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SINAI DEVELOPMENT STUDY, PHASE I

FINAL REPORT

VOLUME I

A STRATEGY FOR THE SETTLEMENT OF SINAI

SUBMITTED TO:

THE ADVISORY COMMITTEE FOR RECONSTRUCTION  
MINISTRY OF DEVELOPMENT  
ARAB REPUBLIC OF EGYPT

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IN ASSOCIATION WITH INDUSTRIAL DEVELOPMENT PROGRAMMES SA

FINAL REPORT  
LIST OF VOLUMES

- Volume I**      **A Strategy for the Settlement of Sinai**
- Volume II      Managing Sinai's Development
- Volume III     An Economic Development and Investment Plan, 1983 to 2000
- Volume IV      The Land and the Environment of Sinai
- Volume V       Water Supplies and Costs
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**VOLUME I**

**A STRATEGY FOR THE SETTLEMENT OF SINAI**

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# A STRATEGY FOR THE SETTLEMENT OF SINAI

## EXECUTIVE SUMMARY

### 1. INTRODUCTION

This Main Volume of the Final Report of The Sinai Development Study-Phase I (SDS-I) presents:

- A Recommended Strategy for settlement and development of the Sinai Peninsula
- A proposed set of projects and programs
- A broad brush picture of the outcome to be expected by the year 2000 if the Recommended Strategy is carried out

The other six volumes and more than forty working papers (including a comprehensive set of ten synthesizing papers submitted in April 1982) give further justification for what is recommended here and explore the means of accomplishing the proposed strategy.

The products of SDS-I may be identified as a body of research findings, a strategic approach, and a series of distinct but interrelated tasks to be implemented over the next two decades. The Report also describes the process of producing these products, so that others can reconstruct the steps followed by the SDS Team and introduce easily whatever modifications they find necessary.

Sinai has stood still for hundreds of years while changes and developments took place around it. It has now started to move. Where should it be going? To whose benefit? How quickly can the peninsula be transformed to accommodate a population of one million or more? And what will it cost? The Strategy recommended in this Final Report offers at least tentative answers to these questions.

### 2. KEY PLANNING ISSUES

Many plans for the full development of Sinai have been discussed. For centuries plans were formulated more in terms of military or security considerations than in terms of development and settlement. During the past few years, however, the issues receiving most attention were:

- Can Sinai contribute to the development of Egypt beyond the major contribution already being made by petroleum production?
- To what extent can Sinai feed itself?
- How much development can local water support in Sinai? How much more water will need to be imported from the Nile system to sustain a major settlement effort?
- How much irrigated agriculture can the soils of Sinai support?
- Can one million Egyptians find housing and other amenities in Sinai by the year 2000? How will 300,000 or so of that million find employment?
- Which economic sectors are most promising? For which parts of Sinai? When should they be developed?

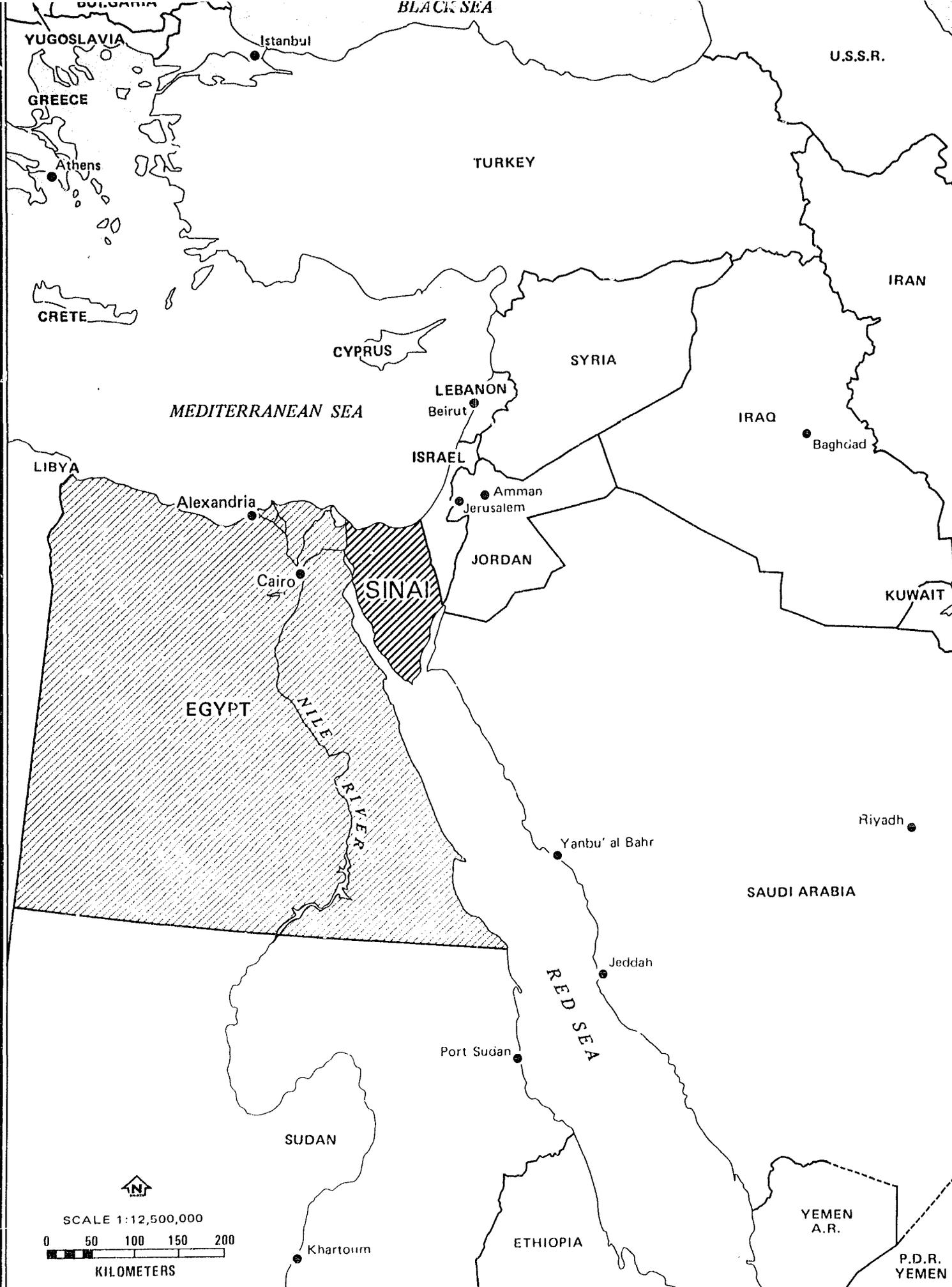


FIGURE E.1  
LOCATION MAP

- Does the development of Sinai require special administrative arrangements? If so, what arrangements?
- How will the desert climate affect development? How will the mountains and the seacoasts affect development?
- How can the present population of Sinai be well integrated into the projected development?
- What assistance is needed to help Nilotic Egyptians adjust to living in Sinai?
- What are the likely costs and benefits of developing Sinai?

From the outset SDS-I focused on the civilian economy (i.e., excluded issues of national security) and undertook no special analysis of petroleum prospects. Each of the questions listed above has been studied and answered, at least tentatively, in this seven volume Final Report. It will be useful to have them in mind while reading this Main Volume, which summarizes the Study's main recommendations.

### 3. KEY POTENTIALS AND OPPORTUNITIES

Sinai has three premier potentials. These are the cornerstones of any development plan:

- Location
- Mineral resources
- Land and seascape.

Sinai is near the geographic center of the Middle East--a region of the world where economic activity is growing very rapidly. Sinai has locational advantages over its competitors, because it is close to Saudi Arabia and Iraq, the world's first and second ranking oil resource nations, and other countries that already provide large markets for Egypt. The peninsula lies between Cairo and the expanding markets of the Middle East. It is also close to Europe, where the growing demand for sunny beaches as well as fresh fruits and vegetables gives Sinai, with its dry semi-tropical climate, some very promising opportunities.

Sinai's mineral resources already provide a major support to Egypt's economy. While additional mineral development may not be as significant as petroleum has been, it will surely be important to Egypt as a whole as a way to diversify the national economy and to Sinai as a way to attract new investment. The potentials for agricultural chemicals, building materials, steel, and other mineral-based activities all appear promising.

Sinai has an abundance of flat and rolling land suitable for agriculture, industry and human settlements. Moreover, its landscape provides Egypt with an opportunity to expand the choice of lifestyles available to its citizens. The peninsula boasts truly exceptional mountains and seashores. These attributes also provide Egypt with the possibility of expanding its tourist industry on a year-round basis.

Sinai has several secondary potentials for development, of which the three most significant are:

- Soils which are of "fair" to "good" quality for irrigated agriculture
- An enterprising resident population
- Highways, airports and some other infrastructure in excess of current needs.

The soils of Sinai are not of the top class found in the Nile Valley and Delta. However, with good farming practices and large investment in water delivery systems, Sinai can become a major food producer. These agricultural possibilities are particularly important, since the Middle East region is projected to be increasingly short of food during the next several decades.

In recent years the Bedouin of Sinai have shown great flexibility in adapting to opportunities for work made available to them as a result of large-scale investment in petroleum and agriculture as well as by construction and transportation activities. Indications are that they are eager to be full partners in any further development of the peninsula.

While Sinai is generally short of infrastructure, its highways and airports have excess capacity, providing a basis for going ahead quickly with other projects.

The opportunity for developing Sinai has much to do with what is going on around it and in the world. First in importance is the growth of the economies of the countries around the Arabian Gulf, especially since 1974. This provides a large new market for Sinaian goods. Secondly, but less surely, the "Camp David" accords provide Sinai with the opportunity for peace and with access to other markets to the north and east.

The world economy is recovering from a long recession just as Sinai is getting started with intensive development. This coincidence in timing is fortunate, in part because of Sinai's proximity to the Suez Canal. Moreover, Sinai's competitors for warm water beach tourists have in most cases already fully developed their best sites and/or to some degree spoiled their beaches with incompatible developments. Sinai's unspoiled beaches and coral reefs come on the market at an opportune time.

These are only a few highlights of Sinai's potentials and opportunities. It is also important to keep in mind that Sinai is large and diverse. A different set of opportunities is found in each of the peninsula's subregions; but each of those potentials is interactive with the others.

#### 4. KEY RECOMMENDATIONS

SDS-I has integrated its key recommendations into a Recommended Strategy, in which each major element is intended to reinforce the others. The proposed path to economic development places emphasis mainly on irrigated agriculture and manufacturing. Greatly simplified, a central theme of this report is that Sinai in the year 2000 will have an agricultural north and an industrial south.

Full development of Sinai within a generation will require massive government investment to "shrink" it and to turn it "green". Sinai is as large as many countries (about 61,000 square kilometers.) Communications and transportation systems need to be designed and built to minimize the "friction" not only of the peninsula's areal extent but also of the region's difficult terrain. These systems will bind Sinai's diverse subregions to each other, integrate Sinai with Nilotic Egypt and connect all of Egypt with the

rest of the Middle East. Modern highways and telecommunications are a prerequisite to development.

Sinai is a desert.\* Full development requires fresh water, most of which will have to be imported from the Nile system. However, both seawater and groundwater (much of which is brackish) can be used to a greater extent than at present, and reused. The Recommended Strategy proposes to deliver Nile water, including drainage water from the Delta, to many areas throughout the peninsula.

Sinai is population poor. A much larger population will be needed to achieve full development of such a large area. A national goal is to mitigate the overcrowding near the Nile. High priority is recommended for programs to encourage migration to Sinai and to develop the special skills needed for its development.

Sinai is rich in natural resources. The most significant direct contributions to be made by full development of natural resources are through the mining of minerals and the promotion of tourism. Early emphasis is advised on expanding the mineral and tourism sectors.

SDS-I found that a year 2000 population of about one million was a desirable target. Sinai's climate is harsh; providing a pleasant environment for living will be essential to success in attracting immigrants and achieving other Government goals. Nearly a dozen new towns will be needed to settle population in places with good potential for economic development .

Sinai is situated between the Nile Valley and the Middle East (or West Asia). It is bounded on three sides by seas. Sinai can be developed to serve as a land bridge to the Middle East and as an export zone for all Egypt.

Sinai is a large and diverse region. Because of its high mountains and sharp differences from place to place in terms of land capability and climate, the SDS team concluded that at this stage development can best be planned and managed on a subregional basis. Sinai's development should be directed to exploit many settlement opportunities in all five of its subregions.

The Study has estimated that LE 11,268 million will be needed during the next 17 years or so, about 40 percent of which would be spent before July 1992. (See Table E-1, over-leaf.) However, if appropriate decision rules are followed in selecting those investments the equivalent of 70 percent of that (representing an amount equal to all but LE 900 million of all investments excluding bulk water conveyances) could be recovered (through expected returns on the investment) by the end of the year 2000. Special development banking, credit, and budgeting institutions are recommended for Sinai.

Absorbing an additional 800,000 people and LE 11,268 million of investment will be a massive and challenging administrative task. A powerful development agency is recommended to plan and manage Sinai's growth for the remainder of the 20th century.

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\*Deserts account for one-fifth of the world's area and are defined as having less than 250 mm (10 inches) of rainfall a year. Sinai averages 40 mm and much of it receives half that.

Table E-1

Summary of Investment Plan, 1983-2000

(LE million)

	<u>Gross investment</u>		
	<u>Total</u>	<u>1983-91/92</u>	<u>1992/93-2000</u>
National System, subtotal	<u>6,816</u>	<u>2,258</u>	<u>4,558</u>
Production sectors, subtotal	<u>3,100</u>	<u>450</u>	<u>2,650</u>
Petrochemical complex	<u>2,500</u>	<u>300</u>	<u>2,200</u>
Other heavy industry	600	150	450
Service sectors, subtotal	<u>3,716</u>	<u>1,808</u>	<u>1,908</u>
Main highways, harbors	<u>185</u>	<u>125</u>	<u>60</u>
Telecommunications	204	54	150
Electricity generation*	1,000	1,000	--
Bulk water conveyances	<u>2,235</u>	<u>585</u>	<u>1,650</u>
University	80	40	40
Parks/nature reserves	12	4	8
Regional System, subtotal	<u>4,452</u>	<u>2,103</u>	<u>2,349</u>
Production sectors, subtotal	<u>2,662</u>	<u>1,335</u>	<u>1,327</u>
Agriculture	<u>912</u>	<u>400</u>	<u>512</u>
Industry and mining**	750	495	255
Tourism	350	140	210
Other production and services	650	300	350
Service sectors, subtotal	<u>1,790</u>	<u>768</u>	<u>1,022</u>
Roads, harbors, airports	<u>110</u>	<u>60</u>	<u>50</u>
Telecommunications	204	49	155
Electricity/gas (mostly distribution)	508	289	219
Higher education***	24	6	18
Hospitals***	291	66	225
Community infrastructure	134	62	72
Housing	519	236	283
Production sectors, subtotal			5,762
Service sectors, subtotal			5,506
Grand total			<u>11,268</u>

\* Mostly for distribution west of the Suez Canal

\*\* Excluding petroleum

\*\*\*Other education and health care are included in community infrastructure

Sources: Volume III, Chapter 6, and Volume VI, Chapter 3.

The time frame of the Recommended Strategy begins with a period which concentrates on research, planning, institution building, and construction of infrastructure well beyond immediate needs. Emphasis will then shift to expanding and strengthening five separate complementary economies in the five different subregions of the peninsula; during this phase of development water delivery systems will be completed, and agricultural, industrial, and touristic sites will be improved.

- The Northwest Subregion will emphasize agriculture as well as industry spilling over from the Suez Canal cities
- The Northeast Subregion will continue to encourage high-tech agriculture while also developing industry (including agro-industry) and tourism
- The Uplands Subregion will benefit from a variety of rural development programs
- The Southwest Subregion will continue and diversify petroleum-based activities, host an expansion of other industries and mining, and encourage tourism as well as some irrigated agriculture
- The Southeast Subregion's growth will be dominated by rapid expansion of tourism, and will also benefit from trade and light manufacturing activities.

Once all of these five economies are well established, the development of Sinai can move towards a closer alignment with national goals. At this stage development in Sinai can emphasize import substitution (moving towards self-sufficiency), diversification of exports (beyond unprocessed petroleum), and broadening the range of its social services (to include, for instance, higher technical education and research of special relevance to Sinai and other desert areas in Egypt).

## 5. ORIGIN OF THE STUDY

The Ministry of Development authorized the start of the Sinai Development Study-Phase I (SDS-I) in November 1980. Acting on behalf of the Ministry, the Advisory Committee for Reconstruction commissioned consultants Dames & Moore, in association with Industrial Development Programmes SA, to perform the Study. The Consultants organized a core team of professionals, supported by more than 40 specialists, including personnel supplied by the following sub-contractors:

- The Desert Institute of Cairo
- Remote Sensing Center of Cairo
- International Agricultural Development Service (IADS) of Rosslyn, Virginia
- Marcel Breuer Associates of New York City
- Norconsult of Oslo, Norway
- Nuclear Materials Corporation of Cairo
- Solar Engineering Group of Princeton, New Jersey

- University of Arizona (Office of Arid Land Studies) of Tucson, Arizona.

Financial support for the Study was provided by the Government of Egypt (GOE) and the United States Agency for International Development (US/AID).

Early in 1981, to guide the work of the SDS-I and to review reports and papers submitted by the Consultant, the Advisory Committee for Reconstruction appointed a Steering Committee, under the leadership of H.E. Arch. Hassan Mohammed Hassan. Whenever the Consultant requested its assistance, the Steering Committee met to review concepts, recommendations, and reports formulated by the Consultant. Thus, while the present Report is solely the responsibility of the Consultant, its value is due in large measure to the faithful, wise and generous counsel offered by the Committee and its individual members when they met, as they did frequently, with experts from the Study Team.

