UNITED NATIONS
ECONOMIC AND SOCIAL COMMISSION
FOR WESTERN ASIA
(ESCWA)

JOINT ESCWA/UNIDO/HCST WORKSHOP

Report of the

WORKSHOP ON THE INTEGRATION OF SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT PLANNING AND MANAGEMENT PROCESS

CO-SPONSORED BY

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO),

THE HIGHER COUNCIL OF SCIENCE AND TECHNOLOGY (HCST),

ISLAMIC FOUNDATION FOR SCIENCE, TECHNOLOGY AND DEVELOPMENT (IFSTAD),

Held at the Premises of the

ROYAL SCIENTIFIC SOCIETY
AMMAN

27-30 SEPTEMBER 1993

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REPORT OF THE WORKSHOP

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UNITED NATIONS
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NATURAL RESOURCES SCIENCE AND TECHNOLOGY DIVISION
WORKSHOP ON THE INTEGRATION OF SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT PLANNING AND MANAGEMENT PROCESS IN THE ESCWA REGION
(AMMAN, 27-30 SEPTEMBER 1993)

I. (Agenda of the Workshop)

DAY -1- Monday 27 September 1993

PLENARY SESSION - 1

TIME	EVENTS
09:00 - 10:00	REGISTRATION
10:00 - 11:00	**OPENING SESSION:** - Statement by: Dr. Hani Al-Mulki, the Secretary General of the Higher Council for Science and Technology (HCST), Amman. - Mr. Sabah Bakjaji, United Nations Economic and Social Commission for Western Asia (UN-ESCWA), Executive Secretary of UN-ESCWA and Under-Secretary-General of the United Nations. - Mr. Recardo Seidl da Fonseca, on behalf of Mr. K. Venkataraman, UNIDO, Director Technology Development and Promotion Division. - UN-ESCWA Secretariat, Natural Resources Science and Technology Division, OIC, Mr. Mundhir Abdul Salam. - UN-ESCWA, Science and Technology Sub-programme, Senior Officer, Mr. Zeki Fattah.
11:00 - 11:30	**Coffee Break**

Morning Session/Continue

11:30 - 12:30	**SCIENCE, TECHNOLOGY AND DEVELOPMENT IN THE 1990s: A Time for Radical Change in the Dominant Approaches to Policy in the Third World Countries.** Mr. Martin Bell Science Policy Research Unit (SPRU), Sussex University, England.
12:30 - 13:00	**Discussion of Mr. Bell's paper**
13:00 - 14:30	**Lunch Break**

Afternoon Session

Country Studies

14:30 - 15:00	**INTEGRATION OF SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT PLANNING AND MANAGEMENT IN THE ESCWA REGION.** Professor Antoine B. Zahlan Consultant, England.
15:00 - 15:30	**Discussion of Professor Zahlan's paper.**
15:30 - 16:00	**Case Studies from Egypt** **A Case Study on:** **NATIONAL SYSTEMS FOR PRODUCTIVE RESEARCH AND DEVELOPMENT MANAGEMENT.** Dr. Ahmed Samih El-Nockrashy Executive Director, STC Programme, Academy of Scientific Research and Technology, Cairo, Egypt.
16:00 - 16:20	**Coffee Break**
16:20 - 16:40	**Discussion of Dr. El-Nockrashy's paper.**

16:40 - 17:00	**TECHNO-ECONOMIC ASSESSMENT OF DOMESTIC RESOURCES: A Model of Inter-action Between Research and Development Institute and Industry.** Dr. Adel Kamal Ismail Central Metallurgical Research and Development Institute, Cairo, Egypt.
17:00 - 17:20	**Discussion of Dr. Ismail's paper.**
17:20 - 17:40	**TECHNOLOGY TRANSFER OF EFFICIENT AND LOW-COST DOMESTIC WASTE WATER SYSTEM IN EGYPT: A Case study for Marketing Local Innovation.** Dr. Ahmed Fadel Ashry Head of Public Works Department, Faculty of Engineering, Mansoura University, Egypt.
17:40 - 18:00	**Discussion of Dr. Ashry's paper.**

