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# IMPEDIMENTS TO THE TECHNOLOGICAL DEVELOPMENT OF THE PETROLEUM AND MINERAL RESOURCES SECTOR IN WESTERN ASIA COUNTRIES

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ABSTRACT

Most of the Western Asia producing countries are still exporting their natural resources as the unprocessed raw material. The related processing and manufacturing industries they have acquired during and after takeovers are limited in capacity and technology. The impediments to the development of all these industries have arisen from two main sources:

(i) The imported technological core around which they had evolved before take-over and the absence of any effective technology transfer procedures,
(ii) The national technological, economical, administrative and political problems.

This paper describes the main features of these impediments and discusses the necessary steps required to overcome these impediments at national, regional and international levels, so that thinking and decisions can be made for the realisation of the integrated and effective development of these industries within the Western Asia region. National forces have lately entered the scene of the mineral resources industries and have so far produced a decided effect on:

(a) The breaking of deadlocks impeding the main progress of national oil and mineral resources industries,
(b) the issuing of new national policies which aim at reforming the whole status of these industries,
(c) the encouragement of the function of national innovating powers,
(d) the proper and full use of practical and technical aid made available by regional and international organizations, and the utilization of the financial support of Arab banks and Funds in order to start the integrated development of oil and mineral resources industries.

Within the current decade, some Arab national technological powers, working on regional and international scales, have achieved useful experience and some remarkable successes towards technology transfer and development in the oil and mineral resources sector. There are lessons to be learned from these experiences which can be applied to the integrated development of industry in the whole Western Asian region and which can lead to a promising new future.

## (1) INTRODUCTION

It was an imported technological core around which industries of petroleum and mineral resources evolved randomly in the Western Asia countries. In order to achieve its own objectives, the imported industrial core has used every possible way to explore and exploit easily the most available natural wealth. This resulted in exhaustion of these resources for an unfair return to the parent Western Asia countries and negligible technical advantage to these countries. This is why limited national technical capacity has faced a lot of crisis when they made takeovers later on. It is important to emphasize here that the national technological core,[1] strained by running the wheel of production, was looking till now to stimulate all aspects of the existing industries and create a suitable atmosphere for its own survival and development.[2] Most of this paper is devoted to reviewing some aspects of these strains and to show briefly the main counteractions taken by the national core, the regional and international bodies.

## (2) TRENDS IN OIL AND MINERAL RESOURCES INDUSTRIES IN DEVELOPED COUNTRIES

Oil and mineral resources industries were the first "research intensive" industries in developed countries. States of developed countries have realized the importance of these industries from the very early decades of the oil production. Measures were taken by these states to consolidate their own awareness in this respect.[3] One example is the support of advanced systems for higher education: Universities, polytechnics and laboratories within the whole developed industries have made most successful innovating systems. However, certainties over the flow of oil and mineral resources supplies, before the early seventies, resulted in the developed countries carrying their main tasks within the framework of "insurance policy against supply difficulties which might occur".[4] That is why they worked for (i) satisfying the constant increase in their energy demand, (ii) keeping for themselves all aspects of processing these commodities and (iii) engaging most of the producing countries in one task only, i.e. the delivery of oil and mineral resources as raw materials.

Industrial innovation in a free enterprise system was promoted largely by competition amongst international companies. Although research and development was only a part of the innovation process, it made an important contribution to it. Financial incentives in the form of low interest loans and the availability of risk capital was an incentive for national firms in the developed countries to invest in research. Marketing was also an important feature in transfer of technology to the buyers inside the developed but not the developing countries, and this is still facilitated by free trade and access to larger foreign markets. Although the success of size of the firm plays a minor role in innovation - once the firm is larger than a minimum threshold- governments in the developed countries actively encouraged the formation of very large firms which proved extremely active in the innovation field. These actions were turned down completely inside the developing countries. Since the early years of this century again governments of the developed countries supported their big firms in the establishment of international cartels. Cartels were, however, results of the defensive policies of the developed countries and in many instances proved barriers to delivery, transfer and diffusion of technology, and innovation even inside these countries. As a good example of the above-mentioned fact, in 1945-46 it was clear to the Gaullist Government that the period of coal as the energy basis of industry was over. It was

also evident that the American Petroleum refiners who had set foot in France and were trying to monopolise the petrol market would eventually get hold of the chemical industry as well, being able to control the raw material and the available technology as well. The French answer to this threat was the creation of The Institute Francais du Petrole. Its task was (i) to explore for petroleum (ii) to develop refining and (iii) to teach the skills at university and technical level. I.F.P. was financed by a levy on petrol, and was thus independent of government interferences. I.F.P. has been particularly successful with petrochemical processes, which competed successfully all over the world.[5,6]

The above-mentioned guidelines and actions have resulted in:

(i) limiting the diffusion and transfer of technology in the host countries to the daily running procedures, while the secrets of the black magic of the industry were retained by their consultants and supervisors.

(ii) opposing any national step towards acquisition of the needed technologies, and

(iii) impeding the function of the winning enterprises in the developing countries and the Western Asias.

## (3-1) SOME RESIDUALS OF THE PAST

### (3-1-1) A Hazy Background

It is hard to blame national powers, who are steering their oil and natural resources business now, for their suffering of the large spectrum of technological problems impeding their technology development. They were, at the very start of most existing technologies, in the darkest corner of its background. The gap between them and the skills imported to construct, operate, and supervise all aspects of the implanted industry in their homeland was too deep and wide enough to keep them in that dark corner most of the time. Since "a developed society properly informed, can form its own judgements"[7] these underdeveloped countries could not make their own judgements towards developing technologies taken over later in the sixties. One may emphasize that in the sixties, a considerable rise in national interests has taken place. This is why that decade marks the beginning of the intermediate state of the technological development of oil and natural resources within the Western Asia region. Most of the Western Asia producing countries were concerned with one main goal to be achieved in this fresh start, and that was "how best to utilise available technologies as a means of accelerating their own economic growth".

In order to utilise what was available, they have explored possible measures that they themselves might take to facilitate the transfer of technology they require for their main objectives. They have thought of a definition for the technology transfer needed. Without getting into the variety of theoretical models, they defined it simply as "the transfer across national boundaries of techniques implanted in their homeland and international techniques leading to new production methods or to new products". These new techniques may be either implicit, as in the case of new types of capital equipment or intermediate products, or may be transmitted directly, either as licences etc., or in the form of consultancy or management contracts in matters relating to production or marketing. By their experience along the sixties, they found different combinations of the above, together with occasional training of personnel by suppliers of capital goods were the common forms of transfer. These forms, when they were realized later on, considerably affected the entire activities of oil and natural industries inside their countries, from individual research & development & the setting up of private, governmental, & regional production facilities to final marketing & distribution.

(3-1-2) Who Decides?

As indicated before, oil and mineral resources of the Western Asia region were until the end of the 50's almost wholly developed under exclusive concessions granted before World War II to companies controlled by what is now known as the "seven sisters". Through these concessions, which owned most or all the Western Asia proven reserves and production, these multinational powers were the decision makers in every aspect of the industry. In the mid-sixties[8] they had 60% of the world proven reserves waiting for recovery within the Western Asia lands, and they recovered 463.6 million tons of it in 1966, i.e. about 27% of the world total production at that time. The reflection of this large wealth on the Western Asia area was (i) 15% of the production was refined locally (i.e. 4.3% of the world refining capacity in 1966), where 49% of it was used for local consumption,[9] (ii) the revenues which were collected by the concerned governments were built on abstract pricing models and most of it was returned back to the Multi-National Companies in the form of imported goods and technologies in black boxes (table A), and (iii) the maximum presence of local national personnel in the senior staff never exceeded 1% of the whole staff (i.e. about 40 persons in 1960). Whereas 71755 simple workers were brought from the Western Asia region. However, this reflection never was an encouraging one and caused the most crucial depression after the takeover start in some of the Arabian countries.