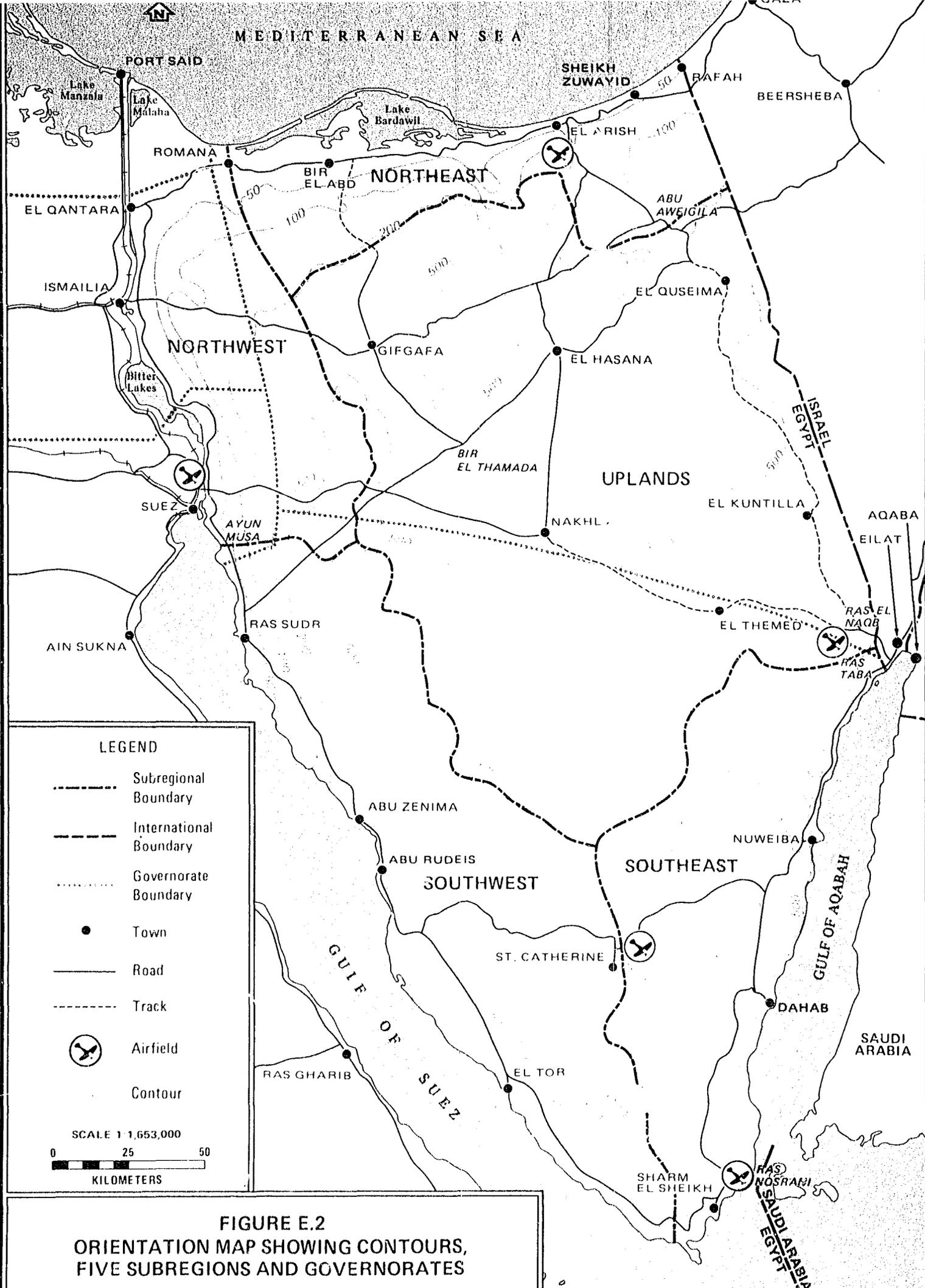
## 6. METHODOLOGY

In order to prepare recommendations regarding development strategies, sector programs, information management, and specific project actions, the Study team emphasized:

- Inclusion of Egyptian agencies at all levels of government in the study process at every possible stage
- Collection, review, evaluation, verification, synthesis, and summary of all available information on resources, economic activities, and social needs
- Identification of development opportunities and requirements
- Drafting recommendations regarding further studies needed to improve the data base for project analysis and for future planning
- Evaluation of how new information regarding resources or sector opportunities would affect proposed strategies and plans
- Formulation of alternative spatial plans and development strategies
- Preparation of action proposals to expedite reconstruction and high-priority development projects.

Two subjects received particularly intensive attention during the course of SDS-I:

- Analysis of ground and surface water potentials, the costs of developing these potentials and supplementing them with Nile water or through techniques such as desalinization, and alternative configurations of systems to convey Nile (and Delta drainage) water to Sinai
- Land capability analysis, with special emphasis on locating soils throughout Sinai that will respond well under irrigation and estimating the probable areal extent of such soils in different sub-regions of the peninsula: Land capability analysis also identified locations (and recommended policies to reserve such locations) for tourism, industry and various other urban uses. Criteria for siting new (or greatly expanded) settlements were also studied.



**FIGURE E.2**  
**ORIENTATION MAP SHOWING CONTOURS,**  
**FIVE SUBREGIONS AND GOVERNORATES**

Some of the results of this activity are found in this Report, reflecting conclusions from the most recent cycle in the planning process. Other details can be found in a series of more than 50 working papers, interim reports, and major memoranda submitted to the Advisory Committee for Reconstruction from time to time throughout the three-and-a-half-year Study. These background materials, together with working files, many books and other data sources collected during SDS-I, have been turned over to the Ministry to form the nucleus of a Sinai information center, which is being established to facilitate future planning.

## 7. ALTERNATIVES CONSIDERED

SDS-I considered many alternative strategic approaches to the full development of Sinai. A few are discussed in this Report (see especially Volumes III, V, VI). Concepts considered during earlier stages of the planning process, although not included in the Recommended Strategy, may nevertheless prove useful from time to time to "fine tune" the Strategy as implementation proceeds and feedback from on-site experience becomes available.

Alternative concepts designed and evaluated in some depth included:

- A greater emphasis on industry with less agriculture
- A minimal use of imported water
- Concentration of development in the Northeast
- More concentration on the coasts
- Earlier emphasis on tourism
- Emphasis on only a few large settlements
- Greater emphasis on (scattered) agriculture
- A more optimistic outlook on the future implications of the "Camp David Accord"
- A stronger influence of "past trends" on the future.

Each of these alternatives was set aside, at least in part, during the iterative process which led to the preparation of a comprehensive set of recommendations, either because it did not stand up under careful evaluation or because it did not fit efficiently with other elements of higher priority.

The Recommended Strategy is not the winner from amongst a group of competitors but a melding of the best elements suggested from several sources and approaches. Two guiding principles shaped this selection process:

- What development is best fitted to Sinai's land capability?
- What can Sinai do best for Egypt as a whole?

An iterative and incremental process was followed to fit activities and uses to the capacity of the land. Alternative activities and uses were measured as to their potential contribution to the nation as well as to the local residents. Two additional considerations might be mentioned here: Egypt's desire to reduce its dependence on imported food and Egypt's long-term need to diversify its merchandise exports away from petroleum. Concern for

these two objectives contributed to the Recommended Strategy's emphasis on irrigated agriculture and export-oriented activities.

## 8. CURRENT SITUATION

Sinai is a relatively underdeveloped region within Egypt. It suffers from generations of isolation and has not benefited as much as other parts of the country from past development efforts. The people of Sinai have low family incomes and live in relatively poor-quality houses; the social facilities and services to which they have access are of significantly lower quality than those of the rest of the country. Since 1979 there has been a great deal of investment to construct basic infrastructure, especially roads and housing (mostly on the coasts), and to extract petroleum in the offshore areas along the Gulf of Suez.

There is evidence that the urban economy has advanced somewhat during the past generation and also that more livestock are being raised than in previously recorded periods. This last success, however, has led to overgrazing and increased desertification.

The Northwest subregion is comprised mainly of the eastern portions of the three Suez Canal Governorates; more than half of its present population lives in the Ismailia Governorate. The effects of development are beginning to be visible. Several thousand feddans of irrigated land are productive east of Deversoir, including 1,000 feddans being improved by Pioneer Youth. The reconstruction of El Qantara has been delayed by uncertainty regarding further expansion of the Suez Canal. At Ayun Musa, in the southeast corner of Suez Governorate, industrial, agricultural, and tourism projects are recommended. In Port Said Governorate major developments are planned for the El Tina Plain.

The Northeast subregion has been the most developed historically and receives the most public and private attention today. Over half of the peninsula's citizens live within 10 kilometers of the Mediterranean. Recent activities in this subregion include the opening of banks, the construction of colleges, the installation of aqueducts and highways, the practice of new types of irrigation and animal husbandry, and the beginnings of sophisticated manufacturing and tourism activities.

The Uplands subregion of Sinai is a high, windswept plateau where the traditional economic activity has been grazing. In this subregion, there has been some strengthening of infrastructure (for instance, the reconstruction of highways, schools, government offices, and clinics); the traditional lifestyle of the Bedouin remains, although there is evidence that population is drifting away from some localities toward coastal settlements. The fact that as many as half the residents receive direct money and food assistance is another evidence of the need for reinvestment, technical assistance, and diversification to assist the development of this subregion.

The Southwest subregion teems with activities related to the exploration for and exploitation of petroleum and other minerals. However, these activities yield far less benefit to Sinai as a region than they could, since most workers live elsewhere and most of the minerals (including petroleum) are processed in other parts of Egypt. Tourism is doing well, as evidenced by visitors to St. Catherine's monastery and the surrounding mountains; weekenders from Cairo are beginning to visit beaches on the Gulf in increasing numbers. The opening of the Hamdi tunnel north of Suez and the upgrading of the coastal highway are expected to have a major positive development impact.

In the Southeastern subregion economic activity decreased between 1981 and 1983. Livestock grazing and small-scale agriculture occur in the wadis. There is some winter tourism at the prime sites, but hotels have not been full. Groundwater is pumped into the area to supply hotel guests and some irrigation requirements.

Currently, Sinai development activities and achievements are not at all evenly distributed. Development is concentrated in the pleasant Mediterranean climate on the north coast and close to the petroleum reservoirs in the southwest. Both the high plateau, which makes up half the peninsula's land mass, and the northwest coast continue to be somewhat neglected.

## 9. KEY IMPLEMENTATION ISSUES\*

Full development under the Recommended Strategy will require prior resolution of certain key policy issues. The Consultant has concluded that ten separate but interrelated policy areas will be most important to the success of the proposed Strategy. They represent both a work plan for management and an agenda for senior policy-makers.

### 9.1 Location of Development

Per capita development costs in certain locations in Sinai will be higher than elsewhere. Any large-scale development in the far south will cost more than along the northern coast, and in the southeast more than in the southwest. Any agriculture away from the Mediterranean climate of the north coast, and especially development at higher elevations, will have a higher delivery cost for water and probably also a longer journey to market for its products. Within the twentieth century, however, strategic and social considerations will be as important in determining the location and timing of development activities in Sinai as any projection of economic returns. SDS-I does not deal extensively with the broader issue of whether or not certain activities are better located in Sinai or elsewhere in Egypt; however, the activities that are recommended are viable in Sinai, in the opinion of experts on the Study Team, provided complementary aspects of the Recommended Strategy are also implemented.

### 9.2 Nile Water

The rapid development of Sinai projected in the Recommended Strategy is necessary to achieve a population of about one million within seventeen years. Such development will require early availability of Nile water in large quantities to all areas of the peninsula projected to have high water-consuming activities, such as irrigated agriculture. The scale of the effort is one of delivering approximately 1,500 million cubic meters of water from the Nile system to diverse locations, some of which are about 460 meters above sea level or about 250 kilometers from the closest take-off point. The cost of primary conveyances is estimated at LE 2,235 million, to be spent during a period of less than 15 years. (The major aqueducts would have to be in place by no later than 1996/97 to support the population projected for the year 2000.) This represents an investment of about LE 7,128 per job just for primary water conveyances. As stated above, some places will cost much more than others to service, and jobs in irrigated agriculture require more water than would be needed for an equal number of jobs in industry.

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\*Section 2 can be read as a statement of the issues that confronted planners in 1981; similarly, this Section 9 summarizes the issues that confront the implementors in 1985. Although these lists overlap in some respects, each also contains elements which are unique.

In its Water Master Plan the Government of Egypt has already committed some 5,000 million cubic meters of Nile River and Delta drainage water annually to Sinai. Sustaining and activating at least part of this commitment will be crucial to the success of the proposed development in Sinai. Equal determination will be required to complete within 15 years a program to construct approximately 2,400 kilometers of aqueduct in desert terrain and to avoid unbearable side effects on the economy, the construction industry, or the environment. A central purpose of this Report is to suggest good productive uses, consistent with national goals for Sinai, of the water to be transported to the peninsula. (For further discussion, see Volume V.)

### 9.3 In- Migration

After considering various extrapolations of population pressures within the Nile Valley and pull factors, primarily to higher wage areas (including some in less pleasant environments), the Consultant has concluded that wage and quality-of-life incentives can be provided which are sufficient to attract Nilotic Egyptians to settle permanently and productively in Sinai.

After more thorough study to spell out the details of such incentives, a policy decision will be needed to declare Sinai a special strategic development zone, within which special wage or other incentive packages may be allowed to some workers, and possibly students as well. (For further discussion, See Volume VI.)

### 9.4 Sinai's Economic Role in Egypt

Sinai offers several specific economic opportunities to the nation, among which the following are most prominent:

- Proximity to Middle Eastern markets
- Hydrocarbon reserves
- Various other minerals
- Sites attractive to tourism and industry.

In the past the economic role of the peninsula has been limited mainly to livestock production, petroleum extraction, and specialized tourism. At a policy level, new economic roles and functions need to be assigned to Sinai; these can then be included in the sectoral ministries' investment and staffing programs and in the project lists of responsible regional agencies and the governorates.

It is the conclusion of the Consultant that during the planning period Sinai might not compete successfully for many prospective development projects without strong persistent guidance from the nation's leadership. It is also the Consultant's judgment that in the long run Sinai can sustain a viable economy along the lines described in this Report, provided that the Government of Egypt gives initial and unambiguous support to this effort between now and the year 2000. (For further discussion, see Volume III.)

### 9.5 Service Role

The goal of integration with Nilotic Egypt requires the provision of all basic social services to Sinai on a timely and equitable basis, in accordance with standards accepted for the nation as a whole. In order to stimulate rapid growth of job opportunities and population in Sinai, it will be desirable to introduce some services and facilities ahead of current needs; this policy would also accelerate the process of integration.

The Consultant also recommends a national policy decision to locate higher technical education (and eventually a university) as well as other significant research facilities in Sinai, and through similar actions, to improve the social climate of Sinai, even before the peninsula's economic and population growth justifies such institutions. Important facilities such as these, and other social amenities, should be scaled and built in terms of Sinai's potential and planned structure of permanent settlements, not merely in terms of current population and needs. (For further discussion, see Volume VI.)

## 9.6 Trade with Middle East and Mediterranean countries

At El Arish, Ras Taba, El Tor, and other places, Sinai has a comparative locational advantage in trade with Middle Eastern and Mediterranean markets. Policy guidance is needed to instruct ministries, organizations, and governorates to initiate trade-oriented activities consistent with national foreign policy and economic objectives, including fishing, controlled environment agriculture, manufacturing, and tourism. Without substantial Government intervention and promotion such trade could be delayed and important opportunities lost. (For further discussion, see Volume III.)

## 9.7 Job Creation

To establish a pattern of permanent interdependent settlements, widely dispersed throughout the peninsula and to attract up to 600,000 new settlers to Sinai will require early and continuous creation and filling of jobs. A population of one million will require over 313,000 jobs; there are now barely 40,000. Jobs with attractive wages will be the primary drawing card for immigrants and the incentive to settle permanently. Thus, a high primary concern for officials responsible for Sinai's development during the next two decades will be ways to create permanent jobs which are both numerous and high-paying. After the year 2000 or so, it is expected that considerable private interest will have been built up and growth will be on a more self-sustaining basis. (For further discussion, see Volume III.)

## 9.8 The Environment

Sinai's natural endowment includes a harsh climate and barren landscape. Within this overall description, however, there are special places and special times of year that are very attractive indeed:

- Seasonally, the high desert in spring, the Aqabah coast in winter, and the Mediterranean coast in summer
- Spatially, the offshore coral, the coastal lakes, small islands that are havens for migrating birds, rain-catching high mountains, and rocky canyon retreats of hare, antelope, and oryx.

Development can and frequently does debase such environmental niches. A policy directive with attendant management programs is recommended to conserve the environment of this unique peninsula even while development is pushed energetically. (For further discussion, see Volume IV.)

## 9.9 Management

The Consultant concludes that a simple acceleration or redirection of the trends of development since independence would not achieve the goals and targets set for Sinai by the year 2000. Moreover, the normal pattern of administration will not be appropriate to initiate and guide the revolutionary

changes proposed in this Report. A policy decision is needed to establish a special development-oriented management system in Sinai. (For further discussion, see Volume II.)

### 9.10 Costs

Highways to service areas that are settled at densities of 10 or 20 persons per square kilometer are not as cost-effective as those that serve areas with hundreds of persons per square kilometer. Fresh water delivered by a 200-kilometer aqueduct is more expensive than water drawn at the riverbank. Developing Sinai does incur development costs above those of Nilotic Egypt. Although the Consultant is convinced that in the long run it will not cost more to build a house or a road in Sinai than elsewhere, some increased costs (particularly those calculated on a per-capita basis) cannot be avoided in the first stages of development. The Recommended Strategy has been designed to achieve the Government's goals at a minimum cost. Whether or not the achievement is commensurate with the cost is a question that can only be decided in terms of overall national and strategic objectives.

## 10. NEXT STEPS

The immediate follow-up to the Sinai Development Study-Phase I requires a decision on whether or not to proceed along the path suggested by the Recommended Strategy. This decision will require thoughtful consideration and may involve lively debate over a period of several months. Meanwhile, major projects that emphasize the strengthening of basic infrastructure are underway, and the Consultant endorses the continued rapid completion of these projects as generally appropriate and consistent with the Recommended Strategy and its most promising options.

Five major types of additional action are needed to begin implementation of the recommended strategic path to development:

- Establishment of appropriate development institutions, tailored to the special requirements of Sinai
- Establishment of a job creation and economic investment program with appropriate manpower recruitment, migration, and training components
- Acquisition and setting aside of land for key land uses, including industry, tourism, and other activities which may be initiated several years from now
- Restoration of deteriorated ground- and surface-water resources, including Lake Malaha, a few dams, and many wells and their appurtenances
- Further studies to confirm the Recommended Strategy and the projects and plans needed to put it fully into action.

Volume II provides a discussion of the institutions needed to plan and manage development, which is to say institutions that will help maintain or accelerate the pace of reconstruction and social transformation in Sinai. Attention is also given to the management of water and other environmental resources in Volumes IV and V.

Sinai will become a dynamic society insofar as the bringing together of natural and human resources is successful. Two programs to assure this are manpower development and land-use control, which need to be implemented while

infrastructure is being put in place in order to increase benefits to Sinai from investments being made and in order to avoid losing important opportunities because of short-run actions that do not allow sufficiently for long-run potentials.

Water is the weakest stone in Sinai's development foundation. An important early step is restoration of traditional water sources. This program should advance side-by-side with plans to import large supplies of water from the Nile system.

The strategic planning process is iterative. It moves in cycles, constantly repeating its review of fundamental goals, incorporating newly acquired information and analysis, conceiving alternative scenarios, reaffirming or revising strategies, learning from experience, and finally articulating new projects and actions that can transform aspirations into reality. In the case of Sinai, the Ministry of Development, in order to underline the iterative or cyclical nature of the planning process even before SDS-I was launched, foresaw the need for "Phase II, Development Work" following promptly after review of SDS-I findings. Phase II studies are to include spatial and regional plans for the entire peninsula, more precise project identification, and an acceleration of (pre)feasibility studies for projects that utilize local resources and contribute to early settlement of new communities.