DAY -2- Tuesday 28 September 1993

PLENARY SESSION - 2

Morning Session

09:00 - 10:30	**INTEGRATING R AND D WITH INDUSTRIAL PRODUCTION AND TECHNICAL CHANGE: Strengthening Linkages & Changing Structures.** Mr. Martin Bell Science Policy Research Unit (SPRU), Sussex University, United Kingdom.
10:30 - 11:00	**Coffee Break**
11:00 - 12:00	**CHALLENGES FOR INDUSTRIAL TECHNOLOGY POLICY IN THE ESCWA REGION IN THE 1990s: Integrating the Acquisition of Imported Technology with the continuous Technological Dynamism of Industry.** Mr. Martin Bell.

12:00 - 12:30	**Discussion of the two papers presented by Mr. Martin Bell.**
12:30 - 13:30	**THE ROLE OF TECHNOLOGY TRANSFER IN THE DEVELOPMENT PROCESS - EMERGING TRENDS AND ISSUES.** Mr. Carlos Correa and Mr. Branko Vukmir UNIDO Consultants made a brief presentation on the above.
13:30 - 15:00	**Lunch Break.**
	Afternoon Session
15:00 - 15:30	**Country Studies from Egypt/Continued**
	THE ROLE OF R AND D IN LOCAL PRODUCTION OF SPARE PARTS. Dr. Adel A. Nofal Head of Metal Forming Department, Central Metallurgical R&D Institute (CMRDI), Cairo, Egypt.
15:30 - 15:45	**Discussion of Mr. Nofal's paper.**
	Case Studies from Jordan
15:45 - 16:00	**UNIVERSITY PROGRAMMES THROUGH APPLIED SCIENCE CURRICULA.** Professor G. S. Hassawy and B. Abu-Ghazaleh. Applied Science University, Jordan
16:00 - 16:15	**Discussion of Professor Hassawy's paper.**
16:15 - 16:30	**Coffee Break.**

16:30 - 17:00	**EXPERIENCES IN INTEGRATING SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT PROCESS: A Case Study of the Electricity and Cement Industries in Jordan.** Dr. Hisham Khatib Consultant, ex-Minister of Energy in Jordan, and Mr. Hatim Al-Hilwani, Director, Cement Factory, Amman, Jordan.
17:00 - 17:15	**Discussion of Mr. Khatib and Mr. Al-Hilwani's paper.**
17:15 - 17:30	**AN EFFECTIVE FORUM TO INTEGRATE SCIENCE AND TECHNOLOGY INTO THE DEVELOPMENT PROCESS.** Dr. Fawaz El-Karmi Director, Energy Sector, Higher Council for Science and Technology, Jordan.
17:35 - 17:40	**Discussion of Dr. El-Karmi's paper.**
17:40 - 18:00	**THE ROLE OF SCIENCE AND TECHNOLOGY IN INDUSTRIAL DEVELOPMENT: The Case of Jordan.** Dr. M. I. T. Ali Shahateet Head, Industrial Studies, Complementary Technical, Training and Industrial Studies Centre, Royal Scientific Society, Amman, Jordan.
18:00 - 18:15	**Discussion of Mr. Shahateet's paper.**

DAY -3- Wednesday 29 September 1993

PLENARY SESSION - 3

Morning Session

09:00 - 10:30	**TECHNOLOGY-INTEGRATED PLANNING (Part One)** Professor Nawaz Sharif Asian Institute of Management, Bangkok, Thailand.

