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UNIDO AND THE DEVELOPMENT AND TRANSFER
OF INDUSTRIAL TECHNOLOGY *

prepared by

the Secretariat of UNIDO

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C O N T E N T S

	para.	page
I. <u>Introduction</u>		3
- Mandates	1 - 7	3
- UNIDO approach to the application of industrial technology	8 - 11	7
- Magnitude of UNIDO activities	12 - 15	9
II. <u>Transfer of Technology</u>		10
- Information activities and the Industrial and Technological Information Bank	17 - 23	10
- Enhancing the bargaining position of developing countries	24 - 28	12
- Training	29	13
III. <u>Choice of Technology</u>		14
- Programme of action on appropriate industrial technology	30 - 33	14
- Development of new technologies	34 - 38	15
IV. <u>Elimination of Obstacles</u>	39 - 42	16
V. <u>Methods of Integrating Science and Technology in Economic and Social Development</u>	43 - 46	17
VI. <u>Support for National Policy Making and Institution Building</u>		18
- Technology policies and plans	47	18
- Institution building	48 - 54	19
VII. <u>New Forms of International Co-operation</u>		22
- Co-operative Programme of Action on Appropriate Industrial Technology	56 - 59	22
- Industrial and Technological Information Bank	60 - 62	24
- Co-operation among developing countries	63 - 67	24
- Organisation of consultations in specific industry sectors	68 - 69	26

I. Introduction

Mandates

1. General Assembly resolution 2152 (XXI) which established UNIDO calls upon UNIDO to undertake operational activities, action-oriented studies and research programmes to promote the industrialization of the developing countries. It further calls upon UNIDO to "play the central role in and be responsible for reviewing and promoting the co-ordination of all activities of the United Nations system in the field of industrial development" (paragraph 27). In view of the fact that industrial technology is an integral part of industrial development, the resolution underlines UNIDO's role inter alia in "building and strengthening of institutions and administration in the developing countries in the matter of industrial technology..." [paragraph 2(a) (iii)]⁷ and "dissemination of information on technological innovations originating in various countries and, for the developing countries, assistance in the implementation of practical measures for the application of such information, the adaptation of existing technology and the physical, social and economic conditions of developing countries through the establishment and improvement, inter alia, of technological research centres in these countries" [paragraph 2(a) (iv)]⁷.
2. Since this resolution, activities to promote the development and transfer of industrial technology have been a major component of UNIDO's activities and as such have received particular attention both in operational activities and in discussions in the policy-making organ of UNIDO, viz. the Industrial Development Board (IDB). For example, IDB resolution 36(VII) calls for the exchange of newly adapted technologies, information and development assistance, as part of the exchange of experience among developing countries.

3. The Lima Declaration and Plan of Action adopted by the Second General Conference of UNIDO envisages that developing countries should reach a share of 25 per cent of the world industrial production by the year 2000. Recognizing that the achievement of this target would imply the application of technology on a massive scale, it pays particular attention to the building up of indigenous technological capabilities of the developing countries and the measures necessary at national and international levels for the development and transfer of industrial technology. In addition, the Second General Conference adopted a resolution on the selection of appropriate industrial technology (ID/CONF.3, Res.2) in which it called upon the Executive Director of UNIDO to prepare a concrete co-operative programme of action to promote the creation, the transfer and the use of appropriate industrial technology together with the way and means of its implementation. Consequently UNIDO prepared such a programme of action and the way and means of its implementation proposed therein have been broadly endorsed by the IDB in its decision IV (XI).
4. The Lima Declaration and Plan of Action has also been instrumental in initiating several mandates and activities for UNIDO in the field of industrial technology. Following a proposal contained in the Lima Declaration and Plan of Action, General Assembly resolution 3507 (XXX) called upon UNIDO to establish an industrial technological information bank. The same resolution called upon the Executive Director of UNIDO and the Secretary General of UNCTAD to continue their efforts in their respective fields, to assist in the establishment, in developing countries, of centres for the transfer and development of technology at the national, sub-regional and regional levels.
5. Endorsing the Lima Declaration and Plan of Action, General Assembly resolution 3362 (S-VII), asked UNIDO to establish a system of consultations between developed and developing countries and among developing countries themselves, in order to facilitate the achievement of the goals set forth in the field of industrialization, including the redeployment of certain productive capacities existing in developed countries and the creation of new industrial facilities in developing countries. Such consultations include the associated technological

aspects. The resolution's endorsement of the Lima Declaration and Plan of Action also covers the recommendations of the Ad Hoc Committee on the Long Range Strategy for UNIDO which emphasized UNIDO's activities in the field of technological information and operational activities on the "transfer, development and adaptation of appropriate technologies, including exchange of industrial know-how among developing countries". G.A. resolution 3362 (J-VII) also recommended that a joint study be undertaken by all Governments under the auspices of UNIDO, in consultation with UNCTAD, in making full use of the knowledge, experience and capacity existing in the United Nations system of methods and mechanisms for diversified financial and technical co-operation which are geared to the specific changing requirements of international industrial co-operation.

