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PROGRESS MADE IN THE IMPLEMENTATION OF THE WORK PROGRAMME

REPORT TO THE COMMISSION ON "MID-DECADE REVIEW ON THE IMPLEMENTATION OF THE VIENNA PROGRAMME OF ACTION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT IN THE ECWA REGION" 1979-1984

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INTRODUCTION

The Ad Hoc Expert Group Meeting on the Mid-decade Review on the Implementation of the Vienna Programme of Action on Science and Technology for Development was held at the ECWA Headquarters in Baghdad from 17 to 20 February 1985.

The Meeting was organized jointly by ECWA and the United Nations Centre for Science and Technology for Development in connection with the Global Mid-decade Review of the Implementation of the Vienna Programme of Action to be undertaken by the United Nations Intergovernmental Committee on Science and Technology for Development at its seventh session in May/June 1985.

The Meeting was opened by the President of the Scientific Research Council in Iraq, H.E. Mr. Najin Khalil, who stressed the importance of the Meeting for countries in the ECWA region. In his welcoming statement the Executive Secretary of ECWA, Mr. Mohammed Al-Attar, outlined the purpose of the regional meeting in the context of the Operational Plan for the Implementation of the Vienna Programme of Action. The representative of the United Nations Centre for Science and Technology for Development, Mr. A.D. Padang, also made a statement providing background information on the preparatory work for the convening of the regional review in the ECWA region.

The Meeting was attended by Government experts from the following ECWA members: Bahrain, Iraq, Jordan, the Palestine Liberation Organization, the People's Democratic Republic of Yemen, Qatar, Saudi Arabia and the United Arab Emirates.

Observers from the following international and Arab organizations also attended the Meeting: UNESCO, UNIDO, Arab Telecommunications Union (ATU), Arab Industrial Development Organization (AIDO), Arab Federation for Engineering Industries (AFEI), Arab Institute for Training and Research of Statistics (AITRS), Arab Labour Organization (ALO), Federation of Arab Engineers (FAE), Iraqi Federation of Industrial and Commerce Chambers (IFICC), Federation of Arab Scientific Research Council (FASRC), ALECSO Institute of the Arab Research and Studies, and the Arab Federation for Food Industries (AFFI).

The Meeting wished to express its appreciation to ECWA and the United Nations Centre for Science and Technology for Development for having convened the meeting. It also expressed its appreciation to ECWA for the preparatory work it has undertaken for he review and, in particular, for the assistance it has extended to ECWA members in the preparation of their country papers as an input for the review.

The Meeting also wished to express its appreciation to the Government of Iraq for the facilities it has accorded the participants in attending the regional review.

At the commencement of its work, the Meeting elected the following participants as its officers:

Chairman : Prof. Suham H.F. Al-Madfai (Iraq)
Vice Chairman : Mr. Nasser Al-Manssory (Qatar)
Rapporteur : Mr. Sami Nsour (Jordan)

In the conduct of its review, the Meeting availed itself of the valuable information contained in the country papers before it which was supplemented by data and information provided by its participants. The paragraphs that follow reflect the results of the review.

II. GENERAL BACKGROUND

The United Nations contribution to the development of science and technology in the ECWA region dates from 1963, when the United Nations "Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas" (UNCAST) was held in Geneva. This conference established the "Advisory Committee on the Application of Science and Technology to Development" (ACAST). The committee laid down guidelines for two important aspects of science and technolgoy for development. The first was concerned with the basic structure of science and technology, with policies, institutions and the development of skilled personnel. The second dealt with methods of technology transfer from developed to third world countries.

In 1971 this led to the preparation of the "World Plan of Action for the Application of Science and technolgoy to Development". This Plan of Action was in essence the Committee's contribution to the Programme of Action for the "Second United Nations Development Decade". It emphasized specifically the development of science and technology capacities and institutions. In the words of the Plan of Action itself: "A country without an indigenous scientific and technological capacity has no means of being aware of its own needs, nor of the opportunities existing in science and technology elsewhere, nor of the suitability of what is available for its own needs".

Arab countries were represented on the Advisory Committee until it was dissolved in 1980. What is interesting, however, is that two "Regional Plans of Action for the Application of Science and Technology" were drawn up by the United Nations Organizations. One for the ECA region and the other for the ECWA region. Both were concerned with the Arab region in line with the World Plan of Action. Between them these two Plans covered all the Arab countries. The plan entitled "The Regional Plan for the Application of Science and Technology to Development in the Middle East" was prepared by the United Nations Economic and Social Office in Beirut (UNESOB) which was later succeeded by ECWA.

Parallel efforts to those of the United Nations system were also made by the specialized departments in the Arab League secretariat. Often, as shall be seen, these efforts resulted in a joint programme. The Cultural Department in the Arab League pursued its goal of assisting Arab countries to develop science policies; in building research facilities and organizing scientific research; in formulating scientific research programmes and scientific studies; in applying appropriate methods of technology transfer and adaptations in developing scientific personnel; in strengthening scientific co-operation; and in strengthening relations between science and society. The Department organized a large number of scientific conferences in

the region, most of them convened under its own auspices. Through its continuous efforts the Department managed to create an atmosphere conducive to making the necessary changes required in the scientific policy in the Arab countries.

In 1971, the Arab League established the Educational, Cultural and Scientific Organization (ALECSO). This Organization has the following principal objective: (a) to assist in the formation of an Arab educational system, and cultural and scientific organizations; (b) to explore new areas of Arab co-operation in the fields of education, culture and science; (c) to develop exchange of information in the field of education, culture and sciences; and (d) to apply the Arabic language in the field of sciences. ALECSO has made some significant contribution to furthering the development of science and technology in the region. It conducted the feasibility study for creating an Arab Fund for scientific research, and for establishing a special fund for financing research and technical assistance projects.(1) It was instrumental in convening the "Conference of Arab Ministers Responsible for Scientific Research and Needs of National Research Council in the Arab States", in Baghdad in 1974.

The First CASTARAB Meeting (The Conference of Arab Ministers Responsible for the Application of Science and Technology to Development) was held in Rabat, Morocco, in August 1976. The Conference was organized by UNESCO, ALECSO and ECWA. The main working document was prepared by the first two organizations. It contained a comprehensive review of the status of application of science and technology in the Arab region. The recommendations of CASTARAB I fell into three main groups: (a) Science and Technology Policies; (b) Regional Co-operation; and, (c) Follow up action. Four of the recommendations of the Conference covered subjects related to item (a) above. They deal with instruments, personnel, allocation of science and technology as percentage of GNP, the transfer and appraisal of technology; and higher education and other services. It also recommended a long run futuristic study of the state of science and technology in the Arab world for the year 2000.

