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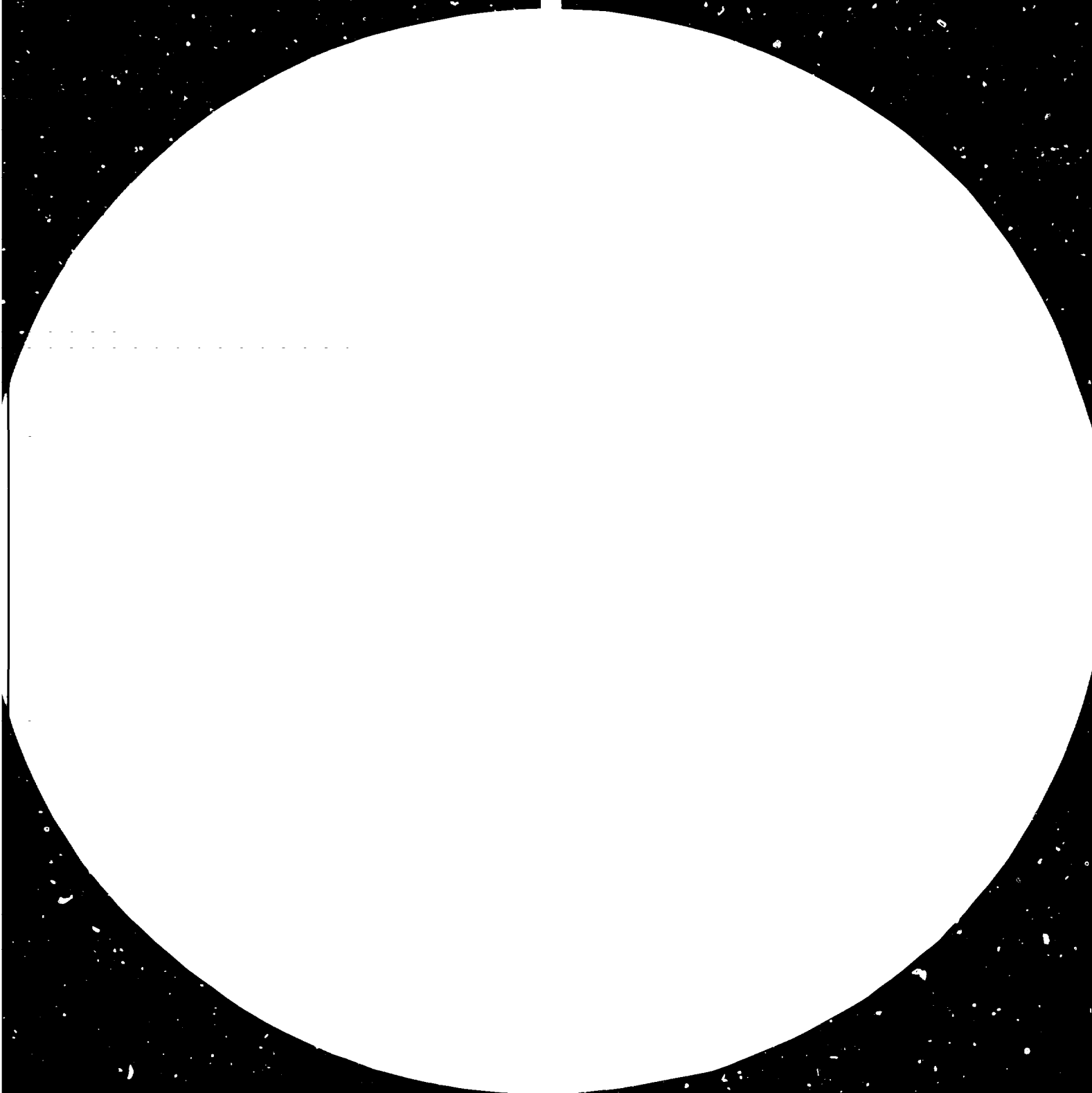
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I. INTRODUCTION

Background

1. The Governments of Africa, through the Organization of African Unity (OAU), have consistently declared their faith in industrialization as a strategic element in the structural transformation of the African economies. This faith, clearly stated in the Addis Ababa Declaration on Industrial Development in Africa, as adopted by the First Conference of African Ministers of Industry (1971) and reaffirmed in various summit meetings of the OAU as well as subsequent meetings of African Ministers of Industry, also acknowledges the role of technology as an inalienable factor in the attainment of Africa's industrialization goals and in achieving collective self-reliance.

2. The Heads of State and Government of the OAU adopted the Monrovia Declaration on Economic Development in Africa (1979) in which they commit themselves to, inter alia, "the development of indigenous entrepreneurial, technological manpower as well as the technological capacities that will enable the African peoples assume greater responsibility in the attainment of rapid industrialization". The Lagos Declaration and Plan of Action (1980) went further by adopting a comprehensive set of recommendations in the field of industrial technology, identifying a number of key or priority industrial sectors for concentrated action, and reiterating their support for the resolution adopted at the Third General Conference of the United Nations Industrial Development Organization (UNIDO) recommending that the United Nations General Assembly should proclaim the 1980s as the African Industrial Development Decade. Such a proclamation was proposed in order to create a greater awareness among the African countries on the need to accelerate the industrialization process on the continent; to facilitate the full participation of their entire population in the industrialization process; and to obtain greater technical and financial support from the international community towards the industrial development efforts of the African countries. The resolution also calls upon UNIDO and the ECA to co-operate with the OAU in preparing a draft programme of action for the decade.

3. As a follow-up, the OAU and UNIDO, in co-operation with the ECA and the ARCT, organized a Joint OAU/UNIDO Symposium on Industrial Technology for Africa in Khartoum, Democratic Republic of the Sudan, from 5th to 11th November 1980. The objective of the Symposium was to discuss and evolve practical measures of action in the field of industrial technology based on alternative models and experiences, taking into account the need to initiate action for achieving the objectives of the African Industrial Development Decade and for operationalizing the relevant recommendations of the Monrovia Declaration ^{1/} and the Lagos Plan of Action ^{2/}.

Participants

4. Delegates from 35 African countries participated in the Symposium, as well as representatives from various subregional, regional and international bodies, including the UNDP, UNCTAD, WIPC, the African Regional Centre for Technology (ARCT) and the Arab Bank for Economic Development in Africa (BADEA). The list of participants and observers is attached as Annex I.