6. Resolution 47(XI) of the IDB, which is based on a Draft resolution introduced in Lima, represents a consolidation and restatement of certain UNIDO activities and mandates in the field of development and transfer of technology. It considers that UNIDO "should continue to make an important contribution to the promotion of international co-operation in the development and transfer of technology in order to accelerate the industrialization of the developing countries" and urges UNIDO to promote the implementation of an integrated programme in the field of development and transfer of industrial technology. The areas in which the resolution asks UNIDO to assist the developing countries, through resources available to it directly and indirectly, include:
- (a) the formulation and implementation of national technology plans and programmes and the identification and implementation of measures for improving them;
 - (b) the elaboration of policies on the development and transfer of industrial technology;
 - (c) the establishment, improvement and interlinking of national, subregional, regional and interregional centres, including special attention to strengthening technological extension and field services, with emphasis on the transfer, development and practical application of industrial technology; and the interlinking of such centres along with the Industrial and Technological Information Bank into the network for the exchange of technological information as provided in G.A. resolution 31/183;

- (d) the promotion of dissemination and exports, as widely as possible, of technologies from developing countries;
 - (e) the selection of available industrial technology, the adaptation of that technology to local economic and social conditions and the development of indigenous and appropriate technology;
 - (f) the examination and evaluation of the technical, economic, commercial and development implications of industrial technology transfers;
 - (g) training programmes at national, regional, subregional and international levels, seminars and exchange of personnel in technical activities, especially aimed at providing the capability to acquire, evaluate and manage industrial technology, for personnel in developing countries and for the better utilization and development of skilled personnel within and between developing countries;
 - (h) studies and the publication of their conclusions on ways and means to promote technological and industrial co-operation among developing countries, including co-operative projects that can be implemented with the technical resources of those countries;
 - (i) the initiation of specific co-operation activities among the developing countries which will cover the exchange of personnel for purposes of providing advice or receiving training, and the facilitation of institutional co-operation involving, inter alia, research institutes and enterprises that carry out engineering studies and provide consulting services and manufactures; and
 - (j) the intensification of courses on technological and industrial management, including industrial technological information in accordance with the needs of each country.
7. In pursuance of the Lima Declaration and Plan of Action, a United Nations Industrial Development Advisory Committee has been established to enable UNIDO to fulfil effectively its central co-ordinating work in the field of industrial development, especially with respect to the implementation of the Programme of Action on the Establishment of a New International Economic Order. Also, a United Nations Industrial Development Fund has been constituted to enable UNIDO inter alia to intensify its activities in the development and transfer of technology.

UNIDO approach to the application of industrial technology

8. The approach that UNIDO has adopted in relating the application of industrial technology to programmes of socio-economic development in general, and industrial development in particular, can be briefly stated as follows. The application of industrial technology, as indeed of all technologies, is a means to an end, the end being the development goals of each country. An appropriate technology path has therefore to be derived from the development goals adopted. Industrial development is a 'centre piece of the development process'.^{1/} It cannot be viewed only as the means of producing a large variety of goods and services by modern processes and techniques; it must result in adequate employment opportunities, greater income generation and distribution to poorer sections and improvement in the conditions of life for the larger community in developing countries. The Lima target of the developing countries achieving a share of 25 per cent of the world industrial production by the year 2000 is thus not a mere quantitative target but it has qualitative implications as well. The achievement of the Lima target is, and should be, consistent with other development goals, such as the fulfilment of basic needs and the redistribution of income. Since the application of industrial technology affects the pattern of industrial development and hence the pattern of development itself, it has to be derived from, and closely linked to, the development process and to industrial development on the lines envisaged above.
9. Technology is in fact not applied in isolation but as part of the performance of one economic activity or another which contributes to development. In such activity, say industrial development, technology is again applied, not alone, but matching with investment, skills, resources and other related factors. In other words, the application of industrial technology cannot be divorced from the total context of industrial development. When considering industrial technology, and for that matter, any technology, a balance has therefore to be struck between considering it in the abstract and treating it as totally indistinguishable from the economic activity itself. UNIDO's approach has tried to strike such a balance between these two trends, either of which by itself is likely to be misleading in the long run.

^{1/} See page 4, Committee for Development Planning, Report on the Tenth Session, E/5478.

10. There is also a close interrelationship between industry and technology in general. Perhaps no other single branch of economic activity influences or gets influenced by technology more than industry. It is not only in the sense that industrial development very often paves the way for the initial technological development of the country and contributes to the development of skills, but also because the application of technology in other sectors often requires the manufacture of products on an industrial scale. No where are the ramifications of technology transfer and development more apparent than in the field of industry.^{1/}
11. Within this over-all framework, attention will be focused on certain major elements for purposes of national and international action. The linkage of technology to industrial development and through industrial development to over-all development goals, will be successful only in the context of the formulation of relevant policy measures by the national governments. Technology policy and planning therefore becomes an important element. The second major element is the development of technological capabilities in each country which is a prerequisite for the selection, acquisition, adaptation, absorption or development of technology. This will involve among other things the building up of institutions and the training of manpower. The third element is the appropriate choice of technology, since inappropriate choice will be not only expensive but will distort the pattern of development. The fourth element, to assist the other three, is a greater flow of information. Consequently UNIDO activities have and will continue to stress four elements, namely technology policy and planning; indigenous technological capabilities; appropriate choice of technology; and the flow of information. These activities have the basic aim of stimulating and assisting action by governments, institutions and enterprises in developing countries.

^{1/} It may be relevant to note in this connexion that industry (or sectors of industry) has been selected as a subject area in three regional economic commissions for the preparations for the UNCSTD.

Magnitude of UNIDO activities

12. UNIDO's efforts to assist developing countries in the development and transfer of industrial technology have taken the form of:
 1. operational activities;
 2. meetings and expert groups;
 3. studies and publications; and
 4. collection and dissemination of technological information.