Table (A)

The Western Asia trade

(million US dollars)

The value of exports is the "free-on-board".
The value of imports includes an allowance for freight and insurance to place of importation which for many countries is partially estimated.
(after The Economists Diary 1976, p 91).

| | Imports (CIF) | | Exports (FOB) | |
|---|---|---|---|---|
| Country | 1960 | 1970 | 1960 | 1970 |
| Bahrain | 60 | 264 | 60 | 277 |
| Iraq | 389 | 509 | 654 | 1098 |
| Jordan | 120 | 184 | 11 | 34 |
| Kuwait | 242 | 625 | 960 | 1654 |
| Lebanon | 290 | 559 | 43 | 184 |
| Oman | 8 | 37 | 2 | 222 |
| Qatar | 60 | 64 | 150 | 251 |
| Saudi Arabia | 234 | 711 | 891 | 2424 |
| Syria | 240 | 360 | 113 | 203 |
| Yemen, S. | 214 | 201 | 168 | 146 |
| Total | 1877 | 3781 | 3057 | 7040 |
| Increase rate (1960 base) | | 201% | | 230% |

Table (B)*

The Seven Sisters Profits **

| | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|
| B.P. | 218 | 379 | 167 | 1157 |
| Exxon | 1310 | 1517 | 1532 | 2443 |
| Gulf Oil | 550 | 561 | 197 | 800 |
| Mobil | 483 | 541 | 849 | 1040 |
| Shell | 938 | 901 | 704 | 1780 |
| Standard Oil | 455 | 511 | 547 | 844 |
| Texaco | 822 | 904 | 889 | 1586 |
| Total | 4776 | 5314 | 4610 | 8772 |

* This table was published in The Economist, September 20 1975 with the following title "Poor, Poor Seven Sisters". page 85. Total profit of these sisters in 1970 equals about 146.5% of the total surplus of the whole Western Asia region.

** after tax in million US dollars.

It is important to emphasize here that:

(a) Before the 60's, the employment policy in oil industry has been the source of much difficulty between Multi-National Companies and host governments, and frictions with the local population. One source of difficulty has involved the improper employment of national personnel. In 1971 Schurr and Homan[10] indicated that "the size of the expatriate staff has also proved to be a sensitive subject in that the presence of sizable blocks of expatriate technicians and management personnel acts as a continual and obtrusive reminder to the host country of the enclave character of the oil sector. All of the producing countries have worked for greater employment of their nationals and especially for accelerated promotion of more local personnel into staff and management positions".

(b) Gross employment by the oil industry has fallen by roughly 25% from 1961 to 1967, while the total production of crude oil in the same region has about doubled during the same period, and

(c) Brain drain has risen sharply during the sixties outside the Western Asia region up to 56.5% (Syria), 35.5% (Lebanon), and 9.2% (Iraq).[11] Two-thirds of the Syrian engineers by 1975 are working abroad. A significant thrust of internal brain drain has been observed within the region. This is because of non-efficient utilization of the technological capacity which includes the misfunction of technologists because they are in unsuitable jobs.[12]

The foregoing facts have haunted most national decision makers in the field of oil and natural resources sector up to the 70' break. These decision makers realized that unless they recover and put themselves together by their own efforts, they will never recover. While they are doing so, and in order to accomplish a proper start for the technology transfer process, they should think about the following urgent tasks:[13]

(1) Assess any existing technology implanted in their homeland.

(2) Identify a specific suitable technology from those available.

(3) Adopt a suitable mechanism which may help on the short run to absorb any preferred technology and to provide them on the long run with the effective judgements to select and transfer new technologies, and

(4) Fit the selected technology in their long run national economical, political, social, and environmental policies. By accomplishing these tasks they may qualify themselves to real, practical, and powerful decision makers in most aspects of their oil and mineral resources industries. Later on, they may be capable of breaking through the highest impediments and start a new era for their national industries.

(3-1-3) The bottleneck

The combination of factors which restricts the way ahead for technological development in oil and mineral resources sector comes mainly from two main sources: (1) the technology exporters, the source of technology, and (2) the technology importers, the developing countries. This combination develops as the gap between the developed and the developing continues to grow. Through a series of round table meetings and conferences held in the seventies, it has been shown that the developed countries may share the developing countries their interest in resolving some of the major international problems like the transfer of technology. In Nairobi May 1976, Dr. Kissinger proposed at the UNCTAD IV to facilitate technology transfer to the developing countries. When he appeared at the State Department national meeting on science, technology, and development in November 1976, some of the congressmen attacked the Department of State for "its belated recognition of the importance of including science and technology in diplomacy" (Abelson and Tinker, 1977).[14] However, it is well known that the United States, as a leading developed country, believes in one mechanism of technology transfer, the one which works through the multi-national companies. These companies have capital, managerial skills and know-how. Now, it is certain that the United States "must have a principal role in helping developing countries to create their own technologies "as was clearly stated by Dr. Kissinger in the above-mentioned national meeting. But what is less certain is whether the multi-national companies will take that statement seriously. An emphasis on factors which arise of the technology sources and contributes in shaping the bottleneck, will be given later on.

A variety of factors arises inside the Western Asia countries and builds up main impeding elements to the technology development of their oil and mineral resources industries. These factors stem directly from individuals, private sector, and government willingness towards these industries. Interactions of these sources may change the existing combination of these factors, their size, and effect on technology development. They are much dependent on every aspect of the technology, and in each case they interact differently. These combinations settle across the different stages of the industry and paralyse some types of its managerial and technical functions. It will be worthwhile to

unveil these factors and clear their features, then enhance more effort which may lead in the near future to a collective model for the impeded technology development. I will be very ambitious to tackle the first, since there exists a lot of uncertainties in most official data available so far, and I shall depend on my practical judgements in bypassing any large uncertainties. Most of the facts represented hereafter may be generalized to most of the middle east area since these facts relate to the same level of under-development dominating the other middle east regions. A lot of data has been gained though along my short life experience in this field as Minister for oil and mineral resources in Syria (1974-1976) and as a Chairman for OAPEC in 1975. With the limited scope of this paper I cannot go through their details and may need another integrated and extensive analysis.

Once President George Pompidou made in 1968 the following joke "There are three roads to ruin: women, gambling and technologists. The most pleasant is with women, the quickest is with gambling, the surest is with technologists."[15] He may have meant the effectiveness of the first two elements but not the third. However, before the late sixties, the middle east decision makers have made such a joke to mean only the third element. These decision-makers used this kind of background to assess the role of the individual technologists. This is why these individuals have done little work in comparison with other technologists in the world. However, even with this high damping factor, middle east individuals were brave enough to break through that limited atmosphere and make a remarkable contribution to their country's development. As good agents of technology transfer and development, they have:

(i) transferred a wide spectrum of knowledge to the area in the field of oil and natural resources. It ranges from academic education to practical field research work. In Syria for example, Dr. Izzat Suwade has developed, with his colleagues in the Syrian University (now Damascus University), very skilled personnel and started small chemical projects. Few technologists were enthusiastic enough to accomplish a geological survey within the period of (1958-1961). The result was (1) $1/10^6$ minerals maps, (2) $1/10^6$ geomorphology, hydrology and tectonic maps, and 1/200 000 Syria's geology map (Jassem & Manashi, 1974).[16] Manhal in 1958 discovered oil in Karachock.

(ii) created a large technological momentum inside the cultural structure of their countries and adapted the most successful skills now functioning in the region. This momentum has led, in the late fifties, to some private projects which survived till the late sixties and may be until now. A very limited number of these skills joined together to form elementary consulting bodies, but they failed and then joined the governmental posts to earn their own living costs and fade away. Some of them were ambitious enough to leave the country to do any suitable work in the area; otherwise they leave for the West for good (Zahlan and Nader, 1969).[17]

(iii) disseminated most of the technological information to the area across their private studies, small projects, and their interaction with development of the area, and

(iv) worked as an active conduit for technical flow between their countries and the developed centers all over the world.

Interpersonal and political problems were their main difficulties all the time, otherwise they would have done better (Zain 1975, Hamdan 1975).[18]

Dependence on massive import of technology through channels established by local technocrats led to the emergence of advanced technology enclaves during the early sixties, and that perpetuated themselves in the context of general technological vagueness. This action has saturated the individual capacities there and never helped to absorb or to use strongly the scientific knowledge and the technical know-how around them. Besides, national technologists never got the chance before to build up their internal scientific and technological capacity properly. This was not done because they were not in a position to bridge the gaps between different circles of decision makers, national enterprises and educational systems. So far they are not officially involved in making the long run national decisions in oil and mineral resources today.