In this Final Report the Consultant confirms the need for Phase II studies emphasizing four types of tasks:

- Establishment of new development institutions, including organizations to be responsible for such vital tasks as water management, employment promotion, and land-use allocation
- Prefeasibility and feasibility studies and other actions to prepare and initiate specific projects
- Preparation of master plans for each of the five subregions, starting with specific areas earmarked for most intensive development
- Engineering and construction of major infrastructure and settlements.

A list of already identified programs, projects, and studies is presented in Appendix B to the Main Volume of this Report. This can be considered a tentative agenda for the second phase of the Sinai Development Study.

Perhaps the most important follow-up to this Final Report will be the wide dissemination, discussion, clarification, and adoption of its key recommendations. A good understanding of the basic concepts of the Recommended Strategy and the role of key projects in the proposed implementation program will facilitate the alignment among the five responsible governorates, several concerned ministries, and other high-level authorities, that is necessary if Sinai is to develop quickly and become the home of one million Egyptians between now and the year 2000.

Table E-2 illustrates how priorities will change through time in terms of sectors, construction programs, management concerns, and planning activities. The planning emphasis of one phase will generally be reflected in the management concerns of the next phase and the construction emphasis of an even later phase. Since the table is a summary of changing priorities, it would be a misinterpretation to read it as saying that rural development, for instance, is unimportant after 1986/87; the table is intended to suggest that the rural development program, given proper attention in the next few years,

Table E-2

Development Priorities by Phase

	<u>Priority Sectors</u>	<u>Construction Emphasis</u>	<u>Management Priority</u>	<u>Planning Emphasis</u>
<u>PHASE I</u>				
1982/83-	-Rural development	-Ferry crossings	-Regional Agency	-Reserve key touristic, agricultural, industrial sites
1986/87	-Tourist marketing	-Highway network	-Information, monitoring systems	-5 subregional plans
	-Agricultural research	-Telecommunications	-Agricultural, industrial credit	-Groundwater research
		-Wells, small dams, cisterns	-Industrial promotion policies	-Water master plan
		-Resorts for domestic tourists		-Eilat detailed plan
				-Abu Rudeis new town
<u>PHASE II</u>				
1987/88-	-Irrigated agriculture	-Water conveyances	-Water systems	-Settlement plans
1991/92	-Industrial promotion	-Industries	-5 economies	-Irrigated agriculture
	-Manpower and immigration	-New towns	-Job creation	-Export programs
		-Tourist hotels	-Locational patterns	-Watersheds
			-Build local enterprises	-Social development
<u>PHASE III</u>				
1992/93-	-Agricultural processing	-Agricultural projects	-One economy	-Energy after petroleum
2000	-Petrochemicals	-Energy systems	-Exports	-Health and education
	-International tourism	-Heavy industry	-Maintenance systems	-Sectoral policies
	-High-tech industry	-Water, sewerage systems	-Revenue generation	-Regional economy
		-100,000 housing units	-Preserving high quality of tourism	-Infrastructure for population beyond one million
		-Harbors		
<u>PHASE IV</u>				
After 2000	-Specialized agriculture	-Recycle, reuse water	-Style of life	-Urbanization
	-Infrastructure	-Recreation, conservation	-Participation in decisions	-Transport and communications
	-Higher education and research	-Canal tunnel or bridge	-Environmental enhancement	-Maintaining economic growth
		-Improved housing	-Reassign interim Regional Agency to permanent institutions	-Aging population
				-Review sub-plans and opportunities

will be strong enough to continue without special emphasis or initiative in subsequent periods.

Perhaps the critical difference between Sinai today and in the year 2000 will be the extent to which initiative shifts from Cairo to local peninsular personnel and institutions. With the growth of population, experience and economic activity, the shift is inevitable. Careful monitoring of changing trends, periodic reconsideration of the Strategy and its priorities, and open communication between Cairo and Sinai appear to be key themes required of any effective execution process for the next two decades.

# A STRATEGY FOR THE SETTLEMENT OF SINAI

## 1.0 INTRODUCTION

### 1.1 SCOPE OF THE STUDY

Sixty Egyptian and expatriate professionals carried out the Sinai Development Study - Phase I under the guidance of the Advisory Committee for Reconstruction through a specially appointed Steering Committee. The report of this Study is presented in seven volumes. The first volume gives in summary form the findings of the other volumes and describes the process of synthesis through which various specialized studies were brought together into a single Recommended Strategy. That strategy is a closely woven bundle of ways and means of establishing within one generation a permanent six-fold increase of population (to about one million) in such a way that the residents of Sinai are fully integrated with Egyptian society and well distributed throughout the peninsula.

Seven arrays of studies\* were carried out, principally in Cairo, but also in Sinai and the United States:

- Natural resources
- Social
- Economic
- Infrastructure and services
- Management and administration
- Data base
- Research and development projects

#### 1.1.1 Natural Resources

In this area the Study concentrated on bringing many earlier studies to a common level, so that conclusions could be drawn and further work identified on a priority basis. The two largest tasks were the analyses of ground and surface water and of land capability. The principal subcontractors for these tasks were the Desert Institute in Cairo and the Office of Arid Land Studies of the University of Arizona. The latter focused mainly on locating soils suitable for irrigated agriculture. Studies were done of the peninsula's minerals and its flora and fauna. These studies took note of off-shore resources.

The Consultant's work was that of review and evaluation rather than feasibility analysis, although several feasibility analyses are recommended for future years. Volumes IV and V present the findings of the major natural resources studies.

#### 1.1.2 Social Studies

Sinai social studies were based partly on a social survey conducted in 1981. Desk studies paid special attention to previous desert settlement efforts, the overcrowded conditions of the Nile Valley, and the characteristics of the one in ten members of the Egyptian labor force who work outside the nation's borders. Manpower studies considered the timely availability of necessary skills to achieve development, and the immigration needed to make up the identified gaps. Results of these studies are reported in Volume VI.

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\*Appendix A contains a list of working papers, interim reports, and major memoranda submitted to the Advisory Committee for Reconstruction from time to time throughout the study period.

### 1.1.3 Economic Studies

Natural resources studies involved the greatest depth. The economic studies have the greatest breadth and emphasize the following "leading" sectors:

- Agriculture
- Manufacturing and mining
- Tourism.

The various opportunities and difficulties of changing Sinai from a dominantly mono-crop agriculture (livestock) to a diverse, self-reliant, multi-sector economy provided the study team's greatest challenge. Mining and quarrying, agriculture, and tourism are closely tied to land capability. Manufacturing in Sinai is expected to be tied primarily to agriculture and mining, and secondarily to local and export markets. A large proportion will be "footloose" in that it is free to locate near infrastructure and labor and not constrained to locate near resources. Tourism is projected to be principally located at warm water beaches, in the south during all but the coldest and hottest months of the year and in the north during the summer; supplementing beaches which can accommodate thousands of tourists, there is a diversity of other special tourist attractions provided by history and nature. Active promotion programs are recommended along with the protection of suitable sites from other land uses.

Construction will provide a great many jobs during the projected rapid settlement of the peninsula in the late 1980s and 1990s and will create a lively demand for many goods and services. Commerce, too, will "push" the economy as Sinai buys the materials and equipment to build its economy and house its population, and begins to sell its products to Nilotic Egypt and neighboring countries. All aspects of these economic studies are presented in Volume III.

### 1.1.4 Infrastructure and Services

The most costly and the most significant interventions by the Government of Egypt will be in the provision of infrastructure and services. The Consultant's studies in these areas emphasized phasing and cost. Priority was given to the introduction of Nile water and the establishment of environmentally sound human settlements in a harsh desert climate. A highway from Suez to the Gulf of Aqabah via Nakh1 and Ras Taba is proposed in order to integrate the east and west of Sinai and to provide a land bridge between Egypt and other countries of the Middle East. The "Investment Plan" in Volume III summarizes the costs of these interventions. Volumes V and VI describe them.

### 1.1.5 Management and Administration

During each of the studies described above various experts advised the study team regarding management implications of the proposed settlement and development programs. Their advice is synthesized in Volume II. To this synthesis was added a discussion of organizational requirements for comprehensive planning and for development implementation.

The careful collection and organization of data was a constant preoccupation of the study, which produced a considerable file of books, maps, statistics and other references. The most important information and the data that may require frequent reference are assembled into a Data Book for the use of Sinai's development managers. It is presented as Volume VII.

### 1.1.6 Research and Development Programs and Projects

One output of the Sinai Development Study is the breakdown of the Recommended Strategy into programs and projects labeled as to time and place. In addition, the primary research and development efforts required are listed for each phase by activity sector. Key projects and studies are summarized in Appendix B to this Volume.

Project recommendations were made from time to time during the study period. In 1981 several comprehensive lists of projects were submitted by sector and type. In early 1982 an augmented set of projects including costs, priorities, and phasing, was submitted in Working Paper 32, Draft Report on a Development Strategy for Sinai, and other reports. Several of these projects are now in the feasibility study phase.

## 1.2 PROCESS

SDS-I was conceived as a major early contribution in the process of planning and development of the Sinai peninsula. Throughout the study the SDS team has benefited from and contributed to work underway by the Ministry of Development (MOD), the Sinai Development Authority (SDA), the five Governorates, several Ministries and international agencies. The process of the study can be explained as including three major components:

- Applied research
- Perspective planning
- Action program preparation.

These three distinct types of effort were combined with the intent that they would improve each other's quality and relevance, and save time.

Applied research continued from early 1980 to mid-1983, mostly synthesizing and analyzing existing data with a good deal of field checking. Moreover, some original data collection was carried out as needed and feasible.

Perspective planning was a second part of the study effort. After considering the goals of the Government, the land capability of the peninsula, current plans and budgets, development in adjacent and nearby regions and nations, and the capacities of existing institutions, preliminary scenarios were devised for possible alternative futures for Sinai. The team developed ideas about what the future could contain by synthesizing the inputs of sector specialists with the results of interviews and discussions with knowledgeable and responsible Egyptian and Middle Eastern professionals and policy makers.

The goals, potentials, intervention assumptions and concepts of the future were then combined into three Alternative Development Strategies. These Alternatives were prepared in such a way that they could readily be evaluated against each other with respect to their performance in several sectors. Based on these evaluations, and taking into account the advice of senior professionals such as those on the SDS-I Steering Committee, the Consultant designed one strategy for development as the recommended path to follow in Sinai. It is presented with options, along with suggested guidelines for monitoring its implementation. The Recommended Strategy is a framework within which sector plans, area plans, and 5-year plans can be formulated.

Action program preparation like applied research was a continuous activity throughout the study. In the first year projects were proposed based directly on national goals. During the later years more specific project and program action proposals were prepared and submitted to the MOD, based on central concepts common to the several strategies under preparation. This line of work culminates most directly in the Summary List, which forms Appendix B to this Main Volume, under sectoral headings.

The three products of SDS-I-- Research Findings, the Recommended Strategy, and Action Program Proposals--are already being used. Each can be used separately by different persons and agencies. Further research and planning is expected to go on continuously and to improve the data base as well as both the Strategy and the Action Program.

The first most important follow-up to this Final Report might be the wide dissemination, discussion, and adoption of the key recommendations herein. A good understanding of the basic concepts of the Recommended Strategy and the relationship of the key projects to the implementation of that strategy will be necessary in order for the five responsible governors, several concerned ministries, and other high-level authorities to work in concert to accelerate development and settlement. In other words the Recommended Strategy is as important as a tool for building the consensus necessary for efficient development of the Peninsula as it is for the particular substantive details integrated within it.

### 1.3 HOW TO USE THIS VOLUME

This is a multipurpose volume. First, it is a summary of and guide to the other six volumes. Water, economics, management, and other topics are briefly discussed here to introduce the substance presented in greater depth in the sector volumes and earlier Working Papers.

At the beginning of this summary volume an Executive Summary identifies the key points. The Executive Summary may be useful to read both at the beginning, as a preliminary view of the Study, and again at the end, as a digest. Included in this volume are several summary tables and integrative maps or illustrations from other volumes. These figures will be useful for quick reference for those who are implementing Sinai's development and will serve as an introduction for those less familiar with Sinai as it is today.

Assessments of Sinai's potentials for development (land capability) are stated with the specific intention that they be reviewed and updated as the results of further studies become available.

## 2.0 THE CURRENT SITUATION OF THE SINAI PENINSULA

### 2.1 INTRODUCTION

The Sinai Peninsula covers a land area of over 61,000 square kilometers. It has about 900 kilometers of coastline on the Mediterranean, Gulf of Suez, Gulf of Aqabah, the Suez Canal, and the Bitter Lakes. As 82 percent of its circumference is coastal, its development orientation is similar to that of an island nation. Island countries of a similar size include Sri Lanka and Ireland. Sinai is about the same size as West Virginia, USA, and the United Arab Emirates; it is 50 percent larger than either Switzerland or the Netherlands, and six times the size of Lebanon.

Sinai is at the geographic center of the Middle East. Sinai is closer to Beirut, Aqaba, Baghdad, and Jeddah than is Cairo. From Cairo, Sinai, and especially some parts of Sinai, appear remote. For certain trading partners of Egypt it is close by. By introducing modern development to Sinai, Egypt moves itself closer to the center of the Middle East. The move to Sinai is part of a broad trend, started shortly after the end of the colonial occupation, away from the protected valley of the Nile out to the coasts.

### 2.2 THE SETTING

The Sinai Peninsula has four coasts: the Mediterranean, the Gulfs of Aqabah and Suez, and the Suez Canal. Its neighbors to the east are Saudi Arabia, Iraq, Jordan and Israel; and to the west, the Suez Canal Governorates, the east Delta, and the Red Sea Governorate. This dynamic "zone of influence" includes the rapidly growing metropolises of Jeddah, Yanbu, Aqaba, Eilat, Gaza, Port Said, Ismailia, Suez, Zagazig, and Cairo. Development in Sinai will sooner or later become integrated with the development occurring in this larger zone of influence.

The frequency and variety of shipping in Sinai's "four seas" provide an exceptional range of opportunity for trade. The focus is likely to be on the smaller ships and barges, which carry raw materials, manufactured products, and tourists; furthermore, a good deal of travel that now flies over Sinai, or sails around it, could pass through it by road, stopping enroute to do some business and to enjoy the scenic countryside and new amenities.

The rapid growth of the Egyptian and Saudi Arabian economies has been extensively and well reported in the national, regional, and international press. Some other growth economies are also particularly relevant, although less often the subject of discussion. Egypt's most rapidly growing area is Planning Region Three\* where agriculture is expanding both horizontally and vertically, including some capital intensive new forms of irrigation and controlled environment projects in Salhia.

Industry, higher education, recreational tourism, and many other activities are also expanding rapidly in the Suez Canal Zone. This growth is characterized by a high level of participation by the private sector in collaboration with public sector initiatives.

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\*North Sinai, South Sinai, Suez, Ismailia, Port Said, and Sharkia Governorates.

Saudi Arabia is investing billions in establishing a new western entrepot at Yanbu to replace its facilities on the Arabian Gulf. Small economies, such as those of Cyprus, Lebanon, Jordan and Turkey, today serve Saudi Arabian demand. With the movement of the Saudi Arabian geo-economy to the west coast, Sinai will have a greater locational advantage and more rapidly growing trading opportunities than it has had heretofore. Aqaba in Jordan has been enjoying a very rapid rate of economic expansion and suffers many of the social and physical problems of rapid urban growth. Plans for Sinai's South-east Subregion could include projects designed to share in Aqaba's economy and absorb some of its population growth.

Sinai is surrounded by some of the world's premier religious and historic tourist sites (e.g., Mecca, Cairo, Luxor and Jerusalem) and is situated between the Mediterranean and Indian Ocean resort areas, which are attractive to European travellers. Thus, its location offers a prima facie case for tying into established tourist circuits, offering beach and mountain recreation along with worship or study. St. Catherine's Monastery, Sarabit El Khadim, Pelusium, and Ein Guderat offer opportunities for worship and study for tourists who have been relaxing in neighboring areas. The coraled and historic beach at Ayun Musa is an hour closer to Cairo Airport than is Alexandria, and Great Bitter Lake is almost two hours closer.

### 2.3 THE LANDSCAPE

The fact that despite its central location Sinai has been neglected and does not now have a robust economy is due largely to its harsh landscape and to other characteristics of its land. The Sinai Peninsula is hilly, rocky, and eroded. Only about 9 percent, or 5,600 square kilometers, can be considered flat, and much of that is deeply eroded. Some of the flat land is infested with high, "walking" dunes. Sinai has one kilometer of coast for each 55 square kilometers of land, but not one good natural harbor site has been identified on any coast. The flat coastal plains are subject to storms that sweep in from the sea. The high mountainous interior has a climate of extremes--cold winters, hot summers, and long periods of wind storms in between. The landscape has not encouraged agricultural or urban development but is nevertheless quite attractive for recreation and tourism.

### 2.4 WATER RESOURCES

In an average year very little rain falls on Sinai, except on the Mediterranean coast and in the high mountains. Once every three to five years, the southeast monsoon reaches Sinai, as it did early in 1983; then bridges and dikes are washed out, and aquifers recharged. Rain in Sinai, as in most of the Middle East, means fodder for the livestock more than it means soil moisture for field crops. The animals go to the rainfall rather than the rain coming to the fields. Cloud-seeding and afforestation programs offer some hope for increasing rainfall in the north; in the south dew can be harvested in the high mountains.

Sinai has two large coastal saline lakes in the north (Malaha and Bardawil) and some salt marshes with mangroves in the south. Surface water areas are popular rest stops for migrating birds, and the lakes are also fruitful fishing grounds.

The groundwater of Sinai is typically deep and sour. Unlike the Western Desert where the Nubian sandstone aquifer drifts on for hundreds of kilometers from Chad to the Qatara Depression, Sinai is underlain by a large variety of aquifers due to its being at the geological contact line between Asia and Africa.

On the Mediterranean coast and on the Gulf of Suez coast between Abu Rudeis and El Tor there are shallow aquifers with significant potential. The rest of Sinai can reach substantial supplies of water only in deep aquifers, and most of them are thought to have quite brackish water. It would be unrealistic to think of irrigating more than a small fraction of the irrigable agricultural soils of Sinai with groundwater. However, many of Sinai's small permanent settlements can be provided with domestic water supplies from wells. Volume V of this report gives detailed information about the sites and potentials of these wells.

## 2.5 SOILS

At present, barely 20,000 feddans (about 82 square kilometers) of soil are being irrigated in Sinai, about one-half with Nile water. Through several reconnaissance studies and numerous field trips, mainly by experts from the Desert Institute, about 9,600 square kilometers have been identified that are recommended for detailed surveys to identify sites for irrigated agriculture. (Figure 2.1.)