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(1) See O.A. El-Kholy. "The 1976 CASTARAB Rabat Meeting: A Review in Technology Transfer and Change in the Arab World, A Seminar of the United Nations Economic Commission for Western Asia 1977. ed. by A.B. Zahlan (Pergamon Press, 1978), pp. 149-162.

Regarding regional co-operation, the Conference identified five areas of co-operation and as recommendations in each case were accompanied by detailed programmes of action. The areas recommended were:

1. Water Resources and Water Management;

2. Ecology of Arid and Semi-Arid Lands;

3. Geological and Geophysical Studies;

4. Marine Environment and Development of Coastal Areas; and

5. Non-conventional Sources of Energy.

Under the follow-up action, CASTARAB I set up a permanent ministerial follow-up Committee. UNESCO and ALECSO were called upon to provide a technical secretariat for this Committee. The Committee was given the responsibility to prepare for CASTARAB II, and to prepare a feasibility study for the establishment of an Arab Fund for Scientific and Technological Research. For a number of reasons, the recommendations were unfortunately not carried out with the entnusiasm expected. The forthcoming Conference of CASTARAB II will attempt to assess the implementation of these recommendations. Though the feasibility study for establishing the Arab Fund for Scientific and Technological Research was carried out, the decision on implementation is left for CASTARAB II.

But long before this, the effect of the joint efforts just mentioned and the combined activities that were carried out in the region on the one hand, and the increasing realization of the need for co-operation in the process of development on the other, have induced the Arab countries to establish a number of specialized organizations within the Arab League. This included the Industrial Development Organization, the Arab Labour Organization, the Council of Economic Unity among Arab States, the Federation of Arab Scientific Research Council, the Union of Arab Scientific Communities, etc.

As the fervour continued, assistance and directives were being sought from every direction to help in the application of science and technology for development. The Arab countries actively participated in the Second United Nations Conference on Science and Technology for Development (UNCSTD) held in Vienna in 1979. This Conference was particularly relevant for the Arab countries, since it was concerned with evaluating new national and international relations that would accelerate development through the application of science and technology. It was aimed at mobilizing world resources to bring about more effective

relations among nations. Its mains objectives were identified as follows:

(a) To adopt concrete decisions on ways and means of applying science and technology in establishing a New International Economic Order;

(b) To strengthen the technological capacity of developing countries;

(c) To adopt means for the utilization of science and technology potential in the solution of problems regarding global national and regional development;

(d) To provide instruments to developing countries in the utilization of science and technology for solving socio-economic problems.

ECWA played the pivotal role for preparing the region's contribution to the Vienna Conference in the following ways:

(a) It provided advisory services to the member States in preparing their national papers for UNCSTD;

(b) It organized the First Preparatory Regional Meeting for UNCSTD in December 1977, and working papers on the five subject areas mentioned below were discussed;

(c) It prepared the ECWA Region's Report to UNCSTD. (This report was reviewed at the Third ACAST Meeting in May 1978); and

(d) It organized the Second Preparatory Regional Meeting for UNCSTD in July 1978.

The five subject areas which were selected for specific recommendations for joint development and assistance were food and agriculture; transport and communications; natural resources; industrialization; and human settlement. Detailed studies were carried out for each, and they were presented to the Conference. Specific resolutions were also passed for action at the international, national and regional levels.

The Vienna Programme of Action was formulated on the basis of the studies, recommendations and resolutions made in ECWA and various regions of the world. The preparation for the Conference created an opportunity for countries and regions to assess their situation regarding science, technology and development. The Programme of Action therefore reflected governments' concensus on the best possible course of action by developed and developing countries, as well as by international and non-governmental organizations, for utilizing science and technology for development. It also conforms with the objectives of

the New International Economic Order. The Vienna Programme of Action forms an integral part of the International Development Strategy for the Third United Nations Development Decade.(2)

The programme was designed to focus on three major objectives on which its recommendations were to be based: (i) the strengthening of the scientific and technological capacities of developing countries; (ii) the restructuring of the existing pattern of international scientific and technological relations; and, (iii) the strengthening of the role of the United Nations System in the field of science and technology, including the provision of increased financial resources.

The Vienna Programme of Action recommended that an Operational Plan be formulated for the implementation of the recommendations made at the Vienna Conference. To implement the recommendations of the Vienna Programme of Action in a coherent manner, the Intergovernmental Committee of Science and Technology for Development decided in 1980 that the Operational Plan should be composed of the following eight major programme areas:

1. Scientific and technological policies and plans for development;

2. Creation and strengthening of scientific and technological infrastructure;

3. Choice, acquisition and transfer fo technology;

4. Development of human resources for science and technology;

5. Financing of science and technology for development;

6. Scientific and technological information;

7. Strengthening of research and development in and for developing countries and their linkage to production systems;

8. Strengthening of co-operation in the field of science and technology among developing countries, and between developing and developed countries.

The Operational Plan was approved in 1981 by the Intergovernmental Committee as a framework for further action to be decided by the Committee.

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(2) See General Assembly resolution 34/218 of 19 December 1979.

With a view to assessing progress in its implementation, the Operational Plan envisaged a global Mid-decade Review to be undertaken by the Intergovernmental Committee, a plan subsequently reflected in the 1984-1989 United Nations Medium-Term Plan and approved by the General Assembly. The Mid-decade Review, which will now be conducted by the Intergovernmental Committee on Science and Technology at its seventh session in May/June this year at the U.N. Headquarters in New York, will be based largely on regional inputs. For example, it will include regional reviews of the type now organized jointly by ECWA and the United Nations Centre for Science and Technology for Development.

The preparatory work for the Review report was carried out in four stages.

In the first stage, a comprehensive questionnaire was developed which was structured around the eight programme areas referred to earlier.

In the second stage, a team of three experts was formed, one was a United Nations staff and two were from the region. The countries of the ECWA region were divided into three groups. Each four countries were assigned to one team member. They visited the countries concerned over two months and met a large number of officials in the concerned government departments. Therefore the information for the Review was compiled on the basis of the questionnaire and direct interviews.

In the third stage, a preliminary review report was prepared for each ECWA member*. These reports were sent to the countries prior to the meeting (mentioned in stage four below) for their consideration and comments. The members were asked to send all their suggestions and comments on the report with their representative to the Mid-decade Review Meeting in ECWA Headquarters in Baghdad between 17 and 21 February 1985.

In the final stage, the regional report was prepared on the basis of the preliminary reports and discussions and inputs from the country representatives during the Mid-decade Review meeting referred to above.

In the following, the Mid-decade Review in the ECWA region is conducted on the basis of the objectives set out in the Vienna Programme of Action, and in line with the eight major programme areas referred to above.