13. A major component, in terms of financial and staff resources of UNIDO's activities is operational assistance to the developing countries on request, in a practical manner through technical assistance activities and advisory services. The existence of a large number of field personnel together with the location of industrial development field advisers in the developing world has provided UNIDO with a strong field presence, which has now been combined with an overall conceptual framework arising from the Lima Declaration and Plan of Action.

14. The development and transfer of technology has several aspects - policy aspects, institutional aspects, enterprise level considerations, skills, training, investment, feasibility studies, etc. Sometimes activities relating to the development and transfer of technology can be carried out as distinct and separate activities, eg. assisting in the establishment of a research institute or a national office for transfer of technology. More often, development and transfer of technology occurs as a part of several inter-related activities, such as those mentioned above. As a result, a large number of sections in UNIDO have the development and transfer of industrial technology as an integral part of their activities.

15. The expenditures on UNIDO's technical co-operation activities has risen from \$21 million in 1972 to \$40 million in 1976. Of these, the share of technology and technology-related activities is estimated to be steadily around 80 per cent, involving as a rough order of magnitude, 500 experts in the field per annum. Since its inception UNIDO has held over 250 meetings of which roughly two thirds have been related to the development and transfer of industrial technology either in an individual industry sector or on a general non-sectoral basis. UNIDO activities in this field are expected to grow further in response to General Assembly Resolution 31/162 which calls for strengthening of operational activities of UNIDO and also on account of the constitution of the United Nations Industrial Development Fund.

II. Transfer of Technology

16. UNIDO does not look upon transfer of technology as an 'one shot affair' but as a process spanning the selection, acquisition, adaptation and absorption of technology, whether imported or indigenous. In regard to selection of technologies, UNIDO activities will continue to be focussed on a greater flow and utilization of technological information and the building up of evaluation capacities, whether for selection of technology or equipment. In the acquisition of technologies where the developing countries remain unequal partners vis-a-vis the developed countries, UNIDO activities, will extend beyond the erstwhile training, technical assistance and publications activities to certain new initiatives designed to strengthen the collective bargaining position of the developing countries. In regard to the adaptation and absorption of technologies, the emphasis will continue to be on training activities, but on a larger and more diversified scale.

Information activities and the Industrial and Technological Information Bank

17. As part of its technical assistance activities UNIDO has implemented over 40 projects of a national or sub-regional nature to assist the developing countries in the greater flow and utilization of technological information. These activities will be continued. In addition, UNIDO is implementing a series of important headquarters activities to assist governments, institutions and enterprises in developing countries in a practical way in regard to concrete problems of industrial and technological development.
18. UNIDO has for over eight years been active through its Industrial Inquiry Service in providing assistance to developing countries by way of practical information on specific questions concerning industry. About 5000 inquiries are being answered every year by the Inquiry Service of which about 50 per cent would relate to equipment or technology. In addition, guides to information sources have been published for about 25 sectors in industry. The publication of an "industrial opportunities" column in UNIDO's Newsletter has enabled developing country enterprises to publicize their specific requirements of technology.

19. With a view to promoting a greater flow of information permitting the proper selection of technologies, following the lead given by the Lima Declaration and Plan of Action and the authorization of the General Assembly and the Industrial Development Board, an Industrial and Technological Information Bank (INTIB) has been established as a pilot operation. The pilot operation will be for a period of 18 months from 1 July 1977, after which it will be evaluated.
20. Due to limitation of resources, the operations in the pilot stage will be confined to iron and steel, fertilizers, agro-industries, and agricultural machinery, and the users to selected institutions in developing countries rather than individuals or firms.^{1/} The large number of institutions assisted by UNIDO in various countries would form the nucleus of the initial users.
21. The INTIB will be primarily concerned with the selective processing of technological information, thereby providing the developing countries with a basis for making decisions. It will have the assessment of information as a major element in addition to information procurement. It will also mobilize in a systematic manner UNIDO's in-house information.
22. The INTIB is currently engaged in the consolidation of in-house information and in the development of effective links with users and suppliers of technological information. During the first stage the information requirements of other sectors and areas will continue to be met by the ongoing Industrial Inquiry Service of UNIDO. This service will continue for all sectors and would relate to all aspects of industrial information as requested.
23. UNIDO has paid particular attention to the collection and dissemination of practical experience available in developing countries themselves, since in an increasing number of cases developing countries have applied specific technologies in a manner suitable to their own conditions. Transmission of this experience in a practical way calls for a wide spectrum of activities of increasing the dynamic forms of dissemination ranging from documentation and manuales to meetings, promotional activities, pilot plants and demonstration and training centres. The activities proposed by UNIDO in this field include

^{1/} For details see ID/B/183, "Establishment of an Industrial and Technological Information Bank".

the assessment of some of the technological processes successfully applied in developing countries in regard to mini plants for iron and steel, small-scale multipurpose pharmaceutical plants, utilization of medicinal plants in developing countries, and utilization of agricultural waste in paper making. This will be in addition to the information already being disseminated by UNIDO on technologies and equipment available from developing countries through its Information Service on Industrial Equipment and connected technologies. The dissemination of such information has evoked wide response from both developing and developed countries for further information.