Table 2-1  
Candidate Areas for Irrigable Soils, by Subregion  
(in square kilometers)

<u>Subregion</u>	<u>Area<sup>a/</sup></u>	
	<u>(km<sup>2</sup>)</u>	<u>(Percent)</u>
Three Northern subregions, subtotal	8,386	87.4
Northwest	1,719	17.9
Northeast	1,499	15.6
Uplands	5,168	53.9
Two Southern subregions, subtotal	1,212	12.6
Southwest	1,006	10.5
Southeast	206	2.1
TOTAL	9,598	100.0

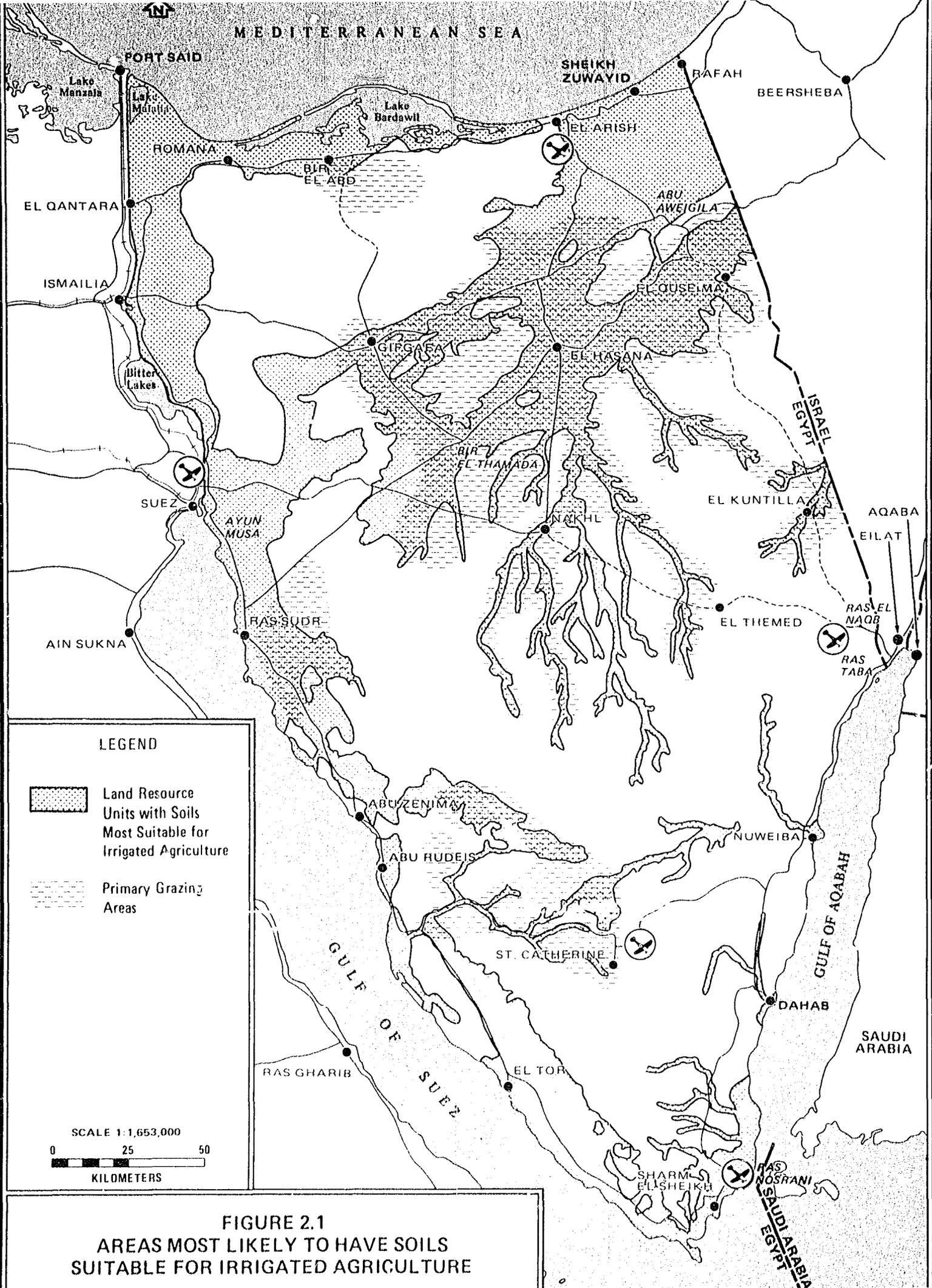
<sup>a/</sup> Areas have been estimated by measuring with a planimeter on maps at a scale of 1:750,000.

SOURCE: Derived from Tables 3-3 through 3-6 of Volume IV, prepared by the Office of Arid Land States of the University of Arizona, using field reports of the Desert Institute.

The analysis of past surveys suggests that no more than 3,000 square kilometers of land will be found to have soils suitable for irrigated cropping; that is to say, further study of more than two million feddans is likely to identify about 700,000 feddans that could be recommended for irrigation on the basis of soil quality and engineering considerations.

Though widely dispersed, there are soils suitable for crop production in all parts of the peninsula. They are generally not very good soils but could be improved with use. Half are either more than 200 meters above sea level or more than 100 kilometers from the nearest takeoff point for Nile waters, making it quite costly to deliver water to the soil. Figure 2.1 shows the Land Resource Units where the irrigable soils are most likely to be found.

High levels of production can be expected because of the sunny climate if good soil management practices are followed; on the other hand agriculture



**FIGURE 2.1**  
**AREAS MOST LIKELY TO HAVE SOILS**  
**SUITABLE FOR IRRIGATED AGRICULTURE**

will be hindered by such problems as duning, high water tables, salinity, high percolation rates, windiness (high evaporation rates), relatively small plots interspersed with poorer soils, and wind and water erosion. Each of the negative factors can be overcome with care and at some cost.

In addition to the areas suitable for irrigated cropping, there are much larger areas suitable for livestock grazing and tree crops. Livestock is already an active sector, but agro-forestry is quite small compared to the potential. Both these sectors could benefit from the use of water from the deep aquifers and, on an interim basis (to get the roots of trees well established), Nile and/or drainage water.

These findings are based on reconnaissance soils surveys, conducted mainly by the Desert Institute and REGWA. Field reports were interpreted by a team from the Office of Arid Land Studies of the University of Arizona.

## 2.6 ENERGY

Sinai is endowed with energy resources far exceeding its anticipated needs. Sinai petroleum is currently used as a major source of energy for all of Egypt. Natural gas supplies are also abundant.

Proven recoverable reserves of coal at the Gebel Maghara mine are reported to total 35.6 million metric tons. Better quality reserves at Umm Bugma in the Southwest are reported to total 65 million metric tons. There are potential sources of geothermal energy in Sinai. High wind velocities are common in several areas, particularly along the coast of the Gulf of Suez. Sinai has an abundant solar energy resource; peak solar insolation rates are around 1,000 w/m<sup>2</sup> impinging on a horizontal surface.

Energy planning for Sinai means targeting early transfer from petroleum to other sources of energy. Such a change in technology offers a greater benefit in a dispersed settlement pattern than in the conventional settlement of the Nile Valley.

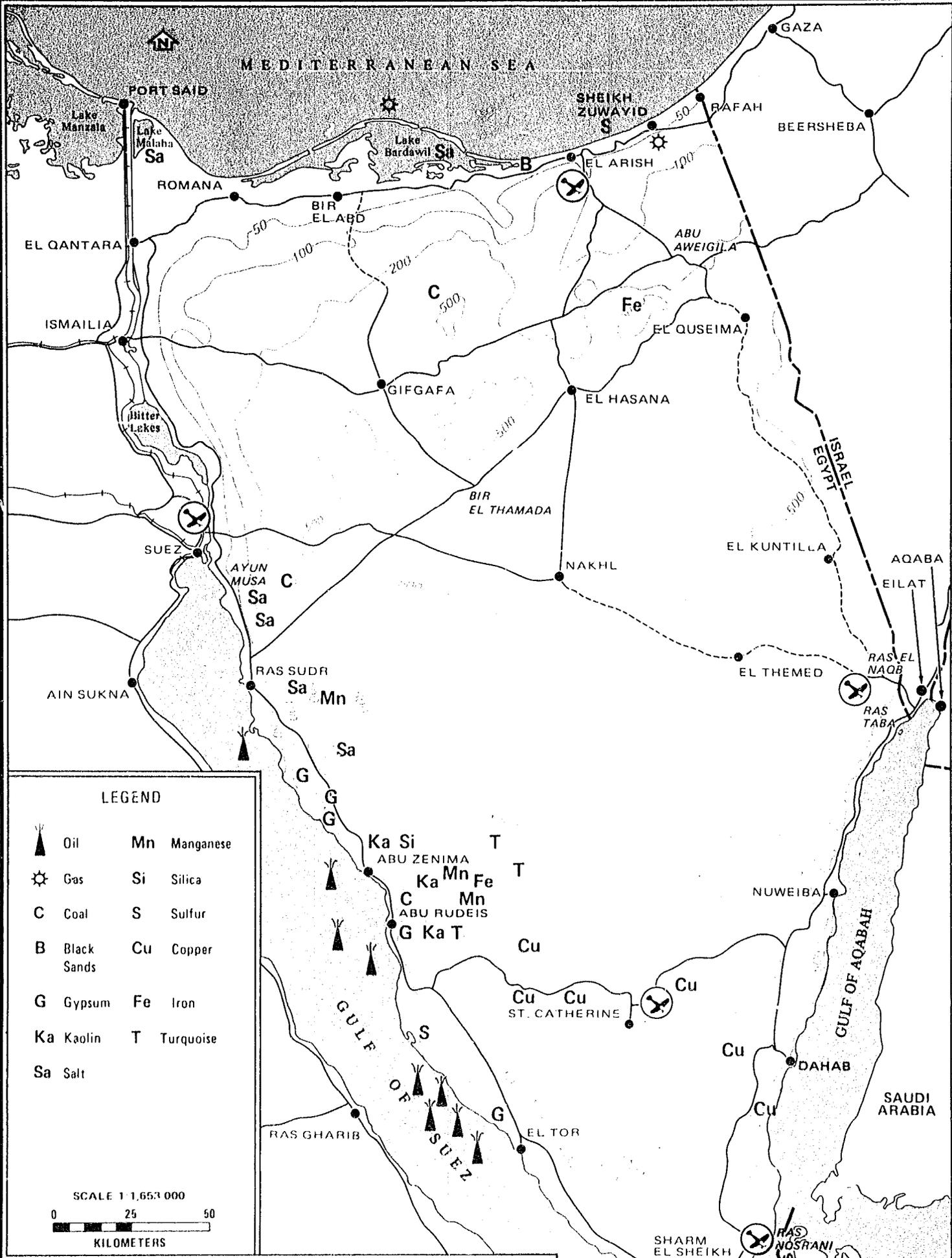
## 2.7 MINERALS AND BUILDING MATERIALS

Mineral exploitation is at a relatively low level in 1983, reflecting the world recession. In southwest Sinai petroleum is being extracted, and kaolin is being mined. Feasibility studies to restore the ferromanganese and coal mines are being completed, and the development of natural gas is expected to be taken up soon. Volume III of this report and Working Paper 37, Minerals, present more detail on this topic. The known mineral resources that show promise of economic production are concentrated in the Southwest subregion. Building materials are frequently located conveniently close to the locations where communities are most likely to be built. (Figures 2.2 and 2.3.)

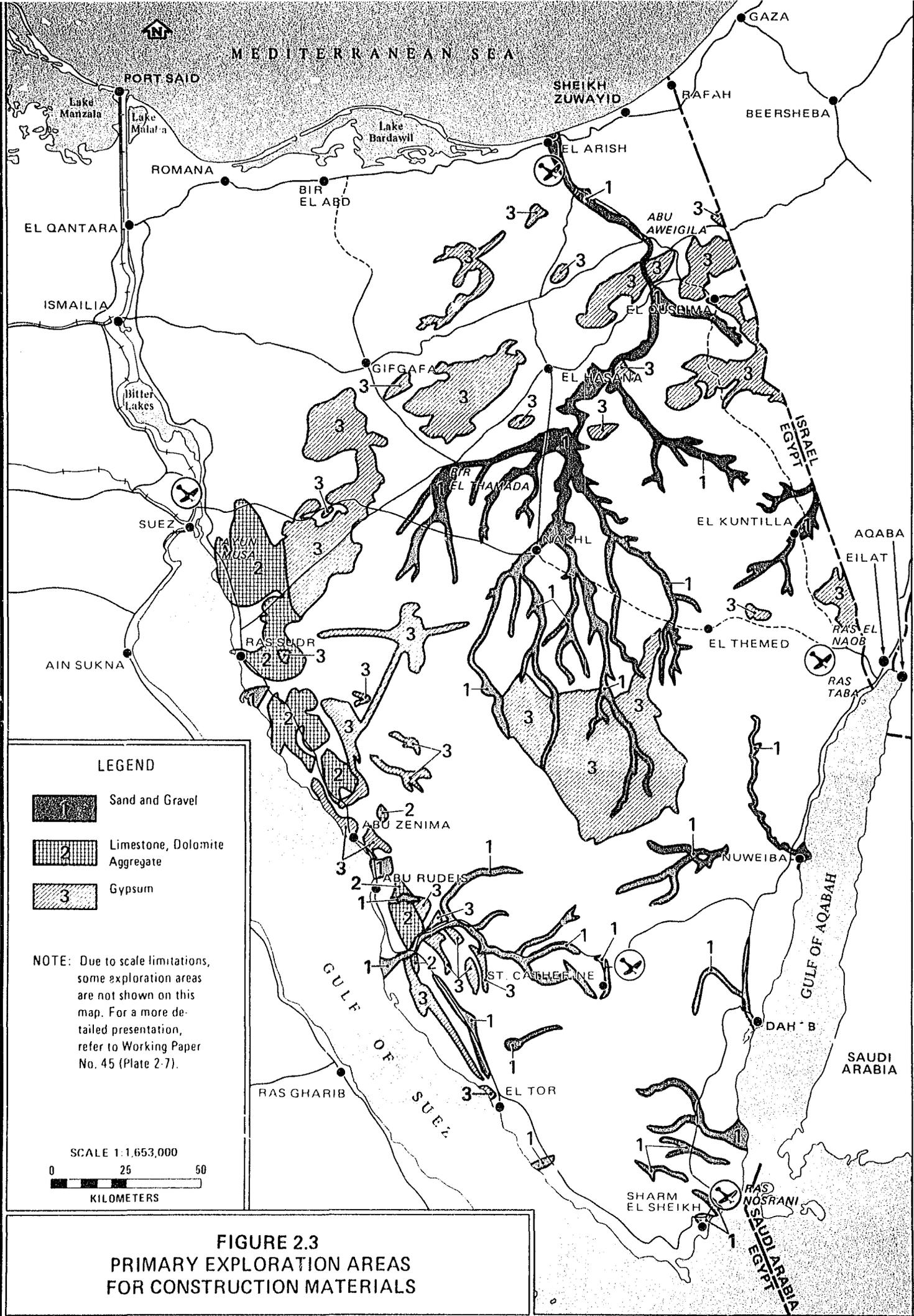
## 2.8 FLORA AND FAUNA

Because Sinai is contiguous to Africa, Europe and Asia, and has been from time to time warmer and cooler, the range of vertebrates is exceptionally large; and because there are so few of each species, protection would seem important. Reptiles and insects are relatively profuse, as they have adapted themselves better to survive long periods of drought.

The pattern of dominant plant groups varies from mangrove forests to high mountain alpine shrubs, as described in Volume IV and Working Paper 41, Environment. In most areas, the vegetation is sparse, but there are no vegetation-free desert areas. The vegetative diversity of Sinai, within this



**FIGURE 2.2**  
**PRINCIPAL KNOWN MINERALS**



**LEGEND**

- 1 Sand and Gravel
- 2 Limestone, Dolomite Aggregate
- 3 Gypsum

NOTE: Due to scale limitations, some exploration areas are not shown on this map. For a more detailed presentation, refer to Working Paper No. 45 (Plate 2-7).

SCALE 1:1,653,000  
 0 25 50  
 KILOMETERS

**FIGURE 2.3**  
**PRIMARY EXPLORATION AREAS**  
**FOR CONSTRUCTION MATERIALS**

pattern, is great and significant. There are about 1,000 species, of which 270 are indigenous and not known in other part of Egypt. Thirty-nine of these species are found nowhere in the world but Sinai. (Figure 2.4.)

Perhaps the most interesting flora and fauna of Sinai are not terrestrial, but aquatic. The corals of Aqabah are justly world famous. Among the large variety of coral growing to great depths along the entire Aqabah coast, and extending beyond Ras Mohammad towards Hurghada, is an even greater variety of fish. Sinai offers a natural heritage for Egyptians that is not available elsewhere in the country.

## 2.9 LAND USE AND INFRASTRUCTURE

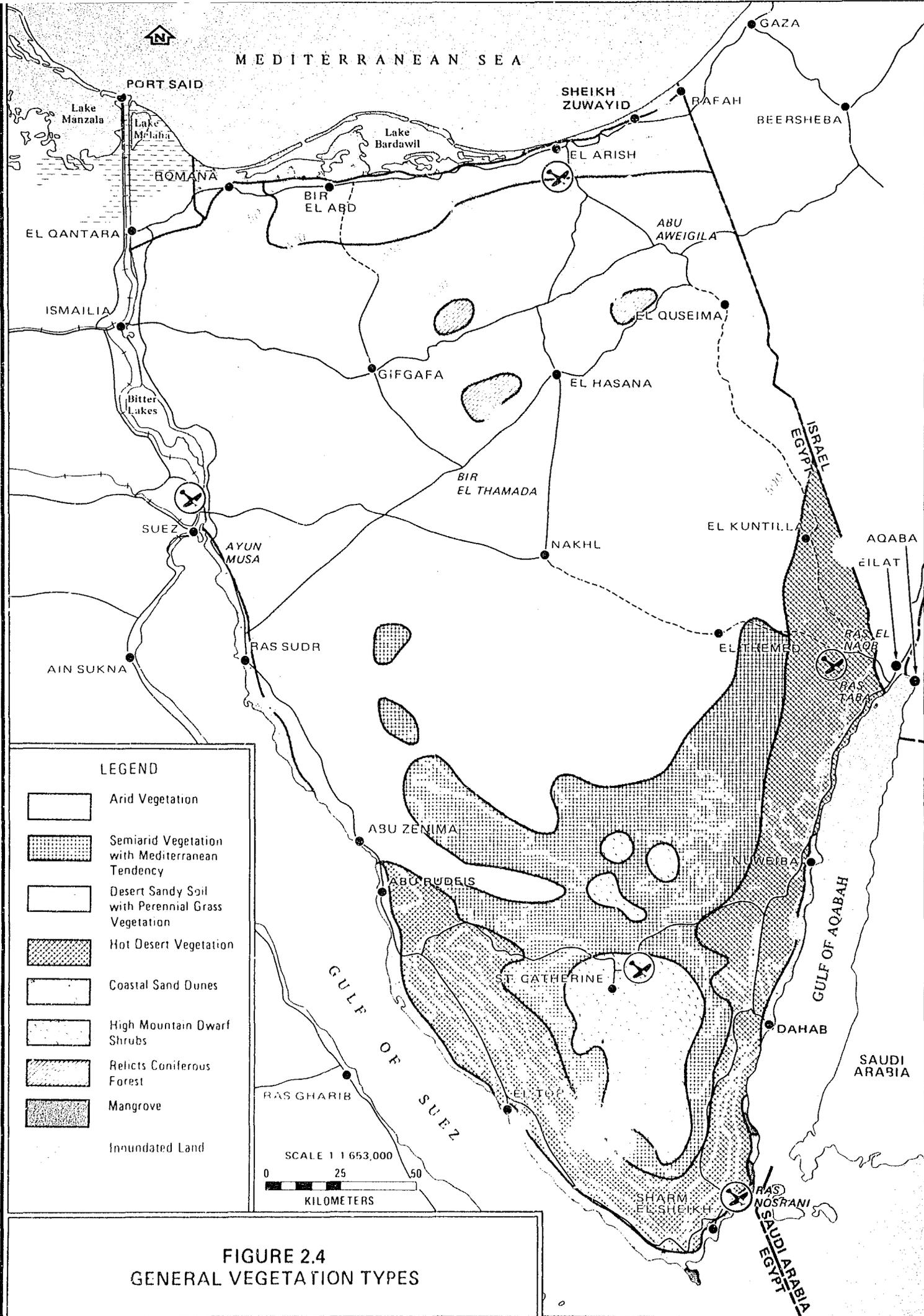
The single largest land use in Sinai is grazing, which covers a large portion of the peninsula. Camels have the most extensive grazing range. Goats are the most numerous; sheep the third most common. Camels are concentrated in the drier south, and sheep in the wetter north. The second largest land use is infrastructure, which is dominated by highways in northern Sinai and in the more mountainous south. Airfields are more evenly distributed, but none are found on the plain directly east of the Suez canal. Beyond these extensive uses, the Sinai land use pattern is quite segregated by development axes and subregion. Urbanization is characteristic only of the Mediterranean coast (Northeast subregion). Tourism dominates the Aqabah coast (Southeast subregion). Petroleum and other mineral exploitation is dominant on the Southwest coast, which has at present a proto-urban development. The Northwest subregion has a little agriculture, considerable grazing, and one urban place (El Qantara).