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* Excluding Lebanon.

III. DISCUSSION OF THE EIGHT PROGRAMME AREAS OF THE OPERATIONAL PLAN OF THE VIENNA PROGRAMME OF ACTION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

A. Programme Area I: Scientific and technological policies and plans for development

1. Every ECWA member now has development objectives and to attain these objectives a variety of measures have been utilized. Science and technology policies and plans could be very effective tools if well formulated and integrated into development efforts. Scientific policies should be directed to the advancement of scientific knowledge and to the development of technical education and basic research required to support the development process. Technological policies, on the other hand, are concerned more with the application of production processes and techniques in economic activities. They contribute to production and capability building. However, in order to develop indigenous technological capabilities and attain self-reliance science and technology must be considered in an interrelated manner.

2. In the region 1976/77, as table 1 shows, nine out of thirteen countries had national development plans. Column four in the table shows that there were only seven national institutions which were concerned with science and technology policy. Only one country, Egypt, had established a science and technology policy, and four countries were "envisaging" establishing one.

3. Table 2 shows quite a different picture. With the exception of Qatar and the Palestine Liberation Organization, every ECWA country now has national development plans. Although the plans differ in their comprehensiveness and orientation, they are nevertheless linked to central implementation or co-ordination bodies. Moreover, there are now national science and technology policy-making bodies in eleven ECWA members showing a marked improvement over 1976-1977.

4. The institutions responsible for science and technology policy-making in the ECWA region tend to vary. In some countries it is the Ministry of Planning, in others it is the Ministry of Higher Education and Scientific Research Councils or Centres. The latter are usually autonomous bodies often with a president who has the rank of minister, and who is linked directly to the Cabinet.

5. These councils and centres have independent budgets from the government and their responsibility includes the formulation of science and technology policy; co-ordination and management of scientific research; promotion of research; and advising gov-

ernment on technology policy (see table 3). In most of the cases they are also responsible for the follow-up in the application of science and technology to development in the production sectors, and provide advance technology services. Table 4 shows the sectoral scientific research activities which are the concern of the science and technology policy-making bodies in a number of ECWA countries. In many cases they also have a mandate to follow up on development in new fields and frontiers of science and technology (e.g. space, nuclear energy, environment, genetic engineering). They are also responsible for creating favourable conditions for research and development activities at the national level for integrating research and development activities with production, and for following up on issues related to transfer, acquisition and adaptation of technology.

6. Often the councils, or the centres, operate in co-operation with relevant national committees formed for specific purposes (e.g. National Committee for Transfer of Technology).

7. Without any exception the objective of linking national scientific and technological plans and development strategies is well defined in the functions and responsibilities of the centralized policy-making bodies. The autonomous research organizations, such as the Royal Scientific Society in Jordan, the Kuwait Institute for Scientific Research, and the research units attached to the Ministries and universities also state this among their objectives. The indications, however, are that more effort in this respect is needed. This is true although at present more applied research is being undertaken, and there is better research co-ordination between research institutions and the production sectors.

8. Based on available information there appear to be comprehensive technology plans in Egypt and to some extent in Jordan. In many other ECWA countries there are technology plans at sectoral levels.

8(i) In Egypt the Academy of Scientific Research and Technology is responsible for preparing the science and technology plan. The plan is implemented in parallel with the country's development plan. The Academy has a budget and a programme of action. The main emphasis of the plan is on linking research to industry and other production sectors. It emphasizes the role of intermediate bodies such as the Engineering and Industrial Design Development Centre and the Invention and Innovation Development Service. It also stresses adaptive research.

8(ii) In Jordan the Science and Technology Department in the Ministry of Planning draws detailed plans regarding priorities and requirements in the field of science and technology. It also recommends organizational measures to implement them.

These are all included in the 1981-1985 National Development Plan.

8(iii) In Iraq, the implementation of the first five-year plan of the Scientific Research Council is about to end. The plan included 357 research projects. Each research project included assessment of the following: (a) the human and material resources needed for implementation; (b) the agencies involved; (c) the type of technical training needed; (d) the agencies which would benefit from them; and (e) the plan of action for implementation. Iraq has also developed a comprehensive scientific strategy to guide the five year plans. The objectives of the strategy included upgrading scientific research in the productive sectors, adapting products to prevailing conditions; developing infrastructure; and strengthening links between basic research in universities and applied research in the Scientific Research Council and research units in the Ministries.

8(iv) In Syria the State Planning Commission together with the Scientific Studies and Research Centre, and the Supreme Council of Science draw up the technology policy at various sectoral levels. There is a plan to establish a national science and technology body as well as sectoral science and technology plans implicit in the national development plan.

8(v) The Saudi Arabian National Centre for Science and Technology (SANCST) is responsible for drawing up and integrating science and technology plans with the overall development plan. The science and technology plan however is focused on the following sectors: natural resources, marine, health, environment, basic science, housing, energy, outerspace, education and telecommunication.

8(vi) The available information indicates that Bahrain, Kuwait, Oman, Qatar, and United Arab Emirates have a national and regionally co-ordinated science policy, as well as a central agency to monitor it. There are, however, no such indications regarding the existence of plans for science and technology for development in these countries. There are growing signs that the universities as well as some new research centres (for example, the Industrial Development Technical Centre in Qatar and the Bahrain Centre for Studies and Research), are participating in the formulation of science and technology policies. This is noticeable in Qatar, in the United Arab Emirates, Kuwait, and Bahrain. Saudi Arabia has a well conceived technology policy.

9. In the People's Democratic Republic of Yemen, preparations are currently underway to set up an independent national technology policy-making body. Currently the formulation of policies for science and technology is the responsibility of the Ministry of Planning. There are also sectoral plans for science

and technology namely in agriculture, industry, health, education, environment, housing, telecommunications and the basic sciences. The same analysis applies more or less in the Yemen Arab Republic.

10. The Economic Department of the Palestine Liberation Organization is the body responsible for formulating the science and technology policy for the organization. This policy usually covers various sectors. The organization is also considering setting up a separate national science and technology policy making body.

11. The Kuwait Institute for Scientific Research acts as the national science and technology policy-making body in Kuwait. There are also science and technology programmes for specific sectors in Kuwait.

12. Generally, a limited provision is made in the science and technology policies in the ECWA members regarding combining efforts with developing countries outside the region in the field of science and technology for development.

13. There has been noticeable progress regarding scientific and technological publications. However, science and technology statistics are not, generally speaking, easily accessible. In many instances what is available is usually outdated.