10:30 - 11:00	**Coffee Break.**
11:00 - 12:00	**TECHNOLOGY-INTEGRATED PLANNING (Part Two)** Professor Nawaz Sharif.
12:00 - 13:00	**Discussion of Professor Sharif's papers.**
13:00 - 14:30	**Lunch Break.**
	<u>Afternoon Session</u>
	Case Studies from Syria, Lebanon and Iraq.
14:30 - 15:00	**TECHNOLOGY-BASED INSTITUTION INVOLVED IN THE PROMOTION OF NATIONAL DEVELOPMENT: The Case of the Syrian Scientific Studies and Research Centre (SSRC).** Dr. Amr Armanazi Director, Electronics Institute, Scientific Studies and Research Centre, Damascus, Syria.
15:00 - 15:15	**Discussion of Mr. Armanazi's paper.**
15:15 - 15:30	**STATUS AND PROSPECTS OF SCIENCE AND TECHNOLOGY IN THE REPUBLIC OF YEMEN.** Dr. M. L. Al-Eryani Under-Secretary-General, Scientific Research. Professor A. S. Babaqi Dean, Faculty of Graduates Studies and Scientific Research, Sana'a, Republic of Yemen.
15:30 - 15:40	**Discussion of Dr. Al-Eryani and Mr. Babaqi's paper.**

15:40 - 16:00	**TRENDS IN TECHNOLOGICAL DEVELOPMENT IN IRAQ.** Mr. Sami A. Rahim Head, Heavy Industry Department, Industrial Planning Commission, Ministry of Planning, Iraq.
16:00 - 16:15	**Discussion of Mr. Rahim's paper.**

Meeting of two Technical Committees Commenced

ROUND TABLE COMMITTEE MEETINGS:

16:15 - 17:00	**COMMITTEE ONE: International Issues and Relevance to ESCWA Countries:** **Committee Members:** Mr. Martin Bell, Mr. Nawaz Sharif, Mr. Carlos Correa, Mr. Recardo da Fonseca, Mr. Branko Vukmir and Mr. Zeki Fattah. **COMMITTEE TWO: Regional Issues:** **Committee Members:** Mr. El-Nockrashy, Mr. Derwish, Mr. Jalal, Mr. Al-Madfai, Mr. Armanazi, Mr. El-Karmi, Mr. Shahateet and Mr. Omar Bizri. **COMMITTEE Co-ordination:** Mr. Antoine Zahlan.
17:00 - 18:00	Finalization of the recommendations and policy directives suggested by the Committees.

DAY -4- Thursday 30 September 1993

PLENARY SESSION - 4

Morning Session

09:00 - 10:30	**NEGOTIATING TECHNIQUES AND STRATEGIES** Dr. Branko Vukmir UNIDO Consultant.
10:30 - 11:00	**Coffee Break.**
11:00 - 12:30	**STRUCTURE AND TYPES OF TECHNOLOGY TRANSFER AGREEMENT.** Dr. Carlos Correa UNIDO Consultant.
12:30 - 13:00	**Discussion of the presentations made by Messrs/ Vukmir and Correa.**
13:00 - 14:30	**Lunch Break.**

Afternoon Session

14:30 - 15:30	**PRINCIPLES OF CONTRACT DRAFTING.** Dr. Branko Vukmir
15:30 - 16:00	**Discussion of Mr. Vukmir's presentation.**
16:00 - 16:30	**Coffee Break.**
16:30 - 17:30	**EVALUATION OF TECHNOLOGY AND PAYMENTS IN TECHNOLOGY TRANSFER AGREEMENTS.** Dr. Carlos Correa.
17:30 - 18:00	**Discussion of Mr. Correa's paper.**

CLOSING SESSION

II. REPORT OF THE WORKSHOP ON THE INTEGRATION OF SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT AND MANAGEMENT PROCESS IN THE ESCWA REGION

Amman, Jordan (27-30 September 1993)

(A) Introduction

This workshop is part of the Science and Technology work programme for the biennium 1992-1993. It was implemented in close cooperation with the United Nations Industrial Development Organization (UNIDO), the Higher Council for Science and Technology (HCST) in Jordan, and the Islamic Foundation for Science, Technology and Development (IFSTAD). The workshop also substantively benefitted from the discussions held with UNESCO's Regional Office for Science and Technology in the Arab States (ROSTAS). The substantive material for the workshop was developed by ESCWA, UNIDO, consultants from the Science Policy Research Unit at the University of Sussex (SPRU) in the United Kingdom, the Asian Business School in Bangkok and through contributions by a number of regional and national experts who prepared inputs for the workshop, as shown below.