The supply of internally produced scientific knowledge and technical know-how did not automatically create on the other hand a demand till the seventies, because the existing demand during the sixties was historically directed to the outside world.

However, a notable change in that historical trend has been noticed in the mid-seventies as table (A) may show. The encouraging figures given in table (A) has one drawback made by a dominating whirlpool which keeps on stirring the whole national technological media: the tendency for all types of technologists to emigrate to the more developed countries within the Western Asia region where incentives are greater, may be the center of that whirlpool. Libya's imported work-force is shown in table (H) as an example of the above-mentioned fact. Besides, most Western Asia's industrial employment of technologists suffers from over-abundance in the tertiary sector and in the traditional professions.

Table (H)

Libya's Imported Workforce*

| | |
|---|---|
| Egypt | 250,000 |
| Tunisia | 42,000 |
| Jordan | 10,000 |
| Palestine | 10,000 |
| Syria | 14,000 |
| Lebanon | 7,000 |
| Sudan | 5,000 |
| Morocco | 2,000 |
| Algeria | 1,000 |
| North Yemen | 400 |
| Somalia | 200 |
| Mauritania | 100 |
| Iraq | 60 |

*After Halliday, F. (1977), Development & Change, 8, (263-291). (Source: Voice, 47 London, 11 March 1976, p 8).

Table (C)**

| COUNTRY / TECHNOLOGIST TYPE | BAHRAIN | | IRAQ | | KUWAIT | | SAUDI ARABIA | | SYRIA | | QATAR | | U.A.E. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | S | D | S | D | S | D | S | D | S | D | S | D | S |
| (A) Educated : I) Managers | n.a. | n.a. | n.a. | SS | n.a. | n.a. | 980 | 134 | n.a. | SS | n.a. | n.a. | n.a. | n.a. |
| II) Engineers | n.a. | n.a. | 522 | 2110 | n.a. | n.a. | 1951 | 5791 | 522 | 2110 | n.a. | n.a. | 13 | n.a. |
| III) Admins. | n.a. | n.a. | 582 | 5795 | n.a. | n.a. | | | 300 | 5795 | n.a. | n.a. | n.a. | n.a. |
| Total | 23 | | 1104 | 9905 | | | 5925 | 2931 | 822 | 7905 | 216 | 190 | 88 | |
| (B) Skilled Technicians | 78 | n.a. | 4150 | 2470 | n.a. | n.a. | 3426 | 2426 | 3422 | 15000 | 310 | 104 | 105 | 30 |
| (C) Semi-Skilled Technicians | 313 | n.a. | 14480 | 8000 | n.a. | n.a. | 6481 | 5376 | 4616 | SS | 988 | 164 | 32 | 30 |
| (D) Trained Workers | 284 | n.a. | n.a. | SS | n.a. | n.a. | 6705 | 16860 | n.a. | SS | 463 | 280 | 120 | n.a. |

D = Demand, S = Supply, SS = Self Sufficiency

**after regional reports delivered to OAPEC in 1975.

The national private sector in the Middle East region was keen enough to study carefully (1) the development of technology in the West, (2) the most important local needs for industrialization, and (3) the abundance of technical capabilities in the region, which they may utilize, and (4) the profitability of selected technologies in oil and mineral resources. The outcome was a creation of small projects for utilization of some proven minerals like cement and phosphate and small firms in oil distribution, transport, and later on refining. Three main interrelated factors may be considered as the backbone of the private sector policies: (i) the size of the regional market, (ii) the competition pressure, and (iii) the availability of the national manpower. With these guidelines this sector never failed and made a significant success. Besides, (a) they have got a good market throughout the developing Middle East, (b) the rate of competition with the outside world was very low, since this sector has started with a foreign interest, and (c) there was no shortage of skilled manpower needed to run the interests of this sector. Thus, this sector openly dominated Syria, Lebanon, Jordan, Iraq, and some of the Arabian peninsula up to mid-sixties. In order to follow the technological development, leaders of this sector, having good ties with the exporters of technology, have managed well to adapt new technologies which provided them with more profit and success. These leaders were successful as well in promotion of technology development: (A) they have supported any useful innovation made by their technical staff. They encouraged them with high salaries and visits to the West. (B) they have invested well in research and development within their quality control laboratories and if possible in some universities around them. <u>But, they made two big mistakes: (1) they never cared about real technology transfer, because they used to get their needs off the shelf, and (2) they were under-developed in their social welfare policies towards the working class</u>.

Across the sixties, most of Western Asia oil and mineral resources industries have started to gain their individual national momentum and took one of the following paths:

(i) <u>The less populated states line</u>: which aimed at sharing the Multi-national companies' activities in the area. The oil-exporting country following this line expected some kind of on-the-job experience in the transportation, refining, and marketing ends of the oil business. It

is less obvious by now that this line will provide these countries with the most suitable means through which they may gain an integrated knowledgeability in oil and mineral resources industries.

(ii) The more populated state line: which is till now, strongly opposed by multi-national companies and their parent governments, since it strips out their strength of controlling the various technological, economical, and political aspects of oil and mineral resources industries. Across this line, a remarkable success has been done by realizing new technological, economical and political potential which has so far proved capable of handling most aspects of the nationalized industries. New specialized enterprises have emerged with the creation of new geological, geophysical, reservoir engineering and refining works.

The latter line made its success through numerous factors, the main of which are:

(a) The rise of new policies in the Arab-Homeland which aims at considering national capacities, the human potential, the natural resources, and the material means of meeting the challenge of implanting science and technology as vital means for the emergence of the Arab countries from under-development.

(b) The availability of a national technological core which have had a quiet but decided effect on some main deadlocks arising in the first stage of nationalization.

(c) "The re-entry of the Soviet Union as a major world oil power, offering not only to sell or barter oil at relatively low prices but also to help the under-developed countries build up an indigenous publicly owned oil sector" (Tanser, 1969).[19]

(d) The crystallization of new major tensions inside the international oil and mineral industry through the competition among the international companies, particularly between the long established majors and the newcomers.

(e) The conflicts of interest between the oil importing under-developed countries and the international oil companies.

However, the continuous series of coups d'etat in the 1960's has sharply reduced the size of the success achieved in the Western Asia's oil and mineral resources sector and thereby shared in limiting its development.

The role of the Western Asia governments in technology transfer and development was, so far, elementary and relatively small. One may consider it as a very slow reconnaissance work. This was partly due to the absence of technologists and scientists in the government decision making circles, and their limited number in civil service. The latter may reach about 17% by late seventies. Thus the state machine has remained aloof from the oil and mineral resources industry's technological needs during the last two decades. Table (B)[20] shows the existence of policy-making bodies for science and technology in Arab countries (1975). There have been, however, measures taken by the Western Asia governments which helped technological development in an indirect way. These measures may be visualized within the following frames:

(i) Scientific and technological knowledge:

(a) It is noted, in the last decade, that scientific and technological policies for the development of the region if it exists, sometimes does not fit with the framework of the overall development policies. A sequence of changes in the system of higher education have been achieved to support a good system for higher education. These changes were limited to improve the courses, the experimental facilities, and the relative number of staff to students. The most successful step was the establishment of a few universities and of laboratories within the existing industries such as the University of Oil and Minerals in Dhahran (Saudi Arabia). These new institutions have started to be the innovating ones and are more likely to respond directly to development policies.