Opening of the Symposium

5. The Symposium was inaugurated by His Excellency Izzeldin Hamid, Minister of Industry of the Democratic Republic of the Sudan. In his address, Mr. Izzeldin Hamid pointed out that the third world constituted 75 per cent of the world population, but hardly contributed 20 per cent of the world income and only 10 per cent of the world industrial output. The African region was the least developed

1/ Monrovia Declaration of Commitment of the Heads of State and Government of the Organization of African Unity on Guidelines and Measures for National and Collective Self-reliance in Social and Economic Development for the Establishment of a New International Economic Order (AHG/ST.3 (XVI) Rev. 1).

2/ ECW/ECO/9(XIV) Rev. 1

region in the third world, containing the largest number of the least developed countries as well as being the least physically integrated in terms of transportation, communication and energy. The African countries insisted on industrial development, knowing that it constituted an important factor in achieving a balanced international economic order. The present world industrial structure, however, represented a mismatching of endowment of resources and productive capacities. The achievement of the Lima target involved a combination of policy issues, including the development and transfer of industrial technology. The objectives of the Symposium, Mr. Hamid noted, were closely consistent with the Monrovia Declaration and the Lagos Plan of Action. He called for the enhancement of collective self-reliance through the promotion and strengthening of technological capabilities in the field of industrial technology.

Mr. Hamid emphasized the importance of the creation of an industrial infrastructure at national levels within the framework of an integrated economy; thus promoting inter-dependence among all sectors and sub-sectors of the economy and achieving harmonized industrialization within the overall economic development. In regard to strengthening technological capabilities, he referred to the experience of Sudan which included the establishment of specialized research centres and institutes; review of the curricula of educational institutions so as to expand technical education to suit the country's potentials and future requirements; and the involvement of universities, research centres and technical institutes in the preparation of the Six Year Plan for economic and social development

6. Speaking on behalf of the Executive Director of UNIDO, Mr. G.S. Couri, Senior Technical Adviser in Charge of the Technology Programme, conveyed the best wishes of Dr. Khane, the Executive Director, for the success of the Symposium. Recalling the recommendation of the Third General Conference of UNIDO that the 1980's be proclaimed as the Industrial Development Decade for Africa, he pointed out that at the beginning of the Decade, the African Continent found itself in a difficult economic situation which was compounded by problems such as inflation and growing unemployment in the developed world, diminution in the scope and volume of external aid, the energy situation, and lack of progress in the North-South Dialogue. As part of their efforts in achieving the Lima target of industrialization,

African countries should press vigorously to increase their share of 0.9 per cent in world industrial production to at least 2 per cent by the year 2000 as called for in the Lima Declaration and Plan of Action on Industrial Development.

7. The Symposium was the first of a series of meetings, reviews and dialogues that were necessary in this context. It was based on the realization that unless Africa came to grips with both technology and self-reliance, it could not come to grips with development. Industry was related to other African priorities such as food and energy, and equally with technology. This complex relationship had to be activated. There was a need to build structures and policies to handle technology, just as many countries had done to handle investment. The primary emphasis was at the national level and countries would have to choose from various options, models and experiences. Intra-African co-operation needed to be promoted, with OAU, ARCT and ECA playing a vital role. Mr. Gouri pointed out that the Executive Director of UNIDO had, inter-alia, set up a Secretariat Task Force to co-ordinate and accelerate the Secretariat's activities in regard to the African Industrial Development Decade, and re-iterated, on behalf of the Executive Director, UNIDO's commitment to continue to assist the African countries in all aspects of industrialization.

8. Speaking on behalf of the Secretary-General of the Organization of African Unity, Mr. P.O. Etiang, Assistant Secretary-General (EDECO), referred to the slow technological progress of Africa in comparison with other developing regions and its own vast technological needs and potentials. The subject of industrial and technological progress was given special emphasis in the Lagos Plan of Action, which is now regarded as Africa's economic blue print up to the turn of the century. The biennial Conference of African Ministers of Industry and its follow-up Committee on Industrialization in Africa had expressed the aspirations of OAU Member-States for technological development of Africa. To this end, UNIDO, ECA and the OAU had been active in creating various specialized institutions for technological development in line with the decisions of the Member-States. Relevant in this connection were the African Regional Centre for Technology, the African Regional Centre for Engineering, Design and Manufacturing, and the Association of African Industrial Technology Organizations.

9. Emphasizing the importance of technological co-operation in Africa, Mr. Etiang referred to the role assigned to the OAU in this regard, which included identification and encouragement of joint projects, establishment of regional and sub-regional institutions and monitoring developments and activities in Africa which are related to the specific decisions of the African Heads of State and Government.

Election of Officers

10. The Symposium unanimously elected the following as officers:

Mr. Abdel Rahman Ahmed El Agib (Sudan)	Chairman
Mr. Sidi Lamine Ba (Senegal)	Vice-Chairman
Mr. R.D. Arunga (Kenya)	Vice-Chairman
Mr. Joseph Rakabane Monametsi (Botswana)	Rapporteur

Organization of Work

11. The Symposium unanimously adopted its agenda and programme of work. All discussions were held in plenary, and were based on background documents prepared and introduced by UNIDO, the OAU and ARCT.

Transmission of Report of the Symposium

12. The Symposium decided that its Report should be forwarded by the Chairman to the Secretary General of the OAU and the Executive Director of UNIDO for appropriate and necessary follow-up action by the two Organizations. In compliance with the Symposium's decision, a letter of transmittal was prepared by the Chairman and forwarded to both the OAU and UNIDO.

II. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

13. The Symposium welcomed the CAU/UNIDO initiative in holding one of the first meetings at an operational level for the implementation of the Monrovia Strategy and the Lagos Plan of Action at the beginning of the African Industrial Development Decade. This initiative would also constitute the first in a series of meaningful actions in Africa to bring about the implementation of the Vienna Programme of Action adopted by the United Nations Conference on Science and Technology for Development and the New Delhi Declaration and Plan of Action adopted by the Third General Conference of UNIDO. It was therefore important that programmes in the field of industrial technology should be formulated and initiated without loss of time as a means of achieving self-reliant and self-sustaining economic, social and cultural development. The actions proposed in the Symposium would be consistent with the Lagos Plan of Action and contributory to, and integrated with, its other essential elements.

14. The immensity of the task and its diversity are further heightened by the urgent need for prompt action. The development of industrial technological capabilities in Africa will reflect itself in the development of priority sectors such as food and energy. Not many African countries are yet committed to particular technologies and courses of action. This is an advantage as well as a potential point of vulnerability, if the right courses are not adopted.

