CHAPTER 3

The Middle East as a Context for Technology Transfer

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The Middle East as a Context for Technology Transfer

INTRODUCTION

In the *1970's* the rapid expansion of oil wealth in some Middle Eastern countries at early stages of economic development was the major stimulus for technology transfer. Dependence on oil for revenue, limited infrastructure, a scarcity of technically trained manpower, and political and social tensions among and within Middle Eastern countries have at times, however, posed constraints.

This chapter outlines opportunities and constraints for technology transfer to Islamic countries in the Middle East. Two overarching themes form the context for technology transfer to the Middle East. The first is the disparity between human and natural resource endowments that characterizes the region as a whole. With the exception of Iran, those countries with larger populations have relatively low petroleum reserves. This basic imbalance is perhaps the most important feature of the Middle East context for technology transfer. Neither population nor oil resources are static, but they are critical parameters for economic and technological development in the near term. Technology transfer is thus constrained more in some countries by limited capabilities to purchase advanced technology, and in others by a scarcity of indigenous technical manpower.

Social and political concerns also shape the context for technology transfer to the Middle East, but in so many ways that it is impossible to generalize. As Middle Eastern countries attempt to combine Western technology with traditional values, the role of Islamic tradition and culture becomes difficult to define: sometimes it may support transfer, at other times it may be an impediment. Regional conflicts often limit prospects for civilian transfer; on the other hand, opportunities for regional cooperation are also available in joint economic development projects.

No one context, of course, can be considered optimal for technology transfer. Opinions vary about the significance of particular factor endowment mixes (involving land, labor, and capital resources) and of sociopolitical factors. A country with a high level of capital availability and a highly educated pool of scientific and technical manpower would certainly be more capable of obtaining and using imported technology than one that has neither the financial resources to purchase technology nor the human capability to use and absorb it.

Technology can itself be considered an additional resource. While requiring other inputs to be effective, technology can also be used so as to substitute for resources in short supply. Viewed from this angle, the challenge is to carry out transfer of technologies that will utilize existing factor endowments in the most effective way. In order to do this, a variety of technologies are needed. For these countries, importation of less sophisticated technologies may be critically important in some sectors, while advanced technologies are needed in others.

Definitions of the Middle East region range from the borders of the Arab states and Israel to the much broader region of Muslim states extending into North Africa, Asia, and the Soviet Union. The region represents a broad mix of resource endowments, levels of industrialization, and social and political systems. The countries of the region also vary in the levels and types of their technology imports, their technology suppliers, and hence in their prospects as potential markets for Western goods and services.

This report focuses primarily on six countries—Algeria, Egypt, Iran, Iraq, Kuwait, and Saudi Arabia. OTA recognizes that the six nations selected for special attention in this study are by no means representative of the Middle Eastern region as a whole, however defined. They do not include the poorest states of the region, such as the Sudan; the more radical states, such as Libya; or any non-Islamic country in the region. They also do not include the region's most technologically advanced country, Israel, since the main focus of the report is on those Middle Eastern countries which only in the past 10 to 15 years have tried to bridge the development gap very rapidly. Israel's distinct historical experience and technological capabilities put it in a separate category, one that presents different issues and problems for technology transfer than those in the six countries under review.

OTA's selection is intended to highlight key elements that present different opportunities and dilemmas for technology transfer. All of the countries in this study, for example, are oil producers, share a common Islamic heritage, are located in a hostile desert geographical context, and are attempting rapid economic development based largely on revenues from oil and gas. The differences among them, however, are striking and lie chiefly in levels of hydrocarbon reserves and production, financial reserves, economic structure, population size and composition, social and political systems, and past experience with technology transfer.

This chapter describes the context in which technology transfer occurs and in which policy decisions must be made. The major part of the chapter discusses the natural, financial, and human resources of Middle Eastern countries of particular interest. In conclusion, the social and political context is briefly considered. Questions of how Middle Eastern leaders develop policies to utilize these resources are addressed in chapter 11.

NATURAL RESOURCES AND ECONOMIC STRUCTURE

Figure 3 illustrates the disparity in the Middle East between human resources and petroleum reserves. Oil reserves in the Middle East have been the key source of revenues and the basis for industrial development in all of the countries selected by OTA. These reserves are especially large in Saudi Arabia and Kuwait; reserves in Algeria and especially Egypt are more limited. In contrast, the manpower base for technology transfer is larger in Algeria and Egypt, while being much smaller in Saudi Arabia and Kuwait.

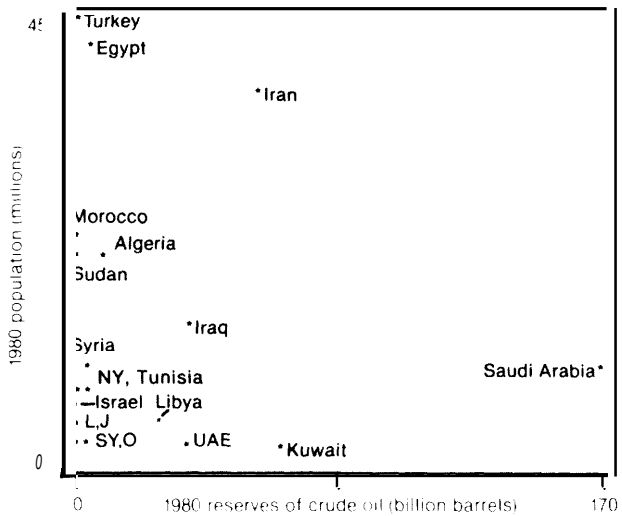
The positions of these countries change, however, when viewed from different perspectives. Petroleum revenues in relation to production contrast sharply with the same relationship on a per-capita basis. A comparison of figures 4 and 5 shows how the positions of various countries change when crude oil reserves are calculated on a per-capita basis. As illustrated by figure 5, Kuwait, a small city-state northwest of the Persian Gulf, has the highest per-capita oil reserves of any Middle Eastern country. In contrast, Kuwait ranks on a par with Iran (fig. 4) when total oil reserves are compared. Disparities also exist among the countries in both gross domestic product (GDP) and gross fixed capital formation (GFCF) per capita, as well as in the relationship between the two (figs. 6 and 7). Kuwait emerges as the high extreme when these indicators are examined on a per-capita basis, while Saudi Arabia and Iran were the high extremes on the basis of sheer wealth and investments in infrastructure, irrespective of population size.

NATURAL RESOURCES

Petroleum

The six countries included in this study are similar in their present emphasis on hydrocar-

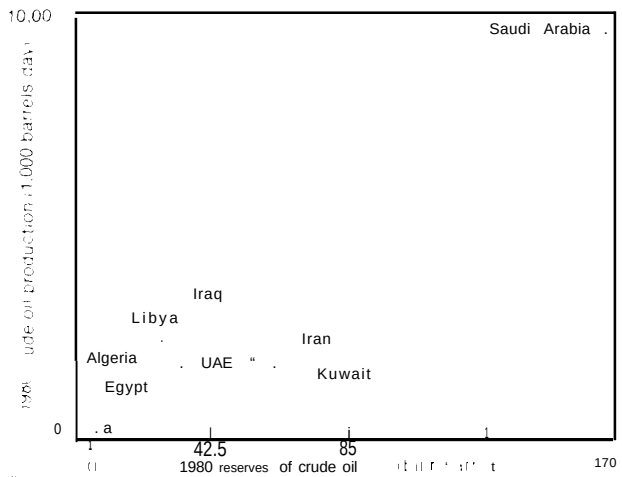
Figure 3.— Population Compared to Crude Oil Reserves, 1980



L = Lebanon
J = Jordan
O = Oman
SY = (PDR) Yemen
NY = Yemen Arab Republic

SOURCES: International Monetary Fund, *International Financial Statistics Yearbook*, 1982, and Energy Economics Research Ltd., *The "Oil and Gas Trends" Statistical Review 1981* (Reading, United Kingdom).

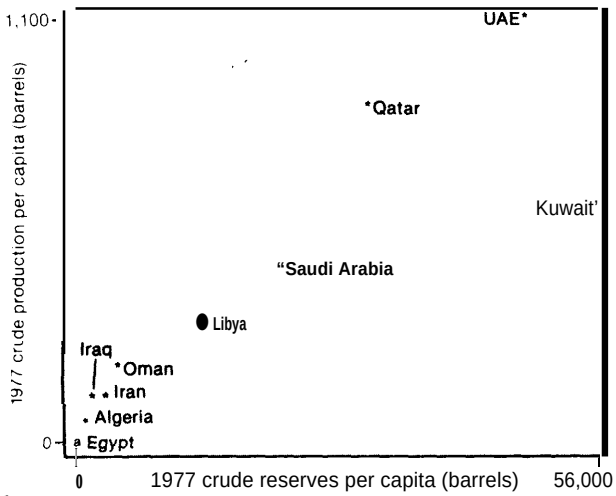
Figure 4.—Crude Oil Production Compared to Crude Oil Reserves, 1980



[a]Production and reserves are negligible for Bahrain, Israel, Lebanon, Jordan, Morocco, the Sudan, North Yemen, and South Yemen.

SOURCE: Energy Economics Research Ltd., *The "Oil and Gas Trends" Statistical Review 1981* (Reading, United Kingdom).

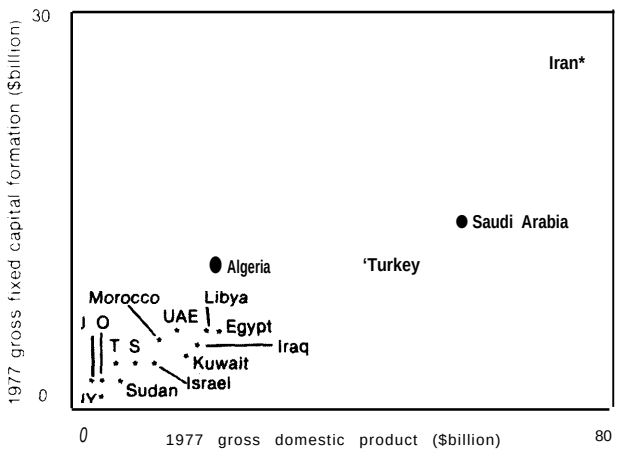
Figure 5.—Crude Production Per Capita Compared to Crude Reserves Per Capita, 1977



[a]Includes Egypt, Israel, Jordan, Lebanon, Syria, North Yemen, South Yemen, Morocco, Sudan, Tunisia, and Turkey.

SOURCES: International Monetary Fund, *International Financial Statistics Yearbook*, 1982, and Energy Economics Research Ltd., *The "Oil and Gas Trends" Statistical Review 1981* (Reading, United Kingdom).

Figure 6.—Gross Fixed Capital Formation Compared to Gross Domestic Product, 1977

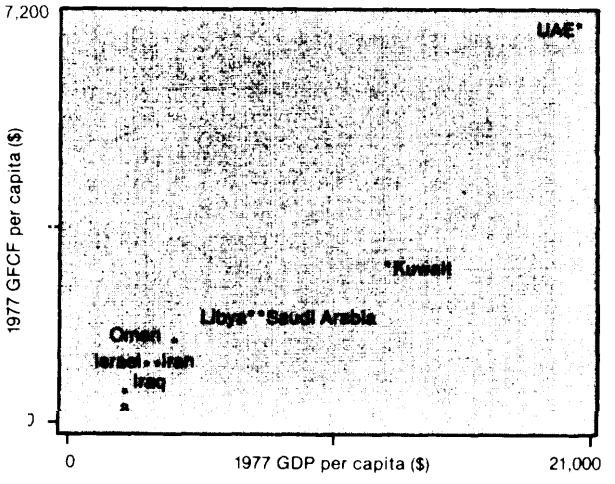


T = Tunisia
S = Syria
J = Jordan
O = Oman
NY = North Yemen

Note: The IMF does not publih natinal accounts statistics for Bahrain, Lebanon, Qatar and South Yemen. They are not included in this figure. Gross Capitol Formation is used for Israel, Iraqi, GDP data is from 1976 Iraqi GFCF data is from 1975.

SOURCE: International Monrtary Fund, International Financial *Statistics* Year *book 1982*

Figure 7.—Gross Fixed Capital Formation Compared to Gross Domestic Product Per Capita, 1977



a Includes Egypt, Morocco, Jordan, Syria, Tunisia, Turkey, Algeria

Note The I M F does not report national accounts statistics for Bahrain, Lebanon, Qatar and South Yemen They are not Included on this figure Gross Capital Formation is used for Israel, and Oman, Iraqi GDP data is from 1976 Iraqi GFCF dala is from 1975

SOURCE International Monetary Fund International Financial *Statistics Yearbook 1982*

bons as a source of their revenue and growth. To be sure, the centrality of petroleum is a comparatively recent development in some of the countries under review. But today, oil and gas account for over 90 percent of total merchandise exports of five of the six countries under review, and for a large proportion of domestic production.

Even in Egypt, the country with the smallest oil resources, petroleum has recently become centrally important. Through the 1960's, for example, Egypt was the world's leading producer of cotton fiber and a major producer of other agricultural products. Today, however, with population growing rapidly, Egypt has become a net importer of many basic food products, and in recent years, the importance of cotton exports has declined. Instead, Egypt relies increasingly on petroleum and worker remittances for export revenues; in 1981, oil revenues accounted for 70 percent of Egyptian export earnings.