Enhancing the bargaining position of developing countries

24. Raising the capabilities of government officials and enterprises in the acquisition of technologies is an important element in strengthening the bargaining position of the developing countries. This is sought to be done through publications as well as training programmes. As an addition existing UNIDO publications in this regard,^{1/} a new publication entitled "Guidelines for the Evaluation and Screening of Transfer of Technology Agreements" will be prepared and published. Training programmes have already been conducted by UNIDO with appreciable results at national, regional and interregional levels.

Further training programmes are under way in a number of countries. As part of this effort, the material for training courses already accumulated by UNIDO through its past activities, will be compiled systematically for use in further training programmes whether held by UNIDO or by national agencies.

25. Complementary to such activities is the provision of short term advisory services on request. UNIDO has already been providing such services in selected cases for the acquisition of technology (eg. in Egypt, Nigeria and Peru) with significant benefits to the countries concerned. These activities will be expanded. In addition, UNIDO has been instrumental in helping the development of national institutional capabilities in the acquisition of technology, through technical assistance projects, for example in Mexico and Malaysia. UNIDO will hold, in June 1978, an Intergovernmental Meeting to assess the impact of government regulation of transfer of technology in developing countries. The results of this meeting will also help UNIDO to further develop its programme of assistance to national registries.

^{1/} eg. "Manual on the Establishment of Industrial Joint Venture Agreements in Developing Countries" (U.N. Sales No. 71.II.B.23); "Guidelines for the Requisition of Foreign Technology in Developing Countries with Special References to Technology Licence Agreements" (U.N. Sales No.73.II.B.1); "National Approaches to the Acquisition of Technology (DTI-Series No.1); and "Functioning and Organization of National Offices for Transfer of Technology" (ID/WG.228/3).

26. As part of its effort to strengthen the bargaining position of the developing countries collectively and individually, UNIDO is convening in March 1978 a meeting of the representatives of 14 national registries of transfer of technology with a view to promote an agreed system of exchange of information on the terms and conditions of technology contracts. Preliminary work in this respect has already been done and several registries have already expressed their willingness to participate in such an arrangement.
27. A symposium held by UNIDO jointly with the Licensing Executive Society in 1976 brought out at a practical level, the views of the suppliers of technology and the requirements and concerns of representatives from developing countries. UNIDO will continue to promote the exchange of views, at a practical level, on the acquisition of technology. As a follow up of the UNIDO/WIPO/IDCAS conference on industrial property and transfer of technology in Arab States in March 1977 in Baghdad, a project will be initiated for strengthening the collective bargaining for acquisition of technology in the IDCAS region.
23. A practical method of strengthening the bargaining capabilities of personnel from developing countries has been designed by UNIDO and will be put into operation for the first time in the TECHTRANSFER FAIR in Utrecht in May 1978. Developing country representatives attending the Fair for negotiation of technology licences will be provided a training programme for three days and will in addition have the benefit of advisory services, on request, from UNIDO specialists during the Fair to assist them in resolving concrete problems arising in the negotiations.

Training

29. UNIDO activities in this field will continue to focus on technical assistance activities, fellowship operations and group training. The technical assistance activities (19 projects were implemented in 1976) are aimed at strengthening the capabilities of technical and other categories of personnel through training at national and enterprise levels. In plant group training programmes (which reached a level of 28 in 1976 involving 476 participants from developing countries) are aimed at improving the technological experience and capabilities of the participants in specific sectors of industry. Several types of training programmes for the selection and acquisition of technology have been developed and will be put into operation at national or enterprise levels. UNIDO will also continue to bring out updated editions of its Guide to Training Opportunities for Industrial Development.

III. Choice of Technology

Programme of action on appropriate industrial technology

1. The choice of technology forms the central theme of UNIDO's co-operative Programme of Action on Appropriate Industrial Technology.¹ The Programme provides a framework within which developing countries could be enabled to adopt proper criteria for selection of technology. It envisages a series of activities in the following respects: 1. comparison and evaluation of alternative industrial technologies; 2. promotion of technological research; 3. collection and dissemination of practical experience; 4. application of technology to rural development; 5. technology for alternative processes and energy; 6. national and international policies related to appropriate industrial technology; 7. institutional infrastructure of appropriate industrial technology; and 8. training programmes in appropriate technology.
2. Over 35 specific projects have been enumerated in the Programme of Action. They are not meant to be exhaustive but to provide only a beginning. They are not meant to be implemented by UNIDO alone, but by the United Nations system as a whole as well as by national governments. Since there is no consolidated fund for this programme, special contributions for this programme to the United Nations Industrial Development Fund could be considered. Each participating agency is also requested to consider allocating a greater portion of its own resources to its programmes in its respective field of competence within the proposed Programme of Action.
3. Measures to implement the Programme of Action include the organization of international meetings in the field of appropriate industrial technology, the establishment of a consultative group on appropriate industrial technology, and the monitoring, analysis and follow-up of the developments in this field. These measures have been endorsed by the Industrial Development Board and are under implementation. The first meeting of the Consultative Group on Appropriate Industrial Technology was held in November 1977. The first global meeting, to be called the International Forum for Appropriate Industrial Technology is scheduled for the second half of 1978.
4. The appropriate choice of technology presupposes the existence of alternative technologies for production and knowledge and information about them. One of the first tasks is to enlarge the flow of available information. With this in view the evaluation and comparison of alternative industrial technologies will

¹ ID/B/188 and Decision IV (XI) of the Industrial Development Board.

be undertaken in selected branches of industry. The information made available will be fed into the Industrial and Technological Information Bank. In this connexion UNIDO has also initiated a programme for the preparation and publication of technical memoranda, to start with, on sugar processing and rice milling, in co-operation with the International Labour Office.