Altogether thirty five high-level participants from ten ESCWA countries, and representatives from several Arab regional organizations concerned with science and technology attended the workshop. The consultants came from five different countries outside the region. Most of the participants also prepared inputs in line with the terms of reference developed by the ESCWA Secretariat for discussions in the workshop. They addressed issues and problems relevant to their particular countries.

(B) Organizational Cosponsorship

The Arab Area Programme and the Technology Negotiation and Acquisition Unit in the Technology Development and Promotion Division in UNIDO worked with ESCWA on this workshop from its inception. UNIDO took charge of developing the material for the part concerned with technology negotiation and acquisition and for its presentation in the workshop. It also substantively and financially supported the development of the workshop material related to technology management and integration in the development planning process. UNIDO staff also actively

participated with ESCWA staff in running the workshop. The Higher Council for Science and Technology in Jordan provided all the required logistic support to convene the workshop. Its technical staff contributed studies and made valuable contribution to the discussions in the workshop. The Islamic Foundation for Science, Technology and Development supported one of the case studies developed for Egypt and covered the cost of one participant in the workshop. The workshop was held for four days in the premises of the Royal Scientific Society in Amman.

(C) Objective of the Workshop

The workshop aimed at introducing decision-makers in various institutions concerned with the application of science and technology in the development planning process to:

- Effective technology management and methods of strengthening the links between the process of technology transfer and development of local technological capabilities;

- Managing technical changes, and identifying instruments, mechanisms and institutions concerned with formulating technology policy;

- Integrating technology in the development planning process; and

- Methods of technology negotiations and acquisitions.

A number of case studies were developed reflecting the experience of the member countries under each of the issues addressed. These case studies helped to highlight the nature of the problems faced in the region and the type of solutions needed. The title of the case studies, and the authors are mentioned in the section under: "papers presented to the workshop" in this report. The institutions to which they belonged are mentioned below.

- **National Institutions**

Ten national institutions from the ESCWA member countries presented case studies to the workshop. They included:

1. Academy of Scientific Research and Technology in Egypt,

2. Central Metallurgical Research and Development Institute (CMRDI) in Egypt,
3. Faculty of Engineering at Mansoura University in Egypt,
4. The Electricity and Cement Industries in Jordan,
5. The Royal Scientific Society in Jordan,
6. Applied Science University in Jordan,
7. The Higher Council for Science and Technology in Jordan,
8. Scientific Studies and Research Centre in Syria,
9. Department of Heavy Industries, Industrial Planning Commission, Ministry of Planning, Iraq.
10. Faculty of Graduate Studies and Scientific Research, Sanaa, Yemen.

- **International Institutions**

The substantive material for the workshop was designed jointly by ESCWA Science and Technology Programme and the Technology Negotiation and Acquisition Unit in UNIDO. Consultants from four international institutions assisted in developing the material and presenting it in the workshop. These included in addition to the consultants from SPRU and the Asian Business School, which have already been referred to above, two consultants, Dr. Carlos Maria Correa, Director of post graduate studies, science and technology, policy and management centre of Advanced Studies, University of Buenos Aires, Argentina, and Dr. Branko Vukmir, a private consultant in international business transactions, technology transfer and foreign investments and engineering contracts. The contributions of both consultants in the workshop was supported by UNIDO.

(D) Preparation of the Substantive Material of the Workshop

The substantive material of the workshop was composed of two categories. The first related to issues concerning management and integration of technology in the development planning process. The second related to technology negotiation and acquisition. The material dealing with the issues of management and integration was in turn composed of two categories. The first related to the most recent development on the frontiers of knowledge about the subject both in developed and developing countries. The second related to the experiences of the ESCWA member countries in the management and integration of science and technology in the development and planning process. The national institutions which cooperated in developing the case studies have already been mentioned.