Aside from Iran and Iraq, the emergence of the Middle East as an important petroleum exporting region dates only from the middle of this century. Before World War II, few countries besides Iran and Iraq had discovered or developed oil resources. While oil had also been discovered in Saudi Arabia and Kuwait before the war, exports became significant only in the mid-1940's for Saudi Arabia, and later in the decade for Kuwait. At the beginning of the 1950's, development of Middle Eastern oil was still in its early stages; in the next 10 years, production nearly tripled, and in the following 10 years, it tripled again. Oil output in the Middle East rose from nearly 10 million barrels per day (b/d) in 1967 to 22 million b/d in 1977, an annual increase of 8.3 percent; by 1977, the Middle East alone accounted for over 36 percent of total world output and about 60 percent of total world exports.1

Despite the common importance of petroleum, however, there is a sharp division between the oil-rich countries and those less well endowed with hydrocarbon resources. Table 2 and map 1 illustrate some of the major differences in oil reserves, production, and exports among the six countries examined, with Saudi Arabia, Kuwait, and Iran at one end of the spectrum and Egypt and Algeria at the other. Saudi Arabia's huge proven oil reserves, for example, estimated at 165 billion barrels in 1983, vastly exceed by as much as 18 and 50 times those of Algeria and Egypt, respectively.' Saudi Arabia's close to 10 million b/d in crude oil production in 1981, was more than 16 times that of Egypt.[3] Similarly, Saudi Arabia's 9.3 million b/d petroleum exports vastly

[1] Peter Mansfield, *The Middle East* (Oxford: oxford University Press, 1980), p. 87.

[2] The World Bank cites Egyptian oil reserves at 2.9 billion barrels. An estimate of 3.3 billion barrels is included in ''Economic Trends Report: Egypt, Economic and Commercial Sections, American Embassy, Cairo, Egypt, Sept. 6, 1 982. p. 10.

'In 1977 before the Iranian Revolution and the outbreak of war between Iran and Iraq, Iran, Iraq, Saudi Arabia, and Kuwait accounted for about one-third of total Middle East crude oil production, and Iran and Saudi Arabia numbered among the four largest producers in the world. See Mansfield, op. cit., p. 89.

Table 2.—Oil and Gas in the Middle East

	Reserves		Production				Exports			Apparent consumption	
	Crude Oil (billion bbl)	Natural gas (trillion ft³)	Crude Oil (1,000 bpd)		Total prod Na.t gas (billion ff³)		Crude Oil exports	Refined petroleum product	Dry gas	Petroleum (thousand bpd)	Dry qas
	1981¹	1981	1971	1980	1979	Dry gas	1979	exports 1979	1979	1979	1979
Kuwait	67 9	33.2	2.625	1.656	460	213	2081	294	0	154	213
Algeria	8 2	131.5	1.294	1.012	1.539	520	1 082	71	393	104	12q
Egypt	2 9	30	542	595	ND	ND	267	33	ND	226	ND
Saudi Arabia	168 0	1124	9835	9900	1 786	390	8818	429	0	415	390
Iran	57 5	485.0	3.178	1.662	1.401	512	2407	141	134	532	358
Iraq	30 0	27.5	3.487	2.514	509	60	3275	42	ND	191	ND

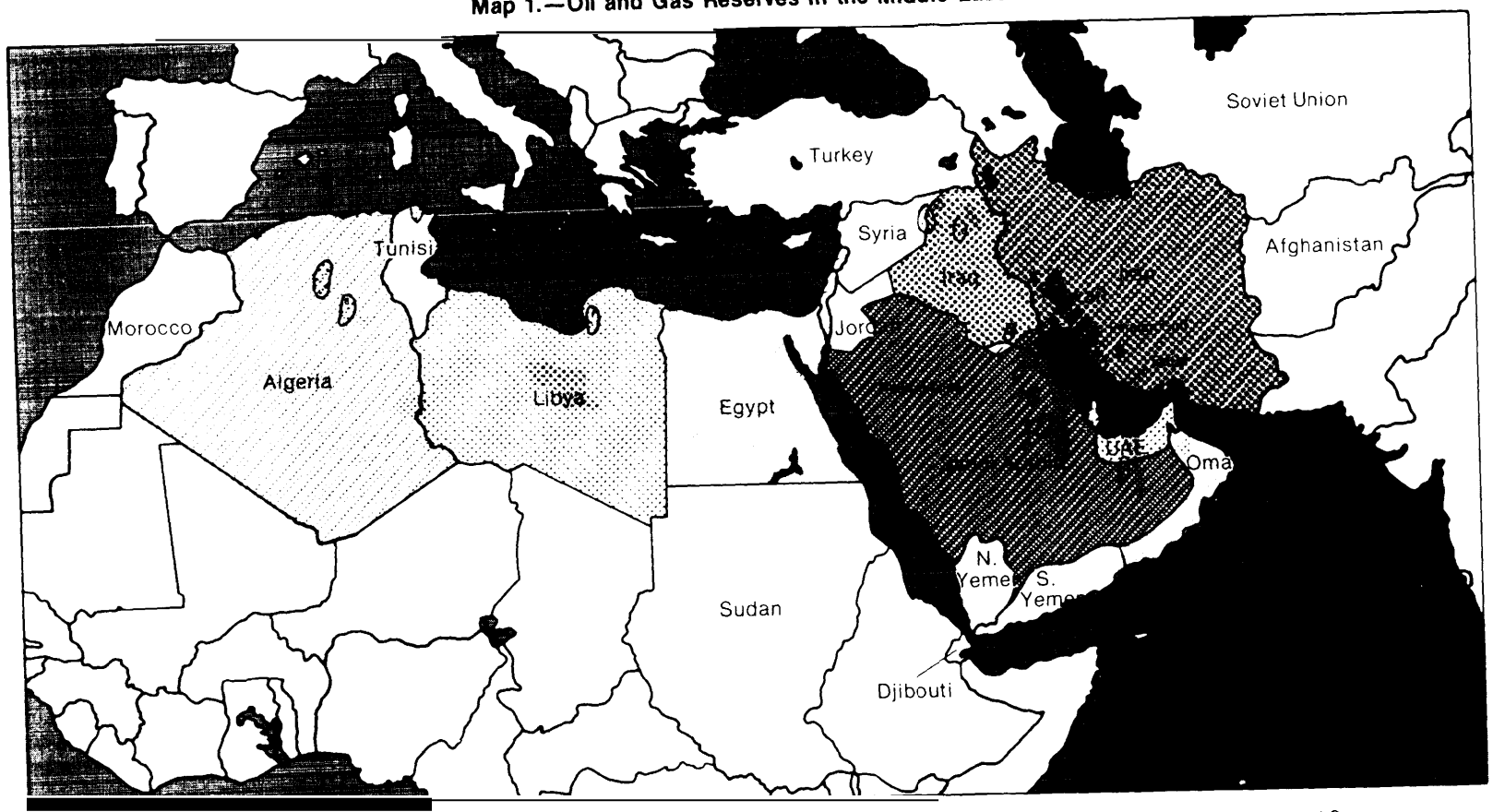
NB no data

SOURCE Energy Information Administration U S Department of Energy International Energy *Annual* 1980 (Washington D.C., U.S. Government Printing Off Ice September 1981) pp 28 29 66 67 86

Photo credit United Nations (B P Wolpert SI)

Egypt's population is concentrated in the Nile Valley, and Cairo (shown here) is the largest city

Map 1.—Oil and Gas Reserves in the Middle East



Key:

Crude Oil (billion barrels)	Natural Gas (trillion cubic feet)
1-20	1-20
21-40	21-40
41-60	41-100
61-100	101-250
More than 100	More than 250

Major deposits of crude oil

Major deposits of natural gas

NOTE: The delineation of boundaries on this map must not be considered officially accepted. Geographic names or their spellings do not necessarily reflect recognition of the political status of an area.

SOURCES: Office of Technology Assessment: oil and gas reserves from U.S. Department of Energy, *1982 International Energy Annual* (Washington, D.C.: U.S. Government Printing Office, 1983), p. 80. Location of oil and gas fields from Michael Dempsey, *Atlas of the Arab World* (New York: Facts on File Publications, Nomad Publishers Ltd., 1983), p. 17.

exceeded the 199,000 b/d of crude oil exported from Egypt in the same year. In the 1970's, Saudi Arabia and Iran were the two largest oil exporters in the world, and oil revenues in Saudi Arabia were the largest in the world.

While reserves are large in Iraq and Iran, the war between them has resulted in greatly reduced petroleum exports. This has been true especially in Iraq, where petroleum exports were at a record low of less than 1 million b/d as of 1983 in contrast with three times that level before the outbreak of hostilities.

In some countries, such as Algeria and Iran, natural gas has also been important. Table 2 highlights some of the major differences in natural gas reserves, production, and exports.[4] As table 2 illustrates, dry gas exports have been very important for Algeria and Iran in particular, whose reserves of natural gas are among the world's four largest. In 1983, Iranian proven natural gas reserves, estimated at about 483 trillion cubic feet (ft^3), were second only to those of the Soviet Union. During the 1970's, Iran was the largest natural gas exporter in the Persian Gulf. Algerian natural gas reserves have been estimated as fourth in magnitude after the Soviet Union, Iran, and the United States.[5]

[4]For the Persian Gulf region, proved natural gas resources have been estimated at about 700 trillion ft^3, or about 26.6 percent of the world total. In 1980 the aggregate gross production of natural gas in the Persian Gulf countries was 4.3 trillion ft^3. But 60 percent of this was flared, and less than 5 percent reinjected into oil reservoirs. See U.S. Department of Energy *The Petroleum Resources of the Middle East,* Foreign Energy Supply Assessment Program Series (Washington, D.C.: Energy Information Administration, May 1983), p. 75.

[5]See U.S. Department of Energy, *The International Energy Manual, 1982* (Washington. D. C.: U.S. Government Printing Office, September 1983), p. 80. In 1981, Algeria possessed an estimated 131.5 trillion ft^3 of natural gas reserves, and approximately 29 trillion ft^3 of probable and possible reserves; this did not include an additional 1.5 billion barrels of liquefied petroleum gas. Dry gas exports from Algeria in 1979, at close to 400 billion ft^3, were higher than most other countries in the Middle East, and more than 2½ times those of Iran.

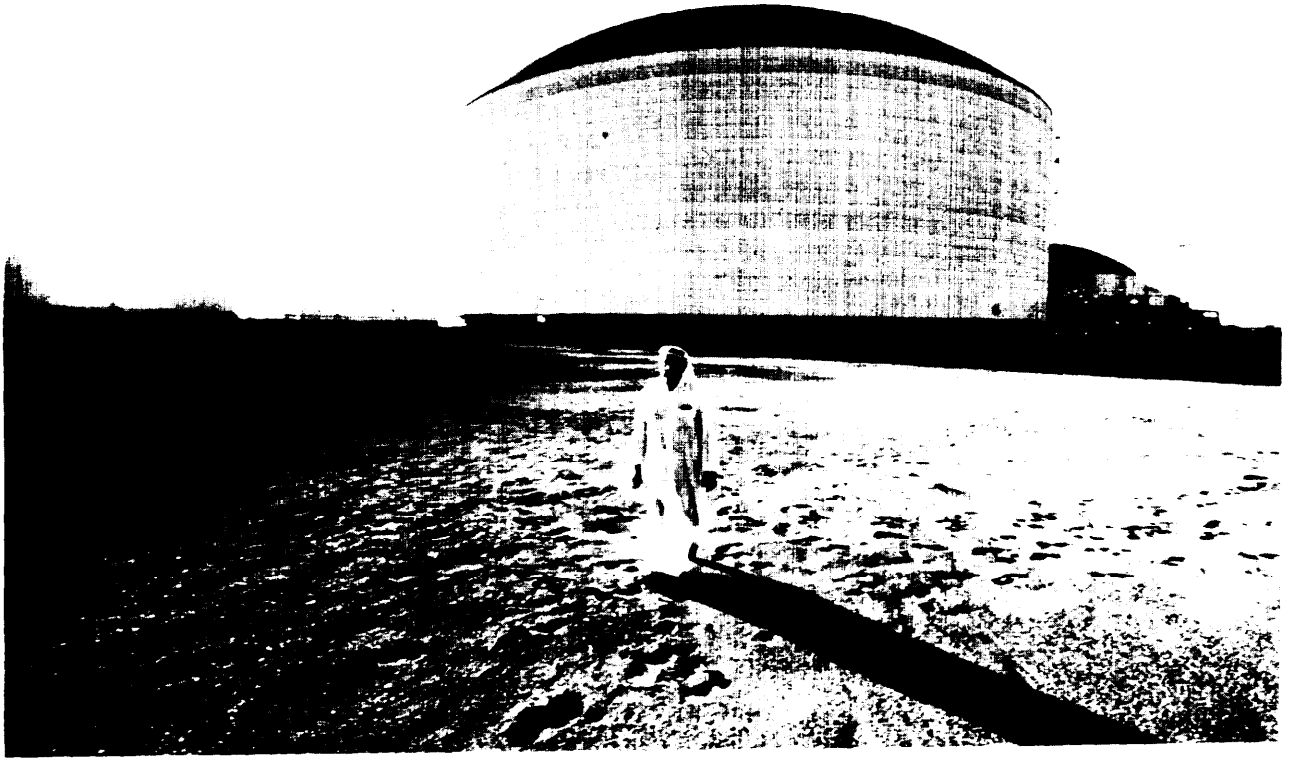


Photo credit Aramco World Magazine

Butane and propane liquefied gases are stored in special refrigerated tanks prior to export from Saudi Arabia

In Egypt, natural gas reserves are far more limited but not insignificant. Egypt's proven natural gas reserves are now estimated at between 5.5 and 7 trillion ft^3.[6] Although natural gas reserves in Saudi Arabia, at about 121 trillion ft^3 in 1983, are fifth in size, in Saudi Arabia and Kuwait the production of natural gas has been small relative to oil, and almost all has been associated gas (i.e., gas produced in conjunction with petroleum extraction operations).