The existing land use pattern offers very little restriction to future land use. In considering a five-fold increase in population, planners and developers are free to establish new patterns or reinforce existing ones. However, each existing land use is related to historically recognized land capability, and should not be set aside lightly. The introduction of Nile water will change land capability, and therefore, the land use pattern, in several areas.

Volume VI describes Sinai's infrastructure and makes recommendations for its improvement as part of the overall development program. The infrastructure, as represented by roads and airfields, is developed far beyond the needs of the current population. The condition of these facilities is, however, not always such that they can provide efficient service.

The traditional water supply in Sinai is a well. Many wells are supplemented by a cistern. Wells are divided according to salinity into two groups: one for humans and another for animals who tolerate a higher saline level. The second most common source of water is springs, which also may have associated cisterns. Some of the more recent communities and agglomerations in Sinai have their water delivered by ships or trucks. Water pipelines are under construction along the Mediterranean and Gulf of Suez coasts. The SDS-I social survey team and other researchers found a great variation in the daily water consumption per capita in different places--from 3 liters a day at Nakhl to 200 at El Qantara. As a general rule, the smaller more remote places consume less water per capita.

The supply of electricity is very uneven throughout Sinai. In 1981 fully two-thirds of the peninsula's electricity was in El Arish; most areas had none. Telecommunications are still at a rudimentary stage, but a major improvement program is already underway. Three-quarters of all Sinai telephones were in El Arish in 1981; most settlements had none. Relative to other



services, transport is highly developed. Regular bus service from Cairo is reliable to both the north and the south. Sinai Airlines flies two or three times a week. Route taxis serve more remote areas. And ferries serve El Arish and El Tor on a regular basis. An active reconstruction program is underway to adjust imbalances and to improve the overall quality.

The settlement, economic, and infrastructure systems of the Sinai Peninsula of 1983 were relatively inflexible. For instance, the only paved highway to the south looped around the coast; three of the five subregions had a single-sector-dominated economy; nine-tenths of the area was served by water systems that had no surplus for future growth; and telecommunications were on a priority basis only, everywhere but El Arish.

The Northeast subregion's health care is provided by a hospital in El Arish. The Northwest subregion is served by the Suez Canal cities and a hospital at El Qantara. The Southwest has hospitals at Ras Sudr, Abu Rudeis, and El Tor. A hospital at Sharm El Sheikh serves the Southeast. This array leaves large areas, but rather small populations, unserved by hospitals. However, many small clinics can and do treat local populations, and ambulances are well distributed.

The educational system in Sinai is founded upon many small primary schools, some of only one or two rooms. Attendance at secondary schools is difficult for many children, as they must live away from home. For example, a child living in the Feiran Oasis must go to Ras Sudr for secondary education. This particularly discourages the education of girls. Table 2-2 presents a summary of major service facilities in Sinai.

## 2.10 POPULATION

Half of Sinai's population lives within 10 kilometers of the northern Mediterranean Sea coast, mostly in El Arish or east of it. About one in seven Sinaians live in the mountains, mostly in small settlements near reliable springs and wells. About four in five live near the seacoasts. And only one in eight live to the south of the road connecting Suez to Ras Taba. Sinai is a coastal region with a mountainous hinterland. Because of its history, rather than its land capability, it is principally settled by Bedouins. Except for the city of El Arish, fully seven in ten Sinaians are Bedouin. Volume VI analyzes the special problems and potentials of the current Sinai population.

The current "post-war" circumstances are such that the economy is in transition and the population is shifting within Sinai. In general, upland areas are either standing still or losing population, while coastal locations are growing, particularly the Mediterranean coast. Much of this shift is due to recent, possibly temporary, job opportunities.

The principal population issue for the remainder of the century will be immigration--how to attract the right immigrants at the right time to the right place.

## 2.11 ECONOMY

With a population of about 172,000 Sinai has three economies: traditional, intermediate, and modern. The traditional and the modern are hardly interrelated at all. The traditional economy is a semi-nomadic grazing economy, including the raising of goats, sheep, and camels; the husbanding of date palms and olive trees; and the raising of a few crops, predominantly barley, on the basis of the winter rains. This economy is found throughout Sinai, but is particularly characteristic of the Uplands.

Table 2-2

Major Service Facilities and Utilities in Sinai, 1981 <sup>1/</sup>

<u>Health</u>	<u>No.</u>	<u>Beds</u>		
<u>Hospitals, total</u>	<u>7</u>	<u>113</u>		
Northwest	1	16		
Northeast	2	64		
Uplands	0	--		
Southwest	4 <sup>2/</sup>	33		
Southeast	NS	--		
<u>Education</u>	<u>No.</u>	<u>Classrooms</u>		
<u>Secondary Schools, total</u> (10th to 12th Grades)	<u>5</u>	<u>63</u>		
Northwest	0	--		
Northeast	4	60		
Uplands	0	--		
Southwest	1	3		
Southeast	NS	--		
	<u>No.</u>	<u>Classrooms</u>		
<u>Preparatory Schools, total</u> (7th to 9th Grades)	<u>11</u>	<u>102</u>		
Northwest	1	6		
Northeast	8	91		
Uplands	0	0		
Southwest	2	5		
Southeast	NS	--		
<u>Utilities</u>	<u>Generators</u>	<u>Capacity</u> <sup>3/</sup>	<u>Potential</u> <sup>4/</sup>	
<u>Electricity, total</u>	<u>33</u>	<u>11,630</u>	<u>12,605</u>	
Northwest	4	900	600	
Northeast	13	8,800	11,000	
Uplands	2	100	25	
Southwest	14	1,830	980	
Southeast	NS	NS	NS	
	<u>No.</u>			
<u>Telephones, total</u>	<u>914</u>			
Northwest	108			
Northeast	716			
Uplands	0			
Southwest	90			
Southeast	NS			

<sup>1/</sup> Survey was conducted in the summer of 1981 and does not include eastern Sinai (east of El Arish, Nakh1, and St. Catherine)

<sup>2/</sup> Plus 60 bed facility under construction in El Tor in 1983

<sup>3/</sup> Peak capacity in kilowatts

<sup>4/</sup> Annual generating potential in megawatt hours

NS Not surveyed.

The modern economy is founded on the extraction of petroleum and on international tourism. It temporarily and significantly includes the multinational forces and accelerated construction of infrastructure. This new economy has so far had very little constructive impact on the people or the permanent economy of Sinai. Labor and equipment are brought in from the outside, and most of the economic benefits flow back out, to be invested elsewhere. The modern economy is concentrated in the south (Abu Rudeis and Sharm El Sheikh) although there is also a construction boom in the north.

The intermediate economy is thriving, and to a certain degree integrating with the traditional, primarily on the Mediterranean coast. This intermediate economy is based on modern agriculture, using groundwater for irrigation; intensive fishing in Lake Bardawil and the sea; and small-scale manufacturing, commerce, construction, transport; and domestic tourism activities.

The Sinai Peninsula could not provide for its own "basic needs" of water, food, and shelter in 1983. On the other hand it has a large surplus of energy. The dependence on outside sources for many basic supplies is not uniformly distributed in all subregions, but is nevertheless widespread.

During the planning process the consultant considered several different divisions of Sinai into subregions. As reported in Volume IV, these included geologic, climatic, hydrographic, tribal, political, and transportation zones. Toward the end of the study period the peninsula was analysed in terms of five subregions--one facing each coast and one for the uplands (largely defined by the vast upper reaches of the Wadi El Arish). Appendix C includes a brief profile of each of the subregions.

### 3.0 NATIONAL AND REGIONAL DEVELOPMENT GOALS

#### 3.1 INTRODUCTION

Regional development, with the goal of successful national integration, is the subject of plans prepared by governments to improve a region's development performance above recent trends, in line with national objectives. The preparation of a development strategy for Sinai is somewhat unusual. The Peninsula is a large arid region at the center of the Middle East. It is a peninsula in many ways quite separate from "mainland Egypt". The goals set to be attained by its development are far more than a modification of trends; they spell out a whole new role for Sinai within Egypt. Therefore, the careful statement and analysis of goals is unusually important in designing an appropriate strategy. Furthermore, over the years, it will be more than usually important to monitor the achievement of development goals to determine whether or not plans should continue to be guided by the same strategy, or some modification of that strategy, or possibly by another, substantially different approach.

Beginning in May 1974 with the presentation of the October Working Paper which set out a program for "A New Map of Egypt", Egypt has been preparing regional development strategies and plans for several areas. Most of these regions have been on the coasts and include: Northwest Coast (Alexandria to Libya), Red Sea (Suez to Sudan), Suez Canal (linking the Red Sea to the Mediterranean), Aswan (on Lake Nasser), New Valley (in the Western Desert), and now Sinai (a peninsula whose borders are 82 percent coastal).

Egypt's national goals have a special meaning in these developing regions. They can be interpreted both as intending to ensure social justice for the residents of these regions (comparable conditions to those in more advanced or densely populated Nilotic Egypt) and as requiring of these regions a special role in the achievement of national objectives. A philosophy included in the Sinai development strategy is that settlement of the peninsula should contribute to the reduction in regional disparities in Egypt and also assist the nation as a whole in accelerating the achievement of its goals. The planning process has been guided by an iterative study of national and regional goals under the oversight of the SDS-I Steering Committee.

Whereas regional strategies and plans are designed to achieve goals through the use, first, of indigenous resources and, second, of other national (or international) resources, they are shaped to a considerable degree by assumptions, including, most significantly, assumptions or visions regarding the future. SDS-I was based on assumptions included in the Request for Proposals (RFP) and incorporated into the Terms of Reference (TOR). Of necessity, planners participating in SDS-I have made further assumptions concerning Egypt's economy, population, international relations, and the availability of Nile water as these matters are outside the scope of study. When and if these assumptions are found to be in error, the recommended strategy will need to be reviewed and possibly revised.

The Recommended Strategy has been designed to achieve certain goals and objectives within each sector and subregion of Sinai. The strategy is not meant to improve on trends, but to achieve goals. Below are listed (a) eight National Goals, (b) the eight Regional Goals confirmed by the Steering Committee, and (c) nine working hypotheses used by the SDS team.

## 3.2 NATIONAL GOALS

- Social
  - Improved quality of life, for all Egyptians
  - Slower population growth, especially in Cairo and the Delta
  - Reversal of the brain drain, in part by creating well-paid, high-tech, modern, economic activities within Egypt
- Economic
  - Industrial development, including foreign joint ventures to provide jobs and export earnings
  - foreign aid reduced, later eliminated
  - Expanded private sector
- Strategic
  - Food self-sufficiency, improved yields and land reclamation
  - Integration of remote areas into the mainstream of Egyptian civilization.

## 3.3 REGIONAL GOALS

- National integration: To integrate Sinai fully into the economic, cultural, and political life of Egypt while creating a "life style" appropriate to the special circumstances of the peninsula and reducing the current disparity in social services relative to Nilotic Egypt.
- Population absorption: To attract, through jobs and amenities, enough people to reduce pressures of overpopulation near the Nile, and to reach a total population in Sinai of about one million by the year 2000.
- Resource development: To develop natural resources, including petroleum and other minerals, land suitable for agriculture or industrial sites, surface and underground water, trade routes, and beaches and other tourist attractions, in ways that serve the national economy as well as the growing population in Sinai itself.
- Development/attraction of manpower: To attract and/or train workers who have the requisite skills in agriculture, mining, industry, construction, tourism, and other sectors, to perform in ways that result in high productivity for the enterprises and communities where they work.
- Economic viability: To develop by the year 2000 a viable, self-sustaining economy that produces goods and services that meet national and export needs; encourages cost-recovery; and follows a least-cost path toward desired goals, while keeping financial risks associated with public and private investment within manageable limits.
- Dispersed settlement system: To foster the enhancement and creation of permanent, interdependent settlements--both large towns and small villages--that are widely dispersed throughout the Sinai Peninsula,

with ample amenities to attract and retain a rapidly growing population.

- Improved communications and transport: To build and maintain highways, ports, a telecommunications network, and other infrastructure components that serve essential economic as well as national security requirements and provide convenient links from Egypt through Sinai to the Middle East, and from Sinai to Egypt and to export markets.
- Enhanced environment: To enhance the environment of Sinai by introducing Nile water, small sea ports, and perennial vegetation, and to conserve the unique environment and resources of the Sinai, including scarce water resources, outstanding coral reefs, historical and religious monuments, and grazing lands.

### 3.4 WORKING HYPOTHESES

- Egypt intends to go ahead with the settlement of Sinai for political, social and strategic reasons that outweigh but do not set aside economic considerations.
- Egypt will have a robust expanding economy to the year 2000.
- Egypt will enjoy good and rapidly growing trade relationships with many of its neighbors to the north and east (for instance, in Europe, Lebanon, Saudi Arabia, Iraq, Jordan, Gulf States, and Israel).
- Egypt will encourage both large and small-scale industries in Sinai, including factories processing Sinai's minerals.
- The national government will adopt appropriate incentive programs to attract talented new settlers to Sinai and will also provide training to the extent necessary.
- Egypt will confirm long-standing plans to allocate substantial amounts of Nile water to serve the needs of reclamation and settlement in Sinai.
- Special international investment interest in Sinai projects will continue for at least another decade or two.
- Egypt will set prices in Sinai comparable to those in the rest of Egypt for basic commodities like energy, foodstuffs, water, and building materials.
- The Government's overall political, social, strategic, and economic goals for Sinai will remain fairly constant at least until the year 2000.

### 3.5 PURPOSE

These development goals and objectives have been used to formulate scenarios, alternative strategies, and the Recommended Strategy. They have been an instrument for better understanding among the diverse members of the planning team. They have also been used to evaluate the alternative strategies. At this point in the presentation, they also limit the range of the remainder of this volume. Goals beyond those stated will not be considered

here. Moreover, this explicit statement of goals will be useful to future planners who need to understand the basis of this Study's recommendations whether they are evaluating progress toward those goals or contemplating a fresh restatement or revision of goals. The implementors of the Strategy will find this explicit statement of goals a useful point of reference against which to measure the array of actions available to them at any one time. These goals and objectives may also be of use to the perspective and five-year planners of Region Three as they prioritize their plans and project lists.

While applying these goals, it is useful to keep in mind that their relevance and their impact are to some degree different in each of the subregions of Sinai. For instance, in the Southeast (Aqabah coast) the goals concerning the conservation of the environment are more important than for Sinai as a whole, because the Southeast will base its economy largely on tourism attracted by its environmental features and will also have to sustain development largely on limited available groundwater. The goal of dispersed permanent settlements has a greater relevance to the Uplands subregion than does the population absorption goal. The opposite may be said for the Northeast subregion (Mediterranean); there, settlement is already quite spread out, and the population absorption capacity is greater.

It may be helpful, as it was within SDS-I, to use these goals from time to time as the basis for setting "development targets" along sector lines. Such targets, because of the diversity of the region, will need to be set for each subregion and monitored accordingly.

Those responsible to execute whatever development plans the Government adopts for Sinai will call to the attention of the nation's policymakers the need to modify the Sinai development strategy and its attendant plans, programs and projects, when and if, the above-listed hypotheses about future national and international conditions are found not to exist in the real world. Such modification can be considered as normal with the preparation of each five-year plan and subject to consideration each year for each subregion, governorate, or markaz in the peninsula. In a subsequent Chapter, we describe the organization and application of "strategic monitoring" based on sample surveys as an efficient means to compare the achievement of development targets to national goals as they are revised from time to time.

### 3.6 SUMMARY

All of the goals listed and discussed above can be summarized concisely as follows:

- Permanent settlement in all parts of Sinai
- Full integration with the rest of Egypt
- Optimum development of natural resources.

To a substantial degree the other goals and objectives are amplification of these three themes. None of these three can be measured perfectly, but none can be easily misinterpreted. It is useful to give each equal importance and to recognize that they are only partially reinforcing. Much of the difficulty in managing Sinai's development will have to do with mitigating the conflicts among the various goals to be achieved by the development of the peninsula.

These goals, when combined with the information summarized in the preceding chapter about Sinai and supplemented by the facts and forecasts reflected in the assumptions given at the time the Study was commissioned provide a base for the analysis of Sinai's land capability, which is summarized in the next chapter.

## 4.0 LAND CAPABILITY

### 4.1 METHODOLOGY

The SDS-I land capability assessment had multiple purposes:

- to contribute to a data base, synthesizing environmental, geographic and other relevant information
- to identify where key land uses could be sustained in Sinai
- to recommend which infrastructure elements would be helpful in which places
- to earmark problems or limitations to development by location
- to provide an input to the design of a development strategy.

The data base is reflected in Volumes IV, V and VII of this report. These reports describe Sinai's geology, soil, ground and surface water, minerals, energy potential, vegetation, topography (including off-shore areas) and major infrastructure. They also identify current land uses as well as the water and other resources being used. Information concerning petroleum has not been emphasized.