(b) Bearing in mind the limited flexibility in the domestic productive systems and their flow absorption of technological knowledge, the Western Asia governments have started some elementary domestic research institutions which were to develop a small indigenous technical capability but not to handle any technological adaptation. IDCAS of the Arab League and the UNDP of the United Nations have played an effective role in the early days of these institutions.[21] Later on, governments of Western Asia region were very slow in taking advanced measures to support these institutions and

Table (D)[38]

POLICY-MAKING BODIES FOR SCIENCE & TECHNOLOGY IN ARAB COUNTRIES (1975)

| | Ministry of science[2] or ministerial science policy committee | Science policy planning body - general | Multi-sectoral body for co-ordinating scientific research | Co-ordinating bodies for scientific research | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Medical research | Agricultural research | Nuclear research | Industrial research | Space research | Oceanographic research | Environmental research |
| Algeria | yes[1] | yes[2] | yes | - | - | - | yes[2] | - | - | - |
| Bahrain | - | - | - | yes[3] | yes[4] | - | - | - | - | - |
| Egypt(Arab Republic of) | yes | yes(5)(?) | yes(5) | yes | yes | yes | yes | - | - | yes |
| Iraq | - | yes(5) | yes(5) | - | yes | - | - | - | - | - |
| Jordan | - | - | yes | - | yes | - | - | - | - | - |
| Kuwait | - | - | yes[6] | - | - | yes | - | - | - | - |
| Lebanon | - | yes[5] | yes(5) | - | - | - | - | - | - | - |
| Libyan Arab Republic | - | yes[7] | - | - | - | - | - | - | - | - |
| Morocco | - | - | - | - | yes | yes | - | - | - | - |
| Oman | - | - | - | - | - | - | - | - | - | - |
| Qatar | - | - | - | - | - | - | - | - | - | - |
| Saudi Arabia | - | - | - | - | yes[8] | - | - | - | - | - |
| Sudan | - | yes(5) | yes(5)(11) | yes | yes | yes | yes | - | yes | yes |
| Syrian Arab Republic | - | yes(?) | yes(?) | - | - | - | - | - | - | - |
| Tunisia | yes[1] | - | yes | - | yes[9] | - | yes[10] | - | - | - |
| United Arab Emirates | - | - | - | - | - | - | - | - | - | yes[1] |
| People's Democratic Republic of Yemen | - | - | - | - | - | - | - | - | - | - |
| Yemen Arab Republic | - | - | - | - | - | - | - | - | - | - |

(?) Situation not altogether clear
(1) Ministry of Higher Education & Scientific Research-does not cover the whole of the national R&D system
(2) Government Department of Mining & Geology.
(3) Ministry of Health
(4) Ministry of Municipalities & Agriculture.
(5) The same body performs both functions
(6) Kuwait Institute for Scientific Research.
(7) Ministry of Planning.
(8) Ministry of Agriculture & Water.
(9) Direction de l'enseignement, de la recherche et de la formation.
(10) Environment High Committee
(11) Including a specialized Council for Economic & Social Research.

hence kept far away of their main roles. Instead of handling technological adaptations and industrial research and development they have been concerned so far with quality control tests only.[22] Another major obstacle to the development in these countries originates from the divorce between local research and development, if it exists, and the educational and productive systems and from the lack of general scientific and technological culture,

(c) Table (E)[23] shows some indicators of the level of research and development spending in those Arab countries which have provided relevant data to Unesco. Figures for some non-Arab countries are quoted for comparison. It is depressing to note the rare availability of funds and the governments' shallow eagerness to enhance technological development and technology transfer actions,

(d) The role of information on science, technology, and production techniques was under-estimated by the local technocrats. They felt that the procedure for transferring information related to the imported technologies is archaic and cumbersome. This is reflected in:

(1) little national knowledge about the mechanism for information flow through existing industrial systems and its impact on governmental political decisions.
(2) the absence of national model transfer agreements.
(3) the randomness in transferring patents, licences, know-how, processes, and new technologies to the region.
(4) non-existence of technology transfer centers which may facilitate the optimum use of technology, and
(5) an under-estimate of U.N. facilities which is available for information on problems concerned with the transfer of technology.

(e) Within the early stage of the takeover, the national oil and mineral resources sector, guided by the need to share in the balance between economic and social progress has overloaded itself with untrained manpower (Table A). This has resulted in (1) slowing down its progress by its bulky non-efficient cadres, (2) doubling the cost of production, and (3) raising the manpower-drain from the rural sector up to 100% in the countryside surrounding oilfields or mining places,

Table (E)[38]

R & D EXPENDITURE IN SELECTED ARAB COUNTRIES*

| Country | Year | R&D expenditure as % of GNP | Average annual expenditure per R&D scientist or engineer | Per capita expenditure on R&D |
|---|---|---|---|---|
| | | | US $ | US $ |
| (1) Arab Countries | | | | |
| Algeria | 1974 | 0.13 | 30,000 | 0.6 |
| Egypt | 1973 | 0.83 | 7,235 | 2.2 |
| Iraq | 1974 | 0.25 | 16,860 | 2.4 |
| Jordan | 1973 | 0.31 | 15,390 | 1.1 |
| Kuwait | 1973 | 0.01 | 17,100 | 0.8 |
| Lebanon | 1973 | 0.40 | 22,400 | ... |
| Sudan | 1974 | 0.33 | 31,177 | 1.0 |
| Tunisia | 1972 | 0.30 | 10,900 | 1.1 |
| Yemen A.R. | 1975 | 0.25 | 35,267 | 0.3 |
| (2) Non-Arab Countries | | | | |
| Federal Republic of Germany | 1972 | 2.3 | 59,584 | 96.6 |
| Japan | 1973 | 2.0 | 18,312 | 54.4 |
| Netherlands | 1972 | 2.2 | 42,035 | 76.0 |
| Norway | 1972 | 1.3 | 36,081 | 46.9 |
| United States of America | 1973 | 2.5 | 55,800 | 139.0 |

* UNESCO, 1977, "Science and Technology in the Developed Arab States", No. 41, p 161.

(f) A field study carried out in 1975 by OAPEC's team aimed to indicate the main features of the national technical manpower of the Arabian oil sector.[24] It showed clearly that proper training in this sector has started only in Egypt in 1956 on national basis. Iraq and Algeria made another start in the late sixties with more advanced institutions. U.A.E. have started a technical center for 100 persons per year in 1968 followed by a similar center in Kuwait by 1969. Besides their field search, OAPEC's team analysed some official data on member countries, the result of which lies in the following facts:

(1) Planning departments of the oil industry are aware of the crucial role of monitoring manpower movements as a practical mean for planning its long run development.

(2) Few of these planning departments are capable of achieving their elementary objectives. The rest are not capable of doing this, since they lack personnel and modern techniques to tackle any available data.

(3) Most of OAPEC members are dealing with training on all levels without using any available capacity around them. Some of these members may have extra trained personnel and training centers which can be used all over the OAPEC area.

(4) Most of the standing problems have some solutions embedded in some social and technical incentives.

(5) There is an overwhelming conclusion over the low standard of the national trainers. This is due to their short experience in such sophisticated work.

(6) Whatever political communication is developed regionally is used neither to improve technical cooperation nor to transfer the regional experience properly.

It is clear from these facts that no correlation exists between the size of OAPEC's oil industries and their intention to build up suitable national skills.

(ii) Technology transfer process:

The Rabat declaration (CASTARAB 1976) marks the first milestone on the way of technology progress in the Arab World. The very scattered recommendations and resolutions brought up by previous congresses, conferences, and seminars on oil and mineral resources, were revived in very detailed recommendations by Rabat declaration. Technology transfer and assessment has been discussed thoroughly by CASTARAB as a special topical subject, the result of which was several inter-related recommendations (3,4,5,6,37, and 38). It is useful at this point to review the Arabian background thinking over this matter:

(a) Arabian Oil Conferences: These conferences were started in 1959 where it was generally recommended, by the 6th recommendation, that Arab oil producers should consider the importance of starting specialized institutions for training, research and development in the oil industry.[25] The same idea was repeated by the 3rd conference (1961), the 4th (1963), the 6th (1967), and the 7th (1970). It was recommended in the 5th conference (1965) that the Arab oil producers should establish an Arabian Petroleum Institute to act as a research and development center for all aspects of oil industries. In the Dubai 9th conference (1975), it was stated that there was no significant development of this recommendation.