As discussed in chapter **14,** however, prospects for oil and gas production in the Middle East are uncertain. on the one hand, some observers argue that oil reserves may be significantly depleted in many Middle Eastern countries by the beginning of the 21st century. One study conducted by the Department of Energy (DOE), for **example**, projects that if the average production during the 1990's were to remain the same as that in the 1980's, then by the year 2000 over one-half of the total known oil resource base in the Persian Gulf would be depleted.[7] On the other hand, large reserves can be expected to remain in the Middle East for the next two decades, and oil resources are not static. Several Gulf States will be able to produce some additional deposits, using more costly secondary recovery techniques, and large oil fields may yet be discovered. In addition, the importance of natural gas may rise greatly during the post-1990 period, offsetting the projected decline in oil production.

Water

Aside from oil and natural gas, the natural resources of all six countries selected by OTA are limited. With a minimum of 40 percent of the land mass of these countries classified as desert–and in some instances, more than 90 percent-the limited amount of cultivable land in these countries makes extensive agricultural development difficult. The Arabian peninsula is the most arid part of the Earth, with Saudi Arabia the largest country in the world having no rivers and few streams. In the other countries under study, basic resources for agricultural expansion—mainly water—have been limited as well, and prospects for substantial improvement are uncertain.

The scarcity of water is a critical constraint in most of the countries under review, although the situation has been alleviated somewhat in recent years by desalination and the construction of dams and irrigation systems. All of these countries have upgraded the delivery of potable water, particularly in urban areas. The Middle Eastern region is fed by two main river systems: the Tigris-Euphrates and the Nile. These two river systems have been the lifeline of this region for centuries, and the heart of great ancient civilizations. Both systems, however, are today limited in their ability to support the region's rapidly growing population.

Agriculture

Limited water availability has precluded extensive agricultural development. Most extreme in this regard are Saudi Arabia and Kuwait, with well over 90 percent of their land mass in 1982 classified as desert. Although there is some variation among the countries under review, all have considerable expanses of unpopulated land, with a few areas of dense population. Cultivable land is generally restricted to small areas lying between vast stretches of desert and steppe. In Iran, for example, more than 50 percent of the total land area has been classified as desert, wasteland, or barren mountain range of no agricultural value. In the late 1970's, only 15 to 16 percent was regarded as land that could be farmed with adequate irrigation.[8] In Egypt, agricultural cultivation has been limited to only 4 percent of the country, with harsh desert compris-

[6] Ibid, p. 80; and "Economic Trends Report: Egypt, ' Economic and Commercial Sections, American Embassy, Cairo, Egypt, Sept. 6, 1982, p. 10.

[7] U.S. Department of Energy, *The Petroleum Resources of the Middle East,* op. cit., pp. 67, 82. These estimates are based on the assumption that oil production will increase at an average rate of 6 percent in the 1980-95 period; during recent years this has not actually occurred.

[8] Richard F. Nyrop (cd.), Iran: A *Country Study* (Washington, D. C.: Foreign Area Studies Series, The American University, 1978), pp. 330-331.

Photo Credit Chevron U.S.A., Inc.

Pipeline construction in Saudi Arabia

ing much of the remainder. In only a few of the other countries in the Middle East outside of the six examined by OTA—such as the Fertile Crescent in Syria—can greater wealth in agricultural land be found, but even here, rainfall is uncertain, and the amount of cultivated land small.

This is not to suggest that agricultural products have been insignificant for domestic consumption or as sources of income for most of these countries. Aside from hydrocarbons, agricultural products have comprised the bulk of exports from many of them, including such items as barley, wheat, and dates from Iraq, cotton from Egypt, and dried fruit from Iran. But the resources for agricultural expansion have been limited, and the climate for expansion of crops much less favorable than in other parts of the developing world.

The further development of agricultural resources is an open question. The extent of underground water resources in the Egyptian and Arabian deserts has yet to be fully determined, and in Egypt, there has been some debate over whether agriculture there has actually reached its limits, given Egypt's physical environment (sun, soil, and water). Israel's success in agricultural production with limited resources is perhaps a case in point. For the time being, however, harsh climate and terrain make the region an importer of many food and agricultural products.

Minerals

The six Middle Eastern countries selected by OTA may have significant reserves of minerals, but they have not been extensively developed. Saudi Arabia and Iran, for example,

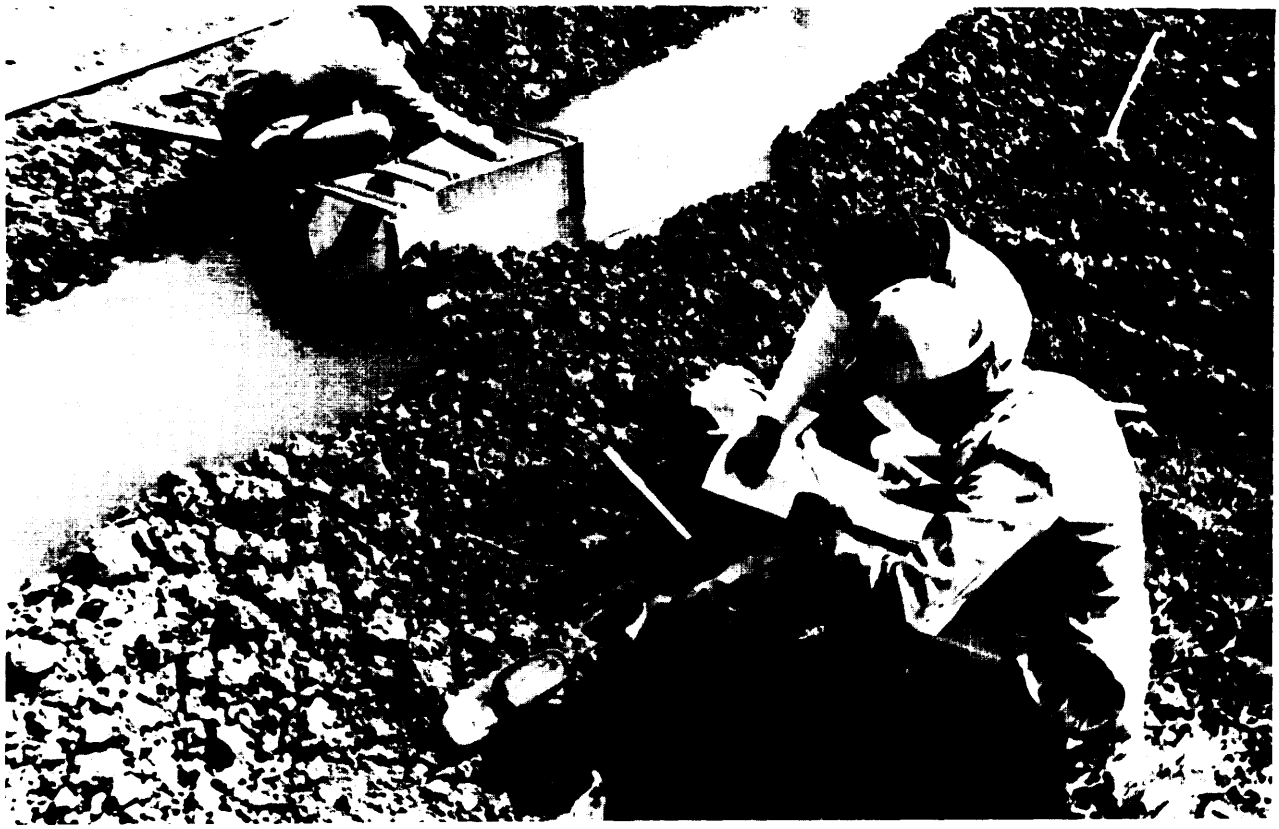


Photo credit *U S Agency for* International Development

Water use and management in Egyptian agriculture

are just beginning to assess their mineral bases. With significant amounts of copper, iron, gold, phosphate, zinc, lead, and some bauxite found in Saudi Arabia, some observers expect Saudi Arabia may become as important an exporter of minerals in the future as it is of oil today.[9] Important mineral resources now being extracted in other areas of the Middle East[10] include iron, phosphates, and, to lesser extent, copper, manganese, coal, and salt. Large deposits of titanium (an important structural metal element) were discovered in Egypt's Eastern Desert in 1971, and several observers have suggested that other large areas of the Egyptian and Arabian deserts that still have not been intensively surveyed may also prove to be rich in other minerals. In addition to hydrocarbons, Algeria has valuable uranium deposits in the Sahara as well as already exploited deposits of iron, coal, phosphates, zinc, and lead, and unexploited deposits of manganese, diamonds, iron, and platinum. At present, however, in the Middle East mining and production of minerals have not been developed to a great degree, and mineral exports comprise a very small proportion of Middle Eastern production and exports.

FINANCIAL RESOURCES

Oil and gas are the foundation of the financial resources of these Middle Eastern countries. High oil revenues have allowed the oil-

[9] Louis Turner and James M. Bedore, Middle East *Industrialisation* (Hants, England: Royal Institute of International Affairs, Saxon House, 1979), p. 3.

[10] See *Iran: A Country Study,* op. cit., pp. 310-311. In 1975, estimated reserves of some of Iran's more important mineral resources were: iron ore, 114 million tons (with a metal content of 35 to 62 percent); copper ore, 1 billion tons (much of it high grade); lead and zinc ore, 10 million tons; antimony ore, 12,000 tons; manganese ore, 720,000 tons; chromite, 7 million tons: and coal, 300 million tons.

rich countries of the Middle East to be freer of the balance-of-payments constraints found in most other parts of the developing world. But in those Middle Eastern countries with smaller reserves, such as in Egypt, financial constraints remain strong. During the current period of oil glut, moreover, the overall financial situation of all of these countries has changed.

The rapid influx of large amounts of capital into the Middle East dates mainly to the early 1970's. Large-scale capital flows resulting from the oil price rises in 1973 generated massive financial resources for the oil-producing countries. Nominal prices continued to increase well into the early 1980's, while oil production remained high. As table 3 indicates, the largest price increase occurred between 1973 and 1974, but between 1979 and 1980, another jump in prices occurred, with Saudi Arabian Light, for example, almost doubling from slightly over $13 to $26/barrel (or about $17 to $30 in 1982 prices).

While the large producers benefited most from this wealth, the effects were felt throughout the Middle East in: 1) private investment, public investment, and direct assistance by oil producing countries to other Middle Eastern countries; and 2) labor remittances to those countries poorly endowed with oil but which exported manpower to the labor-short, oil-rich nations. Large-scale capital flows into the Middle East, in turn, led to rising investments by oil-rich countries in the West and massive imports of goods and services from industrialized countries.

Circulation of oil revenues throughout the Middle East, however, did not greatly offset the growth of vast differences in financial resources among Middle Eastern countries. Table 4 and map 2 show improvement in the financial situations of selected Middle Eastern countries between 1970 and 1980. In 1981, Saudi Arabia's gross international reserves were reported as over $34 billion (U. S.) —more than 20 times those of Egypt. By 1982, Saudi

Table 3.–Crude Oil Selling Prices[a] (U.S. dollars per barrel, Jan. 1, 1984)

	1973	1974	1975	1976	1979	1980	1981	1982
Saudi-Arabian Light (34)	2.41 (4,72)	10,84 (19.52)	10.46 (19,15)	11.51 (18,02)	13,34 (16.29)	26.00 (30.23)	32.0 (34,04)	34.00 (3400)
Algerian Saharan (44)	3.30 (6.47)	14.00 (25.21)	12.00 (19.76)	12,85 (20.12)	14.81 (18.11)	30.00 (34.80)	40.00 (42.39)	37,00 (37,00)

[a]Figures are in normal Prices, numbers in parentheses are real prices in 1982 dollars.

SOURCE Energy Information Administration U S Department of Energy 1981 *International Energy Annual* (Washington D C U S Government Printing Office 1983) p 47 1982 prices computed from given

Table 4.— Balance of Payments and Financial Situation of Middle East Countries (million U.S. dollars)