The following subject areas were researched, entered into the data files, reported on, and analyzed in relationship to each other. Each was researched using aerial photos, satellite photos, maps, scientific reports and/or field surveys:

- Geomorphology
- Physiography
- Environmental geology
- Climate and meteorology
- Soils
- Ground and surface hydrology
- Terrestrial ecology
- Marine ecology
- Cultural heritage
- Infrastructure and settlements
- Economic activities
- Access and location.

The quality of data varies from place to place. Most of Sinai has only been subjected to reconnaissance surveys. This situation is being remedied by several on-going studies to find deep water, irrigable soils, minerals and other productive resources under the overall coordination of the National Academy of Science and Technology.

The land uses considered most important to be sustained in Sinai are irrigated agriculture, grazing, mining and processing of minerals, manufacturing, tourism, human settlements, and major infrastructure elements. The reconnaissance assessment carried out during SDS-I provides a guide for subsequent planning activities, indicating where developers can best search for sites for particular activities, where conflicts are most likely to occur among competing uses, what potential problems are likely to be faced in the process of selecting sites, and how such conflicts might best be resolved.

The following factors were considered in both map and data form: flora and fauna, soils, topography, aquifers, climate (including comfort), construction materials, minerals, and existing land use. Key uses and locations were systematically compared in terms of:

- Opportunities and constraint
- Capability and suitability
- Mitigation and/or enhancement.

The process of land capability analysis had at its core seven steps. In special cases additional steps were carried out. The steps are relatively equal in terms of significance, but some are more time-consuming than others.

- Preparation of an inventory of data and mapping of salient features (including land characteristics and uses)
- Definition of demands on the land for each major use
- Assessment of the capacity of the land in particular locations (not sites) for each key use
- Listing of project concepts by place, use, scale, and time
- Assignment of projects, sector-by-sector, to zones within subregions
- Estimation of the development potential for each zone and subregion through the year 2000
- Design of alternative sets of land-use mixes for each subregion, based on land capacity, varied according to different possible choices of overall national or regional goals and listed in successive phases (time periods) of development.

The last four steps were carried out by separate teams iteratively, using common sets of assumptions concerning the availability of water, infrastructure, investment, markets and administrative capacity. This process identified the places that would sustain uses and the scale parameters of those uses in order to assist land planners designing alternative spatial strategies for development. It was considered most important in this process that no development opportunity should be overlooked; therefore, the maximum potential was searched for in each subregion. Initially, this required relaxing constraints such as lack of water or difficulty of access; subsequently, in order to bring forward the optimum mixture of uses for each subregion and zone, constraints were systematically increased, iteration by iteration, so that the least-cost combination of uses would survive, i.e., the least effective uses and ancillary infrastructure were discarded and only the most cost-effective elements retained.

#### 4.2 SUMMARY OF FINDINGS

The geomorphology of Sinai does not seriously restrict uses that require the construction of buildings, except where slopes are steep and sand dunes mobile. Sinai's geologic structure results in relatively deep and discontinuous groundwater aquifers. The high mountains, the most obvious geomorphic characteristic, introduce restrictions on all key uses except tourism, which they enhance. The coasts, which account for two-thirds of Sinai's borders, do not provide any good natural harbors. Detailed studies are needed to determine particular sites for major new settlements, ports, large scale projects for irrigated agriculture and other special uses.

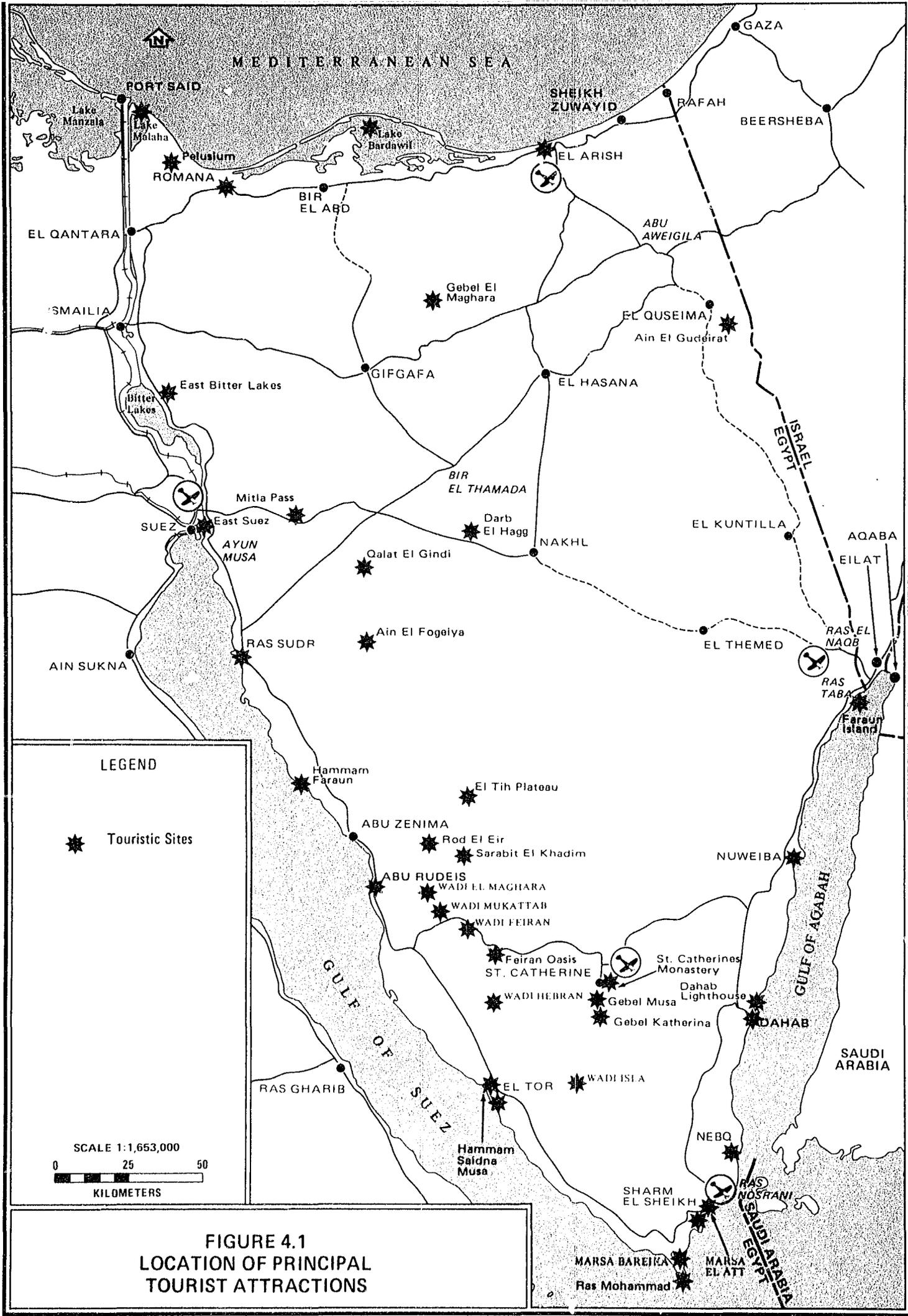
The soils of Sinai, more the product of meteorology than geomorphology, quite sharply limit where crops can be sustained. The process of defining the capability for irrigated agriculture of various land units is detailed in Appendix A of Volume IV, and the results are described subregion-by-subregion in Chapter 3 of the same volume and Chapter 4 of Volume III. About seven or eight percent of Sinai can sustain field crops, given adequate fresh water. This proportion is less than three percent south of the El Tih escarpment and more than ten percent north of there. Figure 2.1 shows patterns covering twice that area in order to identify locations where a further search (e.g., semi-detailed and detailed soil studies) should take place. The capacity to sustain field crops assumes appropriate irrigation. Appendices B and C of Volume IV provide a guide to the careful procedure needed to introduce crops to the land, using irrigation and cropping technologies which are still being developed and would need to be combined, after experimentation, with traditional knowledge of the peninsula.

Figure 2.2 indicates the location of Sinai's principal known mineral resources. Metallic minerals are particularly concentrated in the Southwest Subregion close to fossil energy and gypsum. Land capacity assessment has clarified that the minerals of this area are significant to Sinai's future, largely because they do or can have ready access to water, energy, flat sites for processing industries, and sea transport to domestic and international markets. The extent of these minerals' contribution to economic development in Sinai, and the timing of investment in their exploitation, will depend on results of detailed feasibility analyses.

The requirements of manufacturing and related land uses restrict this sector principally to the coastal plains. Although many large flat sites are available in the Uplands, one or more other requirements are missing. The land capacities that make the minerals of the Southwest developable also make it attractive to industry. This is particularly true as concerns access to world shipping lanes in the Gulf of Suez. Access of a different sort makes the flat land near El Qantara and El Shatt attractive; here an important advantage is the proximity to the rapidly growing industrial cities of Port Said and Suez, their labor forces, their economies of agglomeration, and their infrastructure. The flat land behind El Arish has also been identified as having high manufacturing or industrial capability; in addition, this area is expected to benefit from a large and potentially productive (and therefore populous) hinterland.

Land capacity for tourism is discussed in Chapter 4 and Appendix D of Volume IV, as well as in Volume III. (See also Figure 3.1.) Recently built jetports and highways have made Sinai accessible to mass tourism. Nature and culture provide a uniquely attractive "world class" combination of beaches, mountains, coral reefs, historic fortresses, and the monuments of several religions. The techniques of land planning will need to be practiced well in Sinai to capture and keep the capacity for tourism that exists today and to resolve the competition amongst land uses for any single site.

Chapter 4 of Volume VI also discusses the difficulties of siting human settlements on the Sinai peninsula. It concludes that several ecological zones exist and that the guidelines for siting settlements would be quite different from zone to zone. For instance, the weights of various environmental factors for siting a settlement on the Mediterranean coast would be different than on the Gulf of Suez coast; and a third set of weights would apply in the Uplands. Some existing settlements are found to be well sited, but others are not; the latter group includes some of the most recently established settlements. In a nutshell the Sinai environment is a difficult one for siting human settlements, and great care is called for in each and every case.



Land capability for major infrastructure elements is discussed in Volumes IV and VI. Construction materials are identified and located in Working Papers 38 and 41, prepared in 1982. Steep slopes and mobile sand dunes are factors to be avoided; moreover, for ports and jetties the sea currents and storm characteristics define a set of quite severe constraints. Because of mountainous terrain, some places with quite good land capability for economic activities are difficult to reach with appropriate infrastructure and will continue to be expensive to serve in the future. The cost of delivering Nile water to the Wadi El Bruck is a case in point where the high elevation, rough terrain, and mobile dunes continue to discourage the provision of infrastructure; thus, the Recommended Strategy postpones much of the potential development there until after 2000, despite its relative proximity to the Suez Canal and Cairo.

The land capability for nature conservation of the Sinai peninsula is very high indeed. Because it is the meeting place of Asia and Africa, it has rare species of plants and animals and a rare landscape and seascape. Given the limited demand from competing land uses, it is very attractive to consider protecting large areas of Sinai as nature reserves for use by future generations.

Table 4-1 summarizes, very briefly, a few basic facts of Sinai's unusual land capability. The Southwest is identified with petroleum and other minerals; it is also well suited to tourism (assuming beaches are kept clean) and (heavy) manufacturing. The Northeast, as history tells us, is best suited to irrigated agriculture and human settlement. The Southeast, including the coral reefs, has the best potential for conserving the natural heritage, while the Northwest, as part of the Suez Canal Zone, has the best access to the markets and activities of the more populous parts of Egypt. The Uplands Subregion turns out to be the best place to raise livestock and is a relatively comfortable place to live.

Table 4-1  
Land Capability Ranking of Subregions

<u>Subregion</u>	<u>IA</u>	<u>GR</u>	<u>MM</u>	<u>MA</u>	<u>TO</u>	<u>HS</u>	<u>IN</u>	<u>FF</u>
Northwest	2	4	5	2	4	3	1	5
Northeast	1	2	4	3	3	1	2	4
Uplands	3	1	2	5	5	2	4	3
Southwest	4	3	1	1	1	5	3	2
Southeast	5	5	3	4	2	4	5	1

IA = irrigated agriculture

GR = grazing

MM = mineral mining

MA = manufacturing

TO = tourism

HS = human settlements

IN = major infrastructure elements

FF = flora & fauna conservation (terrestrial and marine)

Source: SDS-I staff analysis; subregions are ranked 1 to 5 in descending order for each key land use. These are rankings, reflecting professional judgement, not statistical measurements.

Land capability in remote areas is remarkably influenced by infrastructure programs. The proposals of the Recommended Strategy will considerably change the capacity of every subregion and zone of Sinai. This is particularly true of the extension of fresh water to desert areas and the extension of paved roads to upland areas. The introduction of modern agricultural technology and agroindustry will also bring about a quantum leap in what is possible on the land. Phase by phase, as the development program goes forward, Sinai's land capability will become more balanced and less exceptional.

#### 4.3 CONCLUSIONS

The purposes noted for land capability studies have been met. Inputs have been organized and coordinated in a "data base." Areas have been identified that will sustain a short list of key land uses. For other uses, methods have been spelled out for defining sites. The constraints on major infrastructure provision have been studied, the planning implications of those constraints articulated, and methods of amelioration defined. The general loci of current or incipient land capability problems have been identified and mitigations suggested, including zoning, phasing of development, pilot studies, conservation areas, and careful siting of certain uses. The process of land capability analysis as an input to development planning has been continuous throughout the project. The reports and maps cited can provide an important set of tools for future planners.

## 5.0 THE RECOMMENDED STRATEGY

### 5.1 INTRODUCTION

Sinai today has three economies and lifestyles:

- Pastoral/subsistence (Uplands)
- Agricultural/peri-urban (Mediterranean coast)
- Modern mining/tourism (South).

The recommended path to full development begins with an emphasis on sets of tasks which build on the existing patterns of the region and its land capability:

- Investment in infrastructure that will integrate diverse parts of Sinai to each other and connect Sinai closely with Nilotic Egypt and the Middle East
- Investment in improving the environment for grazing and related rural activities
- Investment in large scale domestic and international tourism
- Investment in large scale irrigation and water projects
- Investment in heavy industry and mining.

These tasks are complex. Each includes technical, social and physical attributes. During the early years industrial, agricultural and touristic projects will continue to be somewhat isolated and not very interactive. In the following phase with the addition of light industry, higher education, and many tertiary economic and social activities, Sinai will develop an industrial and touristic south and an agricultural and industrial north.

Each of the early-emphasis tasks will generate later activities. Both heavy industry and large-scale irrigation generate light industry (processing, fabrication, assembly, packaging, etc.). Improvements in grazing potentials and access to markets for pastoral producers will stimulate integrated rural development. Large investors in tourism will be followed by smaller entrepreneurs. And the improved infrastructure, related to land capability and locational advantages, will stimulate both a transport industry and many other secondary activities.

Thus, the basic approach is for the Government to lead with strategic investments that will attract other investments--in other words for the Government to undertake those changes in Sinai that will make it attractive for investors and workers. These actions by government in Sinai will make Egypt as a whole stronger economically by providing:

- Better access to world markets
- A broader economic base in mining and tourism

- More self-reliance in food
- Less overcrowding on prime agricultural land.\*

The Recommended Strategy provides a framework within which specific projects can be formulated, physical plans drawn up, new institutions designed, and action programs established. The purpose of the Strategy is to promote the economic and social development of Sinai for the benefit of the country as a whole, and more urgently, for the benefit of the residents of the peninsula and those Egyptians living in overcrowded conditions in the towns and villages of the Nile Valley and Delta, who choose to be "new Sinaians." This chapter describes the strategy recommended by the Consultant under eight headings:

- Land use
- Economic activities
- Social development
- Spatial patterns
- Infrastructure
- Integration with Nilotic Egypt
- Phasing
- Options.

Many of these subjects are written up in greater detail in other Volumes and Working Papers: for example, economic activities in Volume III, land capacity and use in Volume IV, social integration and infrastructure in Volume VI; the design process is detailed in several Working Papers and Memoranda; and phasing is discussed in Volume III.

The process of report writing requires that each of these subjects be described under separate headings; in practice and in theory they must work in unison for the strategy to be effective. Therefore, from time to time, the text will jump ahead or back to a particular integrative activity. These various aspects of the strategy interlock and are dependent on others, both in space and in time.

The development strategy recommended here is not a plan. It is a recommendation for a path to development that precedes the formality of a plan. The strategy includes a list of significant projects, by phases, fitted to the national five-year plans; a preliminary investment plan; land capacity analyses for major land uses; estimates of water and electricity demand; proposals for development institutions; and guidelines for selecting sites for the various recommended activities. It does not include "plan" elements such as budgets, proposed legislation, future land-use plans, the results of prefeasibility studies, or land suitability analyses for specific projects.

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\*The Executive Summary presents "issues" which define concerns about the Recommended Strategy from a different point of view that may be of particular interest to future planners and managers of development implementation agencies.

Table 5-1

Key Elements of The Sinai Economy 1983 and 2000

<u>1983</u>	<u>2000</u>
<u>Traditional economy</u>	<u>Traditional economy</u>
<ul style="list-style-type: none"><li>- pastoral activities</li><li>- nomadic population</li><li>- rainfed agriculture</li><li>- dependence on nutritional supplements</li><li>- low activity rates</li></ul>	<ul style="list-style-type: none"><li>- pastoral activities</li><li>- range management</li><li>- rainfed agriculture</li><li>- surface runoff conservation</li><li>- local handicraft production</li></ul>
<ul style="list-style-type: none"><li>- high dependency ratios</li><li>- urban centers focus on distribution activities</li><li>- labor-intensive methods</li><li>- informal finance</li><li>- high illiteracy levels</li></ul>	<u>Modern economy</u>
<u>Modern economy</u>	<ul style="list-style-type: none"><li>- manufacturing industry</li><li>- irrigated agriculture</li><li>- large-scale land reclamation</li><li>- exports</li><li>- food self-sufficiency</li><li>- private domestic and international investment</li><li>- commercial banking</li><li>- large-scale domestic and international tourism</li><li>- high accessibility</li><li>- urbanization</li><li>- balanced rural communities</li><li>- plentiful power supply</li><li>- exploitation of many minerals</li><li>- intra-subregional linkages</li><li>- inter-subregional linkages</li><li>- sophisticated transportation services</li><li>- reliable potable and irrigation water supply</li><li>- permanent settlement of all labor, with families</li><li>- high literacy levels</li><li>- advanced education</li><li>- management and vocational training</li><li>- sophisticated medical services</li><li>- technology- and capital-intensive agriculture</li><li>- marketing networks</li></ul>
<ul style="list-style-type: none"><li>- petroleum exploration</li><li>- petroleum extraction</li><li>- imported labor</li><li>- without families</li><li>- cultural tourism</li><li>- beach tourism</li><li>- air travel</li><li>- intensive agriculture</li><li>- drip irrigation</li><li>- sprinkler irrigation</li><li>- capital-intensive methods</li><li>- widespread primary education</li></ul>	

The strategy is not to improve on trends but to set a bold new style and pattern--"a new map of Egypt"! It is a strategy to capitalize on opportunities offered by new markets in the Middle East and to release pressure from overcrowding near the Nile. It proposes to do this basically by "shrinking" Sinai through improved infrastructure and "greening" Sinai mainly by importing Nile water.