15. The task is basically multi-disciplinary, integrated and holistic, yet actions have to be conceived and implemented in specific areas and sectors, without being fragmented, unco-ordinated or discontinuous. There is no substitute for actions at the national level. Yet, regional action and technological co-operation are not only desirable for effective utilization of complementarities, but is highly essential in view of the existence of small, least developed and landlocked countries which could only participate in and benefit from development activity in a broader framework. Internal and external inputs have to be blended and a strategy for maximising the benefits of external assistance be formulated and implemented.

B. Recommendations

Action at the National Level

16. In recognition of the prime importance of action at the national level, the Symposium recommends that each African country should review the Lagos Plan of Action in the light of the discussions in the Symposium, also taking into account other relevant action programmes such as the New Delhi Declaration and Plan of Action and the Vienna Programme on Science and Technology. On the basis of this review, a basic national programme in technology should be formulated and implemented, as a matter of priority and urgency which should consist, as a minimum, of:

- 1) a framework of guidelines for action for the development of national technological capabilities;
- 2) a set of minimum programmes in accordance with national priorities in specific industrial sectors and areas including information, institutional infrastructure, manpower and development of indigenous technologies;
- 3) a "kit of policy tool" based on an assessment of national requirements and availabilities as well as of policies relevant to industrial technology, especially in the areas of finance, trade, etc.;
- 4) a monitoring and regulatory mechanism for the inflow of foreign technology and equipment.

17. UNIDO in co-operation with UNDP is called upon to continue to assist African countries in industrial technology development and transfer, including:

- i) preparing technology policies, plans and programmes and establishing the appropriate institutional structures for this purpose;
- ii) strengthening and/or establishing industrial technological information systems and linking them with regional and international systems;

- iii) collecting and disseminating information on technologies in the informal sector;
- iv) developing more pilot projects of adapted technologies and their widespread use;
- v) developing programmes for training technology manpower, including non-formal training.

Action at the Regional Level

18. The Symposium calls for an intensification of intra-African technological co-operation activities for strengthening institutional arrangements at the regional level and for inter-related action in the various activities related to industrial technology.

19. The OAU is urged to intensify its activities in this regard, as required by the OAU Heads of State and Government, inter alia, in the Lagos Plan of Action. To this end, the OAU and UNIDO with the assistance and co-operation of the UNDP, ECA, ARCT and other relevant international and African regional organizations are called upon to:

- i) carry out a cross-country analysis of African technological experience in technology policy and planning as a prerequisite for meaningful action in this area, and dissemination of information and experiences;
- ii) organize a symposium on industrial and technological information exchange systems in Africa;
- iii) prepare a directory of African industrial technology experts and institutions;
- iv) carry out an appraisal of existing regional industrial technology centres and suggest actions for full utilization of their potential;
- v) organize more regional training programmes in industrial technology skills on a regular basis in African centres of excellence;
- vi) promote the establishment of mechanisms for joint acquisition of technology by groups of African States;
- vii) analyse African experience with external assistance in technological fields and propose the implementation of the recommendations of the Symposium, and to bring the results to the notice of African

Governments for review and initiation of further meaningful actions;

viii) assist in the preparation of African participation in the UNIDO system of industrial consultations.

20. The actions to be taken by the OAU need to be re-inforced by other collective actions by the African countries and international organizations. The African countries are thus called upon to intensify their support to and co-operate with relevant African regional centres and other institutions. The UNDP, UNIDO, ECA and other relevant international organizations are also called upon to expand the scope and increase the magnitude of their technical assistance to African regional organizations including the ARCT and the Regional Centre for Engineering Design and Manufacturing and to co-operate with them in the development and implementation of joint programmes.

21. African countries are collectively called upon, and through national, regional and international centres and organizations, to:

i) intensify the development and widespread use of appropriate indigenous technologies;

ii) promote the strengthening and conversion of existing national centres into regional centres of excellence, particularly in the fields of industrial technology, manpower and information,

iii) encourage more widespread involvement of African experts and consultants in UN activities and to formulate and participate in programmes for reversing the brain drain.

C. General Recommendations

22. In view of the value of the Symposium to the efforts of the African countries in the development of their technological capabilities and in order to maintain the momentum generated, the Symposium recommends that the OAU and UNIDO, in co-operation with the ECA, ARCT and other relevant international and African regional organizations should formulate concrete projects based on the deliberations of the Symposium for possible financing by the UNDP, IFSTD, and other sources, for implementing specific activities arising from the recommendations of the Symposium. The OAU and

UNIDO are called upon to print and to widely disseminate the report and recommendations of the Symposium among all African countries and organizations and to bring them to the attention of their governing bodies with a view to ensuring their consideration in the formulation of their future activities in the field of industrial technology. Finally, UNIDO and the UNDP are called upon to intensify their assistance to the OAU in planning effective mechanism and modalities for co-ordinating and monitoring the implementation of regional activities in the field of industrial technology in Africa.

23. The Symposium also recommended that the OAU and UNIDO should organize, in co-operation with the UNDP, ECA and ARCT, a follow-up meeting to this Symposium in 1982 in order to examine the progress achieved in Africa in the implementation of the industrial technology programmes adopted at this Symposium, the Lagos Economic Summit and other relevant fora. The Symposium urged that the follow-up meeting should exchange relevant information and experience on the steps taken, models adopted, constraints experienced and results achieved. The Symposium suggested that for the preparation of the follow-up meeting, it would be desirable to call a preparatory group in the nature of a Steering Committee, consisting of representatives of OAU, UNIDO, UNDP, ECA and ARCT as well as the chairman of the Symposium. The Executive Director of the ARCT announced his invitation to host the meeting of such a preparatory group in Dakar.

D. Concluding Session

24. The Symposium adopted the draft report, decided that its report should be forwarded by the chairman to the Secretary General of the OAU and the Executive Director of UNIDO with an appropriate letter of transmittal and authorized the chairman accordingly. The OAU/UNIDO Secretariats were authorized to edit, reproduce and circulate the final report of the Symposium to all participants and African countries and organizations.

25. The Symposium unanimously resolved to place on record its high appreciation of the hospitality and the excellent arrangements made by the Government of the Sudan and the Sudan EXPO for the conduct of the Symposium.

26. The chairman of the Symposium and representatives of UNIDO and OAU thanked all concerned for the successful manner in which the Symposium was conducted and the constructive results achieved by it.