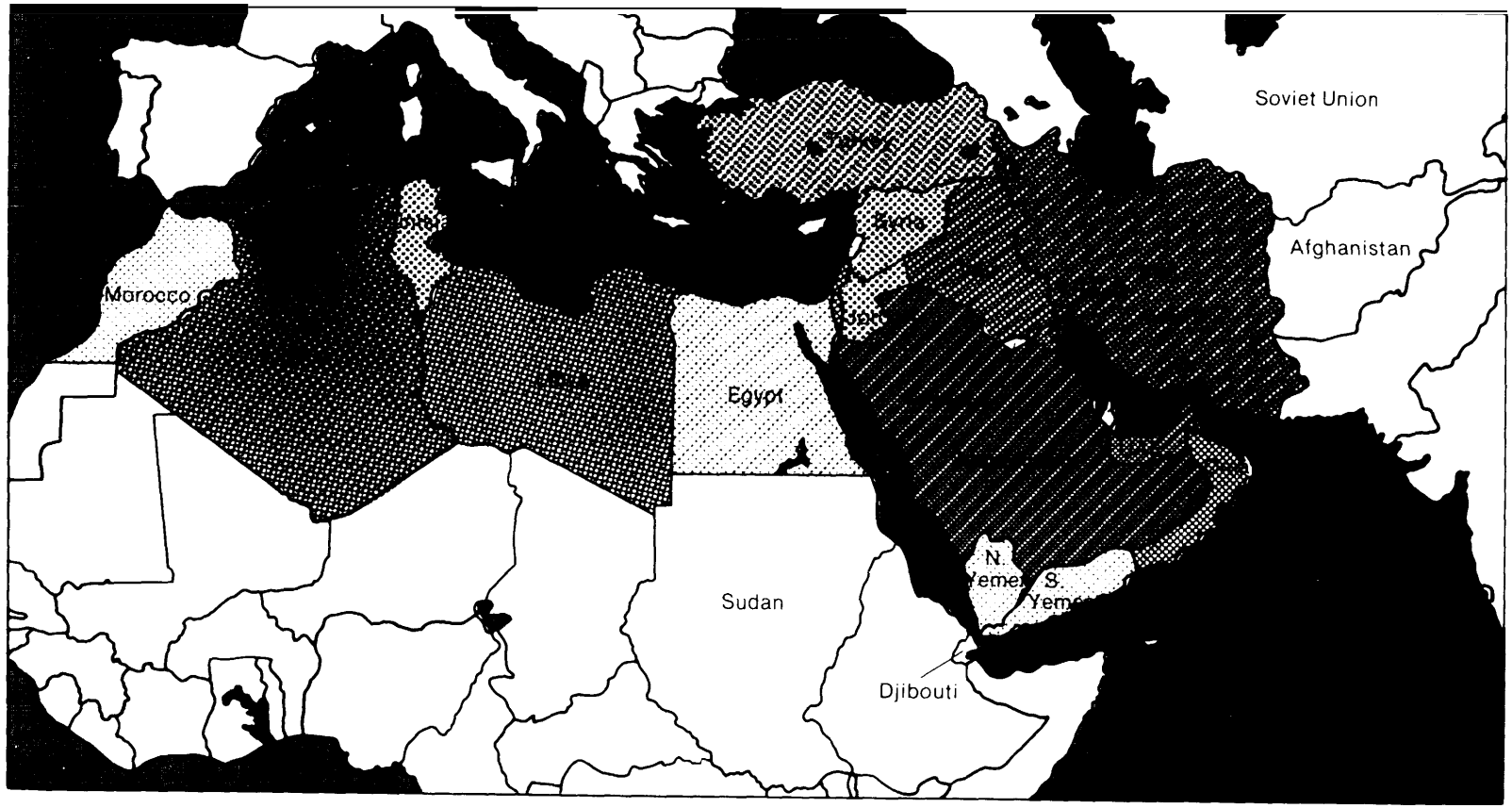
	Current account balance (millions of dollars)		External public debt[a]		Gross international reserves	
	1970	1981	1970	1981	1970	1981
Egypt	– 148	– 2,135	1,644	13,887	165	1,683–
Algeria	– 125	249[b]	937	14,392	352	5,915
Iran	– 507	—	2,193	—	217	17,205[c]
Iraq	105	—	274	—	472	—
Saudi Arabia	71	45,119	—	—	670	34,051
Kuwait	–	13,758	—	—	290	5,077

[a]Outstanding and disbursed
[b]1980
[c]1979

Note Gross International reserves include holdings of gold, special drawing rights the reserve position of International Monetary Fund members in the fund and holdings of foreign exchange under the control of monetary authorities

SOURCE The World Bank, World Developmenf Report. 1983 (New York Oxford *Unlversity Press 1983).* pp. 174-175 178-179

Map 2.—Economic Activity in the Middle East



Key:

GNP per capita (1981, U.S. dollars)	Total GDP (1981, millions U.S. dollars)
1-1000	500-10,000
1001-2000	10,000-20,000
2001-10,000	20,000-35,000
10,000-25,000	35,000-60,000
	More than 60,000

Note: Total GDP for Iran is for 1977, GNP per capita, for 1978. Total GDP for Iraq is for 1979, GNP per capita, 1980. Data for all countries is for 1981.

NOTE: The delineation of boundaries on this map must not be considered officially accepted. Geographic names or their spellings do not necessarily reflect recognition of the political status of an area.

SOURCES: Office of Technology Assessment; oil and gas reserves from U.S. Department of Energy, *1982 International Energy Annual* (Washington, D.C.: U.S. Government Printing Office, 1983), p. 80. Location of oil and gas fields from Michael Dempsey, *Atlas of the Arab World* (New York: Facts on File Publications, Nomad Publishers Ltd., 1983), p. 17.

Arabia and Kuwait claimed total official foreign assets of almost $199 billion-or more than those held by the industrial country bloc. " And today, in addition to oil revenues, both Saudi Arabia and Kuwait enjoy substantial investment income as well. Oil revenues to Kuwait, for example, declined during the first 3 years of the 1980's–falling from $19.5 billion in 1980, $13.6 billion in 1981, and a projected $8 billion to $9 billion in 1982. But this decline has been offset by Kuwait's rapidly growing foreign investment income, estimated at $6 billion in 1980, $8.2 billion in 1981, and $9.1 billion in 1982. '2

Egypt, and to a lesser extent Algeria, on the other hand, have much more limited financial reserves. Egypt is in a more favorable position than most developing countries in that it not only has some petroleum for export, but also earns considerable foreign exchange from remittances to workers from foreign countries and companies. The bulk of Egyptian foreign exchange revenues has come not only from petroleum exports, but from three main services largely connected with petroleum: workers' remittances, tourism, and Suez Canal tolls.[13] But at least for the past decade, Egypt faced serious balance of payments and debt repayments problems. In 1981, therefore, Egypt's current account balance was a negative $2.1 billion (U.S.), as opposed to a positive $45.1 billion for Saudi Arabia. Gross international reserves for Egypt were only about $1.6 billion, as opposed to Saudi Arabia's $34.0 billion (see table 4). Indeed, Egypt's external public debt registered over $13 billion (U.S.), or more than half of its gross national product (GNP). Egypt financial position has been supported by foreign aid, especially from the United States, with economic assistance in fiscal year 1981 reaching over $1 billion.

Algeria's financial resources are also more limited than those of the Gulf States. But while Algeria's external public debt is even higher than Egypt's, natural gas reserves have tended to mitigate reservations about Algeria's high foreign debt and the ability to repay it; Algeria has therefore been able to borrow more freely. In the mid-1970 's, Algeria numbered among the world's most heavily indebted less developed countries (LDCs), both in absolute terms and on a per-capita basis. By 1981 Algeria's total estimated disbursed external debt was $17.5 billion, and the debt service was estimated at 25 percent of imports. But the easier access to foreign capital which Algeria has enjoyed relative to Egypt has allowed the Algerian Government to expand its investments and increase its volume of technology trade. Thus, while Algeria's external public debt in 1981 was even slightly higher than Egypt (table 4), this represented a smaller proportion of Algeria's GNP, and Algeria's international reserves remained significantly higher than Egypt's. Limited capital availability, however, still remains a serious problem for Algeria.

Iraq and Iran represent a middle position. Both Iraq and Iran were important petroleum exporters before the outbreak of war, but since then their financial positions have changed dramatically. As the world's fourth largest producer and second largest exporter of petroleum in the mid-1970's, Iran's revenues from petroleum exports grew from $155 million in 1956 to a peak of $23.6 billion in 1977. Large oil revenues have also dominated Iraq's sources of foreign exchange since the early 1950's and have largely determined the level of imports. The Iran-Iraq War, however, has

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[11] See Ragaei El-Mallakh, "U.S. Economic Ties With the Arab States of the Gulf and Egypt, " *The Middle East in the 1980's: Problems and Prospects* (Washington, D. C.: The Middle East Institute, 1983), pp. 17-32. For estimates of total foreign assets, see George T. Abed, "Arab Financial Resources: An Analysis and Critique of Development Policies, " in *Arab Resources,* Ibrahim Ibrahim (cd.) (Washington, D. C.: Center for Contemporary Arab Studies, 1983), pp. 43-70.

[12] "'Kuwait Economic Trends, " American Embassy, Kuwait, October 1982, p. 3. Figures for 1982 were preliminary estimates. Investment income for Saudi Arabia was estimated at 35 billion Saudi riyals in 1982-83 (or about $10.2 billion at a 1982 exchange rate of 3.44 Saudi riyals = $1 U.S.). See ibid., p. 21.

[13] In 1981, exports of petroleum and petroleum products comprised a total of 2820 million Egytian pounds (L.E.), out of a total export revenue of 4,04O million pounds; cotton, the second largest Egyptian export, brought a total of only 310 million L.E. in export revenue. And out of a total of 4,920 million Egyptian pounds in services receipts, approximately 590 were from tourism, 888 from Suez canal revenues and an estimated 2,200 million from workers remittances. "Economic Trends Report: Egypt, " op. cit., p. 1. (At the end of 19811 Egyptian pound = $1.23 U. S.)

greatly eroded the generally favorable financial position of both countries. As income from sales dropped with export interruption and falling prices, and as expenditures for war-related consumption dramatically increased, the estimated $35 billion in Iraq's foreign currency reserve were drawn down. Capital availability in Iraq has become severely limited and Iraq has turned to external loans and grants. Iran, too, has encountered financial constraints that were unknown before the revolution and the outbreak of war with Iraq. Iran was able to export more oil than Iraq during the 1982-84 period, while Iraq reportedly received considerable Arab aid.

Prospects for financial resource availability in the Middle East are difficult to assess. Because of their reliance on exports of oil and external sources of income (e.g., remittances and foreign aid in the case of Egypt), Middle Eastern countries will remain sensitive to their international environment, including changes in the oil market and regional politics. Most projections suggest that the oil-exporting countries will probably have to adapt to a lower level of income growth in the coming years than in the decade of the 1970's. Opinions differ mainly as to just how much adaptation this adjustment will require.[14]

One view suggests that if oil prices do not rise dramatically, financial constraints may become an important issue, even in the capital-rich states. Along these lines, one estimate projects that the price of oil, which declined in 1983, will rise moderately after 1984.[15] These projections portend only a partial recovery in revenues in the following few years of the 1980's. In real terms, this report suggests that by 1986, nominal government oil revenues will be about 94 percent, and their purchasing power only about 74 percent, of 1981 levels.

On the other hand, other observers have noted that at least for the capital-rich states, even if revenues decline substantially in the coming years, this will not necessarily lead to more severe capital constraints in the oil-rich nations. This is attributed to these countries' limited absorptive capacity, and the flexibility and diversity of capital-rich states in their sources of revenue.[16] Indeed, these observers note, despite budgetary cutbacks in certain sectors, the total 1984 Saudi budget was larger than that for 1982. These issues are discussed in chapter 14.

ECONOMIC STRUCTURE

The countries of the Middle East can be divided between the traditionally agricultural and the overwhelmingly oil-based economies. Despite some diversification during the 1970's, this division still holds.

Figure 8 illustrates this dualism in economic structures in the Middle East, with Egypt at one extreme, and the oil-based economies, mainly Saudi Arabia and Kuwait, at the other.

Prior to the 1970's, few of the countries under review had a well developed industrial or manufacturing base, although their levels of industrial production differed. In Saudi Arabia in 1973, for example, there were four refineries, a fertilizer plant, and a small operation for producing iron and steel products for the building industry.[17] Saudi Arabia had virtually no experience with industrialization, aside from that which the Arabian American Oil Company (ARAMCO) had fostered, and data suggest that under 5 percent of the employed population was engaged in manufacturing activities in the mid-1960's. Iran was at the other end of the scale. With a larger, more skilled population and initial discoveries of oil more than 30 years earlier than in Saudi Arabia, Iran's industrial development was at

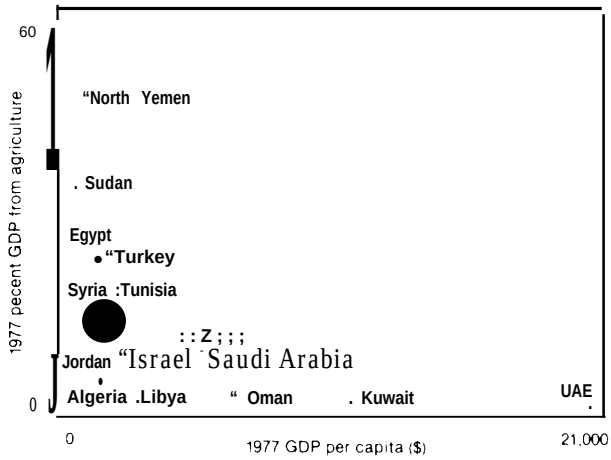
[14] see, for example, Joseph C. Story and Vahan *Zanoyan,* "Economic Outlook for the Middle East and North Africa, *Middle East Economic Digest,* June 3, 1983, pp. 39-47.

[15] According to Storey and *Zanoyan,* by 1985, Kuwait, aong with some of the other smaller Gulf States is projected to be producing either at almost full capacity or at the production ceilings they had before the oil glut began. Saudi Arabian output is projected to grow at a more moderate rate at an average 4.9 b/d in 1983, 6.15 million b/d in 1984 and to remain between 7.2 million to 7.8 million b/d in subsequent years, ibid., pp. 38-39.

[16] See, for example, E1-Mallakh, op. cit.

[17] See, for example, Turner and Bedore, op. cit., p. 4,

Figure 8.— Percent of GDP From Agriculture Compared to GDP Per Capita, 1977



Note: The IMF and the World Bank do not report national accounts statistics for Bahrain, Lebanon, Qatar, and South Yemen. They are not included on this figure. Data for Iraq, North Yemen, and Kuwait are from 1976.
Sectoral origin of GDP is computed at constant factor costs for all countries except Jordan, Israel, and the UAE, which are at current factor costs.

SOURCES: International Monetary Fund, *International Financial Statistics Yearbook*, 1982; The World Bank, *World Tables*, 2d ed., 1980; and data on sectoral origin of GDP for Egypt, Jordan, and the United Arab Emirates are from the United Nations, *Yearbook of National Accounts Statistics*, 1980.

a more advanced stage. Nonetheless, until the 1970's, industry was poorly developed in most of the countries under review.

During the 1970's, growth in revenues stimulated changes in economic growth and structure. In the countries under review, GDP grew rapidly throughout the 1970's, even in those countries with smaller petroleum reserves. The growth rate of GDP in Egypt prior to 1974 was a relatively poor 1 to 3 percent. Between 1975 and 1977, however, it averaged around 13 percent, before declining to an average of **8** to 10 percent annually through mid-1981. These high rates of growth greatly offset population growth rates, and per-capita income also rose rapidly. In Algeria per-capita income in 1976 was estimated as between $780 and *$1,000, lower* than that of the larger oil producers but substantially higher than that of neighboring countries such as Morocco and Tunisia.