(E) Main Issues of Discussion in the Workshop

1. Mr. Martin Bell, the consultant from SPRU presented two papers in three sessions. In the first paper entitled "Science, Technology and Development in the 1990s: A Time for Radical Change in the Dominant Approaches to Policy in the Third World Countries", he maintains that the main institutional and intellectual framework for science and technology policy, inherited from the 1960s and 1970s, in most of the countries in the region, may be inappropriate for the 1990s. Dominant features of the patterns and processes of technological change, particularly with respect to industry, which have become increasingly evident during the 1980s, call for new approaches that focus on (i) the continuous nature of technical change, (ii) the central role of production enterprises in generating it, and (iii) the pervasive accumulation of technological capabilities that they must draw on. The paper concludes by inquiring about the implications of these issues for the approaches to industrial technology policy in the ESCWA region.

2. In the second paper, entitled: "Integrating R and D with Industrial Production and Technical Change: Strengthening Linkages and Changing Structures", Mr. Martin Bell argues that with the new perception and new realities of technological change emerging during the 1980s, several industrializing countries are exploring new approaches to the integration of industrial R and D and production. These approaches centre less on improving the links between R and D institutions and industrial firms and more on changing the structural characteristics of both. He also examines whether or not these approaches are relevant in the ESCWA region.

3. Martin Bell then examines, in the context of the 1990s, the central strategic issue in managing the acquisition of imported technology. He argues that this central issue should be to ensure that the acquisition of imported technology must be built into a domestic trajectory of competitive technological dynamism. This, he further explains, requires management of the interaction between technology acquisition and local technological learning before, during and after the technology acquisition itself. The essential elements of host country policies and institutional framework for acquisition of foreign technology was also discussed, by Mr. Martin Bell.

4. The Role of Technology Transfer in the Development Process: Emerging Trends and Issues. Under this topic the two presenters Messrs Carlos Correa and Branko Vukmir describe the general interrelationships between technology transfer and development; the impact of imported

technology on building local technological capabilities; maximizing potential contributions to economic development and the emerging trends and issues. They also discuss the essential elements in policies and institutional framework for acquisition of foreign technology by host countries.

5. Technology-Integrated Planning. In the two part paper on this subject Mr. Nawaz Sharif suggests that the world is now witnessing a new technological order; and that many of the concerns and difficulties in developing countries are common. The paper also argues that technology is a continuously changing human-made resource used for competitive enterprises embodied in different forms and degrees of sophistication. The advancement of technological capabilities, he argues, is an endless process of accumulating experiences, therefore, the progression of the technology strategy is an essential prerequisite for international market competition.

6. In part two, the paper explains why and how building the technology infrastructure is imperative for promoting innovation by small and medium scale enterprises in developing countries; and that the dynamism and the success of technological innovation efforts is determined by the technology climate of a country. He underlines the importance of identifying technology needs from the point of view of both self-reliance and sustainable development. Finally, he discusses how the integration of technological consideration in planning requires a set of measurable indicators and technology management information system.

7. Mr. Branko Vukmir in the two presentations he made in the final day of the workshop, discussed in the first, negotiation techniques and strategies. He covered in detail the pre-negotiation stage, analysis of information required for negotiation, the process of selecting members of the negotiation teams, the steps in preparing for negotiations, the organizational aspects of negotiations, the objectives of negotiations and tactics and strategy, and techniques of negotiations. In the second presentation he covered the principles of contract drafting, and discussed the basic principles of laws concerning contracts, the obligations of parties to a contract, the role of contract in the technology transfer process, the people who should draft contracts and problems of definition.

8. Mr. Carlos Correa also made two presentations. In the first; entitled "Structure and Types of the Technology Transfer Agreements", he addressed the subject of contract as a legal entity, the general structure of a contract, and the different types of technology transfer agreements. He also

described the checklist to be used for contractual clauses and how the content and implications of different contractual changes should be studied.