III. SUMMARY OF DISCUSSIONS

A. Industrial Technology in Africa: Towards an Integrated Approach

27. Introducing the UNIDO Secretariat paper,^{3/} the Secretariat stated that while the Lagos Plan of Action contained detailed and wide-ranging recommendations in the field of technology, and had also listed the priority sectors of industry,^{4/} there was a need to convert the political commitment reflected in the Plan, to a set of practical measures. Each African country would need to identify its starting point and its options for action in the light of its specific requirements and its existing level of industrial and technological development. Notwithstanding variations in country conditions and levels of development, the overall African industrial scene presented a challenging picture. Increasing Africa's share in world industrial production up to the 2 per cent of the Lima target required the growth of the manufacturing sector at 11.3 per cent per annum as against an average growth of 7.3 per cent achieved between 1955 and 1975. Yet such an increase was required not only for its own sake but for its contribution to other sectors such as food and agriculture, transport and energy. Some features of the African industrial scene included: predominance of food, beverage and textiles in the industrial structure; low contribution of industrializing industries such as engineering industries, an apparent emphasis on equipment and hardware rather than on people and software. Arising from these features, a low level of technological development was achieved.

28. In such a context, a careful approach to technological development was called for, to avoid limited or lop-sided actions. The perceptions of developing countries concerning technology had evolved considerably from concerns limited to contractual conditions of technology transfer to appropriate choice of technology, strengthening technological capabilities, endogenous technology development and finally questions of overall development itself. This necessitated

^{3/} Industrial Technology in Africa; Towards an Integrated Approach. ID/WG.332/6

^{4/} viz. Food and agricultural industries, building materials and construction industries, engineering industries, metal industry, chemical industry, forest-based industries, energy industries.

Integrating actions in the field of technology to development goals and their attainment and to the productive sectors which contributed to such development. The field of technology development and transfer was itself a wide one and needed closely inter-related actions for effective results within a consciously designed national framework for action.

29. During the discussion that followed, it was noted by several participants that the subject of technology had come to the forefront in Africa. The importance of industry and industrial technology as leading factors in development was recognized. Reference was made to shortcomings in the international comparisons of production, some of which stemmed from the concept of development itself. It would be necessary to make a careful examination of the objectives of development, leading to a clarification of that concept, and thence to the role of industrial technology in fulfilling the objectives. In this context, one of the essential considerations would be the fulfilment of basic needs of the majority of the population in the struggle against poverty. It was noted that the priority industries identified in the Lagos Plan of Action would contribute, inter alia, to the satisfaction of basic needs.

30. It was pointed out that the Monrovia Declaration and the Lagos Plan of Action had stressed the strategy of collective self-reliance. Self-reliance, it was urged, should be a cardinal criterion in the design of action programmes. Self-reliance was not autarchy, but rather the ability to take autonomous decisions, to control a country's relationship to others and to ensure that African outputs outweighed the inputs. The pursuit of self-reliance involved control over the development process which in turn required control over technology. Such control was not always in evidence in several African countries due to a number of internal and external constraints. In this connection, the importance of the political will, the need for creating awareness of the issues involved, and avoidance of discontinuities in technological inputs and actions were stressed.

31. Technology and its development and transfer involved a mass of heterogeneous elements which had to be mastered by African countries and utilized effectively in achieving development objectives. There was a continuous need to develop within Africa, technologies of its

own, such that people could live and work with. The role of technology transfer from abroad, which would be the main source for some time to come, cannot be ignored and should be given due consideration. Measures relating to transfer of technology included choice of technology; the terms and conditions of its acquisition; its diffusion throughout the society and closer South-South co-operation ensuring exchange of studies, information on projects and experiences as well as of semi-finished products and manufactures between complementary economies. Attention should be given, inter alia, to organizing and regulating transfer of technology, sensitising decision-makers, enterprises and the public at a variety of levels, as well as developing R and D capabilities and engineering services.

32. Reference was made to the problems facing African technological development, some of which were of a structural nature. The limited market size of many African countries and the problems in creating an export market, including those of communication and transport, underlined the need for an appropriate mix of technologies. It was therefore necessary to co-ordinate the technological development of large, medium and small-scale industry, bearing in mind, on the one hand, the important role the individual entrepreneur could play, and on the other, the consideration that small-scale industry alone could not build a strong economy. The differences in sizes and resource endowments of African countries and the scale limitations in certain industrial technologies called for regional development of certain industries.

33. The foregoing considerations underlined the need for each African country to evolve a framework for national action, based on a diagnosis of the existing situation and aimed at the achievement of development objectives and self-reliance.

B. Action in the Field of Technology Policy and Planning
in Africa ^{5/}

34. Introducing the subject, the UNIDO Secretariat pointed out that technology was a commodity with a price and that it now came to be

^{5/} The papers discussed were: Action in the field of technology policy and planning in Africa, ID/WG.332/2; and The role of external assistance in African Technological Development: Potential and Limitation, ID/WG.332/8

recognized as a fundamental factor in socio-economic development. Technology policy was part of overall development policy. The life style chosen dictated the product mix in a society, and consequently, the technology needed for production.

35. Technology policy and plans dealt with the two streams of technology, namely: the "flow" stream of imported technologies and the "stock" stream of endogenous technology. The former would be predominant for some time to come; but the latter could provide useful inputs to meet requirements that could not be appropriately satisfied by imported technologies. Experience in other regions confirmed that the building-up of indigenous technological capability in handling both streams was a requirement for sound development, regardless of the political orientation or development strategy of a country.

36. While comprehensive technology policies and plans might be difficult and might have to be worked out over a period of time, at least a framework of guidelines and a minimum set of programmes for specific sectors, as well as the mechanism for implementing and monitoring implementations were badly needed. This was essentially a multi-disciplinary exercise that called for maximum participation at many levels and in many walks of life.

37. A framework would establish a consensus on product and technology mix, an assessment of existing capabilities and a strategy for filling in the gaps and overcoming deficiencies on the basis of optimum utilization of resources and the mobilization of desirable demand within clear time horizons. Specific programmes in key sectors were outlined and a kit of basic tools in technology policy and planning was suggested.

38. As regards the role of external aid on African technological development, no clear-cut strategy for optimising the benefits of external aid was in evidence. In some cases, external aid was not based on a well-defined set of national priorities, nor was its full cost to the recipient fully appreciated.

39. While some donor countries regularly analysed their experiences, very few African countries did the same or participated in joint evaluation exercises. Adequate information on the motives and capabilities of prospective donors would improve the recipient country capacity in negotiating mutually-beneficial terms and conditions.