Table 5 illustrates the changes in the sectoral structure of GDP in selected Middle Eastern countries. The Middle East has been characterized by an almost uniform decline in the contribution of agriculture to GDP and continued importance of hydrocarbons to the growth of the GDP. One of the largest declines in agriculture occurred in Iran, where agriculture's contribution to the GDP declined from 29 to 9 percent between 1960 and 1977. Between 1960 and 1981, agriculture's contribution to the GDP declined from 30 to 21 percent in Egypt and 17 to 7 percent in Iraq; in Algeria, agriculture's contribution to the GDP was reportedly around 6 percent in 1981.

At the same time, the proportion of the hydrocarbon sector in the GDP grew rapidly in the more agricultural countries, and remained high in the oil-rich countries. The proportion of hydrocarbons in Algeria's GDP grew from about 15 percent in the late 1960's to about

Table 5.—Distribution of GDP by Sector, 1981

	GDP ($ billion)	Agriculture (%)	Industry (%)	Manufacturing (%)	Services (%)
Kuwait	24.3	(.)	71	4	29
Saudi Arabia[a]	115.4	1	78	4	20
Iran[c]	(69.2)	(9)	(54)	(12)	(37)
Iraq[b]	30.7	8	73	6	19
Algeria	41.8	6	55	11	39
Egypt	23.1	21	38	32	41
Developing country averages					
Middle-income economies	NA	14	38	22	48
Low-income economies	NA	37	34	16	29

NA = not available.
[a]Data for 1980.
[b]1979, *World Development Report*, 1981, p. 139.
[c]Data for 1977, in parentheses, from World Bank.
Note: Manufacturing is a part of the industrial sector.

SOURCE: The World Bank, *World Development Report, 1983* (New York: Oxford University Press, 1983), pp. 152-3.

30 percent in 1979. In Egypt, from a negligible contribution to GDP of 1 to 2 percent at the beginning of the decade, the petroleum sector grew to over 13 percent of the GDP in 1979, 22 percent in 1980, and 20 percent in 1981.[18] Today, in the oil-rich countries of Saudi Arabia and Kuwait, GDP is still heavily oil-centered. Egypt remains on the other end of the scale, with a nonoil GDP still at a relatively high 80 percent of the total GDP. Iran, Iraq, and Algeria again fall in between.

Declines in agriculture have not been accompanied by a rise of manufacturing with like strength. Especially for the heavily oil-centered economies, manufacturing remains a very small contributor to GDP, registering only about 4 percent of GDP in 1981. In Iran and Algeria, the proportion of manufacturing has been somewhat higher (about 11 percent), but still below the average for both low- and middle-income countries worldwide. Instead, the oil-rich countries of the Middle East have been highly service-oriented: the ratio of services to manufacturing output is 2.5 to 3.5 times higher in Saudi Arabia and Kuwait than the average for low- and middle-income countries worldwide; and while somewhat lower in Iran, Algeria, and Iraq, it is well above the world average. In Egypt, on the other hand, manufacturing contributed 32 percent to GDP in 1981, and the ratio of services to manufacturing output was well below the world average.

There are also striking differences between the oil-rich states and the middle-income oil exporters in volume of exports. The export share of GDP is highest in the oil-rich states, reaching as high as 74, 72, and 63 percent in the UAE, Kuwait, and Saudi Arabia, respectively. Two Middle Eastern countries stand out in this context, Algeria (33 percent) and Jordan (51 percent). These data indicate diversification in Algeria's economy but in the case of Jordan the important fact not revealed in the data is substantial exports despite the absence of oil.

IMPLICATIONS FOR TECHNOLOGY TRANSFER

This context provides both opportunities and constraints for technology transfer. On the one hand, the oil-rich countries have substantial revenues, on a scale rarely found in other LDCs, allowing for enormous purchasing power for imports of advanced technology.

Especially for the oil-rich countries, however, the heavy reliance on petroleum for both revenue and economic growth also imposes constraints on technology transfer. The price of oil has been subject to unpredictable fluctuations so large as to have strong effects on Middle Eastern economies. With continuing uncertainty surrounding the price of oil, capital constraints could become more severe, even for the oil-rich countries.

Another implication for technology transfer stems from economic structure. Oil-centered economies such as the Gulf States aim to develop other economic sectors, but may face constraints in such diversification due to limitations in other natural resources. The oil-rich countries, facing uncertainty in the magnitude of future earnings, must work to increase productivity in their economies and to expand manufacturing. In contrast, countries such as Egypt less well endowed with petroleum have a somewhat more diversified resource and economic base but face severe financial constraints.

[18] Figure for Algeria taken from U.S. Department of Commerce, *Foreign Economic Trends and Their Implications for the United States:* Algeria, July 1981, p. 2. Figures for Egypt, from U.S. Department of Commerce, *Foreign Economic Trends and Their Implications for the United States: Egypt,* May 1982, p. 10. Figures for oil and nonoil GDP for the remaining countries in OTA's study vary widely. One of the more conservative estimates suggests that in 1980, petroleum accounted for about 70 percent of the total GDP in Saudi Arabia, 59 percent in Kuwait, 52 percent in Iraq, and about 22 percent in Iran, although other estimates suggest the proportion may be much higher. These estimates are computed from Wharton Econometric Associates, *Middle East Economic Outlook, vol. 3, No.* 1 (Washington, D. C., April 1983), computer printout appendixes to each country section.

MANPOWER

Technology absorption requires not only financial resources, but also a skilled scientific and technical manpower base. Most Middle Eastern countries face shortages of manpower skilled in scientific and technical areas. This is especially the case for the oil-rich countries, while Egypt is among the countries best endowed with large and skilled population resources. The following section assesses the manpower resources of the countries under review, the role migration has played in addressing imbalances among them, and the context this situation provides for technology transfer.

LABOR FORCE

As illustrated in map 3 and table 6, differences in total population among the countries under review are substantial. Estimates of total population in 1981 ranged from 1.5 million for Kuwait and approximately 7 million to 9.5 million for Saudi Arabia, to populations of close to 40 million in Egypt and Iran. Because of differences in land size and terrain, population density varies considerably. Egypt's territory, less than half the size of Saudi Arabia, hosts a population upwards of five times that of Saudi Arabia. And since Egypt's population is heavily concentrated in approximately 5 percent of its total territory, the disparity in population density is even greater. [19]

The size of the labor force also varies greatly in the six countries under review. Approximately one-half the total population of these countries in 1979 was of working age (15 to 64 years old); in Egypt, the proportion was slightly higher, 57 percent. The size of the labor force is estimated to range from about 1.8 million people in Saudi Arabia to over 10 million people in Egypt.

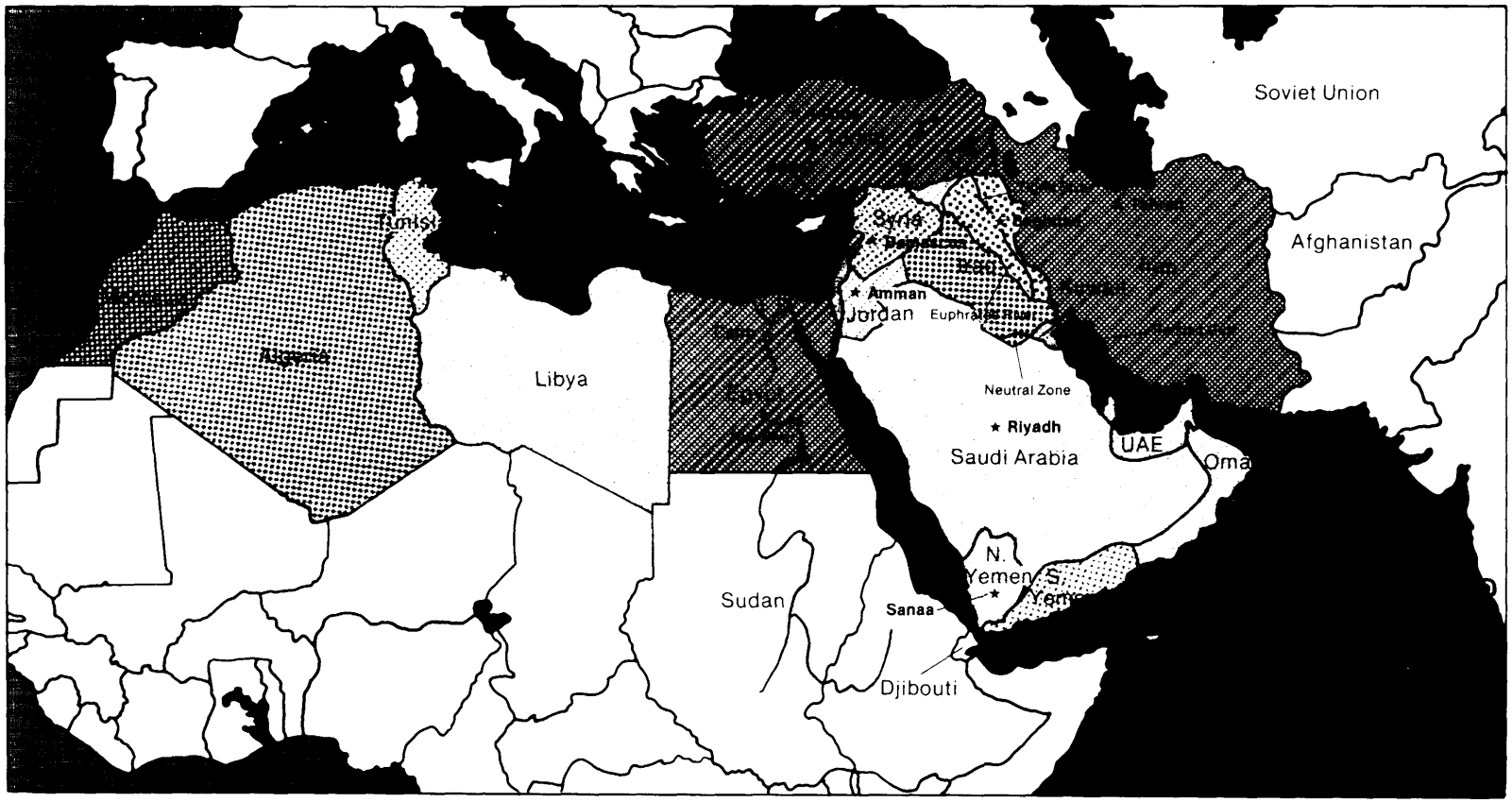
Especially during the past decade, all of the Middle Eastern countries under review have seen rapid growth and structural diversification of the labor force; yet today, all are experiencing shortages of skilled professional and technical manpower necessary to meet the demands associated with rapid economic development and technology transfer from abroad. Matching changes in economic structure discussed earlier, the proportion of the labor force engaged in agriculture has declined over the past two decades.[20] This decline in agriculture, moreover, has been matched by a growth in the proportion of the labor forces employed in manufacturing, construction, services, and industry, and in the number of managerial and administrative personnel, professional and technical workers, and industrial production workers. Nonetheless, throughout the Middle East, agriculture and pastoralism are still the main employers of the population, while professional and technical workers comprise but a small share of the total work force in these countries. (See fig. 9.)

In general, there is a sharp division between the traditionally labor-importing and labor-exporting countries. Saudi Arabia and Kuwait have indigenous populations and labor forces that are relatively small, less technically skilled, and heavily concentrated in the service sectors. On the other end of the scale are the labor-exporting countries such as Egypt, with larger populations and a more skilled and diversified manpower base, but which have experienced high underemployment and unemployment rates.

[19] "Estimates of the total population of Saudi Arabia vary widely from 7 million to 9.5 million people, for 1980. A plausible midrange estimate is 7.7 million. Between 1970-77, most of the countries under review had population growth rates of between 3.1 and 4,0 percent per year. Egypt, with an annual population growth rate of 2.1 percent, was the exception on the low end, as was Kuwait, at 6.0 percent per year, on the high end. Indeed, 98 percent of Egypt's population lives in the Nile Valley, where population density may reach as high as 2,300 persons per square mile. See J. S. Birks and C. *Sinclair, Arab Manpower: The Crises of Development* (London: Croom Helm, **1980),** p. 215.

[20] See The World Bank, World *Development Report 1983 (New* York: Oxford University Press, 1983), pp. 188-189, 147. As illustrated in fig. 9, the agricultural labor force decline may have been even greater, as indicated by the International Labour Organization, which reported an even lower proportion of the labor force in agriculture in 1977.

Map 3.—Population Size and Density in the Middle East



Key:

Total Population (in millions)	Population Density (number of inhabitants per square kilometer)
.2-5	1-15
6-10	16-30
11-20	31-49
21-40	50-60
More than 40	More than 61

NOTE: The delineation of boundaries on this map must not be considered officially accepted. Geographic names or their spellings do not necessarily reflect recognition of the political status of an area.

SOURCE: Office of Technology Assessment compiled from the World Bank *World Bank Development Report 1983* (New York: Oxford University Press, 1983), pp. 148-9. Data for Oman from Agency for International Development *Near East Bureau Strategy 1983-1988* Revised, December, 1983, p. 16. Data for Qatar from Michael Dempsey, *Atlas of the Arab World* (New York: Facts on File Publications, 1983).