Development of new technologies

34. Available information on technologies could also be enlarged through the systematic identification of technologies including the traditional ones available in developing countries themselves. With this in view projects have been initiated in Thailand and India to carry out, through national research institutes, systematic surveys of indigenous technologies in selected branches of their food processing and preservation sectors. The surveys are expected to bring out material on the basis of which some of the existing technologies could be upgraded and some others could be transferred for adoption by other countries. It will also provide a methodology for systematic action by developing country research institutes in the elaboration of their research programmes.
35. In regard to the development of new technologies, UNIDO has adopted primarily two approaches. One is the better use of existing research capacities, particularly by the stimulation of co-operation among research institutes of developing countries. A meeting of Selected Heads of Research Institutes convened by UNIDO in October 1976 revealed the possibilities of several types of co-operative action and also the measures needed to be taken to promote such co-operation. As a result, UNIDO will identify projects for co-operative action and also, where possible, provide the seed money for stimulating such co-operation. Secondly, UNIDO also aims to promote the undertaking of new research projects in regard to areas of common interest to several developing countries. A typical example of this activity is the UNIDO preparatory activity for a research project for the development of a prototype for a small-scale low-cost rice bran stabiliser. A number of other potential research projects of common interest to developing countries have been developed and will be taken up for implementation, subject to availability of funds.
36. Attention is also paid to the adaptation of technologies. Projects which will be continued during the biennium 1978-79 include the adaptation of technology in the mechanical engineering sector in a least developed country in Africa and the strengthening and modernization of technological performances of the medium- and small-scale industries in the Philippines.

37. With a view to stimulating the interest of researchers in universities, UNIDO has also promoted as a pilot project the sponsoring of research projects at graduate level in universities.
38. UNIDO is also establishing a system for exchange of information among research institutions of developing countries for the systematic dissemination of the results of research already done, or being carried out or planned for the future. The modalities of this exchange have been developed in 1977 and the actual exchange of information is scheduled to commence from 1978. This system is being so devised as to admit of later interconnexion with developed country institutions doing industrial research of relevance of developing countries.

IV. Elimination of obstacles

39. In the view of UNIDO, the elimination of obstacles to the better utilization of knowledge should have as the starting point the development of indigenous technological capabilities of the developing countries. The activities that UNIDO has undertaken to build up such activities have already been mentioned.
40. The promotion of co-operation among developing countries as well as between developed and developing countries in regard to the several elements of selection, acquisition, adaptation and absorption of technology could contribute substantially to the elimination of obstacles and to the better utilization of knowledge and capabilities.
41. The Industrial and Technological Information Bank, by providing for a greater flow of information on technologies, and through supplementary on-the-spot advisory services could be expected to provide a significant basis for the elimination of obstacles by way of information to the better utilization of knowledge and capabilities in industrial technology.
42. UNIDO will also convene an expert meeting to discuss the acquisition and use of technology by public enterprises in developing countries. Such acquisition and use through public enterprises could be a means of wider diffusion of technology within a country without restrictions.

V. Methods of integrating science and technology in economic and social development

43. The rapid and fruitful application of industrial technology to industrial development could be achieved only if the attempts to promote appropriate industrial technology are part of the main stream of industrial development and not apart from it. With this in view, UNIDO has avoided the treatment of industrial technology as though it were an element in isolation. It has refrained from treating appropriate industrial technology from a compartmentalized view without linking it to other relevant inputs for industrial development.
44. A key element in the process of integration of industrial technology with industrial development is the stimulation of interest and the sensitization of all partners and decision makers in the process of industrial development. UNIDO's attempt is therefore to reach this goal by stimulating policy and decision makers, enterprises and research institutes in developing countries to promote the application of appropriate industrial technology; stimulating suppliers of technology and equipment in industrialized countries to undertake the necessary adaptation and redesign to suit the needs of developing countries; stimulating governments and donor agencies in industrialized countries and in developing countries with sufficient financial resources at their disposal to allocate more funds to co-operative programmes on appropriate technology; mobilising existing research capacity in developing countries in research organizations, universities, private enterprises, and particularly small companies and individual inventors, so as to promote the adaptation of available technologies and the development of new technologies where necessary.
45. With this in view, the UNIDO will be organising an International Forum for appropriate industrial technology through which further stimuli to integrating industrial technology with industrial development could be attempted.
46. UNIDO will also continue to sensitise policy makers through the development of an integrated view of industrial strategy and appropriate technology. In the meeting of the Consultative Group on Appropriate Industrial Technology the

view was brought out that technology was in fact a derivative of the development strategy. As such, the appropriate technology path has to be derived from the industrial development strategy and consequently from the over-all development strategy itself. It is only by this integration not only conceptually but in practical action that the application of industrial technology can have the most fruitful results. Following the meeting of the Group it is proposed to undertake studies on the interrelationship between industry and technology, and the manner in which this interrelationship can be woven into the broader fabric of the goals of economic and social development.