40. The importance of transferring skills, "know-how" and "software", as against the acquisition of "hardware" had not always been reflected in external aid programmes. The possibilities of co-operation between Third World countries were increasing and could contribute significantly to the benefits of external aid.

41. Various participants underscored a number of the points presented. The following points received special emphasis.

42. It was noted that although most African countries have development plans, very few of these are based on science and technology policies, linked to technological practices at the grass-root level. It was noted further that policy instruments specifically designed to encourage the development and use of national technological capabilities were rare. Policies were often not backed by meaningful policy instruments.

43. Though technology might be difficult to plan, it was possible and necessary to control and monitor it. It was important to select specific priority sectors and to concentrate the action within the framework of clearly defined objectives. Maximum possible participation of all individuals and institutions involved in implementing technology policies and plans would guarantee their success.

44. It was felt that there was a pressing need for establishing control on the "flow" stream of technology without delay, including the selection and procurement of equipment. A number of developing countries in other regions had adopted such policies; different models were available and their experience had been documented.

45. Technology policy should encourage development of indigenous technology, particularly for rural societies and of an income-generating nature. Such a policy, however, should not be unduly restrictive, but should be based on a sound assessment of the potential of such technologies. In addition to technology generation, the standardization of technologies and products within a country, as well as between countries in Africa, was considered an effective means of the rapid development of technological and productive capacities in Africa. Examples from South-East Asia were cited in support of this point.

46. There was a pressing need for analysing and disseminating information and experiences on the methodologies of drafting and monitoring the implementation of technology plans. It was also important to develop a 'technological intelligence' capacity in the choice, acquisition and implementation, as well as for monitoring technological advances and assessing their possible impact on African societies.

47. One of the fundamental tasks identified was the need to carry out a cross-country analysis of the African technological scene today as a prerequisite for identifying actions in technology policy and planning. UNIDO, in co-operation with the OAU and ARCT, was called upon to field, with the possible assistance of UNDP, a multidisciplinary team to study and analyse African experience in formulating and implementing technology policies and plans. UNIDO was called upon to intensify and expand its activities in this area. An approach to formulating technology policies and plans would be that such teams would associate national counterparts in identifying elements of such policies and plans for specific sectors, taking into consideration the present state of industrial technology and the existing policy instruments in the country. The draft technology plan or programmes would be submitted to the broadest possible section of the community that was concerned either in implementation or as beneficiaries before the Plan was adopted. Effective implementation, monitoring and follow-up mechanisms should be established.

48. As regards external assistance various participants noted that, even after years of sustained external assistance, most projects failed to flourish independently. This was attributed to the failure to develop local skills required for operation of the projects. The measure of success of aid programmes would be the speed with which they could operate without foreign experts.

49. A call was made for comprehensive analysis of the social impact of external assistance programmes. Experts from the third world have shown understanding of the problems facing recipients and have been more sympathetic and effective.

50. In view of the paucity of studies on the impact of external assistance on technological development, it was felt that in-depth investigations in this regard were necessary. It was suggested that provision for development of relevant local technological capabilities should invariably be insisted upon in aid packages; perhaps, by common agreement, a fixed percentage of an external aid package could be devoted to local R and D and the development of local capabilities.

C. Industrial Technological Information in Africa

51. Presenting the subject,^{6/} the UNIDO Secretariat underlined the variety of end users of industrial technological information and consequently the diversity of such information, varying from socio-economic data and statistics at one end, through financial, legislative, market, technological and management information. An effective industrial and technological information system thus had to combine technical and socio-economic orientation; identify sources of information and communicate with them; analyse, assess and organize storage and retrieval, and thus provide end users with the right information in the right form at the right time. This was a prerequisite for inspiring confidence and generating demand for the services of any industrial and technological information system.

52. Information relating to the selection and acquisition of technology is particularly important if we want effective results from the "flow stream". Details were given of the operation of the Industrial Technological Information Bank (INTIB) which is specifically concerned with technology choice, and the Technology Information Exchange System (TIES) for the exchange of information on technology contracts between participating countries, as well as UNIDO's long-standing Industrial Inquiry Service. Participants were urged to establish and maintain closer links between institutions in their countries and UNIDO's information systems and services.

^{6/} Action in the field of industrial and technological information in Africa, ID/WG.332/1

53. The necessity of establishing a focal point, no matter how small, close to potential users of information was underlined, together with the pressing need to build a technological intelligence capacity and a cadre of effective industrial information officers.

54. During the discussion, several participants stressed the importance of coordinating the systematic handling and flow of information within the African countries. This was considered to be a basic requirement for exchanging information within Africa on past experience, both positive and negative, for better development of technological capabilities and sound industrial planning and project formulation.

55. The need for regional co-operation in industrial and technological information and the possible role of the OAU and the ARCT was stressed.

56. Examples of successful national information systems, particularly for investment promotion, were cited, as well as cases where a law obliges nationals to provide the required information at the national level. The practice was cited of three African countries whereby, at the time of formulation of a project, information and experience was exchanged with countries where similar projects had already been initiated.

57. The problem of the rather low social standing of information officers was cited as a serious constraint in developing effective information systems. A call was made for upgrading their social status and career development opportunities, and interesting engineers and economists in the information function.

58. Information should be seen as an integral function of each activity and as an essential tool of management. It was important to ensure the flow of information within the system of activities pertaining to industrial and technological development. Attention was drawn to the need for close links with user groups and for training them in the handling and use of information.

59. A plea was also made for the setting-up of national focal points in order for INTIB to increase its activity in the exchange of experience within Africa on experience in the choice of technology. There was a need for collecting and disseminating information on technologies available in the informal sector and on appropriate technologies in developing countries in general. UNIDO was requested to disseminate such information among the African countries.

60. Special attention was drawn to the requirements of the small industrial entrepreneur and to the need of winning his confidence as well as assisting him so as to minimise the danger of his taking wrong decisions on technological matters.

61. While noting that UNIDO activities in information were helpful in many African countries, it was proposed that UNIDO in co-operation with OAU should organize a symposium on industrial and technological information exchange systems in Africa, and further that UNIDO should continue to assist the African countries in setting up information systems at the national level and to harmonize these at the regional level.

D. Industrial Technology Institutions

62. Introducing the subject,^{7/} the UNIDO Secretariat pointed out the value of institutions in implementing policies, plans and programmes as they ensure continuity and become depositories of technological capabilities. A detailed accounting was given of the possible contributions of technological institutions along the spectrum of industrial technological activities. The patterns of institutions, their functions and possible modalities of operation were analysed and experiences from various parts of the world presented.