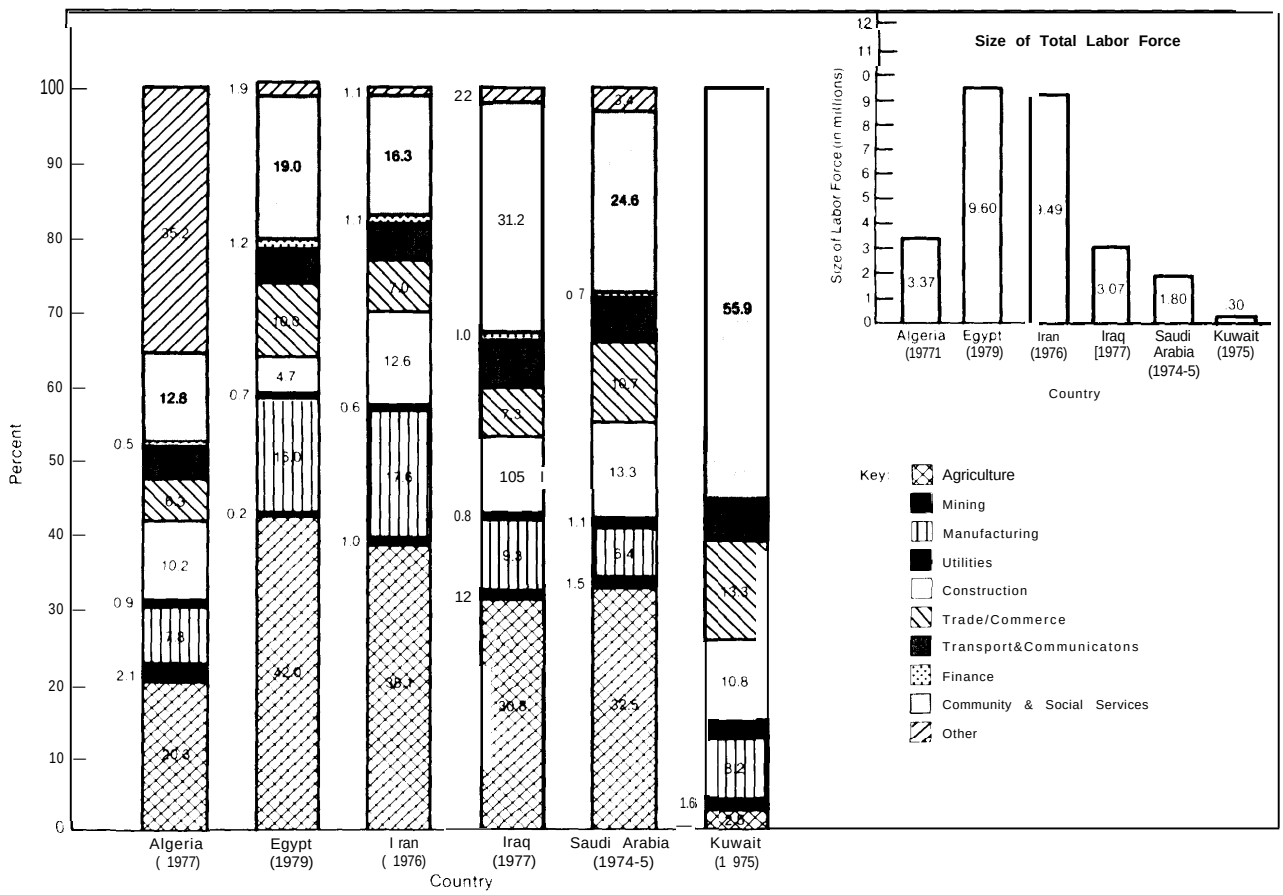
Table 6.—Basic Indicators, Selected Middle East Countries, 1981

	Population (millions) (mid-1981)	Area (1,000 km²)	Average annual population growth (1970-81)	Adult literacy[a] (Ol., 1980)	Urban population as percent of total population (1981)
Saudi Arabia	9.3[b]	2,150	4.5	25	68
Kuwait	1.5	18	6.3	60	89
Iran	**40.1**	**1,648**	**3.1**	**50**	**51**
Iraq	**13.5**	**435**	**3.4**	NA	72
Algeria	19.6	2,382	3.3	35	44
Egypt	43.3	1,001	2,5	44	44
Average middle-income economies	NA	NA	2.4	65	45

NA = not available
[a] Adult literacy represents the percentage of persons aged 15 and over who can read and write, Data for Iran, Algeria, and Egypt are for years other than 1980 but not more than 2 years distant from the other estimates
[b] As illustrated in the text of this report, this is among the higher estimates for the total **population of Saudi Arabia, which range** between about 7 million and 95 million. The estimate here is used to retain consistency of sources.

SOURCE: The World Bank, *World Development Report, 1983* (New York: Oxford University Press. 1983), pp. 148-9, 184-5, 190-1.

Figure 9.— Structure of Economically Active Population in Selected Middle East Countries, (in percent)



Note: Included indigenous and non-indigenous labor force.

SOURCE: Office of Technology Assessment. Computed from International Labor Organization, *Yearbook of Labor Statistics*, 1981 and J.S. Burke and C.A. Sinclair *Arab Manpower* (London: Croom Helm, 1980) pp.45,108.

Many occupational categories are important for technology transfer, among them trained scientists and engineers. Their contribution as managers of projects, in particular, is important. Table 7 shows the number of trained scientists and engineers in these countries in the 1970s. Egypt and Kuwait are at opposite ends of the scale, although scientists and engineers comprise a relatively high proportion of Kuwait's total labor force.

Expansion in education suggests that the availability of scientists and engineers will improve, but that disparities among countries may remain wide. In all of the countries under review, educational enrollments have grown rapidly compared to those of other middle-income countries. Between 1960 and 1980, as table 8 shows, the proportion of the age group enrolled in secondary school more than doubled-and in some cases more than tripled. By 1980, it had reached as high as 75 percent in Kuwait, 57 percent in Iraq, and 52 percent in Egypt, compared to the average weighted growth for middle-income countries in general of 39 percent. Educational training has been extensive in Egypt, while in the labor-short countries under review, the numbers and percents of school enrollments are still low. In 1980, 15 percent of Egypt's population aged 20 to 24 was enrolled in higher educational establishments, as opposed to half that amount in Saudi Arabia. Generally speaking, the availability of indigenous scientific and technical manpower can be expected to increase as a result of these efforts.

Today the disparity among countries is, however, especially pronounced in the vocational and technical fields. In Egypt, almost one-fifth of all students enrolled in secondary or higher level schools in 1976-77 were in vocational and technical schools. The proportion was considerably lower than this in all of the other countries under review, especially in Algeria. While some of this difference maybe accounted for by the different structure of technical training in the countries under review (see ch. 11), these data indicate shortfalls from country plans and perceived requirements. In Algeria, the National Development Plan anticipated a need for 80,000 highly skilled and 180,000 medium-skilled personnel by 1984; 50,000 people of the latter group were to be in technical, scientific, and production areas. In 1978, however, less than 2,000 degrees were awarded in Algeria in scientific and technological fields; as of 1980, higher educational enrollment was 67,000 students, but only 27 percent were in the scientific and technical fields.

Table 7.— Number of Trained Scientists and Engineers, 1970's

Country	Total
Kuwait (1975)	27,246
Algeria	NA
Egypt (1973)	593,254
Saudi Arabia (1974)	33,376'
Iran (1974)	161,183
Iraq (1972)	43,645[a]

[a]**Estimated data** for Iraq include persons in government Institutions only
Note: Current data are not available.

SOURCE: UNESCO, Statistical Yearbook, 1981 (London Computaprint, Ltd 1981), pp V 23-5

FOREIGN MANPOWER

The disparities in the size and quality of manpower resources have led to high levels of migration in the Middle East, both within the region itself and from without. This migration of labor is a relatively recent phenomenon. Until the early 1970's, the Islamic Middle East was conventionally viewed as a closed labor market, with little inflow or outflow of population. The oil price increases of 1973, however, led to an exploding demand for labor in the newly rich oil-exporting countries. Wages increased, employment opportunities grew, and labor from other countries responded rationally -i.e., by moving from low-wage areas to those of higher wages. Once a relatively contained region with little migratory movement of labor (aside from the migration of workers from Algeria to France and the resettling of many West Europeans in Israel), the Middle East became a region of dynamic and massive labor migration. The migration involved both skilled and unskilled labor, and entailed movement both among the Middle Eastern countries and from almost all other regions of the world.

Table 8.—Educational Enrollments in Selected Middle Eastern Countries

	Number enrolled in primary school, as percent of age group[a]		Number enrolled in secondary school, as percent of age group[b]		Number enrolled in higher educational establishments, as percent of population aged 20 to 24		Number enrolled in vocational and technical schools, 1977-78	
	1960	980	1960	1980	1960	1980	Total number	As percent of students enrolled in secondary levels or above[c]
Kuwait	117	96	37	75	NA	12	2,084	4.6
Algeria	46	95	8	33	(.)	5	11,798	1.6
Egypt	66	76	16	52	5	15	403,541[d]	18.0[d]
Saudi Arabia	12	64	2	30	(.)	7	5,169	5.9
Iran	41	101	12	44	1	5	NA	NA
Iraq	65	116	19	57	2	9	28,365[d]	4.7
Average, middle-income economies, 1960-80	75	100	14	39	3	11	NA	NA

[a]Primary school age is generally considered to be 6 to 11 years old, but may vary by country. In some countries, enrollment ratios may exceed 100 percent, owing to some pupils being above or below the official primary school age.
[b]Secondary school age is generally considered to be 12 to 17 years old.
[c]"Secondary levels or above" includes preparatory schools following primary certification, secondary schools, and all higher institutions.
[d]1976-77.
NA not available.

SOURCES: Cols. 1-6: The World Bank, *World Development Report, 1983* (New York: Oxford University Press, 1983), pp. 196-197.
Cols. 7-8: Paul Shaw, *Mobilizing Human Resources in Arab World* (London: Kegan Paul International, 1983), p. 169.

During the 1970's, therefore, the pattern of labor movement in the Middle East became highly complex, affecting employment in all economic sectors. Algeria continued to export unskilled labor mainly to France while importing skilled labor from other countries in the Middle East. The oil-rich countries became importers of all skills in greater numbers, while Egypt became a major exporter of all skills." The Sudan and the Yemens continued to export unskilled labor. And some countries, such as Iraq, began to both import and export labor simultaneously.

As the demand for manpower rose, the numbers of migrants in the Middle East grew, so that by the mid-1970's, one-fourth of North Yemen's labor force and almost one-third of Jordan's was employed in other countries of the Arab world,[22] while close to three-fourths of Kuwait labor force was comprised of foreign personnel. Table 9 illustrates one set of estimates of the magnitude of migrant workers in the Arab world in 1980. According to these data, the number of Egyptians working in other parts of the Arab world grew to almost 750,000 in 1980. Beginning in 1976, Asian labor–Pakistanis, Indians, Bangladeshis, Koreans, Baluchis, and others, or people from countries which traditionally had little contact with Arab economies-began to migrate to the Middle East as well. The number of Pakistanis and Indians working in the Middle East grew to more than 650,000 in 1980.[23] At the same time, the influx of personnel from Western countries also increased, mainly to work in highly skilled professional and technical positions.

Table 10 illustrates the sectoral distribution of foreign workers for two of the largest labor-importing countries in the Middle East, Saudi Arabia, and Kuwait as of the mid-1970s. Both Saudi Arabia and Kuwait have been particularly dependent on foreign workers in their manufacturing, construction, and commerce sectors. In Kuwait, the construction sector is nearly completely (95 percent) dominated by foreign workers, with about 90 percent of the manufacturing sector being comprised of foreigners as well. According to one estimate, Egyptians and Turks make up between 20 and 25 percent of Iraq's work force, a significant proportion of whom are in agriculture, services, and construction. In many Middle Eastern labor-importing countries, Asian labor—mainly Korean, Indian, and Pakistani-has dominated much of the construction sector, while Egyptian labor has dominated manufacturing and such services as education and medicine.

Foreign workers are generally concentrated in either the technical occupations or in the lowest skilled, manual occupations, while indigenous personnel are concentrated in either the managerial positions (often with foreign assistants or deputies) or in the service occupations outside of the production process. Table 11 illustrates the occupational distribution of the labor force in Kuwait. In Kuwait, Egyptians and Jordanians make up large percentages of the professional and technical workers. Kuwaitis make up a larger share of the managerial and clerical workers, with Jordanians being the major foreign group filling these jobs. In the second half of the 1970's Saudi Arabia likewise grew increasingly reliant on foreign labor in the managerial, professional and particularly the technical occupational groups.

Information on the number of migrant workers in Iran has been unavailable since the Iranian revolution. While there may have been upwards of 1 million foreign workers in Iran in 1977, there is little reason to believe that more than a fraction of these workers remains. Prerevolution patterns were that the unskilled

[21] For a discussion of the development of engineering skills in particular in Egypt, and problems of utilizing skills most closely associated with technology transfer and industrial development, see Clement Henry Moore, lmages *of Development; Egyptian Engineers* in Search *of Industry* (Cambridge, Mass.: MIT Press, 1980).

[22] Nazli Choucri, *Migration in the Middle East: Transformations, Policies and Processes,* Technology Adaptation Program, Massachusetts Institute of Technology, Cambridge, Mass., 1983, p. 3-4.

[23] According to another estimate, the number of Pakistanis alone working in the Middle East grew from less than 200,000 in 1975 to almost 1.25 million in 1979, See ibid., pp. 3-10, 3-11.