14. The content and the comprehensiveness of existing technology policies and the institutional links between them and other development agencies tend to vary. The variation is partly explained by differences in the economic and social systems, natural resources endowments, and objective of the development plans. It is also caused by the degree of experience in the formulation of plans.

Table 1

Development Plan and Science and Technology Policy Institutions in the ECWA Region 1976-77

Country	National Planning Institutions	National Plan	National Science and Technology Institution	National Science and Technology Policy
Bahrain	(Planned)	N.A.	(Planned)	N.A.
Egypt	Ministry of Planning	1976-1980	Academy of Scientific Research and Technology	Exists
Iraq	Planning Board	1976-1980	Foundation for Scientific Research	(Envisaged)
Jordan	National Planning Council	1976-1980	Royal Scientific Society	(Envisaged)
Kuwait	Planning Board	1975-76-1979/80 in draft stage only, not enacted	Kuwait Institute for Scientific Research	N.A.
Lebanon	Ministry of Planning	N.A.	National Council for Scientific Research	N.A.
Oman	Development Council	1976-1980	N.A.	N.A.

Cont'd.

Table 1 (Cont'd)

Country	National Planning Institutions	National Plan	National Science and Technology Institution	National Science and Technology Policy
People's Democratic Republic of Yemen	Ministry of Planning	1974-1978	N.A.	N.A.
Palestine Liberation Organization	N.R.	N.R.	Higher Council for Education and Culture	N.A.
Qatar	N.A.	N.A.	N.A.	N.A.
Saudi Arabia	Central Planning Organization	1976-1980 original plan revised	(Planned)	(Envisaged)
Syria	Ministry of Planning	1976-1980	Supreme Council of Science, New institutions planned	(Envisaged)
United Arab Emirates	National Planning Council	N.A.	N.A.	N.A.
Yemen Arab Republic	Central Planning Organization	1977-1982	N.A.	N.A.

N.A.: Not available
N.R.: Not relevant

Table 2

Development Plan and Science and Technology Policy Institutions in the ECWA Region 1979-1984

Country	National Planning Institutions	National Plan	National Science and Technology Institution	National Science and Technology Policy
Bahrain	Ministry of Development and Industry	1980-1984	Bahrain Centre for Studies and Research	D.E.
Egypt	Ministry of Planning	1981-1985	Academy of Scientific Research and Technology	Exists
Iraq	Planning Board	1980-1984	Scientific Research Council	Exists
Jordan	Ministry of Planning	1981-1985	Ministry of Planning	Exists
Kuwait	Planning Board	1980-1985	Kuwait Institute for Scientific Research	Exists
Lebanon	Ministry of Planning	N.A.	National Council for Scientific Research	Exists
Oman	Development Council	1981-1985	N.A.	Exists

Cont'd.

Table 2 (Cont'd)

Country	National Planning Institutions	National Plan	National Science and Technology Institution	National Science and Technology Policy
People's Democratic Republic of Yemen	Ministry of Planning	1981-1985	N.A.	Exists
Palestine Liberation Organization	D.E.	D.E.	Higher Council for Education and Culture	D.E.
Qatar	D.E.	D.E.	Industrial Development Technical Centre	D.E.
Saudi Arabia	Central Planning Organization	1981-1985	Saudi Arabia National Centre for Science and Technology	Exists
Syria	State Planning Commission	1981-1985	Scientific Studies and Research Centre	Exists
United Arab Emirates	Ministry of Planning	1981-1985	D.E.	D.E.
Yemen Arab Republic	Central Planning Organization	1982-1987	Central Planning Organization	D.E.

D.E.: Does not exist
N.A.: Not available

Table 3

Roles and Functions of Some Science and Technology Institutions in the ECWA Region (1984)

	Medium-Term Planning	Co-ordination of Research & Development	Promotion of Research & Development	Execution of Research & Development	Advise & Consultation Services
Academy of Scientific Research and Technology, Egypt	Yes	Yes	Yes	Yes	Yes
Scientific Research Council, Iraq	Yes	Yes	Yes	Yes	Yes
Science & Technology Department, Jordan	Yes	Yes	Yes	No	No
Royal Scientific Society, Jordan	No	No	No	Yes	Yes
Industrial Development Technical Centre, Qatar	No	No	Yes	Yes	Yes
Saudi Arabia National Centre for Science and Technology	No	Yes	Yes	Yes	Yes
Scientific Studies & Research Centre, Syria	No	No	Yes	No	Yes
Institute for Scientific Research, Kuwait	No	No	Yes	Yes	Yes

Note: Up-to-date information was not available for the ECWA members not mentioned in the table.

Table 4

Policy-making Bodies in Science and Technology in the ECWA REgion 1980-1984

Country	Ministry of Science or Ministerial Science Policy Committee	Science Planning Body	Multi-sectoral Body for Co-ordinating Scientific Research	Sectoral Scientific Research(*)					
				Natural Sciences Research	Agricultural Research including Water	Medical Research	Energy Research	Industrial Research	Environmental Research
Bahrain	D.E.	X	Cabinet	X	X	X	X	X	N.A.
Egypt	X	X	Ministry of Higher Education & Scientific Research	X	X	X	X	X	X
Iraq	X	X	High Committee	X	X	X	X	X	X
Jordan	X	X	Ministry of Planning	X	X	X	X	X	X
Kuwait	N.A.	X	Kuwait Institute for Scientific Research	X	X	X	X	X	N.A.
Lebanon	X	N.A.	Scientific Research Centre	X	X	X	X	X	X
Oman	N.A.	X	Development Board	X	X	D.E.	X	X	X
People's Democratic Republic of Yemen	X	X	Ministry of Planning	X	X	X	X	X	X

Cont'd.

Table 4 (Cont'd)

Country	Ministry of Science or Ministerial Science Policy Committee	Science Planning Body	Multi-sectoral Body for Co-ordinating Scientific Research	Sectoral Scientific Research(*)					
				Natural Sciences Research	Agricultural Research including Water	Medical Research	Energy Research	Industrial Research	Environmental Research
Palestine Liberation Organization	X	X	Higher Council for Education & Culture	X	X	X	N.R.	N.R.	N.R.
Qatar	N.A.	X	Amir's Office & IDTC	X	X	X	X	X	X
Saudi Arabia	X	X	Saudi Arabia National Centre for Science & Technology	X	X	X	X	X	X
Syria	X	X	State Planning Commission	X	X	X	X	X	X
United Arab Emirates	X	X	Cabinet	X	X	X	X	X	X
Yemen Arab Republic	N.A.	X	Central Planning Organization	X	X	X	X	X	N.A.

*There are other specific research activities in each institution which are not included here.