9. In the second presentation, he concentrated on the evaluation of technology and payments in technology transfer agreements. The discussion concentrated on assessing the appropriateness of technology, technology transfer and product life cycle, risk appraisals, the technology selection process; quantitative approaches to technology selection, the issue of technology complexity. An experimental model was presented to the workshop dealing with various forms of payment, value and price of technology-problems, methods of evaluation, methods of license fee payments including indirect payments, selection of methods and duration of payment and legal regulations that control them.

10. Finally, Professor Zahlan in a paper entitled "The Integration of Science and Technology into Development Planning in the ESCWA Region" dealt with five major aspects of this subject, namely the place of science and technology in development planning, using the example of Jordan; the integration of education, manpower and work in the planning process; the strategic role played by consulting and contracting firms; the externalization in the region of the industry related science and technology services; and the integration of the science and technology aspects in project negotiations.

III. WORKSHOP RECOMMENDATIONS

(F) Technology Management of Investment Projects

The participants; noting that ESCWA countries are moving towards a liberalized; market-oriented economy; in a world witnessing a diversification of investment patterns and accelerating technological change; stressed that while some progress has been made in building technological capabilities, there is still a strong need to:

(a) share experiences acquired in technology management in order to develop local capabilities;

(b) integrate investment projects with technological capabilities;

(c) improve the performance of acquired facilities and the implementation of subsequent investments through the application of accumulated capabilities;

(d) provide mechanisms for the creation of new enterprises.

Also; noting the high quality of the material produced for the workshop, they recommended that ESCWA; alone or in cooperation with UNIDO and other national, regional and international organizations, mobilize the necessary technical expertise to assist ESCWA member countries to meet the above mentioned objectives.

(G) Regional Cooperation in Science and Technology

The participants noted that regional cooperation could facilitate the processes of technology transfer, technology development, and formulation of effective technology policies and strategies.

The cooperation should, therefore, include building specialized networks to enhance regional cooperation in:

- formulating science and technology policy, research and development, training in various areas of science and technology especially in such relevant areas as water management, the environment and developing competitive advantages in production.

It was, therefore, recommended that ESCWA; alone or in cooperation with UNIDO and other national, regional and international organizations, mobilize the necessary technical expertise to assist the ESCWA member countries to achieve these objectives.

(H) The Development of S&T Information Systems

The participants agreed that sound science and technology information systems (STMIS) are essential to all technological transactions and operations. Such systems should encompass the collection, collation and dissemination of information about S&T institutions, policies, activities, and resources (including institutional and manpower resources) in the region. This information should be compiled according to internationally accepted definitions and specifications such as the Frascati Manual.

It was recommended that ESCWA in response to the above-mentioned requirements of the countries of the region for STMIS, should endeavour to provide the necessary advisory technical services and to mobilize existing systems, such as UNIDO's "INTIB", "TECHMART" and other similar systems in the service of the region.

(I) The Development of Human Resources

The participants emphasized the crucial role played by highly specialized manpower in the following areas: (i) technology transfer negotiations; (ii) technology forecasting and assessment; (iii) technology policies and strategies; (iv) R&D Management; (v) technology management; (vi) quality control, labour and capital productivity.

It was, therefore, recommended that ESCWA; alone or in cooperation with UNIDO and other national, regional and international organizations, mobilize the necessary technical expertise to assist ESCWA member countries to achieve the above-mentioned objectives.

(J) Future Studies, Seminars and Training Courses

In order to capitalize on the expertise, relating to the integration of S&T in development, available in the countries of the region, it is necessary to initiate studies and hold workshops, seminars and training courses covering the following topics:

Studies:

1. An investigation of the specific policies and mechanisms aimed at S&T capacity building related to:

(a) the region's major problems, e.g. water, environmental pollution, desertification,...
(b) the economic competitiveness of the member countries in the region.

2. Study of specific cases of S&T development in the region, including organizational, institutional and networking developments.

3. Study of the impact of the intellectual property system and technology transfer practices upon technological development in the member countries in the region.

The participants also recommended the following topics for future seminars, workshops and expert-group meetings in the region:

Seminars and Training Activities:

- Technology, Invention, Innovation, Choice, and Socio-Economic Constraints.