Table 9.—Migrant Workers in the Arab World by Country of Origin and Employment, 1980

Country of origin	Country of employment: Saudi Arabia	Libya	United Arab Emirates	Kuwait	Qatar	Bahrain	Jordan (East Bank)	Oman	(YAR) Yemen	Iraq	Total
Egypt	155,000	250,000	[illegible]	85,000	[illegible]	3,000	69,000	4,000	4,000	150,000	744,000
Yemen (YAR)	325,000	—	[illegible]	3,000	[illegible]	1,000	—	—	—	—	336,000
Jordan/Palestine	140,000	15,000	[illegible]	54,000	8,000	2,000	—	2,000	2,000	10,000	252,000
Yemen (PDRY)	65,000	—	[illegible]	10,000	[illegible]	1,000					85,000
Syria	25,000	15,000	[illegible]	35,000	[illegible]				[illegible]	[illegible]	88,000
Lebanon	33,000	6,000	[illegible]	8,000	[illegible]	—	—	[illegible]	[illegible]	[illegible]	62,000
Sudan	56,000	33,000	[illegible]	6,000	[illegible]	1,000	—	[illegible]	[illegible]	[illegible]	90,000
Maghreb	1,000	65,000	—	—	—	—					66,000
Oman	10,000	—	19,000	2,000	[illegible]	1,000	—				34,000
Iraq	3,000	—	1,000	40,000						—	44,000
Somalia	8,000	5,000	5,000	1,000		—			—		20,000
All Arab	821,000	377,000	89,000	244,000	23,000	9,000	69,000	9,000	10,000	170,000	1,821,000
Pakistan	[illegible]	[illegible]	[illegible]	[illegible]	21,000	[illegible]	4,000	[illegible]	3,000	8,000	359,000
India	[illegible]	[illegible]	[illegible]	[illegible]	12,000	[illegible]	—	[illegible]	2,000	2,000	319,000
Other Asian	[illegible]	[illegible]	[illegible]	[illegible]	5,000	[illegible]	1,000	[illegible]	—	4,000	186,000
All Asian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OECD and Eastern Europe	[illegible]	[illegible]	12,000	[illegible]	1,000	6,000	2,000	5,000	1,000	[illegible]	[illegible]
Africa and other	[illegible]	[illegible]	1,000	[illegible]	1,000	1,000	—	1,000	1,000	[illegible]	[illegible]
Turkey	[illegible]	[illegible]	—	[illegible]	—				—	[illegible]	[illegible]
Iran	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]					[illegible]
Grand total	1,023,000	546,000	411,000	379,000	81,000	68,000	76,000	140,000	17,000	192,000	2,933,000

SOURCE: J. S. Burks, I. Serageldin, C. A. Sinclair, and J. A. Socknat, "Who is Migrating Where? An Overview of International Labor Migration in the Arab World," paper prepared for the World Bank, June 1981, p. 20.

Table 10.—Employment by Nationality and Economic Sector, Saudi Arabia and Kuwait, 1975

Sector	Total employment		Nationals as percent of total		Percent distribution of nationals		Distribution of nonnationals	
	Saudi Arabia	Kuwait	Saudi Arabia	Kuwait	Saudi Arabia	Kuwait	Saudi Arabia	Kuwait
Agriculture	585,550	7,514	90.6	53.1	51.7	4.6	7.1	1.7
Mining	27,000	4,859	57.0	36.6	1.5	2.0	1.5	1.5
Manufacturing	115,900	24,467	18.6	9.4	2.1	2.6	12.2	10.5
Construction	239,300	32,256	15.0	5.5	0.7	2.0	1.7	14.4
Utilities[a]	20,350	7,271	35.4	28.0	3.5	2.3	26.3	2.5
Trade	192,100	39,559	31.5	16.0	5.9	7.3	17.0	15.7
Transport and communications	103,800	15,685	70.2	29.2	7.1	5.2	4.0	5.3
Community and personal services[b]	455,150	166,802	54.1	38.6	24.0	73.9	27.0	48.5
Not defined	60,650	2	59.1	—	3.5	—	3.2	—
Total	1,799,800	298,515	57.0	29.2	100[c]	100[c]	100[c]	100[c]

[a]Electricity, gas, and water.
[b]Includes financing.
[c]Numbers may not equal 100 due to rounding.

SOURCE: Computed from J. S. Birks and Clive Sinclair, *Arab Manpower: The Crisis of Development* (London: Croom Helm, 1980), pp. 45, 108.

Table 11.—Employment by Nationality and Occupational Groups, Kuwait, 1975

	Professional technical workers	Managers	Clerical and related workers	Sales workers	Service workers	Agricultural workers	Production and related workers	Total work force
Total	41,836	2,854	38,018	24,093	78,300	7,702	105,608	298,415[a]
Kuwaiti	9,739	1,045	17,853	6,185	32,900	3,897	15,348	86,971
Non-Kuwaiti	32,097	1,809	20,165	17,908	45,400	3,805	90,260	211,444
Of which other Arabs	27,147	1,286	16,043	12,282	28,576	3,244	58,140	146,718
Of which Egyptians	11,061	241	2,359	740	8,338	436	14,383	37,558
Of which Jordanians and Palistinians	12,052	562	8,327	3,795	4,086	893	17,938	47,653
Iranians	246	23	384	3,394	4,308	464	20,114	28,933
Pakistanis	730	68	762	380	1,781	61	7,256	11,038
Indians	2,602	177	672	1,729	10,546	9	3,740	21,475
Other Asians	194	41	53	43	76	—	733	1,140
United Kingdom	586	82	133	29	40	2	88	960
France	48	16	12	1	3	2	13	95
Other Europeans	336	64	57	18	24	11	128	638
Americans[b]	176	45	25	7	1	1	15	270

[a]Total includes four persons in the category "not stated."
[b]Includes "USA" and "other Americans."

SOURCE: Calculated from Kuwait Ministry of Planning, *Annual Statistical Abstract, 1981*, Edition XVIII (Kuwait: Central Statistical Office, 1981), pp. 108-114.

workers came from Afghanistan, while the skilled workers came from the Far East.

For many of the labor-exporting countries, on the other hand, large-scale out-migration of technical and professional manpower has led to shortages in these skills at home. Due to out-migration of skilled personnel, Egypt, traditionally a "labor surplus" country, has experienced labor shortages in many of the skilled occupations, such as administrators, teachers, and clerks, of which Egypt continues to be a major supplier to other Arab countries." Algeria today exports over 15 percent of its labor force. The bulk of Algerian migrants go to Europe, particularly to France, where these migrants work mainly as laborers and semiskilled workers, primarily in the heavy industries and construction.

Projections concerning migrationary movements and changes in Middle Eastern labor resources are uncertain. With the decline in oil prices and shifts in development plans and policies (discussed in ch. 11), some observers have already noted an apparent stabilization, if not decline, in the magnitude of migration to and within the Middle East. Iraq is one of the only exceptions: owing to the drain on its labor force caused by the war with Iran, Egyptians and other foreigners have been recruited to move there in greater numbers.

Labor issues in the 1980's will be determined not only by magnitude of demand, but by its structure and composition. A World Bank study predicted that the oil-rich nations' manpower requirements will rise sharply in the next few years especially in manufacturing.[25] This study, carried out in the late 1970's, estimated that demand will be greatest in the "technician" category and in the professional and technical occupations.

It is difficult to predict whether increased education and training at home will be sufficient to meet these demands, and to what extent demand will have to be met with foreign manpower. But for the labor-importing countries, most projections indicate that the demand in the technical and professional sectors may be met largely by foreign workers. The same World Bank study estimated that by 1985, between two-thirds and three-fourths of the manpower requirements of the oil-rich nations, in four out of the top five occupational levels will be filled by foreigners.[26]

The impacts of the recent decline in oil prices on migration, however, remain to be seen. If economic growth rates remain high, labor requirements will grow as well. But if further retrenchment in economic activity should occur, the need for foreign labor will decline. Large layoffs of foreign workers in Saudi Arabia's petroleum industry, especially in the Eastern province, for example, and Kuwait's decision in 1983 to send many Asian workers home are cases in point." But there is no way of judging now whether a large-scale exodus of other types of foreign labor will occur.

IMPLICATIONS FOR TECHNOLOGY TRANSFER

Implications of the manpower situation for technology transfer are difficult to assess. For the labor-importing countries, for example, it is unclear at what point the dependence on foreign labor becomes a problem. Foreign workers can provide enormous economic benefits for recipient countries, aiding technology transfer by filling jobs for which the appropriate skills cannot be found among indigenous personnel. But if one aim of technology trans-

"Emigration of workers, for example, has allegedly created bottlenecks in Egypt particularly in the construction and petroleum sectors. See, for example, Saad Eddin Ibrahim, "Oil, Migration and the New Arab Social Order, " *Rich and Poor States in the Middle* East Malcolm H. Kerr and El Sayed Yassin (eds.) (Boulder, Colo.: Westview Press, 1982), pp. 38-44.

"See Ismail Serageldin and James Socknat, "Migration and Manpower Needs in the Middle East and North Africa, 1975-85, " Finance *and Development, vol.* 17, No. 4, December 1980, pp. 35-36. Note, however, that the study was carried out prior to the period of lower oil exports in the early 1980's when many foreign workers were sent home from the Gulf States.

'Professional and technical personnel, other professional personnel, technicians, and skilled office and manual personnel requirements were expected to be filled largely by foreigners; only "other subprofessional" occupations were projected to be staffed largely with nationals. See ibid., p. 35.

"See, for example, "Kingdom Restricts Foreign Work Force, " Middle East, vol. 2, No. 4, Mar. 20, 1983, p. 3.

fer is to maximize technology absorption among the indigenous personnel, then the continued presence of foreign workers may highlight a bottleneck in the technology transfer process. What is clear, however, is that the labor-importing countries of the Middle East remain heavily dependent on foreign labor in sectors and occupations critical for technology transfer, and levels of training in the technical fields suggest that this situation may not significantly change for some time.

The manpower context for technology transfer in the labor-exporting countries is two-sided. On the one hand, the export of skilled labor provides remittances, providing countries such as Egypt with substantial revenue and thus enhanced purchasing power for advanced technology from abroad. Some have also argued that job vacancies created in Egypt by out-migration could stimulate upward mobility among those who stay behind.[28] On the other hand, the loss of highly skilled manpower in many labor-exporting countries has exacerbated problems at home.[29] Many observers have argued that the out-migration of doctors, teachers, engineers, and other highly skilled manpower has left shortages which it will take years of training to fill. The policies different Middle Eastern countries have adopted to deal with these issues are discussed in chapter 11.

[28] See Georges Sabagh, "Migration and Social Mobility in Egypt," *Rich and Poor States in the Middle East,* op. cit., pp. 72-73.
[29] Choucri, op. cit., p. 9-4 and ibid., pp. 72-73.

SOCIAL/POLITICAL CONTEXT

Technology transfer both affects and is affected by the social and political milieu in which it occurs. In the Middle East, religious and cultural factors, domestic social strains, and regional politics all play a role in technology transfer, in addition to the economic and manpower factors described above. This section briefly discusses the role of Islam, social stratification, social attitudes toward work and women, and regional politics as they relate to technology transfer to the Middle East.

SOCIAL FACTORS

The past decade in the Middle East has been characterized by two sometimes contradictory tendencies: increased modernization, secularization, and/or "Westernization" on the one hand, and a greater reaffirmation of Islamic traditional values on the other.

Rapid economic development has brought with it substantial change in social structures and attitudes throughout the Middle East. Until the middle of this century, the Middle Eastern countries under review were largely tribal-nomadic or agricultural societies where Islam formed the basis of culture and tradition.

The migration to the towns and the settlement of nomads, however, which came with economic growth and industrialization, in some cases changed the social systems and attitudes of the indigenous populations and created new cleavages and classes along urban/rural and social and economic lines. Economic development and technology transfer coincided with the development of new urban upper-middle classes and the emergence of a new class of often Western-educated technocrats. The influx of foreigners to the Middle East brought with it new Western ideas and consumer goods often embraced by the indigenous populations.

In all of the countries under review, however, these changes have been accompanied by powerful conservative strains as well. First, the vast majority of the indigenous populations remain relatively removed from the industrialization and technology transfer process; indeed, a schism has sometimes appeared in these countries between this majority and the minority of people who are most involved

in and who reap the benefits of economic growth. Among almost all groups and classes, moreover, traditional and family/kinship values and norms, based on the Islamic religion, endure. More than 90 percent of the population of each of the six countries under study are Muslims, and Islam remains an important source of legitimacy for Middle Eastern governments—as well as for opposition groups. Although the interpretation of Islamic tradition and culture varies widely among nations and different social classes and groups,[30] the rise of Islamic fundamentalism throughout the Middle East has reaffirmed the importance of retaining Islamic tradition and culture in the face of economic change.

Opinions vary as to the context these social factors provide for technology transfer. One argument is that Middle Eastern and Islamic tradition and culture are intrinsically at odds with technology transfer from the West. This view is based on the notion that Islam is fundamentally resistant to change, and thus represents an impediment to economic development and technology transfer. Although this view has generally been discredited, it is one that still colors the vision of some Western observers .31

Some Middle Easterners, however, also worry about an incompatibility between Islam and Western technology. Here, the argument is that Western technology must be carefully selected and adapted to meet indigenous needs, or the viability of a traditional, Islamic social and cultural fabric will become severely threatened. Contemporary Western technology, proponents of this view argue, embodies its own Western values, both in terms of those inherent in the technology and those embodied in the channels through which technology *is* transferred. These values are considered to conflict with the human values, traditions, and social patterns found in traditional Muslim society. In line with this view, many Islamic fundamentalist groups, for example, are now advocating a return to the fundamental values of the past and a rejection of much that is "modern" or "Western." In their view, technology transfer is a disruptive process, one at odds with traditional society and demanding fundamental changes in the recipient country's whole social fabric to conform to the values embodied in the technology. In this view, technology transfer may be often rejected outright, or the stress laid on transferring "appropriate" technology.