X: Exist, D.E.: Does not exist, N.R.: Not relevant, N.A.: Not available

B. Programme Area II: The creation and strengthening of the the scientific and technological infrastructure

15. The Operational Plan defines the scientific and technological infrastructure (paragraph 108) as the "set of instruction, organizations, facilities, programmes and activities which, in an efficient manner, strengthen the capacity of the developing countries to choose, acquire, generate and apply the resources of science and technology for development". But the institutional infrastructure, according to the Operational Plan, provides only the necessary conditions for the progress of science and technology. In itself it would be not sufficient to attain the development objectives. The sufficiency condition could only be statisfied when parallel development takes place in the following important elements in science and technology infrastructure: policy-making capabilities; education and training institutions; capabilities in drawing up strategies both at the macro-economic and sectoral levels; and capacities at the operational level in research establishments, technical institutes, universities, and science and technology services. It is a fair comment to say that, generally, there has been a noticeable progress in almost all these areas in ECWA countries. However, priorities and the rate of growth in different sectors differed between ECWA countries.

16. It would not be possible to give a detailed picture of the infrastructural development that has taken place. Only an indicative sample can be provided here.

17. There has been a noticeable increase in the number of research institutions as well as research in the universities and in the ministries. The national scientific research councils and centres are now playing a more active role in co-ordinating their own research activities with those in the universities and the public sector. Most of the research units in the ministries carry out work in direct relation to production activities.

18. There has been a considerable increase in research capabilities due to increases in the number of highly qualified personnel who are working in research; in the advanced research facilities now available; and in the number of scientists and engineers involved in research activities.

19. The role of the private sector in research activities has been improving, but it is still minimal. The supply of national engineering and consultancy organizations have not kept pace with this development. As a result, there is still great reliance on foreign expertise in vital management, engineering and organizational services. There has been an apparent shortage of supply in management capabilities, as very little training has

been provided for technology policy-makers. Technology policy research has generally been lacking, and little in-house training was provided for negotiation, organization and decision-making. Urgent policy actions are needed to increase management capabilities and to raise the proportion of women in scientific research, and among university teaching staff. Policy action would also be needed to improve the present lower level of co-operative research activities between the members of the ECWA region and with other advanced developing countires. The overall development in the scientific infrastructure has generally speaking tended to be lop-sided. Corrective measures to improve policy-making and planning would be needed. Thus despite the apparent progress in research facilities and in education and training institutions in science and technology, there is still a need to increase science and technology societies; to expand the dissemination of scientific and technological information; to complete the building of the science and technology infrastructure; to improve the standard of maintenance, particularly in research and development institutes; to enhance communication with the source of science and technology information abroad, within the research institutes and between the latter and the productive activities; and, finally, to increase facilities and opportunities for developing modern management methods.

20. In all the countries reviewed there was a need for building or enhancing data and documentation centres and expanding the operations of standard specification organizations, and patent offices.

C. Programme Area III: The choice, acquisition and transfer of technology

21. In the development of almost all ECWA countries there are now explicit references to technology policy measures and to technology strategy. The development plans in the majority of ECWA countries underline a number of priority areas. The following feature in most of them: energy, industry, agriculture, water resources, health, education, human resources, housing and communication.

22. The rapid economic growth in the region, however, imposed a severe pressure on skilled manpower and management. As a result two phenomenon occured in the region. Among the oil rich countries, which also suffer from labour scarcity, the tendency for importing capital intensive technologies continued, as well as the demand for the necessary advanced expertise and consultancy required for this type of technology. Most of the skilled labour was imported. Turn-key and product in-hand types of contracts were inevitable. The development strategy in these countries was export oriented. There was very little prospect for development local capabilities. Iraq was an exception in

this group. This was due to a number of factors: firstly its long standing experience in the development process; secondly, because of its development strategy, which has followed a balanced growth approach; lastly because of the economic system, which favours public sector activities. Four types of choices were practiced depending on the type of project considered. Egypt, Syria, People's Democratic Republic of Yemen and, to some extent, Jordan all followed some similar arrangement.

23. (a) For a large number of projects in industry, transport, communications, agriculture, and construction, the supplier would draw up, dtails of the project, including methods of production, technological processes, machinery, equipment, erection, installation and methods of implementation, commissioning, etc. Local technical know-how would be involved in preparing the comprehensive contract documents which contain the above-mentioned descriptions, as well as the patents and licenses which would be involved in the transfer process.

(b) For simple projects and those of a recurrent nature, especially in building and construction, the government department concerned would carry out a complete study of the project including its design through its experts or local consulting firms. The role of the local or foreign contractor would be to secure procurement and implementation under the supervision of the department concerned.

(c) The third type of contracts were concerned mainly with projects of very advanced technology (e.g. petrochemical plants and nuclear plants). In this case governments relied on the turn-key method. Only the general conditions for technology transfer were laid down by the authorities. Supplying firms were entirely responsible for other matters. The contracts covered testing of the operation, the organization of the production processes, the training of personnel and the supply of raw meterials.

(d) In the fourth type of technology transfer local capabilities played a large role. Here the technical studies, the design, the engineering and the construction of the project have been carried out by local personnel through the government departments concerned. Often procurement for, and/or erection of the project is left in foreign hands. This type of project included a cross section of projects of all types. In Iraq, for example, this type of contract represented a large proportion of the contracts.

24. In a number of ECWA members, notably Egypt, Jordan, Yemen Arab Republic and, to some extent, the People's Democratic Republic of Yemen, scarcity of investment funds imposed yet another set of considerations in selecting technology. Preference was given to the following projects: Those which, used available natural resources; optimized use of water land and energy; earned foreign exchange; helped to diversify the economy; and to those which utilized available local skills. However, the region desperately lacks national registers of alternative technology advisory services. The technological consultancy services, and exchange of technical information at the regional level.

25. There was a unanimous agreement between those who answered the questionnaire regarding the necessity for establishing a technology transfer centre in the ECWA region, and a fund for regional technology research, as well as establishing links with international centres for transfer of technology.

D. Programme Area IV: The development of human resources for science and technology

26. The Vienna Programme of Action centres this subject around the continuous education, training and utilization of human resources. It also emphasized the infrastructure in education and training needed for strengthening indigenous scientific and technological capabilities. In the ECWA region, as in other developing regions, this consists mainly in building up an adequate supply of qualified personnel at various levels within science and technology fields, particularly scientists, engineers, and technicians. It also involves efficient dissemination of scientific and technological information and stimulating demand for local skills.

27. Table 5 shows that at the beginning of this review period the Arab countries needed to make a lot of progress in the development of their human resources. For example, in 1980 the average percentage expenditure of GNP on research and development in the Arab world was below the average recorded for developing countries, and the share of Arab scientists in the total number of scientists in the world was below the global average. The analysis below shows that there has been tangible progress in the development of the human resources in the ECWA region.

