattern of industrial production of a particular country, based on its natural resource endowment, provides the necessary focus and direction for human resource development as well. This focus should be on the development of skills in industrial plant construction, operation and maintenance, consulting and design engineering capabilities, research and development, standards, marketing, management, technological and entrepreneurial activities.

24. Countries should concentrate their raw-material policies on domestic processing, but the policies should also emphasize total utilization of the materials, including the recycling of by-products and waste materials, energy-saving policies, use of appropriate technology and the availability of infrastructure. Furthermore, they should incorporate local pricing policies for raw, processed and exportable materials. Measures and policies should be designed to achieve goals not only within the national boundaries but also in relation to the international trade and finance structure, with a view to curbing trade barriers for processed materials and smoothing out the effects of sharp declines in the prices of raw materials.

B. International co-operation

25. The domestic processing of industrial raw materials calls for co-operation among countries. Hitherto, trade in industrial raw materials, whether primary or semi-processed, has been largely between developing countries as producers of primary materials and industrialized countries as processors of raw materials. There is a considerable gap between the prices of raw materials, which have been declining, and of manufactured products, which are rising. An equitable means of co-operation among industrialized and developing countries would mean that markets for raw materials could be assured at prices that are fair and remunerative to producers and equitable to consumers.

26. Considerable investments will be required in developing countries to promote domestic industrial processing of raw materials. With this in mind, the new dimension of "just co-operation" could be developed, whereby the necessary investments would come from the industrialized countries. The return on such investments has of course to be fair and shared equitably between the two partners. The locational determinants have to be carefully analysed, taking into account the economics of production, transport and social cost-benefit. It may be noted that for every tonne of aluminium, 2 tonnes of alumina or 5 tonnes of bauxite have to be transported. There are therefore considerable advantages to be gained from locating processing facilities near the sources of raw materials, thus reducing the cost of transportation and its incidence on the final product cost delivered at the market place. The overloading of limited transport facilities and port-handling facilities, which are often major bottlenecks in developing countries, will also be reduced. Existing investment in transport infrastructure can then be more efficiently used and new investment expenditure reduced to minimum. The flow of finance from industrialized to developing countries for domestic processing or partial processing of industrial raw materials thus provides a new opportunity and a new dimension for international co-operation, equitable to both groups of countries and resulting in industrial growth in both.

27. For the extraction and conversion of raw materials, developing countries often need technology, capital, human resources with the necessary technological skills, and markets where the products can be sold at equitable prices. Care must be taken to avoid the experience of the past few years, when the prices of raw materials in the developed country market have decreased considerably and have also shown a tendency to fluctuate between wide limits. The situation could be averted through the pursuit of national, institutional, regional and international policies. The onus for this action rests largely on the industrialized countries of the North, who are the major purchasers and users of industrial raw materials. It is worth noting that the holding capacity of developing countries to store their raw materials for future use until the price is more favourable is very limited owing to their financial situation.

28. The prospects for trade in semi-processed industrial materials rather than in primary raw materials, both among developing countries and between developing countries and industrialized countries, are better when approach and planning are properly integrated. As has been pointed out earlier, apart from finance and technology, one impediment has often been the lack of adequate infrastructure, such as electrical power, water and transport. The requirements for developing such an infrastructure in a country can be more clearly identified when a plan for the utilization of industrial raw material has been developed. Again, there are opportunities for co-operation in the development of infrastructure both among developing countries and between developing and industrialized countries.

C. Co-operation among developing countries

29. Often, more than one industrial raw material is needed for an industrial product, for example iron ore, limestone and coking coal for steel-making. Since as a rule not all of these are available in any one

country, there is considerable scope for industrial co-operation among developing countries in the equitable and co-operative rather than exploitative development of industrial raw materials.

30. The prospects for trade in semi-processed industrial materials rather than in raw materials, both within developing and industrialized countries, would be considerably improved by a proper integrative approach and planning. Thus, a country endowed with bauxite would plan to export alumina instead of bauxite to another developing country with a cheap and abundant electrical power source (hydropower), which can convert alumina into aluminium. Thus, the advantages of value added would accrue to both countries. The importing industrialized country would also reap the benefit of lower cost.

31. Considerable experience and technological expertise are available in domestic processing of raw materials in various developing countries and there is great scope for industrial co-operation among developing countries in this important area of industrialization.

32. Similarly, some developing countries also have experience and expertise in the survey and exploration of mineral, agricultural and forestry resources, and in the development of policies for their optimal use. Since the economic, social and environmental conditions in developing countries are more or less the same, it would be advantageous for them to co-operate in the above operations.

33. The development and utilization of conventional and new sources of energy, both renewable and non-renewable, involves industry for energy and energy for industry. Co-operation between energy-producing developing countries and those with other raw materials will be of mutual benefit. Joint regional and multiregional ventures, based on raw material resources, can open up new markets and new avenues for industrial, technical and economic co-operation among developing countries.

II. ROLE OF UNIDO

34. Concerning the blending of ores, it is necessary to consider technologies for the processing of low-grade mineral ores and the financial and energy costs associated with such processing. Considerable scope exists for co-operation among developing countries and between developing countries and industrialized countries, to exchange information and transfer technologies in this field. UNIDO can also help by providing assistance in diagnostic studies for this purpose.

35. An associated problem is that of setting up joint research and development projects for developing technologies suited to both the characteristics of the mineral ores and forest products, and the scales of production operations in developing countries. Twinning arrangements between research and development institutions in developing countries, such as forest research institutes or mineral processing institutes, could be of great benefit. Similarly, on a wider spectrum, the networking of similar institutions of excellence, both on a regional and an interregional basis,

could prove to be of great benefit in accelerating the rational domestic processing of industrial raw materials. UNIDO can play a useful supportive role by making available information on institutions of excellence in such fields, as well as by bringing together two or more such institutions to work on a common project of interest to developing countries through the provision of technical assistance.

36. The role of transnational corporations in trade in industrial and agricultural raw materials and in processing and domestic production is an important issue. In this connection, UNIDO, in association with the United Nations Centre on Transnational Corporations and the United Nations Conference on Trade and Development, could prepare specific and selected case studies, which may help developing countries to evolve suitable policies.

37. The role of training and transfer of skills in the domestic processing of raw materials cannot be overemphasized. Avenues of co-operation among developing countries and between industrialized countries and developing countries have to be explored and the fullest use made of existing facilities to develop human resources and skills. UNIDO can provide assistance by identifying training opportunities and suitable institutions.

38. UNIDO needs to bring a new focus on to one of the major strategy components of industrialization, namely industrial growth and employment generation through value added by the domestic processing of raw materials. Alternate paths and strategies have been undertaken by developing countries for this purpose. UNIDO could usefully examine the approaches adopted and disseminate the results of its studies for the benefit of developing countries.