In contrast, others believe that Middle Eastern and Islamic culture and tradition complement technology transfer from the West. Proponents of this view argue that nothing inherent in Islam would oppose technology transfer; on the contrary, Islamic tradition is regarded as having traditionally encouraged scientific inquiry and modernization, and technology transfer is regarded as a means of enhancing this process. Resistance to technology transfer in the name of Islam, proponents of this view argue, therefore has little to do with the essence of Islam itself. Instead, they argue, Islam is being used simply as a rallying cry or a source of legitimacy on the part of those disaffected social or economic groups opposed to technology transfer in one form or another. "I slam," one such observer writes, "is an instrument espoused both by incumbent governments and opposition forces as they . . . try to obtain legitimation and mass support for their programs and policies."[32] Proponents of this

[30] The underlying current in all of the countries under review, the precise nature of "Islam" is nevertheless quite *varied,* with sharp splits among Sunni and Shi 'ia, fundamentalist and more liberal, urban, and rural, etc. The fundamentalist Shi'ia Islam of the Ayatollah Khomeini, for example, is in many ways different from the conservative Sunni Islam of the government of Saudi Arabia or the more liberal interpretations in Egypt. In many Middle Eastern countries, the more symbolic and socially conservative popular Islam of the poorer classes contrasts with the more liberal, intellectualized Islam of the wealthier, educated classes, In all cases, however, Islam is a key factor in individual and group identity. See, for example, Michael Hudson's discussion in "The Islamic Factor in Syrian and Iraqi Politics, " Islam in the *Political Process,* James P. Piscatori (cd.) (Cambridge, Mass., 1983).

[31] For a discussion of some of these arguments, see Michael C. Hudson, "Islam and Political Development, " *Islam and Development,* John L. Esposito (cd.) (New York: Syracuse University Press, 1980), pp. 1-25. For a discussion of this view as relevant to the developing world as a whole, see, for example, Denis Goulet, *The Uncertain Promise (New* York: IKOC/North America, Inc., 1977), pp. 17-30.

92 Hudson, op.. cit., p. 13. Whether in economic or political affairs, another observer argues, Islam has become "the language of both power and resistance to power" (Vatin, p. 98 in Piscatori).

view argue that values associated with Western technology can be shaped by the social milieu into which this technology is transferred, and combining science and faith has been the theme of several writings and political parties in the Middle East.[33] Depending on the technology and its method of transfer, proponents of this view argue, Western technology may be used to buttress, if not to further promote, traditional values and beliefs.[34]

A third argument is a combination of these two. In this view, technology transfer is viewed as intrinsically neither destructive nor supportive of traditional Islamic values, but as having the potential to lead to a new and distinct situation that contains elements both traditional and modern. As illustrated in the case of Japan, for example, adherents of this position argue that it is possible for Western technology to interact synergistically with traditional culture, neither destroying the traditional nor the modern, but ultimately creating a new and more productive pattern.[35]

Because interpretations of Islam vary, there is no one way in which Islam can be said to blend or conflict with economic development and technological change so as to resolve these arguments. Little in the writings of Islam and

[33] See, for example, Ziauddin Sardar, *Science, Technology and Development in the Muslim World* (London: Croom Helm Ltd., 1977).

[34] Ziauddin Sardar, ibid. For a broader discussion of this, see John D. Montgomery, "Development Without Tears, " *Technology and International Affairs,* Joseph S. Szyliowicz (cd.) (New York: Praeger, 1981), esp. pp. 155-170.

[35] For a discussion of some of these ideas, see Charles Weiss, Jr., "Mobilizing Technology for Developing Countries, " World Bank Reprint Series: No. 95, reprinted from *Science,* vol. 203, Mar. 16, 1979, p. 1.

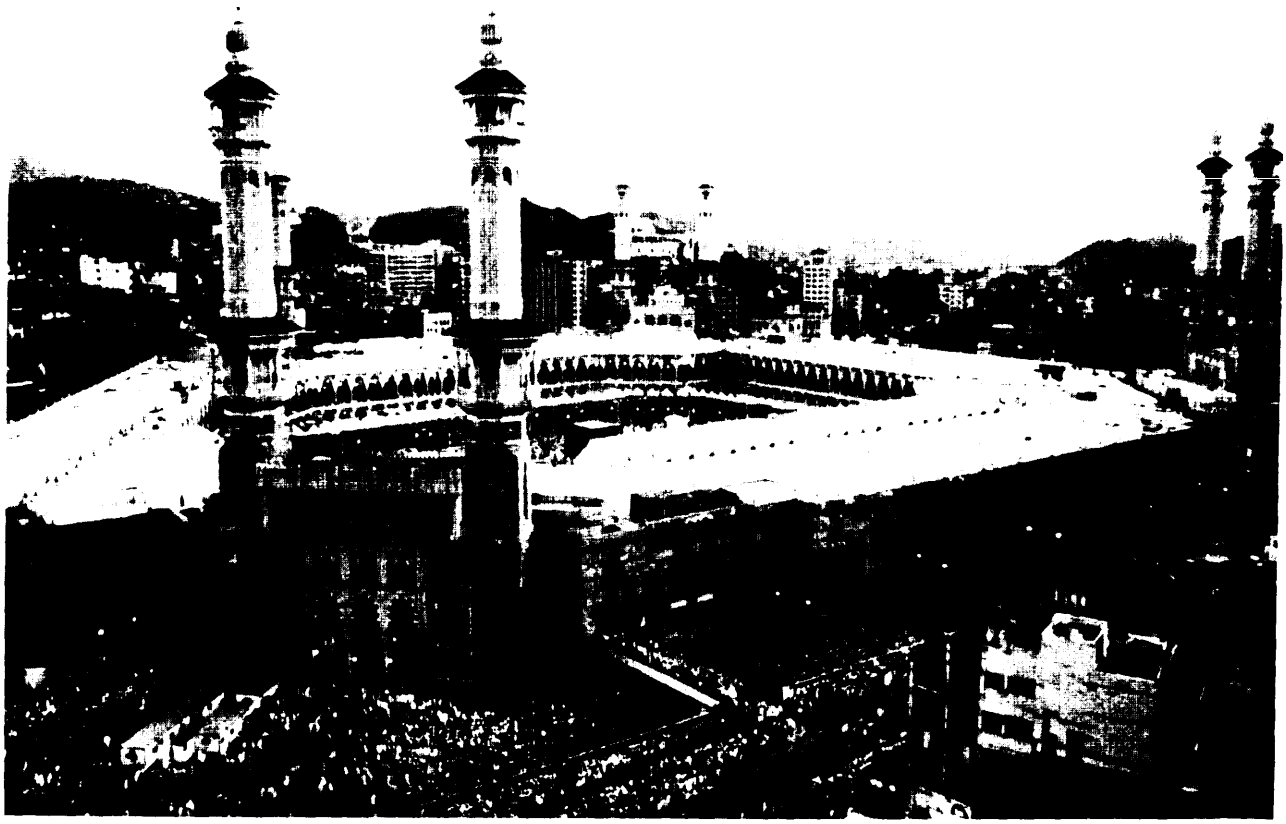


Photo credti Saudi Arabian Ministry of Commerce

Muslims from all over the world travel to Mecca in Saudi Arabia. For centuries, this has been a place of pilgrimage

religious practice spells out clearly the extent and ways in which technology should be used or adopted. Because all practices associated with economic or technological change are not explicitly discussed, the evaluation of technology and its consequences by Islamic precepts has had to rely on interpretation of law and practice, and these have varied among countries and Islamic groups. Thus, Islamic tradition and culture can be viewed as comprising a social context that may be either hostile to or favorable for technology transfer, depending on other social factors and the attitudes of the government in power.

In addition to issues concerned with the interplay of Islamic tradition and culture with technology transfer, two commonly cited examples of the effect of social attitudes on technology transfer are attitudes towards female employment and attitudes concerning occupational prestige. In light of the labor constraints discussed above, both of these issues are often regarded as having important implications for technology transfer.

While the role of women in Middle Eastern Islamic societies is certainly complex, and although there is wide variation among Middle Eastern countries, a woman's role in the Middle East has traditionally been outside of the labor force and segregated from men. One result has been to limit the potential size of the total labor force. Especially for the labor-short countries, this may have contributed to the manpower shortages affecting economic development and technology transfer.[36] Today, evidence suggests that the role of women and attitudes toward female employment in the Middle East have been changing: even in Saudi Arabia–among the most conservative Middle Eastern countries in this regard–the proportion of women in schools and in the labor force has grown considerably since the early 1970's, But the number and proportion of women employed is still low, especially in the professional and technical occupations, and female employment probably will not significantly help to meet expected labor demand for some time.

Some observers have also noted that common historically or culturally shaped prestige values, such as aversion to manual or industrial labor, can also act as constraints on technology transfer. The "high value placed on leisure, " two specialists on Middle Eastern manpower note, the "disinclination to work in manually strenuous jobs, " and "the desire not to be subordinate to an impersonal outside authority' comprise, in the words of these authors, "an important explanatory factor behind many Saudi Arabians' reluctance to enter a wide spectrum of employments in the modern sector. '[37] Similar observations have been made regarding even those Middle Eastern countries where the labor force is regarded as more highly developed: in Egypt, another observer notes. social values have reduced

[36] See, for example, discussion in *Al-Riyad*, Nov. 22, 1983, p. 17 translated in "Study Examines Role of Women in Replacing Foreign Labor Force, " reported in *JPRS: Near East, South Asia*, Jan. 11, 1984, pp. 80-84.

[37] See J. S. Birks and C. Sinclair, "The Kingdom of Saudi Arabia and the Libyan Arab Jamehiriya: The Key Countries of Employment, " Migration for Employment lh-eject, Working Paper WEP 2-26 WP39 (Geneva: International Labor organization, 1979), esp. pp. 21-26. .4s explained by another observer. despite the enormous achievements accomplished by Islamic scientists and thinkers throughout the centuries, ' 'the emphasis on enjoying God's bounty rather than earning God's grace through hard labor tends to deprive Saudi society of a work ethic capable of efficiently harnessing the country's human resources. " See John A. Shaw and David E. Long, *Saudi Arabian Modernization, No. 89, vol. X* of the Washington Papers, series published by the Center for Strategic and International Studies, Georgetown (University (Washington, D.C.: Praeger Special Studies, 1982), p. 2.

Photo credit: Embassy of Kuwait

Women students in laboratory

technical education and vocational education to "a second-class type of education." "Social values," this analyst adds, "may be the factor which has the strongest impact on the educational and training system. "[38] Because one aim of technology transfer is the transfer of skills to indigenous personnel, the low prestige associated with technical fields may well be a constraint on the technology transfer process. But examples such as the successful training of Saudis in ARAMCO to take over many managerial and technical jobs would suggest that, like female employment, these attitudes too may be changing.

In other words, traditional values and beliefs provide a mixed context for technology transfer to the Middle East. On the one hand, traditional values and beliefs could be regarded as impeding technology transfer, to the extent that the latter shapes new attitudes and visions often disconsonant with the patterns of traditional Islamic society. At the same time, traditional attitudes can enhance technology transfer in other ways--for example, by providing legitimacy for technology transfer decisions or creating a context for increased cooperation in technology transfer efforts. A central challenge for Middle Eastern governments today is to balance economic development aims with the maintenance of Islamic values and beliefs, and to avoid choices that might result in social discontent that might find its expression in opposition to technology transfer.

POLITICAL CONTEXT

Political systems in the Middle East vary greatly, ranging from the oldest ruling monarchy in the world, to republican and socialist systems. These different political systems directly shape the way technology transfer decisions are made and implemented.

Of the countries under review, for example, the governments of two, Saudi Arabia and Kuwait, are presently monarchies, with leadership based on heredity. While the last 10 years have seen the development and growth of a cabinet government and ministries in both countries, power still resides in the hands of the monarch-the King in Saudi Arabia, the Amir in Kuwait. Neither country has political parties; public opinion is expressed through the National Assembly in Kuwait (a formally elected representative institution), or the majlis in Saudi Arabia (an informal institution). Prerevolutionary Iran was also a monarchy with, theoretically, an independent legislature (a **majlis**, or parliament) and an independent judiciary. In practice, the monarchy was the central place where power resided, and the Shah personally played an active role in all affairs of state.

Both Iraq and Algeria, on the other hand, are one-party states, socialist in orientation and also based on Islam. Iraq's political system today is under the control of one party, the Arab Socialist Baath (Resurrection) party, with the Party's high command (the Regional Command) being headed by one dominant leader: Saddam Hussein. Like Iraq, Algeria is socialist in orientation and legally a single-party state, with the Front de Liberation Nationale (FLN) as the official party.

In contrast, since 1952 Egypt has had a republican form of government, with an elected president as head of state and government. The executive branch is headed by the president and his cabinet, which dominates the unicameral elected legislative body, the People's Assembly, and the judiciary, although each is constitutionally independent.

Also providing a perhaps unique context for technology transfer are the strains of conflict and cooperation that characterize Middle Eastern regional politics. For the past two decades, almost every country in the Middle East has been involved in war: conflicts ranging from the Arab-Israeli conflict, the Iran-Iraq War (and the revolution in Iran) and, for countries such as Algeria, the West Saharan dispute. These conflicts have set the stage for political alliances in the Middle East, often pitting Muslim against Muslim, and one Middle East government against another. At the

[38] See Bent Hansen and Stir Radwan, Employment Opportunities and Equity in a Changing Economy: Egypt in the 1980s (Geneva: International Labour Organization, 1982), p. 255.

same time, however, efforts to promote greater Islamic and Arab ties continue through a myriad of regional organizations established for cooperation in the political, social, and economic arenas. Because of the importance of oil to the world economy–and especially after the Soviet invasion of Afghanistan, which brought Soviet forces to within only a few hundred miles of the Gulf region-the Middle East has also been seen as an area of great geostrategic significance and superpower rivalry.

IMPLICATIONS FOR TECHNOLOGY TRANSFER

These domestic, regional, and international issues affect all aspects of political and economic relations in the Middle East and create a political context for technology transfer that extends beyond questions of resource or manpower availability. A key challenge for policymakers is to make decisions about technology transfer which take into account economic, political, and social factors and to ensure that these decisions are consistent with broader interests in the Middle Eastern region as a whole. The ways in which different governments have attempted to meet these challenges are discussed in chapter 11.