(b) The Arabian Conferences on Mineral Resources: In the first conference held in Baghdad 1972 five recommendations were made concerning Arabian cooperation in training, standardization mapping, financing field works, marketing and in industrial coordination. It was stated in the first resolution that: "The recommendations of the conference aimed at carrying out a general survey including the technicians working in the mining industries and a list of the various institutes, training centers and specialized laboratories connected with mineral resources, in order to allow an exchange of experts within the Arab World. Moreover, this survey would give the universities and the specialized Arab institutes the possibility to work out educational programmes in geology and mining engineering that would meet the needs of the Arab countries."

The second conference held in Jeddah 1974 discussed a study carried out

by the permanent secretariat of the Industrial Development Centre of the Arab League on manpower training, university education, and on other matters which had been raised in the first conference. The study gave some realistic indications of technical manpower capacity in the Arab World, and joined the Arabian oil conferences in their recommendations on promoting some action towards a technology transfer and development. A general paper on "transfer and development of technology and Arab cooperation in the field of mineral resources" was very useful in leading the conference towards a unified discussion on this important matter.

In the above paper of the permanent secretariat of IDCAS, some important requirements were pinpointed and may help to consolidate Arab cooperation in promoting all available capacities in the mineral resources industries,[26] and describes some parts of the CASTARAB recommendations. The 3rd conference on mineral resources held in Rabat (1977) has discussed in brief a model for developing mineral resources in the Arab World. The IDCAS model again stressed the realization of a rapid and comprehensive progress in mineral activities. "This can be achieved through great research and development efforts in mineral exploration, extraction, concentration and processing. These efforts may be represented by regional surveys for Arab mineral resources using the new technology of remote sensing and of the problems concerning the inherent nature of the Arab region in which the desert environment prevails. These common efforts might also be concerned with material systems such as coal in the Arab region(an importantreductant in iron and steel and other industries) and the vast maritime areas under the economic jurisdiction of the Arab countries".[27]

Finally, the 3rd conference on mineral resources emphasizes the importance of education and training. "The evident background behind this was the necessity of using advanced technology in developing all stages from exploration to exploitation and industrialization. As such it would be possible to produce minerals on a wide scale at competitive prices. Preparing the necessary effective manpower at all the levels of education and training is really a basic condition to realize this goal".[26]

(c) Regional and International Seminars: Technology transfer and development

became an official and academic issue in the Arab World when it was fully discussed in regional and international circles. The Algerian memorandum on technology transfer discussed in OAPEC's summit (Algiers, March 1975) was the first official detailed work on such matter (Arab Oil & Gas Magazine, 1975).[28] It has analyzed with some advanced technicality the main elements in the transfer process (i.e. scientific and technical knowledge, ideas and innovations, techniques and studies of application of knowledge to practical use, techniques and management of production, know-how and management of marketing...etc.), their impact on the developing countries and the main impeding factors. The same thinking was fully introduced into the North-South dialogue conventions but the result has, so far, been nothing, (Mustafa, 1977),[29] since the developed countries refused to harmonise the exchange of oil and natural resources capital available in the developing countries with their technological capital. Emphasis on the main function of technology transfer and development elements was made through OAPEC's seminars (Damascus 1975,[30] Versailles 1975,[31] and Tokyo 1976[32]) which indicated clearly that the Arab countries have never thought or acted properly towards technology transfer and development issues before 1975.[33]

## (3-2) THE INFLATION DILEMMA

Since the early fifties, the United Nations has monitored the inflation phenomenon and considered its rapid rise, after World War II, as serious enough to be treated as a world problem. Inflation grew considerably throughout the sixties as a consequence of the failure of the industrialized countries to change their economic policies. After the mid-sixties, the rise in inflation rates was accompanied by a downtrend in the growth rate of GNPs. This was due to an odd combination of soaring rises in the prices of industrial products and in the rate of unemployment. The Third World, besides suffering from economic and social under-development, has suffered more from the inflation problem. It was overcharged for the industrial products, spare parts, and technological services from the developed countries on one hand and nominally paid in return for its exported oil and mineral resources on the other hand. The oil prices adjustment in 1973, may be the first action performed on behalf of the Third World. Since then, the oil producers have come under fire from the industrialized countries. However, by oil price adjustments, the Arab producers as Third World countries, were able to fulfil their obligations to the Third World. "In 1974, the year the producers started receiving a fair return for their oil, aid disbursements to other developing countries totalled 3.6 billion dollars. This means the Arab producers contributed aid equivalent to about 4% of their GNP, while the industrialized countries contributed only 0.3%. By 1975, the Arab producers had paid out 5.6 billion dollars. An additional 1.5 billion was pledged for financing African development plans during the recent Afro-Arab Summit Conference in Cairo" (OAPEC's Bulletin 1977).[34]

## (4-1) NEW MODES AND POLICIES

New "proper" Arabian modes aiming at technology acquisition by staged transfer processes constitues the backbone of the Arabian oil and mineral resources development policies in the 70's. These policies were planned in the first half of the seventies to be realized by joint collaboration of most Western Asia countries. The following important points taken from the Rabat CASTARAB declaration indicate very well the intention of the above-mentioned modes: "the conference declares that,

(1) the Arab nation is resolved to apply science and technology to economic, social and cultural development in order to improve the quality of life and reduce inequalities between countries and between people;

(2) scientific and technological development is vitally necessary for the purpose of reducing the inequalities in economic and political power which at present characterize relationships between States and constitute a potential danger to world peace;

(3) the Arab nation, at a decisive turning point in its history, has the capacity, the human potential and the material means for meeting the challenge of implanting science and technology in order to emerge from under-development, to eliminate poverty and ignorance and to ensure the well-being of its population;

(4) the exploitation of science and technology in order to improve the human condition requires enormous efforts and a number of concrete actions..."[35]

The conference emphasizes the details of the foregoing actions which reflects a significant rise in Arabian awareness of new trends in technology and development. Such awareness has led the Western Asia region to define and realize new policies in the field of oil and mineral resources. A general view of these policies shows that there are common elements among them for the development of the region's oil and mineral resources industries (Mustafa, 1975).[36] These policies have the following features:

(1) Re-working new feasibility studies for most parts of these industries in view of new local and regional plans. This may lead to a replacement of old technologies with simple, flexible and more efficient ones.

(2) Planning all procedures governing any urgent technology shopping with its related industrial standards.

(3) Defining precisely all aspects and sizes of supply and demand for technical manpower.

(4) Including measures in the periodical plans which aim at insuring optimum employment of skilled labour, and the establishment of an effective system for education and vocational training backed by an administrative and legislative framework and supported by institutions that make it possible to promote, coordinate and, where applicable, carry through the necessary industrial programme,

(5) Development of high standard national consulting firms which may work to reverse the brain drain phenomena, build up national capabilities in the vertical transfer of technology and carry out the task of encouraging innovation and invention as well as application of the results of laboratory experiments or new ideas, with a view to bringing them into general use,

(6) Creation of systematic procedures for transferring registered technologies,

(7) Controlling practical exchange procedures of raw materials with technological capital,

(8) Filling any gap which may be discovered in every aspect of the existing technologies,

(9) Enhancement of all efforts towards acquisition of all aspects of petrochemical and fertilizer technologies,

(10) Proper and full use of practical and technical aid made available by regional and international organizations, and utilization of the financial support of Arab banks and funds in order to start integrated oil and mineral resources industries covering more than the regional needs. Some progress has already been achieved in all these enumerated features. A Syrian example will be considered with some limited details to show the momentum of the above-mentioned progress. However, it is at present too early to indicate the impact of the new policies on the whole region.

## (4-2) PRACTICAL EXPERIENCES IN DEVELOPING SOME ASPECTS OF OIL AND MINERAL RESOURCES INDUSTRIES IN SYRIA

By the end of 1974, it has been shown that the oil and mineral resources industries in Syria were reaching a saturation level of development as a result of the impeding elements mentioned in part three of this work. Hence they may not fulfil their obligations to the Syrian economy within the frame-work of Syria's fourth development plan (Mustafa, 1975).[36] Symptoms of the foregoing saturation state were identified in (i) the limited probabilities of the Syrian oil and mineral resources reserves, when high possibilities had been reported by "The Soviet Petroleum Institute",[37] (ii) the high contrast between the planned and realized size of oil production as one may see in figure (a), and (iii) the lagging of oil and mineral resources processing behind the real domestic needs.