63. It was noted that while Africa was not acutely short of institutions for policy-making or industrial research, their effectiveness has not been clearly demonstrated. There was a clear shortage in institutions concerned with the monitoring and regulation of imported technologies, a fact that had resulted in inappropriate choices and unfavourable contractual arrangements.

64. It was suggested that a diagnostic matrix^{8/} could help identify shortcomings and gaps as a prelude to appropriate action in the priority industrial sectors within the framework of an integrated systems approach. It was proposed that emphasis be placed on identifying

^{7/} Industrial Technology Institutions

ID/WG.332/4

^{8/} ibid, pp. 23-24

functions to be preformed rather than on institutions per se. The strengthening of existing institutions; their involvement in performing new functions with the help of extra inputs; the sharing of programmes and networking of institutions with a centre of excellence as the focal point; and the organization of joint training programmes were cited as possible modalities for obtaining desirable outputs from existing institutions.

65. In establishing new institutions, the time horizon for the function needed, its potential for development and the interim measures necessary during the process of building up the capabilities of the new institution should be integrated in a detailed feasibility study, with well defined phases and detailing of resources needed.

66. In the discussion, the lack of information on existing institutions and their work was referred to, and it was suggested that UNIDO should prepare, in co-operation with the OAU, ARCT and ECA, a directory of national industrial technology institutions and promote exchange of information on their work. The twinning and/or linking of institutions was cited as a means of avoiding repetition of mistakes and benefiting from successful experiences. It was noted that after the colonial period no established relations were formed to replace those that existed with institutions in the colonising countries. Several participants referred to the need to avoid building new institutions until the full potential of the existing institutions was realized. The importance of selective and sustained action in this field was emphasized. The representative of UNCTAD reviewed some examples of the work of UNCTAD in Africa in the institutional field.

67. On the problems of existing institutions, participants referred to inadequate co-ordination between institutions within the same country, the lack of well-defined modalities for co-operation, shortage, as well as the frequent movement of personnel resulting in the lack of continuity in programmes and their implementation, the inadequacy of specialised training opportunities and the absence of close links with end users, particularly in the private sector. There was also a need to establish better co-ordination between organizations and institutions working on similar activities.

68. Suggestions were made for the transformation of some national centres into African centres, the propagation of successful experiences in co-ordinating institutions within a country and linking up the efforts of industrial technology institutions with those in other sectors in view of the basic unity of development effort. Multi-disciplinarity was emphasized, as was also the development of vertical and horizontal linkages by institutions. The need for multidisciplinary training and for structures for exchange of institutional experience was underlined. Attention was also drawn to the need for institutional systems and services for small scale industry. It was suggested that once an institution was established with clearly defined functions, it should be enabled to discharge those functions with adequate resources and manpower, without multiplying institutional arrangements for the same purpose, resulting in dispersion of effort.

69. A reference was made to a possible model of a National Science and Technology Council being developed in an African country with assistance from UNIDO; and it was suggested that UNIDO should assist other African countries in establishing similar institutional arrangements. The model, now being subjected to critical evaluation and inspection, will be made available as soon as detailed necessary feed-back has been obtained.

70. It was recommended that UNIDO, OAU, ARCT and the ECA carry out a programme involving:

- an appraisal of the present effectiveness of industrial technology institutions at various levels of functions;
- a similar exercise for African regional industrial technology institutions;
- Specific joint co-operative programmes; and
- monitoring and follow-up of the recommendations of the Symposium.

E. Industrial Technology Manpower in Africa

71. The document presented by the UNIDO Secretariat ^{9/} dealt specifically with industrial technology manpower development, which is part of the wider issue of manpower development in general. The main characteristics of the specific situation in Africa, e.g.

^{9/} Industrial Technology Manpower in Africa,
ID/WC.332/5

underpopulation, limited educational facilities in colonial times, continued reliance on substantial numbers of expatriates, the social bias towards white collar and clerical jobs and away from science and technology in higher education, have resulted in Africa lagging considerably behind other regions in its stock of scientists, engineers and technicians.

72. Actions in developing industrial technology manpower have to be carried out both at the long-term and short-term levels. The former would be part of the exercise of preparing national manpower development plans, a task that is rather difficult and for which there are, as yet, no generally accepted methodologies in developing countries. It was pointed out that manpower development plans should not be strictly tailored to the manpower needs of development plans and projects, since upgrading of the skills of the population is a good investment leading to self-employment and the spread of entrepreneurial spirit.

73. The immediate needs of the present and immediate future can best be met by flexible modes and ad hoc measures in existing educational, training and production facilities to satisfy specific needs without waiting for the establishment of new institutions. Examples of such actions in a variety of institutions were presented. One of these involved the need for up-grading the capabilities of professionals responsible for training (possibly through the establishment of associations for training and manpower development) who would then develop new and appropriate methodologies and organize group training programmes; special training for multi-disciplinary teams in the skills of technology selection, acquisition and adaptation was suggested; and the importance of inter-institutional linkages in technological manpower development emphasised.

74. During the discussion, the need for fundamental changes in educational systems to suit the African technological environment and to harmonize with development objectives was stressed. One participant pointed out the need to view technological manpower development as being closely related to the general enlightenment of society, since the masses should be the end users of technology.

The significant role that functional literacy could play in this respect was also pointed out.

75. The seriousness of the brain-drain of high level manpower in Africa was discussed and the need for continued political and developmental actions to alleviate this problem emphasized. Attention was drawn to UNDP's TOKTEN Programme and also to UNIDO's programme in Turkey aimed at reversing the brain-drain; African countries were advised to examine the possibility of pursuing similar actions.

76. It was pointed out that developing industrial technology manpower did not only refer to high-level manpower (scientists, engineers, economists, legislators, etc.) but also to middle level para-professionals and technicians of whom there is great shortage in Africa. In view of the high cost of technician training and the large numbers needed, a proposal was made for non-formal training of technicians in production enterprises, and UNIDO was called upon to take appropriate action, in co-operation with other concerned organizations, to develop modalities for this type of training, and to work out, with reference to Africa, the criteria and norms for the required numbers of technicians in certain industrial sectors.

77. Finally, it was pointed out that regional training programmes for helping small African countries to develop their human resources at all levels is of crucial importance.