- S&T Curricula in the Universities, Technical and Secondary Schools (especially on the subjects indicated under issue IV).

- Assessment of science and technology policies and activities in the region.

- Assessment of constraints and solutions for problems facing S&T development.

- The role of governments in the development and harmonization of the public and private sectors' activities in S&T.

- Development of support systems for decision making in S&T activities.

- Innovative schemes for investment projects and technological change, e.g. the BOT scheme.

- High-level training activities in areas such as:

  Technology Negotiation and Technology Transfer.
  R&D management and evaluation.
  The linkages between R&D institutions and users.

List of Papers and Case Studies submitted to the Workshop on Integration of Science & Technology in the Development Planning Process
27 - 30 September, 1993
Amman - Jordan

1	**Technological Accumulation and Industrial Growth: Contracts Between Developed and Developing Countries**	**Martin Bell & Keith Pavit** Science Policy Research Unit University of Sussex, Brighton U.K.
2	**Challenges for Industrial Technology Policy in the ESCWA Region in the 1990s**	**R. Martin Bell** Science Policy Research Unit University of Sussex, Brighton U.K.
3	**Integrating R&D With Industrial Production & Technical Change: Strengthening Linkages & Changing Structures**	**R. Martin Bell** Science Policy Research Unit University of Sussex, Brighton U.K.
4	**A Framework for Technology-Integrated Development Planning**	**Nawaz Sharif** Prof., School of Management Asian Institute of technology Thailand
5	**The Integration of Science & Technology into Development Planning**	**A. B. Zahlan** Cocsultant U.K.

6	**A Case Study on National System for Productive R&D Management**	**Prof. Dr. A. S. El-Nockrashy** Executive Director Academy of Scientific Research & Technology Egypt
7	**Techno-Economic Assessment of Domestic Resources A Model of Interaction Between R&D Institute & Industry**	**Prof. Dr. A. K. Ismail** Central Metallurgical R&D Institute (CMRDI) Egypt
8	**Technology Transfer of Efficient & Low Cost Domestic Waste Water System In Egypt**	**Dr. Ahmed Fadel Ashry** Head of Public WorksDept. Faculty of Eng., Mansoura University Egypt
9	**Role of R&D in Local Production of Spare Parts**	**Prof. Dr. Adel A. Nofal** Head of Metal Forming Dept. Central Metallurgical R&D Institute (CMRDI) Egypt
10	**The Integration of Science & Technology for the Development of University Programmes Through Applied Science Curricula**	**G.S. Hassawi & B. Abu-Ghazaleh** Applied Science University Jordan
11	**Experiences in Integration of Science & Technology in the Development Process (A Case Study of the Electricity & Cement Sectors)**	**Dr. Hisham Khatib** Consultant Jordan
12	**The Role of Science & Technology in Industrial Development: The Case of Jordan**	**Dr. M. Shahateet** Head of Industrial Studies Comp. Tech. Training & Ind. Studies Centre, RSS Jordan

13	**An Effective Forum to Integrate S & T Into The Development Process**	**Dr. Fawaz Elkarmi** Director, Energy Sector Higher Council for Science & Technology
14	**Case Study of the Syrian Scientific Studies & Research Center as a Technology-Based Institution Involved in the Promotion of National Development**	**Dr. Amr Armanazi** Director, Electronics Institute Scientific Studies & Research Center Syria
15	**Science & Technology in the Republic of Yemen: Status & Prospects**	**Dr. M. L. Al-Eryani (1) & Prof. A. S. Babaqi(2)** (1) Deputy Minister, Scientific Research (2) Dean, Faculty of Grad. Studies & Sc. Res., Sana Republic of Yem
16	**Technological Development Trends in Iraq**	**Sami A. Rahim** Head of Heavy Industries Dept. Industrial Planning Comm., Ministry of Planning Iraq

Workshop on the Integration of Science and Technology in the Development Planning & Management Process