## 5.2 ECONOMIC ACTIVITIES

The economic activities included in the strategy may be considered under three headings:

- Regional rural development
- Regional urban development
- Extra-regional development.

The rural development strategy begins with the status quo (dominantly grazing) and the analysis of land capability to support agriculture, especially intensive irrigated agriculture. The urban development strategy is based upon the rural development strategy and the extra-regional development strategy. The extra-regional development strategy is based first upon the peninsula's location in the center of the Middle East and its extensive coastline (including the Suez Canal), and second, on its minerals (including hydrocarbons) and unique scenic resources.

### 5.2.1 Rural Development

Recommendations for rural development in Sinai combine the mundane and the extraordinary. At the mundane level the most urgent tasks are to enrich the grazing economy, especially in the Uplands area, by doing such things as improving range management; reintroducing efficient indigenous forage crops; drilling wells for water holes; restoring and expanding cisterns, small dams and dikes; improving date and olive varieties; introducing small animal husbandry; and expanding handicraft manufacture.

The extraordinary rural development activities begin with irrigation based mainly on the introduction of Nile and drainage water at a cost of an estimated LE 2,546 million\* during the next three five-year plans; this set of activities also includes nontraditional crops and methods of production (for instance, aquaculture and plastic shelters), an emphasis on production for export to the Arabian Gulf and Europe, and enlarged mangrove forests on the coasts.

Rural development in the Uplands includes intensive irrigation but also reinforces the existing development pattern, which is closely fitted to its resources potential. Rural development in the coastal plains is patterned after the availability of soils suitable for intensive irrigation and therefore includes several small settlements which are new.

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\*Including both primary and secondary conveyances, largely for irrigation but also serving domestic and industrial needs.

Table 5-2

## Recommended Strategy: Projected Regional Pattern of Employment\*

<u>SUBREGION</u> <u>ZONE</u>	<u>Employment</u> <u>Projected</u> <u>for 1987</u>	<u>Increase in Employment</u>		<u>Projected</u> <u>Total</u> <u>Year 2000</u>
		<u>1988-1992</u>	<u>1993-2000</u>	
Northwest, subtotal	<u>10,590</u>	<u>22,677</u>	<u>30,524</u>	<u>63,791</u>
North	340	3,705	11,070	14,945
Central	10,250	12,148	15,890	38,288
South	--	6,824	3,564	10,388
Northeast, subtotal	<u>10,795</u>	<u>70,785</u>	<u>55,460</u>	<u>137,040</u>
East	10,080	48,680	49,280	108,040
West	715	22,105	6,180	39,000
Uplands, subtotal	240	11,610	38,910	50,760
Southwest, subtotal	<u>2,716**</u>	<u>11,950</u>	<u>33,240</u>	<u>47,906</u>
North	1,500	7,540	27,620	36,660
South	1,216	4,410	5,620	11,246
Southeast, subtotal	<u>150</u>	<u>4,464</u>	<u>9,444</u>	<u>14,058</u>
South	--	2,964	8,004	10,968
North	150	1,500	1,440	3,090
Total, all Sinai	24,491	121,486	167,578	313,555***

\*Includes leading sector employment generated by agriculture, industry, and tourism as well as other "indirect" or derived employment.

\*\*Understates employment in petroleum subsector because of the "transient" status of many of the workers involved, pending creation of permanent settlements which could attract them and their families to take up residence in Sinai.

\*\*\*Throughout this report this figure is generally rounded to 313,000.

SOURCE: Dames & Moore projections, based on economic activities described in Volume III.

### 5.2.2 Urban Development

Sinai today, in terms of economic productivity, is more urban than rural. The urban development strategy proposed for the future in the north is strongly linked to the processing, servicing, and marketing of rural production. In the south it is more linked to mining and tourism. Everywhere, it is based on production for local consumer markets as well as for export.

### 5.2.3 Extra-Regional Development

The very rapid growth of Sinai in subregions that are nowadays rather sparsely settled is strategically based on certain key activities related to Nilotic Egypt and to Middle Eastern and European demands, specifically the following:

- o Processing of hydrocarbon deposits (petroleum, gas, and coal), including large-scale electric power generation
- o Mining and processing of minerals (including ferromanganese, gypsum, kaolin, salt, and sulfur)
- o Provision of holiday villages and resort facilities for Cairenes and other Nilotic Egyptians
- o Hotels and playgrounds for Middle Eastern and European tourists
- o Higher education for all Egyptians
- o Military bases for all Egypt
- o A 'land bridge' to Jordan, Iraq, and Saudi Arabia
- o Free zones for export manufacturing
- o Conservation of unique terrestrial and aquatic flora and fauna for the sake of future generations as well as to support current touristic and grazing activities

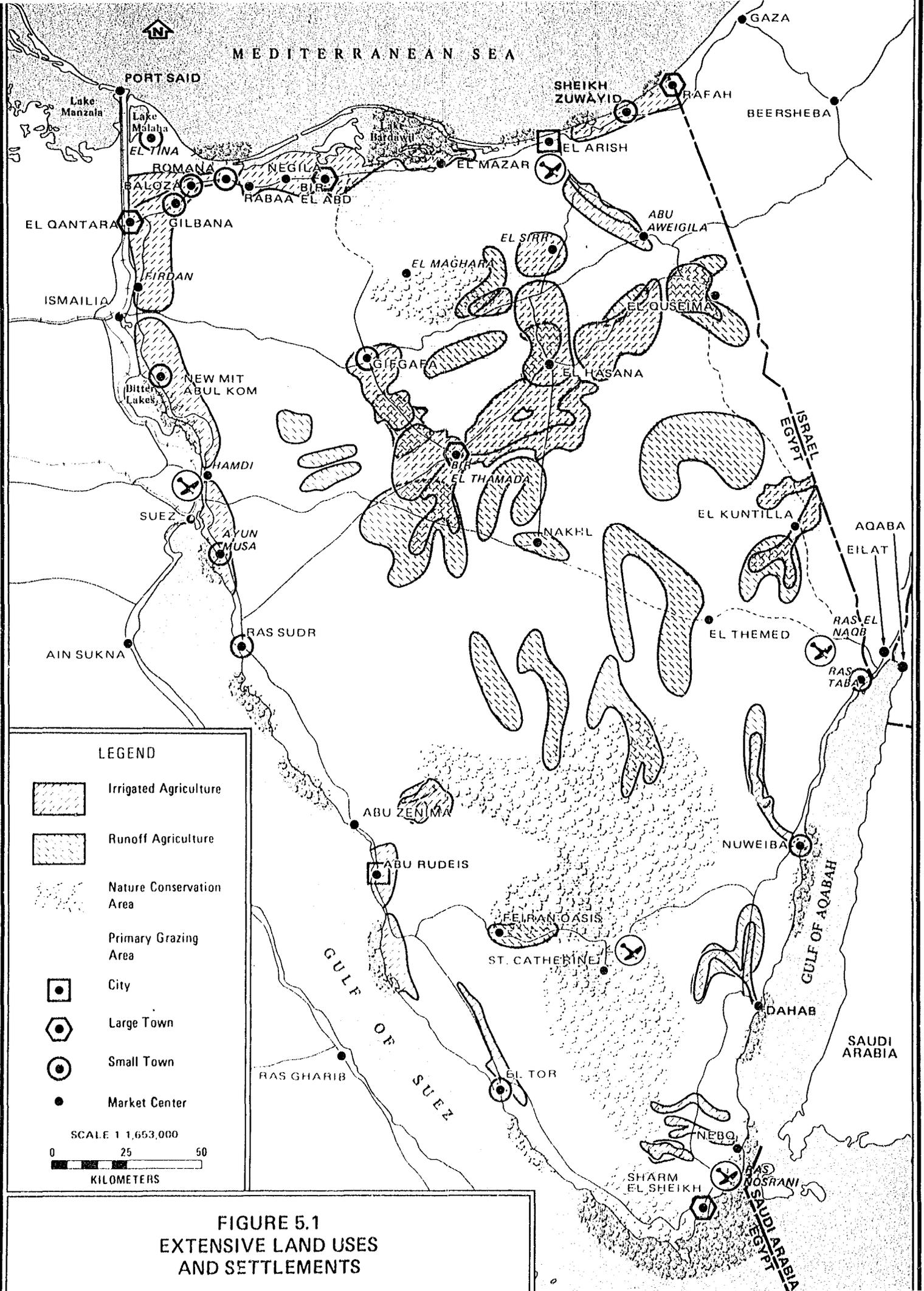
Without the successful achievement of most of these extra-Sinai economic activities the Recommended Strategy cannot be executed and its scope would have to be revised significantly.

### 5.3 LAND USE

The most extensive productive land-use contemplated is grazing, which already has a long tradition in Sinai; 10-15 percent of land is expected to be used for grazing in the year 2000. Another 10-15 percent (partly overlapping with grazing areas) will be set aside for nature conservation. More intensive land-uses (for example, agriculture, urban settlements or townships, roadways, airfields and other infrastructure) together are estimated to require barely 2.5 percent of Sinai's land area.\* Some intensive land uses are located (but not sited) on a land capability basis at or near the places recommended for conservation. Future land suitability studies will identify the best specific sites near those locations.

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\*The areas designated for "agriculture" in Figure 5.1 are larger than the total area recommended for cropping; the maps show "candidate areas" within which suitable parcels of agricultural land is most likely to be found.



**LEGEND**

-  Irrigated Agriculture
-  Runoff Agriculture
-  Nature Conservation Area
-  Primary Grazing Area
-  City
-  Large Town
-  Small Town
-  Market Center

SCALE 1:1,653,000  
 0 25 50  
 KILOMETERS

**FIGURE 5.1  
 EXTENSIVE LAND USES  
 AND SETTLEMENTS**

Some of the locations recommended are more obvious than others for two reasons:

- They have been proven by history, as in Nakh1 or El Arish, or
- There is very little choice in location or site, as in Ras Taba, because of topography and the international border, or in El Maghara, because of site specific resources (namely, coal, a historic site and some soils with agricultural potential).

Other locations are less clearly identified, because the information about the land capability is less certain and/or because there are several possible sites. (For example, new towns recommended at Firdan and El Sirr can best be sited after more is known about the soils and the agricultural technology to be used.) The figures at the end of this chapter (pages 5-27 to 5-32) illustrate the pattern of land-use and the distribution of activities proposed in the Recommended Strategy for each subregion.

The basic land use distribution is an agricultural north and an industrial/touristic south. In the north most of the crop land is near the ocean and most of the grazing is in the hills. In the south industry and mining are mainly on the west coast and tourism dominates on the east.

The Recommended Strategy calls for land use (other than grazing and conservation) in Sinai to be in a series of "nodes" rather than "sheets" for infrastructural efficiency and to encourage the establishment of protected micro-climates. The phased transformation of land use patterns is keyed to pumping Nile water up to the Wadi El Bruk at Bir El Thamada, above Suez, and to extending telecommunications and road transport services to places like Ras Taba as soon as possible in order to establish foci of growth that will promote a diversity of land uses in each of their hinterlands.

Only one-fifth to one-quarter of the land of the peninsula is proposed to be put to use, even extensive uses. However, there will be considerable competition amongst land uses within the prime locations; therefore, firm land-use controls will be needed starting no later than the second phase of the Recommended Strategy.

The land capability of Sinai is just beginning to be tapped and much of it remains to be gaged. The biomass capacity of algal beds and coral reefs are three to four times as great as for similar areas of cultivated land. Halophytic agriculture (using water with up to 20,000 ppm of sodium) has had a late start in scientific investigation in Egypt. The deep aquifers are being test drilled for the first time. Many "known" mineral deposits remain to be "proven". Therefore, as information improves, some changes in the strategy are inevitable; activities recommended on the basis of presently available information will be given up in favor of more promising projects based on more complete information. For instance, when and if it is decided to mine iron ore at Gebel El Halal, plans for the Uplands Subregion will have to be reviewed, since exploitation of that important resource should serve as a catalyst for many other developments. Another instance would be successful mariculture in the coral reefs, which could enhance the importance of fishing and other economic activities in the zone around El Tor.

Table 5-3

Recommended Strategy: Projected Land Use by Subregion, Year 2000  
(in square kilometers)

<u>LAND USE</u>	<u>NW</u>	<u>NE</u>	<u>UP</u>	<u>SW</u>	<u>SE</u>	<u>TOTAL</u>	<u>PERCENT</u>
Nature/culture conservation <sup>a/</sup>	--	455	2,398	2,665	2,664	8,182	13.3
(Coral, km shore line)	(23)	(53)	(--)	(92)	(85)	(253)	(37)
Enhanced grazing <sup>a/</sup>	--	200	5,125	1,775	175	7,275	11.8
Irrigated agriculture	303	231	240	73	5	852	1.4
Tourism	17.5	5.3	0.1	7.4	5.7	36	0.1
Industry	1.8	4.5	0.3	2.6	0.3	9.5	--
Settlements	105	204	77	86	52	524	0.8
Regional infrastructure	<u>12.6</u>	<u>14.5</u>	<u>35.1</u>	<u>10.4</u>	<u>5.8</u>	<u>78.4</u>	<u>0.1</u>
Total area	6,656	6,254	25,376	12,826	9,895	61,007	100.0
Total area developed	440	1,114	7,875	4,619	2,908	16,957	27.8
(Percent)	(6.6)	(17.8)	(31.0)	(36.0)	(29.4)	(27.8)	--

Key: NW = Northwest, NE = Northeast, UP = Uplands, SW = Southwest, SE = Southeast  
-- Less than one-tenth of one percent.

<sup>a/</sup>Conservation and grazing overlap to some extent.

SOURCE: Estimates by the Consultant.

Further iterations of the land capability analysis can take into account more remote possibilities resulting from cloud seeding, reestablishing and expanding wasted mangrove forests, climatic changes in response to agriforestry, and/or large-scale halophytic agriculture using pumped sea water and brackish groundwater. Major effects on land capability from those sorts of developments are much more likely to occur after 2000 than before, and therefore the Recommended Strategy does not depend on them.

A good share of Sinai's land capability lies in its proximity to markets in Nilotic Egypt and in the Middle East as well as in its accessibility to settlers from more crowded parts of Egypt. Any serious or sustained downturn in economic trends in Egypt or the Middle East would have a major negative effect on Sinai's development, and the Recommended Strategy based on potential land capability, taking into account exterior supplies and demands, would need to be revised.

#### 5.4 SOCIAL INTEGRATION

Sinai has been a region apart--a peninsula counterpoised to Nilotic Egypt. The strategy presented here intends to integrate Sinai into the mainstream of Egypt by the following means:

- Enhancing the life of the Bedouins and making available to them training, amenities, and lines of work which encourage them to integrate
- Introducing Nilotic Egyptians to a life-style appropriate to the desert, coast, and mountains.

One of the first integrative activities will be the designing and building of new and renewed communities that are suited to the desert environment and fit the life-styles of the new and current settlers. This is discussed in Volume VI. Another major integrative effort will be the early introduction of higher educational institutions and eventually a university serving young people from all parts of the country.

Basic to both the economic and the social substrategies is the program for manpower development. Farmers from Upper and Lower Egypt will need to learn new ways of doing most of the traditional tasks of agriculture. Many skills that are now in short supply in Egypt will be needed on schedule for Sinai development efforts. One of the basic incentives for moving to Sinai may well be the assurance of employment and training in new skills. Local residents and immigrants who train together in a new skill may find themselves more inclined to integrate than those who are employed in different lines of work. The projected population, by subregion, is given in Table 5-4.

A prime source of immigrants may be current expatriate Egyptians. The worker who has already spent a year or two working outside his or her native place may already have the skills needed to adapt to a new life in Sinai. He may also prefer living among the people of Sinai, with whom he would have much in common, rather than in a foreign nation.

## 5.5 SPATIAL PATTERN

A dispersed pattern of permanent settlements is one of the Government's development goals for Sinai. This objective has been kept firmly in mind while designing the strategy recommended by this report. The strategy includes 18 settlements along the Mediterranean, Gulf of Suez, and Aqabah coasts, and 19 other settlements inland and along the Suez Canal. The highest density of settlements is along the northern coast, and the lowest density is in the southern highlands, reflecting land capacity in each case.

The thrust of the strategy, in its settlement pattern, is away from the concentration on the north coast which is a characteristic of the early 1980s. Thus, the strategy includes proposals for early start-up of new towns south of Suez and in the Uplands. The first objective is a settlement distribution change, followed by a change in the distribution of population. Each five-year phase will deliver a more evenly distributed system of settlements to Sinai than existed before.

The basic hierarchy of settlements proposed for Sinai consists of two large multipurpose cities (Growth Poles), several smaller multipurpose urban centers (Growth Points), and many limited function small towns and villages that are fitted to the landscape (Service Centers and Market Centers).

The settlement pattern has been designed to work at three scales:

- National--fitting into the metropolitan system of the Suez Canal region and the Aqaba/Eilat and Gaza border economies.

Table 5-4

Recommended Strategy: Projected Population, by Subregion,  
Zone and Phase

<u>SUBREGION</u>	<u>TOTAL POPULATION (Percent)</u>				
	<u>ZONE</u>	<u>CURRENT</u>	<u>1987</u>	<u>1992</u>	<u>2000</u>
Northwest, subtotal		<u>14,429</u> (8.4)	<u>32,407</u> (15.2)	<u>88,543</u> (17.0)	<u>167,065</u> (17.2)
North		4,127	4,699	13,864	42,349
Central		9,302	26,708	56,782	97,627
South		1,000	1,000	17,897	27,089
Northeast, subtotal		<u>117,425</u> (68.2)	<u>135,762</u> (63.5)	<u>311,067</u> (59.7)	<u>453,822</u> (46.6)
East		96,604	113,724	234,284	361,124
West		20,821	22,038	76,783	92,698
Uplands		19,238 (11.2)	19,694 (9.2)	53,244 (10.2)	170,004 (17.5)
Southwest, subtotal		<u>17,808</u> (10.4)	<u>22,404</u> (10.5)	<u>52,014</u> (10.0)	<u>137,486</u> (14.1)
North		11,204	13,752	32,472	103,482
South		6,604	8,652	19,542	34,002
Southeast, subtotal		<u>3,100</u> (1.8)	<u>3,401</u> (1.6)	<u>16,295</u> (3.1)	<u>44,699</u> (4.6)
South		1,958	1,958	10,512	34,551
North		1,142	1,443	5,783	10,148
TOTAL		172,000 (100)	213,668 (100)	521,163 (100)	973,074 (100)
INCREASE*					
Number		--	41,668	307,495	451,911
Percent			(24)	(144)	(87)

\*From preceding column.

SOURCE: Dames & Moore estimates, based on CAPMAS census and projections reflecting the Recommended Strategy.

- Peninsular--forming a hierarchy that spreads from El Arish in the north and from Abu Rudeis in the south (these two having but little overlap in their service areas)
- Subregional--comprising the following: Northwest--eight towns arrayed under Port Said, Ismailia and Suez; Northeast--eight towns under El Arish; Uplands--eight towns under Bir El Thamada; Southwest--five towns under Abu Rudeis; Southeast--four towns under Sharm El Sheikh.