78. The attention of the Symposium was drawn to UNIDO's efforts to prepare a directory of African experts and organizations involved in industrial technology and also to a draft OAU/UNIDO study on the development of industrial and technological manpower in Africa. The Manpower study would be widely circulated to all African countries and was intended to form the basis for a meeting of inter-governmental group of experts, which would be partly in preparation for African participation in UNIDO's Global Consultation Meeting on Industrial Training, as well as for identifying action to be undertaken by African countries, individually and collectively. The need for continuation of these efforts, leading to sustained and meaningful action, was stressed.

F. Intra-African Co-operation in Industrial Technology

79. Three documents were presented. The first,^{10/} prepared by the UNIDO Secretariat reviewed the antecedents and present situation in Intra-African technical co-operation up to the Nairobi meeting earlier this year.^{11/} It pointed out the inter-relation between self-reliance and co-operative efforts in promoting industrial technology in Africa and summarized the outcome of UNIDO organized meetings in New Delhi (1977),^{12/} Vienna ^{13/} and New Delhi ^{14/} in 1978, relating to the promotion of technological co-operation among developing countries. Noting that technical co-operation among developing countries is more advanced at the conceptual, philosophical and political levels than in operational terms, and taking into consideration the importance of political will, it pointed out the range of activities in which the African countries could co-operate, extending from the less committed exchange of personnel, through joint meetings, training courses and co-operative research programmes all the way up to jointly-owned production facilities. Specific action programmes based on the functions of industrial technology, the priority sectors of industry and instruments of implementation were proposed. It was pointed out that the starting point for the formulation of feasible programmes would be a thorough identification of the potentialities and complementarities of existing institutions and resources.

80. The second document, ^{15/} presented by OAU, pointed out that the crucial role of industrial technology had been underscored in several African fora, citing as examples the "Addis Ababa Declaration on Industrial Development" and the "Cairo Declaration on Industrialization in Africa": Principles and Guidelines for Co-operation and Development",

^{10/} Inter-African Co-operation in Industrial Technology, ID/WC.332/7

^{11/} UNDP Conference of Governmental Experts on Technical Co-operation Among African Countries, Nairobi, May, 1980.

^{12/} Round-Table Ministerial Meeting on Industrial and Technological Co-operation, New Delhi, January, 1977

^{13/} Meeting of Senior Officials and Heads of National Technology Registries in Developing Countries, Vienna, March, 1978

^{14/} International Forum on Appropriate Industrial Technology, New Delhi, 1978

^{15/} "Intra-African Co-operation on Technology and the Role of the OAU by OAU Secretariat

the "Monrovia Strategy", and the "Lagos Plan of Action" adopted in April 1980, in which two chapters are devoted to the role of science and technology in development. Mention was made of co-operation with UN agencies in establishing regional technology centres and associations in Africa. Proposals for further action in promoting intra-African co-operation in the fields of technology were presented and the role of OAU in co-ordinating this co-operation and the initiatives taken by OAU outlined (see following section).

81. The Executive Director of the African Regional Centre for Technology presented the third document ^{16/} dealing with mobilization for intra-African technical co-operation for self-reliance. He pointed out that the symposium was unique in being one of the first gatherings after the Monrovia Strategy and the Lagos Plan of Action based on "collective solidarity for self-reliant development". This should make the deliberations more novel, concrete and action-oriented. He next cited the formidable impediments facing implementation and created by Africa's continued dependence, even after independence. Costly foreign life-styles that are consumption-oriented have not been matched by production skills and technological capabilities. Removing these endemic impediments called for continent-wide mobilization of mass awareness, based on self-confidence, knowledge of the great technological achievements of past African civilizations, as well as a true appreciation of Africa's immense reserves of natural resources. Awareness should be disseminated upwards to the political leaders, and downwards to the grass roots. He went on to identify two priority areas for co-operation, for example, energy and food. Statistical information on the contemporary African situation in food and energy production and mineral resources were presented and analysed. Particular emphasis was placed on the great potentialities of technological breakthroughs, particularly the role that technology in solar energy and microbiology could play in technological development in Africa. The programmes of ARCT were reviewed as also were

^{15/} "Intra-African Co-operation on Technology and the Role of the OAU" by OAU Secretariat

^{16/} "Mobilization for Intra-African Technical Co-operation for Self-Reliance" by the ARCT

the co-operation with other UN agencies in developing and implementing these programmes.

82. Several speakers underlined the great potential of industrial technological development in Africa and contrasted this with the lack of support to existing regional institutions. Various reasons, e.g. nationalistic considerations and economic pressures, were cited as causes for lack of sustained support.

83. Against examples of unsustained co-operation (e.g. East African Community), examples of meaningful and expanding co-operation (e.g. in Morocco and Tunisia; and Ghana, Ivory Coast, Togo and Upper Volta) were described. A call was made for further expanding such co-operation and for setting up systems for the joint acquisition of technology. Against the apparent lack of political will in some cases, the importance of linking up technological decisions with political will was emphasised. It was felt that the Monrovia Strategy and the Lagos Plan of Action present a new challenge to the technological community which needs new sustained political support and stability.

84. It was recommended that future co-operative programmes be based on positive national experiences, and that this called for substantial improvements in the flow of technological information of all types within a country and between countries, in spite of difficulties due to differences in language, poor communication facilities and the long distances involved.

85. The representative of the UNDP pointed out that Nairobi Recommendations 33 to 36 suggested allocating 5 - 10 per cent of UNDP resources in Africa, both at the national and international levels, to financing of specific TCDC activities. He further indicated that UNDP was agreeable in principle to these recommendations.

86. There was consensus on the imperative need for monitoring the performance of mechanisms and modalities for translating good intentions into practical activities and analyzing successes and failures. UNIDO was called upon to undertake suitable action in co-operation with governmental and other UN agencies, particularly OAU, ARCT and UNDP to perform this function and to bring the results for discussion and initiation of effective remedial action.

G. Intra-African Co-operation and the Role of the OAU

87. The role of the OAU in promoting intra-African co-operation in the field of industrial technology received considerable emphasis from participants. The Symposium noted that despite the large number of Declarations by member-states concerning joint action programmes in the field of industrial development, in general, and industrial technology, in particular, very little concrete action was indeed taking place - a fact which is confirmed by Africa's share of world industrial output of only 0.9 per cent.