ESCWA/UNIDO/HCST/IFSTD

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27-30 September 1993

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Amman, Jordan

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List of Papers and Case Studies submitted to the Workshop on Integration of Science & Technology in the Development Planning Process
27 - 30 September, 1993
Amman - Jordan

1	**Technological Accumulation and Industrial Growth: Contracts Between Developed and Developing Countries**	**Martin Bell & Keith Pavit** Science Policy Research Unit University of Sussex, Brighton U.K.
2	**Challenges for Industrial Technology Policy in the ESCWA Region in the 1990s**	**R. Martin Bell** Science Policy Research Unit University of Sussex, Brighton U.K. E/ESCWA/NR/1993/WG.2/2
3	**Integrating R&D With Industrial Production & Technical Change: Strengthening Linkages & Changing Structures**	**R. Martin Bell** Science Policy Research Unit University of Sussex, Brighton U.K. E/ESCWA/NR/1993/WG.2/15
4	**A Framework for Technology-Integrated Development Planning**	**Nawaz Sharif** Prof., School of Management Asian Institute of technology Thailand E/ESCWA/NR/1993/WG.2/11
5	**The Integration of Science & Technology into Development Planning**	**A. B. Zahlan** Cocsultant U.K. E/ESCWA/NR/1993/WG.2/10

6	**A Case Study on National System for Productive R&D Management**	**Prof. Dr. A. S. El-Nockrashy** Executive Director Academy of Scientific Research & Technology Egypt E/ESCWA/NR/1993/WG.2/3
7	**Techno-Economic Assessment of Domestic Resources A Model of Interaction Between R&D Institute & Industry**	**Prof. Dr. A. K. Ismail** Central Metallurgical R&D Institute (CMRDI) Egypt E/ESCWA/NR/1993/WG.2/6
8	**Technology Transfer of Efficient & Low Cost Domestic Waste Water System In Egypt**	**Dr. Ahmed Fadel Ashry** Head of Public WorksDept. Faculty of Eng., Mansoura University Egypt E/ESCWA/NR/1993/WG.2/5
9	**Role of R&D in Local Production of Spare Parts**	**Prof. Dr. Adel A. Nofal** Head of Metal Forming Dept. Central Metallurgical R&D Institute (CMRDI) Egypt E/ESCWA/NR/1993/WG.2/4
10	**The Integration of Science & Technology for the Development of University Programmes Through Applied Science Curricula**	**G.S. Hassawi & B. Abu-Ghazaleh** Applied Science University Jordan E/ESCWA/NR/1993/WG.2/8
11	**Experiences in Integration of Science & Technology in the Development Process (A Case Study of the Electricity & Cement Sectors)**	**Dr. Hisham Khatib** Consultant Jordan E/ESCWA/NR/1993/WG.2/7
12	**The Role of Science & Technology in Industrial Development: The Case of Jordan**	**Dr. M. Shahateet** Head of Industrial Studies Comp. Tech. Training & Ind. Studies Centre, RSS Jordan E/ESCWA/NR/1993/WG.2/12

13	**An Effective Forum to Integrate S & T Into The Development Process**	**Dr. Fawaz Elkarmi** Director, Energy Sector Higher Council for Science & Technology E/ESCWA/NR/1993/WG.2/13
14	**Case Study of the Syrian Scientific Studies & Research Center as a Technology-Based Institution Involved in the Promotion of National Development**	**Dr. Amr Armanazi** Director, Electronics Institute Scientific Studies & Research Center Syria E/ESCWA/NR/1993/WG.2/14
15	**Science & Technology in the Republic of Yemen: Status & Prospects**	**Dr. M. L. Al-Eryani (1) & Prof. A. S. Babaqi(2)** (1) Deputy Minister, Scientific Research (2) Dean, Faculty of Grad. Studies & Sc. Res.,Sana Republic of Yem E/ESCWA/NR/1993/WG.2/15
16	**Technological Development Trends in Iraq**	**Sami A. Rahim** Head of Heavy Industries Dept. Industrial Planning Comm., Ministry of Planning Iraq E/ESCWA/NR/1993/WG.2/9