VI. Support for national policy making and institution building

Technology policies and plans

47. Resolution ID/B/RES.47 (XI) urges UNIDO to provide assistance to developing countries in the formulation of plans and the elaboration of policies on the development and transfer of industrial technology. Towards this end, UNIDO will assist governments at their request to review, formulate and improve, through the provision of methodologies and mechanisms, their policies in regard to national technology development as well as through comparative studies of national experience in this field. Projects are being implemented in this field in Algeria and Guatemala and planned in Turkey and Ghana. Common to all the projects is a field level survey of the actual conditions in the country concerned, followed by an expert workshop with the local policy makers. A major project on similar lines is envisaged in three sets of developing countries: (i) countries with no explicit technology policies or plans; (ii) countries which have established mechanisms for regulation of imported technology; and (iii) countries which have formulated technology plans. Integral to these activities would be the discussion of the issues with the policy makers of the respective countries in order to stimulate further action. An international meeting of experts and policy makers from developing countries will then be organised to discuss the experiences and arrive at broad guidelines for national action. This project will form part of UNIDO's contribution to the United Nations Conference on Science and Technology for Development.

Institution building

48. Institution building for the development and transfer of industrial technology will continue to be a major activity of UNIDO, as envisaged in General Assembly resolutions 2152 (XXI) and 3507 (XXX), Industrial Development Board resolution 47 (XI) and the co-operative Programme of Action on Appropriate Industrial Technology. These activities will include technical assistance, networking, training, meetings and studies and will pertain to the national, subregional/regional, and international levels.
49. Judged by the number of requests, national institution building is an important element of the technical assistance activities of UNIDO. About 250 technical assistance projects have been implemented by UNIDO in the field of institution building for transfer of technology. Though the titles of the institutions assisted differ, they can be broadly classified into general purpose institutions and specialized institutions. The former provide a set of specialized services to all industries in the areas such as testing, meteorology, product development and general advisory and information services. The latter are specialized institutions in areas such as iron and steel, leather, textiles, cement, building materials, petrochemicals, etc., sustaining the technical capacities of specific industries they serve. In many developing countries, these institutions constitute the major elements of the scientific and technological infrastructure.
50. The approach adopted by UNIDO in assisting institution-building at the national level will continue to be governed by the actual requirements of the developing countries, avoiding a fixed and monolithic institutional solution for all countries. It will pay particular attention to their effective location in the governmental structure and the formation and maintenance of active links among them and with the decision making processes in the government and in industry.
51. Two recent activities are expected to provide further guidance to UNIDO on its technical assistance activities for institution building. One is a survey completed recently in several developing countries on their institutional infrastructure for industrialization. Another is an ongoing joint UNDP/UNIDO evaluation exercise to evaluate the effectiveness of technical assistance projects to establish or strengthen industrial research institutes and their impact on the technological situation in the countries concerned.

National institutional capabilities are also sought to be assisted through fellowships, training programmes, meetings (eg. on commercialization, links with industry, role in project formulation) and publications (eg. on design of research institutes, evaluation of research institutes, national offices for transfer of technology).

52. At the regional level, UNIDO will continue to participate actively in the establishment and operation of regional centres for technology transfer in the ESCAP, ECA, ECWA and other regions or sub-regions. A joint UNIDO/ESCAP workshop will be held in April 1970 for the national focal points of the ESCAP Regional Centre for Technology Transfer, which will, among others, promote the links, through the Centre, between the national focal points and the Industrial and Technological Information Bank and the Co-operative Programme of Action on Appropriate Industrial Technology (ID/B/168). UNIDO, in collaboration with the Denver Research Institute, is engaged in organizing a network among the research institutes in the ASEAN region. In the pharmaceutical field, UNIDO is engaged in co-operation with UNCTAD, WHO and UNAPEC to develop regional pharmaceutical production and technology centres.
53. At the international level, UNIDO has also in a series of meetings brought together the representatives of industrial research institutes, in which the problems of international co-operation in industrial research and commercialization have figured prominently.^{1/} Besides, UNIDO was instrumental in founding the World Association of Industrial Technological Research Organizations (WAITRO) and more recently in the establishment of an Association of African Industrial Technology Organizations (AAITO). By way of promoting co-operation in research between developing and developed countries, UNIDO also initiated an experiment in the twinning of research institutes between the Caribbean Industrial Research Institute (CARIRI) and the Research Productivity Council of New Brunswick, Canada. As a means of promoting co-operation among developing countries, UNIDO has through an agreement with the Indian Council of Scientific and Industrial Research promoted the exchange of experience between India and other developing countries in the field of industrial research and its application.

^{1/} For a list of publications and reports, see the publication UNIDO Abstracts on Technology Transfer (Development and Transfer of Technology Series No.2)

54. UNIDO is also engaged in examining the feasibility of the creation of sectoral technological institutions at the international level. These specialized institutions could concentrate on specific problems common to several developing countries employing an interdisciplinary approach. For example, the first consultation meeting on iron and steel organized by UNIDO recommended the examination of the possibility of and the need for establishing an international technical and development centre for the iron and steel industry.^{1/} As a matter of co-operation among developing countries, it is also possible to earmark within a region or among developing countries themselves specific institutions as centres of excellence in particular disciplines or sectors, as recommended by the Round-Table Meeting of Ministers of Industry on Industrial and Technological Co-operation organized by UNIDO in January 1977. The recommendations mentioned above have currently been taken up by UNIDO for implementation.

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VII. New forms of international co-operation

55. In addition to continuing its past activities in the promotion of international co-operation in the development and transfer of industrial technology, new forms of international co-operation to be promoted by UNIDO would fall broadly under the following heads:

- (a) the co-operative Programme of Action on Appropriate Industrial Technology;
- (b) the Industrial and Technological Information Bank;
- (c) co-operation among developing countries, and in particular follow-up of the recommendations of the Round-Table Meeting of the Ministers of Industry on Industrial and Technological Co-operation among Developing Countries (New Delhi, January 1977); and
- (d) the organization of consultations in specific industry sectors.