The Soviet Petroleum Institute's study on Syria's oil potential, had raised high hopes within Syria's political, economical and technological circles. This new horizon has enhanced more national interest in stimulating national technical capacity, increasing the volume of Syria's financial commitment in oil business and using every possible source of help available from regional and international organizations. The first striking results of such interest were shown in table (F).

An interesting series of studies carried out by Manashi and Jassim (1974)[38] and Haj-Rashid (1974)[39] have given new complementary proposals and revised the scheme of priorities which had been given in the 1971 S.P.I. plan. Two main themes emerged from these works, the first of which aimed at the establishment of a national geophysical capacity. The second was induced by the increased demand for more proven reserves and aimed at using United Nationas technical aid to develop a national deep drilling capacity[40] (Table F).

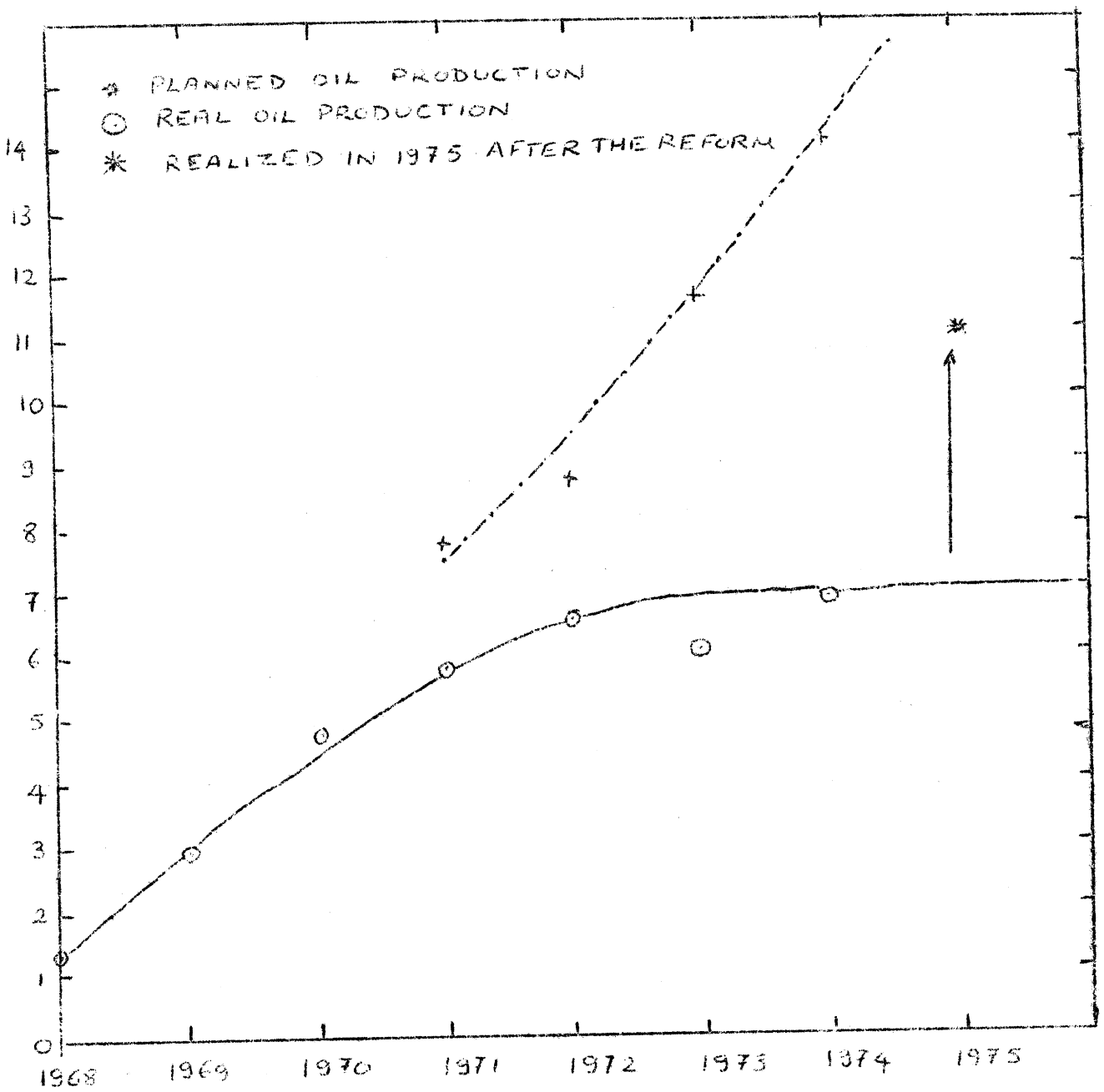
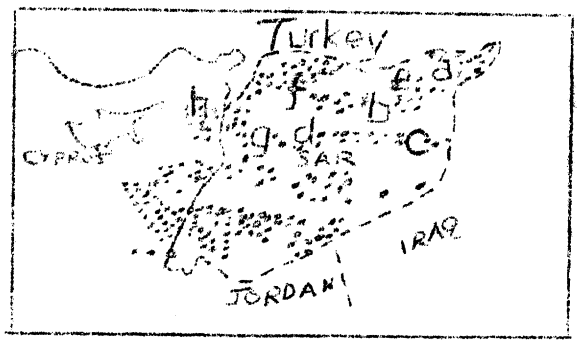



FIGURE (a) OIL PRODUCTION IN SYRIA
(million tons)

Table (F)*

Expected Petroleum Potential in Syria




| TECTONIC UNIT CODE DEGREE | NO. OF STRUCTURES | OIL POSSIBILITY | OIL PROBABILITY** |
|---|---|---|---|
| A<br>1 | 15 | High | 256 MT proved<br>10 MT/Y produced now. |
| B<br>2 | 15 | High | 64 MT proved<br>1 MT/Y produced now. |
| C<br>4 | 24 | Medium | not determined<br>yet |
| D<br>5 | 24 | Medium | not determined<br>yet |
| E<br>6 | 46 | Medium | natural gas in<br>Sukhna structure |
| F<br>3 | 30 | High | discovered oil in<br>Hammam 1975 |
| G<br>7 | 2 | Low | |
| H<br>8 | 2 | High *** | Offshore expl.<br>needed |

* Manashi & Jassim, 1974
** SEE APPENDIX (A)
*** Tripco Geophysical Survey Work, 1976.

In order to change Syria's oil and mineral resources patterns of development, a provisional plan of action has been drawn up and realized within the years 1975/1976.[36] Mobilization of all efforts towards increasing the size of oil and mineral resources proven reserves was the main objective of the (1975-1976) plan. Some practical measures were taken in order to build up a threshold inside the Ministry of Oil and Mineral Resources, and hence to build up a suitable momentum for the expected mobilization. These measures were:

(A) To review and analyze the administrative procedures, the manpower capacity, the technical aspects of the existing technologies, and the functions of the national oil and mineral resources companies working under the auspices of the Syrian Oil and Mineral Resources Ministry,

(B) Evaluation of any available data on oil and mineral resources and to carry out necessary field work in order to fill any hidden gaps within the existing data,

(C) Enhance exploration actions in some regions which might have higher possibilities like the Hammam region where oil is concerned and like the Al-Abtar area where phosphate is being searched for. In the late 1975, oil was found in Hammam. In the late 1976, Al-Abtar's reserve has raised Syria's phosphate proven reserve by ten fold (Rabat, 1977).[27]

(D) Development of two already discovered oil fields (Jebissa, 1968) and (Elaian, 1971). One should emphasize here that under the provisional plan imposed in 1975 and by the well-defined and programmed supply of equipment made available by the Soviet Oil Industry, the Syrian Petroleum Company had managed on her own to develop the Jebissa oil field in 1975 and the Elaian oil field in 1976. The Jebissa and Elaian oil fields provided a 20% increase in the 256 million tons of oil proven reserve in Syria within two years.

(E) To increase the rate of production up to 10 million tons/year in oil and up to one million tons/year in phosphate. With a slight change in running procedures, introducing new incentives and financial encouragements

made available to manpower, and with the help of new marketing modes, the Syrian Petroleum Company has easily attained the planned figure. The same situation applies to phosphate production made by the General Company for Phosphate and Mining.