28. In Egypt there has been significant growth in the number of scientists, engineers and technicians. Egypt at the moment is a major supplier of skills to the Arab countries. Target growth figures for science and technology personnel were not obtainable. The estimates in Table 6 show that there are about 500 in the following categories: scientists, technicians and management personnel, and 500 to 1,000 engineers per 100,000 population. Nearly 5 to 10 per cent of the total science and

technology personnel is engaged in research and development. The percentage in production is the same. Women represent a high percentage (20-30 per cent) of the total science and technology personnel.

Egypt offers extensive training facilities to scientists, engineers and technicians from abroad (nearly 1,000 to 5,000). However, only 10 per cent of Egypts' science and technology personnel were trained in developing countries, and a further 10 to 15 in international institutions. The percentage of those locally trained was quite high.

One of Egypts perennial problems is the high rate of immigration of its skilled and highly qualified manpower mainly to the Arab countries. Therefore among the requirements for containing this problem and building the future stock of scientists, technicians and engineers appropriate measures need to be introduced.

29. In Iraq the growth during the previous five years has been substantial. Nearly 5 to 10 per cent of the science and technology personnel was concentrated in research and development, 25 to 30 per cent in teaching, and 50 to 60 per cent in production. Moreover, high growth rates are also planned for scientists, engineers, technicians and management personnel.

Women in Iraq represent nearly 15 to 25 per cent of the science and technology personnel. Iraq encourages recruitment of women in science and technology activities. It also offers high level training facilities to scientists, engineers and technicians in science and technology personnel from the Arab and developing countries.

It is estimated that nearly 30 per cent of the country's science and technology personnel were trained abroad. The ratio tended to be equally distributed between developing countries, developed countries and international institutions. There are, however, strong indications that the local institutions have recently increased their already high percentage contribution to the supply.

30. In Syria, too, target figures for the growth of science and technology personnel were not given. But there are clear signs of marked increases both in the number of scientists, engineers and technicians. It was estimated (see Table 6) that there were between 1,000-5,000 in the categories of scientists, engineers and management personnel, and 5,000 to 10,000 technicians per 100,000 population. Since 1979, the number of science and technology personnel who worked in research increased from 15 to 25 per cent, those in production activities from 50 to 75 per cent. Syria has developed legislation for encouraging employment of women in science and technology activities, but the 15 per cent

of women engaged in these activities is still very low. Syria offers extensive training facilities at home. The percentage of the trained personnel abroad was estimated at 25-35 per cent. Nearly 10 per cent was in developing countries. Syria, however, offers facilities for training scientists, engineers and technicians from abroad for about 500 to 1,000 persons annually.

31. The Palestine Liberation Organization has established growth targets regarding the future size of its scientific, technological, technical and management personnel. Its present scientific and technological personnel stands at 1,000 to 5,000, and 10,000 to 25,000, scientists and engineers respectively. Of there nearly 5 per cent are engaged in research and development, 5 to 15 per cent in production and 75 to 80 per cent in teaching. The percentage of women in the total number of scientific and technological personnel is not known, nor is there specific legislation to recruit more women. But Palestinian Institutes do offer training facilities for scientists, engineers and technicians from abroad although no estimate was available.

32. Nearly 75 per cent of the personnel in science and technology are trained abroad: 50 per cent in developing countries and 25 per cent in developed countries. However, nearly 25 per cent trained in the former immigrate to developed countries.

32. Jordan has a target to increase the number of personnel in the public sector regarding science and technology. It also encourages the private sector in this respect.

The expansion in the number of science and technology institutions and the number of graduates from universities and technical institutes, both at home and abroad, have been impressive. There are clear indications in Jordan that the proportion of students studying medicine, engineering, agriculture and natural sciences at universities have, for the first time, exceeded that of social sciences.

Moreover, the present number of 500 scientists and 500 management personnel, of under 1,000 engineers, and of under 5,000 technicians, per 100,000 population is inadequate to meet development requirements. It is also estimated that only about 5 per cent of science and technology personnel was engaged in research and development, and 20 per cent in production sectors.

The share of women in science and technology personnel is less that 10 per cent. It has been recognized that to increase the supply of science and technology personnel, there is a need for trainers; research facilities; equipment and materials; and funds. Jordan is severely affected by the high rate of emigration of its skilled manpower and highly qualified personnel.

33. Bahrain, Kuwait, Qatar, Oman and UAE did not have explicit targets regarding future increases in science and technology personnel. Nor was it possible to estimate the accurate size of the science and technology personnel. But all the signs are that the number of local engineers, scientists increased considerably.

There was a concensus that nearly 5 to 10 per cent of the science and technology personnel in these countries worked in research and development; and nearly 25-30 per cent in teaching. It was also reckoned that nearly 80 per cent of the science and technology personnel in these countries were trained abroad. A very small percentage was trained at home or in developing countries. Women still represented a very small percentage (5 to 10 per cent) of the total science and technology personnel. The majority of these countries emphasized availability of trained instructors, suitable facilities and sufficient demand to be among the factors most important for future expansion. Bahrain, however, also emphasized policies to prevent immigration.

34. Saudi Arabia has planned to increase the number of scientists, technologists, technicians and management to 2,750, 2,500, 4,500 and 1,500 respectively. In table 6 the present figures for technicians is 1,000, and for the remaining ones 500 per 100,000 population. it is estimated that 15 to 25 per cent of the science and technology personnel worked in research and development, 15 per cent in production, and the rest in teaching. Efforts, however, are being made to redress the balance in favour of research and production.

Only 5 per cent of the science and technology personnel were women. But Saudi Arabia provided training for science and technology personnel from developing countries for 100 to 500 persons annually. The great majority of Saudi science and technology personnel were trained abroad, and only 10 per cent of the total received their training in developing countries and international institutions. The factors emphasized for the future growth of the scientific and technological capabilities were the same as in other Gulf countries.

35. The situation in the two Yemens was less impressive. Although in both countries there has been a marked growth in the number of scientists, engineers, and technicians, the existing number in these skills are well below the two countries requirements. Actual estimates, however, were not available. The two countries are still actively pursuing their plans for adult literacy.

The number of women among the science and technology personnel was put at about 5 per cent. But there are ample signs of increasing involvement by women in economic activities.

It is estimated that nearly 10 to 25 per cent of the science and technology personnel were trained abroad. Those trained in developing countries represented nearly 10 per cent of the total.

In both countries availability of financial resources, physical infrastructure, training instructors and policies to contain immigration of qualified manpower were considered necessary to develop science and technology personnel for the future.