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Co-operative Programme of Action on Appropriate Industrial Technology

56. UNIDO's co-operative Programme of Action on Appropriate Industrial Technology has received broad endorsement from the Industrial Development Board and has been reported to the ECOSOC and the General Assembly. It identifies the following framework of activities to be undertaken not only by UNIDO but also by national governments as well as by private agencies and regional and international organizations:

- i. evaluation and comparison of alternative industrial technologies;
- ii. promotion of technological research;
- iii. collection and dissemination of practical experience;
- iv. application of technology to rural development;
- v. technologies for alternative sources of energy;
- vi. national and international policies related to appropriate industrial technology;
- vii. institutional infrastructure for appropriate industrial technology; and
- viii. training programmes in appropriate industrial technology.

A basis for co-operative action is thus available in the field of appropriate industrial technology.

57. The important point, apart from implementing specific programmes, is the consolidation of efforts in this field, and the mobilization of interest on a world-wide scale. This step will bring about a fuller use of existing resources and also place the concept of appropriate industrial technology in the main stream of existing activities and not apart from it. This goal can be achieved by stimulating policy and decision-makers, enterprises and research institutes in developing countries to promote the application of appropriate industrial technology; stimulating suppliers of technology and equipment in industrialized countries to undertake the necessary adaptation and redesign to suit the needs of developing countries; stimulating governments and donor agencies in industrialized countries and in developing countries with sufficient financial resources at their disposal to allocate more funds to co-operative programmes on appropriate technology; mobilizing existing research capacity in developing and industrialized countries in research organizations, universities, private enterprises and particularly small companies and individual inventors, so as to promote the adaptation of available technologies and the development of new technologies where necessary.
58. For the mobilization of interest, UNIDO proposes to organize a global meeting called the "International Forum for Appropriate Industrial Technology" in the second half of 1978. To this meeting would be invited policy makers at ministerial level and practitioners as well as interested organizations in the United Nations system, and donor and aid agencies that have shown active interest in the matter. This meeting would provide an opportunity to establish personal contacts and exchange information on the work being done and the problems encountered. In addition to this meeting a Consultative Group on Appropriate Industrial Technology consisting of highly qualified persons of international repute will be convened once a year. The first meeting of the Group took place in November 1977. The results of these meetings, and of the Forum in particular, could be expected to provide important inputs for the United Nations Conference on Science and Technology for Development and the Third General Conference of UNIDO.
59. The United Nations Industrial Development Advisory Committee has already discussed the possibilities of co-operation of other participating agencies in implementing the Programme of Action on Appropriate Industrial Technology and will consider the subject again from time to time to secure co-operation from all the agencies concerned.

Industrial and Technological Information Bank

60. Since in its design and operation the Industrial and Technological Information Bank will rely heavily on its effective links with the suppliers and users of technological information, its operation could well mark the beginning of a new phase of international co-operation in the exchange of technological information. This will be particularly so, since the INTIB is not expected to physically store all available technological information.
61. One component of the INTIB which involves international co-operation in a significant manner is the system of exchange of information among the national registries of transfer of technology on the terms and conditions of technology contracts. This will provide, through international co-operation, access to information not hitherto available, but of great value to developing countries in the acquisition of technology.
62. Another important dimension will be added to the INTIB through a project scheduled for implementation by UNIDO in the biennium to develop a mechanism of technological co-operation between developed and developing countries in the field of small industry. This project is intended to identify the technologies available with small enterprises in developed countries and facilitate the flow of information on such technologies for the benefit of developing countries.

Co-operation Among Developing Countries

63. For several years past co-operation among developing countries has figured significantly in the operation and supporting activities of UNIDO that have resulted, for example, in the preparation of a roster to match the needs of developing countries with the available resources of other developing countries; an interregional consultation in transfer of technology; a manufacturing development clinic on animal-drawn agricultural machinery and hand-operated machines, etc. Co-operation is fostered through exchange of visits, exchange of trainees, meetings and operational projects. A programme of visits to some 20 developing countries has been drawn up for UNIDO purchasing and contracting staff in order that they might acquire first-hand information on the capability of equipment suppliers and consultancy services in those countries to tender

for the supplies and services required for field projects executed by UNIDO. UNIDO is also actively participating in the United Nations Action Programme for Economic Co-operation (APEC) for the development of a programme in the pharmaceutical, fertilizer, and pesticides industries which will involve co-operation among the developing countries.