Again, it is worthwhile to go through the details of these experiences and indicate the main early outcomes since they may be of great value in preparing other actions. However, it is not possible to describe all the details within the framework of this paper.

## (4-3) THE RADICAL CHANGES

The first main outcome of the new Arabian oil and mineral resources policies was an observable sequence of changes in the political horizon of the world. The first big change came into reality after the 1973 October war, where the West, notably the United States, came to realize that any decision related to the Arab World has, at any time, to coincide with the will and aims of the Arabian Nation. The Arabian oil played, in fact, a dominant role in realizing this change.

The second change is materialized by an acceptance by the Western World of the notion of justice: the oil price rise is a natural right for oil producing countries against inflation (Mustafa, 1976).[41] Such an acceptance has grown within a big bloc in the West led by France, which has kept the relationship between oil producers and oil consumers very flexible in reaching a just and realistic formulae between the oil prices and other resources - whether raw or industrialized, especially food stuffs.

The development of oil investment throughout the Arab World manifests the third change. This may result in an enhanced flow of revenues to the Arabian area and will channel the Arabian economy into florishment and eventually replacement of oil revenues in the future.

The fourth change pertains to the increased Arabic trend towards technology. For it is now clear that since the end of 1973, the Arab has found it necessary to introduce advanced technology into their countries in the most efficient way, thereby creating an independent Arab economic set-up. "This trend is materialized by the realization of big projects all over the Arabic World, primarily the ones led by the OAPEC" (Nasri, 1976).[42]

## (4-4) SOME REGIONAL AND INTERNATIONAL CONTRIBUTIONS

### (4-4-1) OAPEC

Since its establishment in 1968, OAPEC sought all possible and practical means to:-

(i) promote harmonization of the oil development policies of its member states;

(ii) enhance the existence of technological manpower in the Arabian hydrocarbon industries, and

(iii) establish joint projects among its member states.

Promising progress has been achieved in this respect. The most important of these achievements are:

(1) The exchange of information in the field of hydrocarbons among its member countries;

(2) The realization of two international seminars on opportunities for cooperation between the Arab World and the developed world in France and Japan. This is besides OAPEC's active contribution in most regional and international hydrocarbon, mineral, economical and political concerned conferences and seminars.

(3) A preliminary study of the status of the oil industry manpower has been made in 1975 which may be useful for planning an effective field study for the manpower sector in the oil and mineral industries (OAPEC 1976).[24] However, it has been shown that: (i) the oil sector will compete with other sectors in the member countries in order to get its demand of 12,000 highly educated personnel from the total of 80,000 supplied by the higher education institutes, (ii) the same situation applies for the operation and service technicians where oil sector's demand reaches about 19% of the total supply in these countries, (iii) Syria and Algeria will be capable, in the last years of the seventies, of achieving self-support in both trained and skilled workers, whereas the rest of the OAPEC countries demand will be about 33% of the total supply. The study's main proposal is to establish an OAPEC technical institute for instructors and teachers who are mostly needed in the regional training schools of the oil sector.

(4) The establishment of four commercial joint venture projects: (i) The Arab Maritime Petroleum Transport Company (1973) which acquired eight tankers with 2.1 million tons capacity, (ii) the Arab Ship-building and Repair Company which has been started in Bahrain 1974 with 100 million dollars capital. Its main function lies in the development of ship-building technology in the OAPEC region. It started with building a dry dock in Bahrain. It is important to emphasize that this Company established a tailored technology transfer training center at the start. (iii) The Fund for Financing Exploration in Arab Countries in Dammam (Saudi Arabia). Its main function will be to foster, with 3600 million Saudi Riyals, oil industry projects in the Arab World, and (iv) The Arab Petroleum Services Company (1977) which may offer, in the future, the most needed services in the field of geophysical surveys, geological mappings, electrical probings and wild-cat drillings. I recall that OAPEC's ministerial council had expected the last two companies to play an eminent role in the development of Arabian oil and mineral resources industries, and

(5) Finally, with its energetic administration in Kuwait, OAPEC are working hard to achieve some ambitious studies and tasks on behalf of the Arabian hydrocarbon industry development (Attiga, 1976).[43]

(4-4-2) The Arab Funds and Banks

With the rise of some new Arab funds and banks a new phenomenon has been witnessed across the last ten years.[44] This phenomenon may be visualized within (i) the direction of all possible financial efforts to furthering the cause of Arab economic integration and development and (ii) the fostering of stronger ties among Arab countries on one side and stronger cooperation between the Arab World and the Third World on the other side. Arab funds and banks have made good progress towards (1) investing in infrastructure and productive projects and (2) providing technical assistance to member countries and some under-developed countries. The size of their contribution to the oil and mineral resources sector is shown in Table (G). However, the contribution is relatively small and should be increased in a way which matches the new needs of the oil and mineral resources sector.

Table (G)

Arab Funds Granted within the Seventies by Some Arab Funds and Banks

| Projects | AFESD* (in millions of Kuwaiti Dinars) | KFAED** | IDB*** (million Dollars) |
|---|---|---|---|
| Energy | 4.0 (1974)<br>23.7 (1976) | 3.0 (Iraq - 70)<br>3.0 (Jordan - 73)<br>9.9 (Syria - 74) | |
| Gas | 6.0 (1974)<br>6.0 (1976) | 7.5 (Jordan - 76) | 70 (Syria - 77) |
| Processing | 14.0 (1976) | 2.0 (Syria - 74) | 189 (Jordan - 76) |
| Mineral Resources | 27.7 (1975) | 3.0 (N.Yemen- 70)<br>3.8 (Iraq - 71)<br>7.13 (Jordan - 76) | 300 (Jordan - expected) |

* The Arab Fund for Economical & Social Development (Annual Report - 76)

** The Kuwait Fund for Arab Economic Development (Private Communication - 1977)

*** Islamic Development Bank (Annual Report - 1976)

(4-4-3) Other regional and international bodies

Oil and mineral resources have been and will always be the main theme in regional and international affairs. Such interest was displayed within the actions of regional and international organizations like theArab League and the United Nations. Whatever concerted actions were taken by such organizations, they are completely different from OAPEC's actions. These actions have an informative, advisory, and consulting nature. Some of the developing countries like Arab countries have under-estimated the role of these actions for a long time. This is why they have lost many opportunities made available by these organizations. However, it is useful here to identify some of the main achievements of The Arab League and draw attention to the very wide features of the United Nations interests:

The Arab League's efforts may be classified as follows:

(i) Conferences and seminars on oil, petrochemicals, and mineral resources. Oil conferences were discussed in article (3-1-3) and the same applies to the petrochemical ones.[45] In the third conference on mineral resources held in Rabat, a strategy of developing mineral resources in the Arab World was adopted. It emphasized the existence of common elements among the Arab States in the development of their mineral resources, and that their exploitation levels in this field vary from one Arab country to another according to their particular industrial development and planning. These latter factors must be taken into consideration in drafting development plans for mineral resources in each country separately. Then it defined minerals available in the Arab States and discussed factors influencing such a strategy like (a) mineral reserves, production and stockpiling, (b) the infrastructure, (c) environment and non-mineral resources, (d) training, education and research and development, (e) financing, and (f) mineral processing and conservation.

(ii) The Arabian experts studies on oil and petrochemicals.

(iii) The establishment of the Arab Mining Company at the turn of this decade, and

(iv) The establishment of the Organization of Arabian Mineral Resources in Rabat (1977)[27] which is expected to play a leading role, like OAPEC's, in the field of the mineral resources industries.

The United Nations' role in the application of science and technology to development in the western Asia countries has been a vital and effective one since the turn of the sixties. The World Plan of Action (1971)[46] and the Regional Plan of Action for the application of science and technology to development in the Middle East (1973)[47] which are based on the United Nations international development strategy,[48] manifests well the background of United Nations' actions in the Western Asia's region. These actions may be classified in two parts:

(1) Actions to build up the necessary scientific and technological capacity and infrastructure in the region to enable its countries to make an optimal use of science and technology in their development, and

(2) Actions[49,50] through the various organizations of the United Nations system to solve a number of specific problems of high priority by obtaining new knowledge through research and development and by applying already existing knowledge. Details and analysis of such actions may need further work.