Table 5

Expenditure on R & D and the Number of Scientists in the Arab countries and in other parts of the World, 1980. Percentage

	Arab World	Developing countries	Developed countries	world Total
R & D as Percentage of GNP	0.27	0.43	2.24	1.78
No. of scientists and engineers engaged in R & D as percentage of world total	0.9	10.1	89.0	100

Source: Statistical Yearbook, UNESCO, pp. V-27, 1984.

Table 6

Estimates of Some Indicators of Human Resources Development in the ECWA Members in 1984

(Approximate numbers and percentages)

	No of Management-Personnel	No. of Scientists	No. of Engineers	No. of Technicians	Percentage of Science and Technology Personnel in the following sectors			Percentage of Women in S & T Personnel	Percentage of R & D Personnel Trained	
	per 100,000				R & D	Production Sector	Teaching		Locally	Abroad
Egypt	500	500	500-1000	500-1000	5-10	50-60	25-30	20-30	70-75	20-25
Iraq	n.a.	n.a.	n.a.	n.a.	5-10	50-60	25-30	15-25	70	30
Jordan	500	500	1000	5000	5	20	n.a.	10	n.a.	n.a.
PLO	n.a.	2500	18000	n.a.	5-10	5-15	70-75	n.a.	25	75
Syria	500	500	5000-10,000	500-1000	15-25	50-60	25-30	5-10	65	25-35
Saudi Arabia	500	500	500-1000	1000	15-25	15	55-60	5	10	90
Bahrain, Kuwait, Qatar and UAE	n.a.	n.a.	n.a.	n.a.	5-10	50-60	25-30	5-10	20	80
Democratic Yemen	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	n.a.	10-25
Yemen Arab Republic	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	n.a.	10-25

Source: Based on replies to ECWA questionnaire to a large number of government officials in 1984.

n.a. = Not available.

E. Programme Area V: The financing of science and technology for development

36. In all the ECWA members the source of financing science and technology activities is primarily the government.

In most of the member countries the national budget specifically allocates funds for activities which are related to science and technology, especially at the sectoral level. The usual mechanism for allocation begins by setting up aggregate indicators for major science and technology components. These would be sent to concerned ministries, which in turn prepare a breakdown for the relevant indicators and pass them down to their affiliate institutions (e.g. universities). The affiliate institutions in turn communicate their plans to their parent ministry which co-ordinates and combines them into one programme for consideration by the national planning authorities. In the case of autonomous councils and centres the communication regarding budgeting would be made directly with the cabinet.

37. It was not possible to obtain target estimates for expenditure on research and development in many countries. But it is evident that in the majority of cases most of the research and development activities were internally financed: 75 to 100 per cent came from the public sector. However, there were some exceptions. For example, the Royal Scientific Society in Jordan partly depends on its earning from research activities. Among external financing for research and development the following features in most of the cases: bilateral agreements, United Nations Organizations; international development institutions; foreign enterprises and regional financial institutions. But the assistance given was in most cases far below the mark.

38. In most of the ECWA member countries the incentives tried to encourage local research and development activities included the following: concessional tax duties on imported capital, equipment, material; provision of foreign exchange, high income; and good working conditions; tax exemptions for returns as a reward for research activities; and remuneration for researchers who introduced innovative technology. More internal demand, however, needs to be generated for local research activities.

39. Except for Saudi Arabia, none of the ECWA countries have established an institution to provide risk and venture capital for science and technology activities. Policies to extend credit in support of science and technology activities existed only in a few institutions. In most cases the prime investor was the government.

F. Programme Area VI: Scientific and technological information

40. In almost all ECWA countries the main sources of information are nationalized. This includes television and radio, as well as periodical publications. However, none of these would seem to meet the requirements of national scientific and technological information systems, although they help in the dessimination process.

41. A sectoral information system with a specific science and technology component exists. Facilities (mainly libraries and computer centres) exist in the important sectors. Some countries also underline the importance of the availability and accessibility of data to feed the information system.

42. Most of the ECWA members have not yet developed national scientific and technological information sources to document information on transfer of technology, know-how information, state-of-art-publications, market reports, industrial technology Egypt, Iraq reports, standards, etc. Some countries (notable among them Kuwait and Saudi Arabia) have developed some form of information system in their scientific research councils. While some regional organizations have undertaken activities towards the establishment of information centres, relatively little was done at the national level in the way of establishing information facilities in science and technology, and the training of information specialists.

43. Most of the countries reported that to set up such a system they would need trained managers, trained staff for organizing, processing information, and generating demand.

44. In most of the countries the training programmes that were provided in the development and use of scientific and technological information systems were given mainly by specialized centres (National Statistical Centres), the universities, or research councils.

45. Most of the countries recognized the need for a regional science and technology information centre. They also recognized the importance of being linked to an international science and technology network while a number of countries (for example, Iraq and Saudi Arabia) have bilateral agreements for direct links to international sources of information, most ECWA members have tended to rely to a great extent on the United Nations system for assistance in obtaining information.

6. Programme Area VII: The strenthening of research and development in and for developing countries and their linkage to the production system

46. Most ECWA countries seem to have established policies, and introduced legislation and directives, to provide incentive to indigenous enterprises to build or strengthen their in-house research and development capabilities.

47. Most ECWA countries also have policies, legislation and directives which encourage foreign enterprises to establish and strengthen research and development capabilities in the country.

48. There are also policies, directives, and legislations which provide incentives to national enterprises to contract or use the services of local research and development institutes and universities.

49. Jordan, Kuwait, Qatar, Saudi Arabia and UAE have policies, directives and legislation to provide incentives to foreign enterprises to contract or use the services of local research and development institutes and universities.

50. It is generally agreed that well defined mechanisms to strengthen research and development and related activities, and link them more directly to the needs of the production system, exist only in some ECWA countries. The existing channels between research and development must be expanded and reinforced. It was noted that Egypt and Saudi Arabia had in their systems such set ups as research associations and institutes for small and medium enterprises which acted to strengthen the linkage referred to.

51. All those who answered the questionnaires agreed that the present mechanisms need improvement. The following policy actions have been suggested: (1) to establish or strengthen linkages between researchers and economic activities; (2) the formulation of national policies to encourage and protect the development of local technology; (3) the generation of demand for local research; (4) incentives for researchers to develop technologies for the local market; and (5) financial support for demonstration and pilot projects.

52. Local consulting engineering design organizations in their respective countries were not sufficient. The policy actions suggested to develop such organizations included: incentives to use consulting engineering services: a changed attitude in preferential use of expertise from foreign countries; the training of sufficient numbers of engineers and consultants. With the exception of Bahrain, UAE and the two Yemens, the ECWA countries have consulting capabilities which are available to industry.