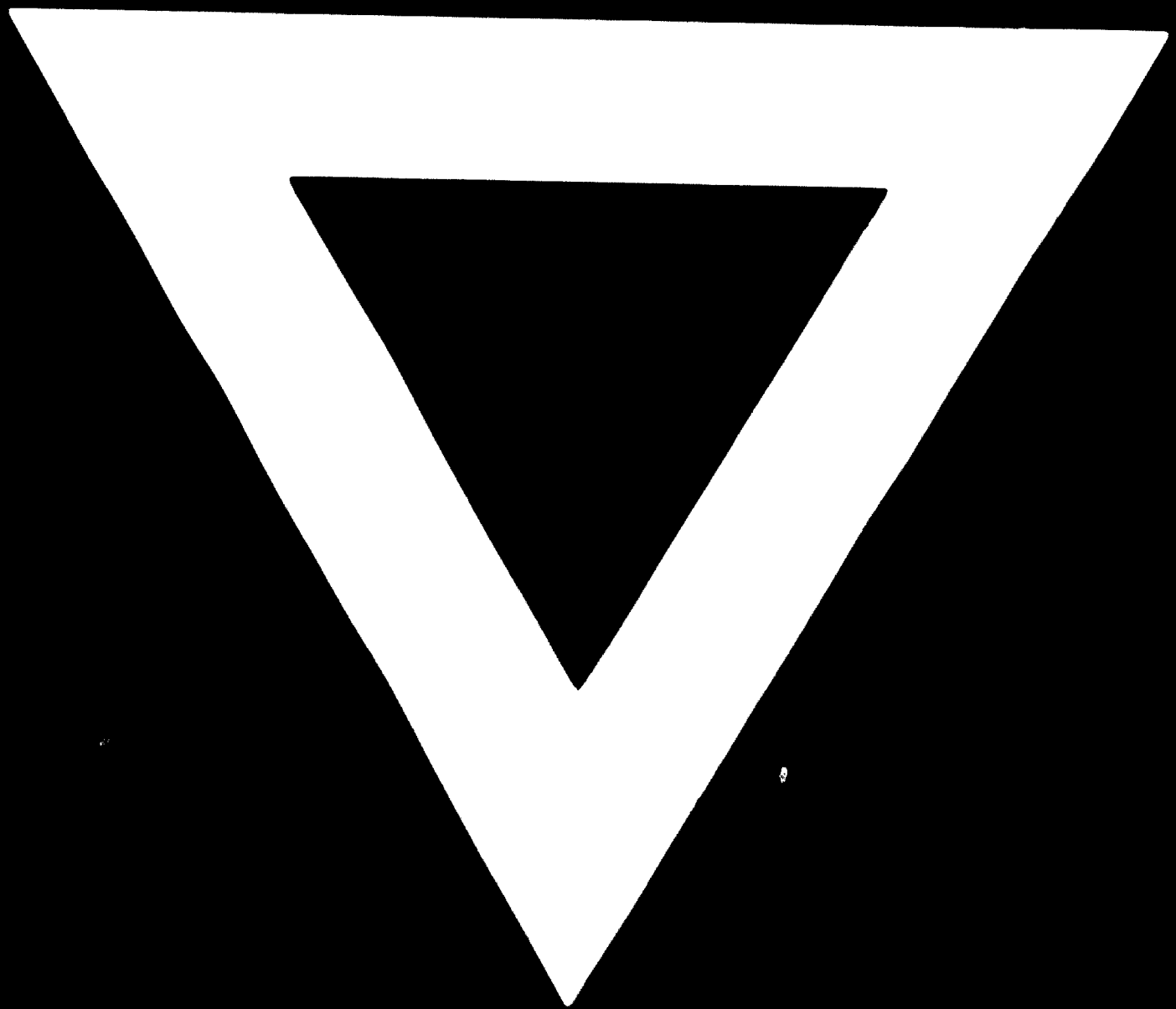
64. In 1976 a total of more than 170 proposals for co-operation among developing countries were placed before the developing countries for their consideration. Thirty such projects have already been approved in 1976.
65. In January 1977 a Round-Table Meeting of Ministers of Industry was organized in New Delhi to explore the ways in which developing countries could co-operate among themselves to achieve the goals in the field of industry set forth in the Lima Declaration and Plan of Action. It identified the following specific areas of co-operation in all industrial sectors, large, medium and small, which may be pursued not only by the developing countries present at the meeting, but also by other developing countries:
- Co-operation in the field of industrial technology with a view to improving 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;
 - Technology Bank, to include considerations relating to joint purchase of technology and examination of contracts and agreements already concluded to provide guidance to others so as to avoid the mistakes concerning the experience of particular technologies by other countries;
 - Industrial training to augment the skills which are considered basic to industrial development programmes;
 - Establishment and strengthening of the institutional framework at the national and regional levels, to sustain industrial and technological development;
 - The creation of programmes of co-operation concerning applied research and development activities in specific sectors, drawing upon machinery and capabilities already available in the developing countries concentrating specifically in the fields of engineering industries; electronics; fertilizers and agro-chemicals; pharmaceuticals, chemical industries; and energy;

- The development of concrete plans for the use of engineering and consultancy capabilities available within the developing countries;
 - To promote collective action for negotiating and bargaining for more equitable economic relationships and for technology acquisition.
66. The importance and utility of expanding and improving certain reputed technical institutions in the developing countries so as to make them centres of excellence to provide services to more than one country was recognized by the Meeting, and it was agreed to explore the possibility of co-operative funding under the auspices of UNIDO to achieve this objective for the benefit of all developing countries.
67. The recommendations mentioned above have been taken up by UNIDO for implementation.

Organization of consultations in specific industry sectors

68. The system of consultations organized by UNIDO represents a new form of international industrial and technological co-operation among all countries. Global consultation meetings have already been held in regard to fertilizers, iron and steel, leather and vegetable, oils and fats, and their recommendations taken up for implementation. The sectors from among which future consultation meetings are envisaged include petrochemicals, agro-industries, agricultural implements, pharmaceuticals and capital goods. These consultation meetings together will provide new possibilities of international technological co-operation in specific industrial sectors.
69. The new forms of international co-operation described above will together provide vastly enlarged possibilities of co-operation in the field of development and transfer of industrial technology.

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