## (5) CONCLUSION

The closed nature of the oil and mineral resources industries in the Western Asia countries and the manner in which they need external technology and manpower provides the two main drawback features of these industries during takeover.

Through the period following takeover (i) most of the Western Asia producing countries are still exporting their production as a raw material. The related industries they acquired are limited in capacity and technology, since most of what was built was done as turn-key jobs and (ii) some of the Western Asia states and their national companies have tried to move from this unfavourable situation. In the late sixties, national oil and mineral resources companies in the Western Asia region were aware of

(i) The vital importance that they should establish new assessments of the available proven reserves. It helps them to (a) grasp the depletion rate of these reserves, (b) re-organize all aspects of their exploration and processing programmes and (c) to initiate new realistic strategies, and

(ii) the help they can get from the independent oil companies. The decline of the multi-national equity spectre in the early seventies has made it possible for the independent companies to offer some of the Western Asia countries more favourable contracts in most aspects of oil and mineral resources industries. This has enabled some of the Western Asia countries to (i) compete directly with the oil cartel, (ii) enhance some national modes towards self-reliance in exploration development, production, and downstream operations and (iii) to help the national administrations to think of new procedures which can be applied efficiently to their countries. The resultant output from the above-mentioned period has started to appear via the following:

(i) The formation of new integrated companies like the OAPEC's ones and The Arab Mining Company,

(ii) the selection of useful types of these industries in order to solve the country's particular needs as downstream industries and

(iii) the participation in regional and international meetings to discuss matters of technology transfer and development which has been discussed in (3-1-3) with some detail.

Within the transition period which ended in 1973, national oil and mineral enterprises were constrained by the need to employ as many people as possible,[51] and by the need to balance economic with social progress. Furthermore, these enterprises need to ensure that any technology which is transferred into their countries is actually beneficial to their development goals. This constraint has led some of the Western Asia countries to pass legislation regulating the transfer of technology to their nation. These regulations satisfy some preliminary requirements for a contract to be acceptable to the government and to place the licensee on the same level with the licensor of the technology.

They have been based on the feeling that while the Western Asia countries have paid for a lot of outdated, outmoded, inefficient technology, they have contributed implicitly through their national income, time and environment to the support of the research and development carried out in the developed countries.

Again in the conference of Ministers of Arab States Responsible for the Application of Science and Technology to Development (CASTARAB) held in Rabat (Morocco) 1976,[52] this argument has been stated and the conference urged the governments of the Arab States to: "make all possible efforts to secure the agreements of governments exporting technologies and of trans-national corporations, with a view to using patents, licences, know-how and trade marks on the most favourable and equitable terms for the Arab States".

However, the Western Asia Governments were very slow in taking measures to promote industrial reform and development of their own oil and natural resources sector. They were impeded by:

(i) The limited size of their indigenous capability in management, technology, and research and development,

(ii) The fact that existing universities and other technical centers which were copies of Western universities, and are not generally aware of the future needs of the business community in terms of original home-made technology that can be profitably utilized,

(iii) The governmental technocracy preference for imported technology, foreign management, and external technical consultancy. It is an expensive procedure, and tends to maintain their local superiority in the industrial sectors,

(iv) The lack of information on most parts of the oil and natural resources industry, which arises when expertise and technology is bought in,

(v) Over-employment, mis-utilization of resources, and the chaotic service programmes.

Backed by progressive national media, which may include decision makers in the technology, economy, and politics of the country, some national oil sectors of the Western Asia countries made a lot of success after the transition period. They struggled to overcome the foregoing impediments and sometimes they bypassed them in order to maintain progress. Bearing in mind that,

(i) they are importers and consumers, rather than producers and exporters of technology, and

(ii) the situation with regard to the attitude of the developed countries that are exporters of technologies, they achieved their progress through two parallel lines:

(A) <u>On the regional line</u>: they achieved the following:-

(i) They started to compile and field check all available data on every aspect of the particular technology. At the same time, they have drawn up numerous decrees and decisions to reverse the brain drain and to build the national technological potential,

(ii) They created new universities, such as the University of Petrol and Minerals in Saudi Arabia. Polytechnics started to function according to the needs of their business,

(iii) They initiated significant governmental reforms which provide them with the freedom for managing their own business through specialized departments of Ministries, and

(iv) In order to promote long-run aspects of cooperation and interdependence among the Western Asia countries in the field of petroleum, they have established the Organization of Arab Petroleum Exporting Countries.

The principle objectives of OAPEC are "the cooperation of the members in various forms of economic activity in the petroleum industry, the realization of the closest ties among them in this field, the determination of ways and means for safeguarding the legitimate interests of its members individually and collectively; the unification of efforts to ensure the flow of petroleum to its consumer markets on equitable and reasonable terms, and the creation of a suitable climate for capital and expertise invested in petroleum industry in the member countries".[53] Emphasis on promotion of research, training and exchange of information among OAPEC members in the field of hydrocarbons, was put forward in article two of OAPEC's agreement in 1968.[54]

(B) <u>On the international line</u>: Besides their individual efforts spent on communications with the owners of technology, they exchanged their experience with each other and with other developing countries having the same industries. They tried to tackle the transfer of technology as a problem open for theoretical analysis and exchange of experience. Later on, they reported their opinions in UNCTAD I, 1964, UNCTAD II, 1968 and UNCTAD III, 1972 to clarify their viewpoint through the following summary guidelines: (i) they need to adopt and implant imported technologies and subsequently to develop them along lines which suits their environment as well as the aspiration to progress and growth of their societies, (ii) they cannot under-estimate the impact of the

use of alien technologies on their environment and societies, (iii) they need to create, with the help of the developed countries, technologies stemming from their creative endeavours and innovations, and (iv) they are aware of the fact that the Western Asia countries should not become testing laboratories for the imported technologies.

In addition there was practical and political progress in promoting technology interchange and mutual aid among these countries, among them with the Soviet Union and the socialist countries,[55] and among them with other developing countries which might add active contributions to a successful future.

Brighton 21 August 1977

APPENDIX (A)

Petroleum Reserves*

There are at present no universally accepted definitions of petroleum reserves. A number of countries (for example the USSR), divide their reserves into five categories; other countries find it sufficient to divide reserves into two or three categories (for example, the United States of America), such as "proved reserves" and "indicated additional reserves". For most countries, the figures for reserves given in the technical press are not accompanied by precise definitions, and usually a single global figure is given.

It should be noted, however, that in all cases the concepts of "reserves" apply to recoverable reserves, this definition being both economic and technical. From the technical point of view, primary reserves and those dependent on secondary recovery processes are grouped together.

In this report, the reserves have been divided into three categories called respectively, proved reserves, probable reserves and possible reserves. The following definitions have been used for these terms:

(a) Proved reserves. Quantities of liquid hydrocarbons which, on the basis of geological and technical data, can almost certainly be considered recoverable from known drilled reservoirs under present economic and technical conditions.[6/]

(b) Probable reserves. Quantities of liquid hydrocarbons which it is hoped can be recovered from known reservoirs, but without the certainty that would enable them to be included in the preceding category.

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6/ This definition is almost identical to that adopted by the American Petroleum Institute (API) for proved reserves. It excludes reserves contained in oil shale and tar sands, but on the other hand it includes condensates.

* After "United Nations Publication No. E.74.II.A.1,1974 (Petroleum in the 1970s) p 26".

(c) Possible reserves. Quantities of liquid hydrocarbons which it is hoped can be discovered in reservoirs at present unknown and extracted under technical and economic conditions predictable over the next 30 years (1970-2000). 7/

7/ The estimates, which are necessarily very approximate, are based on the following elements:

(a) Use of the geological concept of "ultimate oil reserves in situ", also based on statistical observations;

(b) Expected change in the rates of discovery, as a function of statistics on past exploration in the various regions;

(c) Possible reassessment of these future deposits (expected to change in the average rate of recovery as a function of the expected change in petroleum prices and techniques.

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