There are also special programmes at the universities to orient scientists and engineers towards the research and development needs of enterprises.

53. Except for the PLO, there is a general agreement that scientists and engineers in the ECWA countries do have access to special training programmes for the management of science and technology. More often the main source has been bilateral programmes with developed and developing countries, and the United Nations System. The provision, however, has not been very adequate.

54. There are facilities to assist traditional technologies in the form of testing and quality control, and standardization. Limited facilities were also provided in design and engineering services, but there is scope for improvement in this regard. Textiles, agricultural products and marine resources were considered areas of great potential.

55. The overall picture regarding development of incentives for promotion of domestic research and development; development of mechanisms for linking research; development to the production system; and development of consulting engineering organization, is that there has been noticeable progress. The rate of progress, however, tended to differ between the three variables although they are all still in need of greater support in the region.

H. Programme Area VIII: The strengthening of co-operation in the field of science and technology among developing countries and between developing and developed countries

56. An institutional framework for co-operation in the field of science and technology exists in almost all ECWA members. In a number of them specific organizations have been assigned to co-ordinate co-operation activities.

57. Most ECWA countries have concluded a number of bilateral agreements with developed and developing countries. Accurate information was not obtainable regarding the numbers although the areas of co-operation seem to have been well identified. Although the list of the areas of co-operation tend to differ from one country to another, there are frequent references to energy, mineral research, petroleum research, environment, management and water resources.

58. Excluding the People's Democratic Republic of Yemen, Yemen Arab Republic and the Palestine Liberation Organization, the rest of the members in the region provide limited assistance in the shape of education, training and use of research facilities and specialized courses for people from outside the region.

59. Co-operative research in the field of science and technology has taken place between the ECWA members, but more is needed. There are indications that co-operation has taken place in the region regarding experimental development, and demonstration projects. Most of regional co-operation outside research has in fact been in technical and financial assistance. The former is provided through bilateral arrangements and the Arab League Organization and the latter through national and regional development funds and joint Arab ventures.

60. There is, however, a concensus in the questionnaire that future co-operation in the field of science and technology should specifically include the following:

(a) Regional science and technology information;

(b) Solar energy;

(c) Petroleum studies;

(d) Food technology and bio-engineering;

(e) Minerals research;

(f) Medical and pharmacological industry;

(g) Communication and electronics; and

(h) Environmental and meteorological research.

IV. CONCLUSIONS AND RECOMMENDATIONS

61. The Meeting, having carefully reviewed the implementation of the Vienna Programme of Action in the eight programme areas in science and technology for development, submits the following conclusions and recommendations.

62. The Meeting wished to stress that this review dealt only with national and regional activities in the field of science and technology for development.

63. The Meeting noted that progress had been made in varying degrees in the ECWA region in the implementation of the Vienna Programme of Action. It felt at the same time that efforts should be continued at the national level to implement programmes aimed at the development of their indigenous capacities in science and technology. It also felt that more assistance should be given by international organizations to ECWA countries to strengthen their indigenous capcities through consultancy, expertise, organizational support, training and information. The members of ECWA should also make greater effort to utilize the facilities provided by the United Nations Organizations.

A. Scientific and technological policies and plans for development

64. The Meeting noted that a number of members had established science and technology policy-making bodies. Nevertheless, for members that have not done so more determined efforts are needed to set up such bodies to enable them to formulate science and technology policies, utilizing where feasible relevant experience of other developing countries, as well as assistance from international organizations. Even in countries in which science and technology institutions exist, science and technology plans should be fully integrated into the economic and social development plans.

65. To facilitate the assessment of the impact of science and technology on development, methodologies for assessment, including main indicators, would need to be developed to facilitate monitoring and evaluating the progress in the field of science and technology.

B. Creation and strengthening of scientific and technological infrastructure

66. Noticeable progress has been made in the development of the physical aspects of science and technology infrastructure. However, while the progress should be continued and supported, the quality and the coverage of the output of the existing infrastructure should be further improved. In this connection, the

role of the specialized institutes in the university, vocational training centres, maintenance centres and laboratories should be enhanced, supported and improved.

C. The choice, acquistion and transfer of technology

67. Also in this area some progress has been noted. There is a need at the same time for further efforts to strengthen the capacity of ECWA members in the choice, acquisition and trasfer of technology. There is a need, in particular, for establishing national registers of alternative technology, advisory and technological consultancy services and exchange of information on technology negotiations. At the regional level, it is felt that an appropriate mechanism should be introduced to assist in the process of choice, acquisition and transfer of technology.

D. Development of human resources for science and technology

68. Considerable progress has been made in the development of human resources for science and technology in the region. However, more emphasis should be placed on training of highly qualified personnel (e.g. scientists, engineers and technicians). Effective policies should be implemented and incentives provided to reduce the flow of highly qualified personnel abroad (brain drain). The present trend for enhancing the participation of women in science and technology should be continued.

E. Financing science and technology for development

69. Science and technology activities in the region are supported mostly by the public sector (75-100 per cent). Nevertheless, it is believed that full integration of science and technology in social and economic development would require sufficient allocation and utilization of appropriate funding. Efforts should be make to benefit from the experience of countries that have successfully introduced incentives in funding science and technology.

F. Scienctific and technological information

70. The need clearly exists for the creation and/or strengthening of national information centres as a prerequisite for establishing a regional information network. In this regard, emphasis should be given to study programmes at the university level relevant to the operation and management of such information centres.

G. Strengthening of research and development and its linkage to the production sector

71. To establish and strengthen the mechanism for linking the research and development activities to the production sector,

the following has been considered essential: (1) National policies to encourage and protect the development of local technology; (2) Generation of demand for local research activities; (3) Incentives for researchers to develop technology for the market; and, (4) Financial support for demonstration pilot projects.

H. Strengthening co-operation in the field of science and technology

72. In addition to the suggestions made under the previous seven major programme areas, co-operation in the field of science and technology in the ECWA region should include, inter alia

Energy;
Food;
Frontier technologies (as appropriate)

with the aim of establishing relevant specialized centres in the region.

73. In light of the above, and taking into account that the development of science and technology capacity is a continuous process, a review of progress in the implementation of the Vienna Programme of Action should be held continuously at appropriate intervals in the future.

74. To facilitate such a review towards the end of the decade as may be decided by the Intergovernmental Committee on Science and Technology for Development, the Meeting recommends that, in line with the other Regional Commissions, ECWA undertake the necessary preparatory work for the region's end-of-decade review to assist ECWA members in an effective participation in the regional and the global review on the implementation of the Vienna Programme of Action on Science and Technology for Development.