88. Referring to the document presented by the OAU Secretariat,^{17/} the Symposium picked out some of the more obvious factors which have combined to retard intra-African co-operation in the development of industrial technology. The Symposium noted that African Governments have on occasions not been fully aware of, or have preferred to ignore, the benefits of co-operating with one another in the establishment of joint industrial and technological institutions. Secondly, even in the extremely few cases where such multinational institutions have been established, they have not usually been provided with enough financial and other resources necessary to make their impact felt. The Symposium also took note of the large number of unnecessary barriers between countries and their negative impact on the free-flow of products, ideas and know-how which effectively prevent the diffusion of technological knowledge already available to some member states.

89. In examining the various measures to be taken for promoting intra-African co-operation in the area of industrial technology, the Symposium was unanimous in its belief that the Secretariat of the OAU would have to take a leading role in promoting such co-operation. This, participants indicated, was very much within the scope of responsibility of the OAU, as contained in its Charter which includes, inter alia, co-ordination and harmonization of the policies and programmes of member states; mobilization of political will of member states for the carrying out of joint and common activities; taking initiative in promoting the collective undertaking of development projects involving more than one state; etc. The Charter thus gives

^{17/} op.cit., p.25

the OAU Secretariat the mandate to undertake the promotion of concrete action programmes in the field of industrial technology as well as in the transfer of technology.

90. The Symposium felt that, while it was now up to each country to draw up national level plans and action programmes for promoting the development of industrial technology, the OAU Secretariat should monitor, co-ordinate and harmonize these national level policies and programmes for the benefit of the region as a whole, and called on member states to exercise the political will necessary for the realization of the objectives of technological progress.

91. The Symposium noted that a determined and united effort by the African countries, through the OAU, had already brought significant results in the struggle to achieve political independence for the African people. This same unity and determination must now also be channelled towards bringing technological self-reliance to the continent. The OAU Secretariat was requested to intensify its co-ordinating efforts to bring about this technological self-reliance. Such efforts should include co-ordinating all scientific and technological activities at the sub-regional, regional and international levels; organization of conferences, seminars and workshops in the field of industrial technology; monitoring and promoting the establishment of more training institutions and centres of excellence for industrial manpower development; supporting and strengthening regional institutions and centres already established to make them more responsive to Africa's needs. The OAU Secretariat was called upon to seek the support and co-operation of international organizations such as ECA, UNDP and UNIDO in carrying out these tasks.

92. The Symposium called on member states to strengthen the OAU Secretariat in order to enable it carry out the task of co-ordinating the promotion of industrial and technological development in the African region, and carrying out the various responsibilities relating to industrial technology assigned to it within the context of the Lagos Plan of Action.

E. The Role of UNIDO

93. Introducing the two documents on the role of UNIDO, ^{18,19/} the objectives, functions and organizational set-up of UNIDO were explained, with special emphasis on its promotional activities in the field of industrial technology. It was pointed out that UNIDO has been co-operating with ECA and OAU and has provided expert assistance in preparation of the programmes of ARCT.

94. UNIDO's technical assistance to developing countries was of the order of \$70 million in 1979 of which some \$17 million had been spent in Africa. Technical assistance was rendered, inter alia, to strengthening institutional infrastructure including technological institutions, manpower development, the development and transfer of technology in specific industrial sectors, and the formulation of national policies in the field of technology. The field experience acquired through technical assistance activities invested UNIDO's promotional activities with a strong bias towards practical actions in line with the field conditions.

95. UNIDO's activities in the development and transfer of technology have endeavoured to maintain a balanced approach that combines concerns of the productive sector and autonomous actions dealing with technology as an all-pervasive factor. It has also endeavoured to keep in close touch with field experience at the national and regional levels and to link up with other aspects of industrialization (such as investment, training, feasibility studies, etc.) as well as with overall development.

96. As examples of programmes in the field of policy and planning, the cases of Cameroon, Egypt, Ghana and Tanzania were mentioned. In technology transfer, UNIDO has been mobilizing national effort and sensitising decision-makers and specialists by demonstrating new ways for effective and fair transfer. Programmes for reviewing cost and conditions of acquisition were carried out in, among other countries,

^{18/} The Role of UNIDO in Industrial Technology, ID/WG.332/7

^{19/} Strengthening of Technological Capabilities of Developing Countries : The Role of UNIDO, ID/CONF. 4/7

Algeria and Egypt. The last meeting of TIES members was attended by five African countries. Training workshops for strengthening negotiating capabilities have been conducted in a number of countries including a recent one in Cameroon and publications in this regard brought out.

97. As a follow-up to the International Forum on Appropriate Industrial Technology, UNIDO has undertaken a publications programme which has included technical memoranda and manuals on the identification and evaluation of alternative technologies. Promotion of R and D projects included one on a prototype for a small scale rice bran stabilizer and a pilot plant production of ethanol from cellulose by enzymatic action. The impact of technological advances on developing countries is being studied and feasible programmes for effective actions in preparing for such advances are being formulated. An inventory of R and D institutions in Africa involved in adaptive research is under preparation.

98. Within the scope of strengthening technological capabilities, mention was made of the Technology Services Delivery System (TSDS) in the Philippines, the plant-level co-operation programme between small and medium size industrial enterprises in developed and developing countries (in which Kenya and Egypt would participate), the scaling down of metal production units to suit conditions in least developed countries of Africa, and the development and use of mini hydro-generating units.

99. UNIDO's on-going advisory services, particularly in negotiating technology contracts, and its industrial information services were also reviewed briefly.

100. During the discussion, the cellulose project was commended as a good example of a practical demonstration of the value of new technologies to developing countries.

101. Participants expressed the wish that more African experts be involved in UNIDO field activities in Africa, particularly for short-term consultations and that the joint UNIDO/UNDP/OAU/ARCT directory of African technology experts and institutions be completed and published as soon as possible.

The meeting was informed that it had always been UNIDO's policy to encourage the use of experts from the developing countries whenever possible. Participants were urged to submit names of qualified Africans for consideration for assignment as UNIDO experts or consultants, and to recommend the approval of African experts by their governments.

102. One participant felt that some African countries do not benefit to the same extent from UNIDO's activities as some others do and a call was made for widespread UNIDO activity in Africa during the African Industrial Development Decade. Special emphasis was recommended in the following areas:

- manpower development through regional training courses offered regularly in African centres of excellence;
- a massive effort in the field of industrial and technological information in the form of a long-term carefully structured set of programmes;
- a joint UNIDO/UNDP exercise in studying and evaluating the situation in regional industrial technology institutions in the African region as a follow-up to the joint study of national industrial research institutions;
- the development of appropriate technologies through pilot plants and demonstration projects, and the upgradation of indigenous technologies and the dissemination of results.

Annex I

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