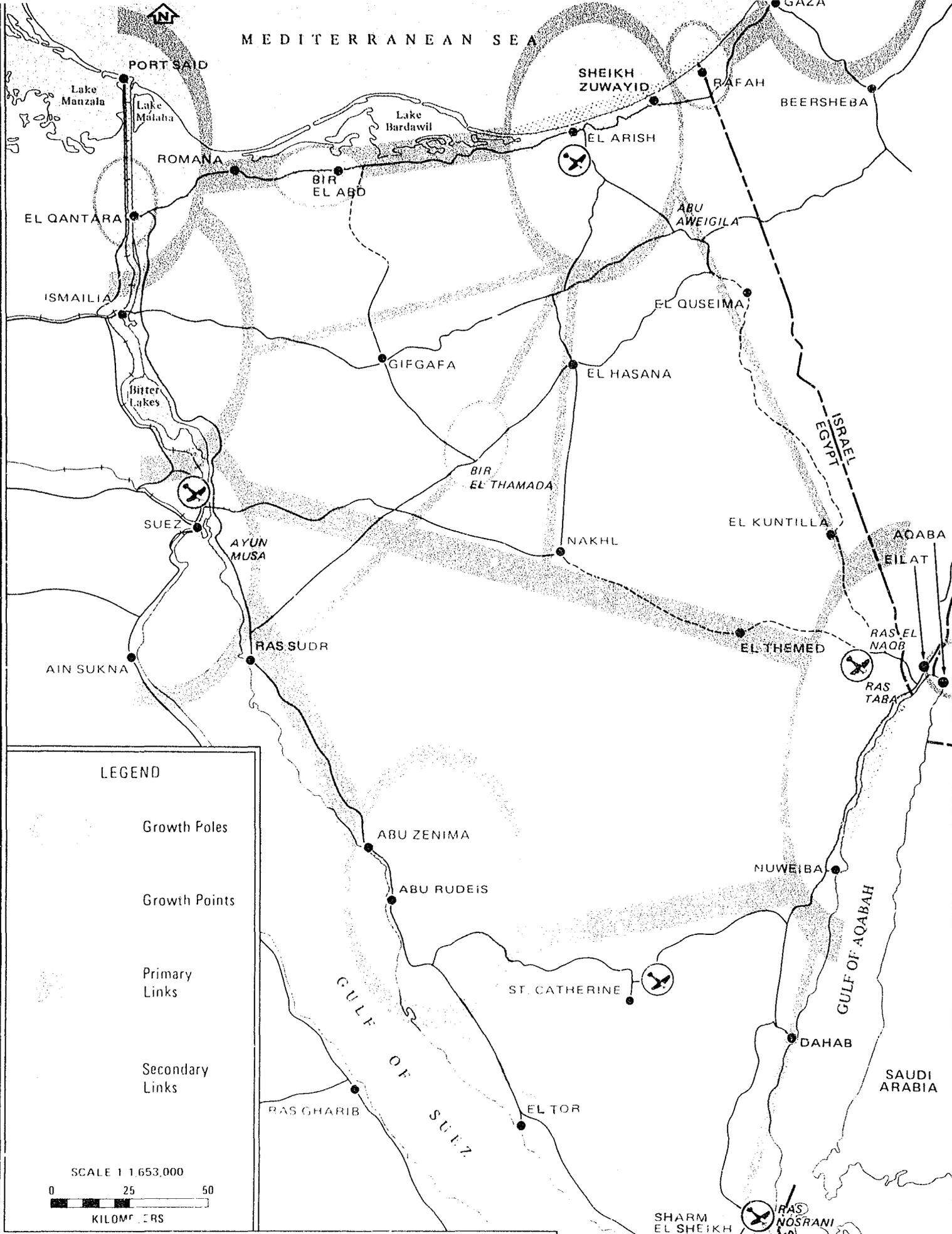
This system is diagrammed in Figure 5.2. Within each of the subregions the relationship of the settlements to relatively flat land is neither even nor similar. In the Uplands area there are vast plains between settlements. At the opposite extreme there is the Southeast, where the population is relatively crowded on the few square kilometers available as the mountains plunge into the sea. Only at Nuweiba and Sharm El Sheikh is there a small coastal area for development. In the Uplands settlement locations are almost equidistant and relate to the fertile soils. In the Southwest/Suez Gulf coast, settlements are located not according to soil fertility but to mineral resources and extra-regional trade. Thus, the power station and petrochemical plant north of Ras Sudr are to serve the mainland of Egypt; the world markets for oil and minerals form the economic link at Abu Rudeis; and the purpose at St. Catherine is to serve visitors mainly from outside the country.

In contrast to the South, where the settlement pattern is oriented to outside demands, and to the Uplands, where the spatial pattern responds directly to soil capacity, the pattern of development in the Northwest Sub-region along the Suez Canal results significantly from overflow of the Canal Zone and the eastern Delta. Here we find Suez extending to El Shatt with industry; Ismailia and El Qantara providing services to other settlements and higher order services; and places like Firdan-east, El Tina, and New Mit Abul Kom functioning much like Delta villages. The holiday villages at Ayun Musa and on the Bitter Lakes are tied to Cairo, like the Alexandria and Damietta resort settlements. In the Northwest there is no shortage of town sites as the flat plain extends for 20 to 30 kilometers to the foothills. The proposed sequence of settlements is similar to the current settlement pattern on the west bank of the Canal.

The Northeast settlement pattern is already well established and requires selectivity as to what should occur at which place rather than decisions of where settlements should be. The selection of Bir El Abd and Rafah or Sheikh Zuwayid as the second rank settlements after El Arish is consistent with the overall objective of decentralization.

Each of the coasts can be understood as a development axis. The northeast coast is a classic example; with the Suez Canal Zone at one end and the Gaza Strip at the other it is surely a development axis. The southwest coast is a similar case; the axis is strongest between Suez and Abu Rudeis, whereas between Abu Rudeis and Sharm El Sheikh it is weaker. The northwest axis is from Port Said to Suez, and the east bank shares in it, particularly at Ismailia. The southeast axis from Ras Taba (near Aqaba) to Sharm El Sheikh is so dominated by a single economic function that it is not particularly constructive to label it a development axis. However, both Ras Taba and Sharm El Sheikh are proposed links to other subregions. A list of principal settlements proposed in the Recommended Strategy is given in Table 5-5 which also indicates the primary functions of these 37 Sinai settlements.

From a peninsular point of view the Recommended Strategy includes a wide range of spatial rationales in its different geographic parts. The resultant



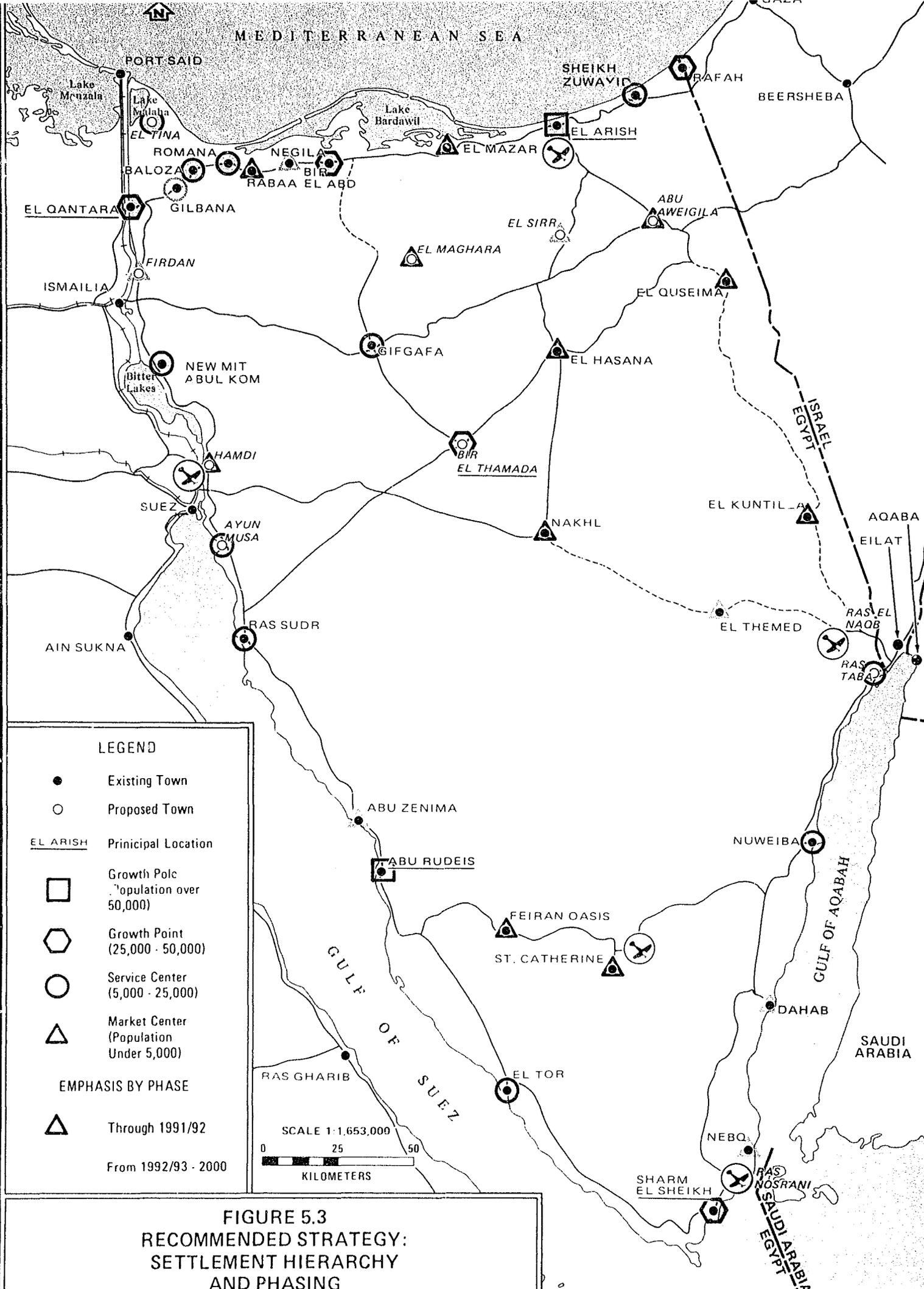
**FIGURE 5.2**  
**RECOMMENDED STRATEGY: GROWTH POLES,**  
**GROWTH POINTS AND LINKAGES**

Table 5-5

Recommended Strategy: Sinai Settlements in the Year 2000

<u>Location</u>	<u>Primary Function</u>	<u>Subregion</u>
<u>Cities/Growth Pole</u> <u>(over 50,000)</u>	<u>(Two)<sup>a/</sup></u>	<u>Subregion</u>
El Arish	Industry/Tourism/Agriculture/ Administration	Northeast
Abu Rudeis (New site)	Industry/Agriculture/University	Southwest
Suez	Industry/Administration	Across west border
Ismailia	Administration/Agriculture	Across west border
Port Said	Commerce/Industry	Across west border
<u>Large Towns</u> <u>(25,000-50,000)</u>	<u>(Five)</u>	
El Qantara	Industry/Transport	Northwest
Rafah	Agriculture/Transport	Northeast
Bir El Abd	Agriculture/Industry	Northeast
Bir El Thamada (New)	Agriculture/Industry	Uplands
Sharm El Sheikh	Tourism/Administration/Industry	Southeast
<u>Small Towns/Service Center</u> <u>(5,000-25,000)</u>	<u>(Twelve)</u>	
Baloza	Agriculture	Northwest
Gilbana	Agriculture	Northwest
El Tina (New)	Agriculture/Fishing	Northwest
New Mit Abul Kom	Agriculture/Tourism	Northwest
Ayun Musa (New)	Industry/Tourism/Agriculture	Northwest
Sheikh Zuwayid	Agriculture/Industry	Northeast
Romana	Agriculture/Tourism	Northeast
Gifgafa	Agriculture	Uplands
Ras Sudr	Industry/Transport	Southwest
El Tor	Agriculture/Fishing/Tourism	Southwest
Ras Taba (New)	Tourism/Transport/Industry	Southeast
Nuweiba	Tourism/Administration	Southeast
<u>Settlements/Market Center</u> <u>(Under 5,000)</u>	<u>(Eighteen)</u>	
Firdan-East (New)	Agriculture/Transport	Northwest
Hamdi-East (New)	Transport	Northwest
El Mazar	Agriculture	Northeast
Negila	Agriculture	Northeast
Rabaa	Agriculture	Northeast
Abu Aweigila (New)	Agriculture	Northeast
El Quseima	Agriculture/Tourism/Transport	Uplands
El Kuntilla	Agriculture	Uplands
El Themed	Agriculture	Uplands
Nakhl	Agriculture/Transport	Uplands
El Hasana (New site)	Agriculture/Administration	Uplands
El Sirr (New)	Agriculture	Uplands
El Maghara (New)	Mining/Tourism/Agriculture	Uplands
Abu Zenima	Tourism/Industry	Southwest
Feiran Oasis	Agriculture	Southwest
St. Catherine	Tourism	Southwest
Dahab	Tourism	Southeast
Nebq	Tourism	Southeast

<sup>a/</sup> Three cities west of the Suez Canal, just outside Sinai, also serve as Growth Poles for the peninsular economy.



smoothness of settlement distribution should not be interpreted as reflecting a smooth implementation program, since each of the five subregions will follow quite a different path to development.

## 5.6 INFRASTRUCTURE

The achievement of the basic objectives of permanent settlement in all portions of Sinai and integration with Nilotic Egypt require major improvements in the infrastructure system. Dispersed settlement needs a west-east highway, which will be located between Aqaba/Ras Taba and Suez to connect the vast Uplands and the Southeast with the Nile. El Arish in the north needs to be better connected to the south, through El Quseima, El Kuntilla and Ras Taba as well as through Ras Sudr.

The infrastructure most lacking in Sinai is a reliable water supply. The Recommended Strategy proposes large diameter pipelines to Rafah, Abu Rudeis, and Bir El Thamada (diagramed in Figure 5.4). Additions to El Quseima, El Tor, Ramlet Himeiyir, and Wadi Hema can be considered at a later date.

Economic development might well proceed with highways, aqueducts, and reliable electricity. However, integration with the civilization of Nilotic Egypt will not be achieved until social services match those of the rest of Egypt. To represent that commitment by the Government the Consultant has recommended the early establishment of higher technical education and eventually a university; the emphasis would be on agricultural, mineral, marine, tourist, petroleum, environmental, and public administration faculties. A location in the south is recommended, possibly at a new town replacing or relocating Abu Rudeis.

The road system proposed is an incomplete gridiron: four major roads east-west and four major roads north-south form a much denser network in the flatter and less arid north. The north-south roads carry predominantly internal traffic, whereas the east-west roads connect to Mansoura, Alexandria, Cairo, Beirut and Aqaba. Two infrastructure corridors are projected to carry most of the vehicle trips, messages, liters of water, and kilowatts--namely, El Qantara (or Port Said) to El Arish and Suez to Abu Rudeis. The rest of the infrastructure systems interconnect these two growth axes and link the rest of Sinai to them.

Ten airfields\* and six harbors are projected. Airports at El Jura, Sharm El Sheikh, Ras El Naqb and a new airport near El Qantara/El Tina and harbors at or near El Arish, Ras Sudr, El Tor and Ras Taba are considered part of the primary system. Eight major hospitals are proposed (half by 1991/92)--Bir El Ald, El Arish, Sheikh Zuwayid, Bir El Thamada, Abu Rudeis, El Tor, Sharm El Sheikh and Ras Taba. Although an extensive electrical distribution grid will be in place by the year 2000, electrical service is proposed to be developed on a subregional basis; because of the rough terrain and the relatively low densities of settlement, some important communities will continue to depend on their own isolated systems.

The major infrastructure systems other than water conveyances are illustrated in Figure 5.5; some additional facilities are shown on subregional figures at the end of this chapter (pages 5-27 to 5-32). Bold strategic infrastructure initiatives such as the road to Ras Taba and a university in Abu Rudeis are considered necessary to signal the Government's commitment and thus to stimulate domestic and international investment. By and large, Sinai is well served in 1983 with regional-

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\*Including the airport at Suez, which will serve some of Sinai's needs.





level infrastructure and poorly served with local-level social infrastructure. In Volume VI the Consultant recommends a program that will upgrade local infrastructure to a level comparable to the rest of Egypt and ensure rapid growth during the next four Five-Year Plans.

## 5.7 INTEGRATION WITH NILOTIC EGYPT AND THE MIDDLE EAST

"The New Map of Egypt", as propounded in 1974, is reflected in the Recommended Strategy. Sinai is no longer isolated but has been closely tied to the rest of Egypt by ferries across the Gulf of Suez and the Suez Canal, by tunnels under the Canal, and by aqueducts, roads, electrical lines, gas conduits, electronic communications, and airlines. Nilotic Egyptians will be attracted to Sinai for recreation, study and work as well as to travel through Sinai to the Arabian Peninsula. These facilities and transactions will help integrate Sinai with the rest of Egypt.

In both recent and ancient times eastern Sinai has been integrated with lifestyles and economies to the East. The Recommended Strategy provides many opportunities for Sinai to integrate better with the rest of Egypt to the west. Egypt needs a door to the East. Eastern Sinai provides it at Ras Taba and to a lesser degree, at Sharm El Sheikh, Rafah and Abu Aweigila (the last being on the most direct route from Cairo to Amman and Damascus).

## 5.8 PHASING

The Sinai regional development strategy has been proposed in three phases. The first two correspond to the government's Five-Year Plans, and the last extends from 1992/93 through the year 2000. What will actually occur during the later phases is subject to several influences:

- The Egyptian economy
- The Middle East economy
- Public sector job creation activities in Sinai
- Egyptian population pressure
- Results of feasibility studies and pilot projects
- Egyptian foreign relations.

These influences will affect both the mix of activities and the scale of investment. They will determine the relative difficulty or ease of achieving the strategy's targets.

The phasing, as described here and elsewhere, assumes that all of these influences will be positive but not euphoric. Therefore, any major downturn or upturn will affect the timing and substance of the relevant phase and require revision of plans and activities as work proceeds.

Each of the three phases can be said to have a dominant characteristic:

- Phase One (through 1986/87)--reconstruction and institutionalization
- Phase Two (1987/88-91/92)--strong development guidance and establishment of five subregional economies

- Phase Three (1992/93-2000)--consolidation of an all-Sinai economy and completion of systems for future self-sustaining growth.

Phase One includes the formal adoption by the Government of a development strategy and is more significant in its planning and institutional aspects than in the achievement of projects. The key to the entire effort to develop Sinai will be establishing appropriate institutions. These institutions should enlist the positive participation of the five concerned governorates, the Suez Canal Authority, the concerned ministries and high-level authorities, such as the Ministry of Irrigation, Ministry of Tourism, Ministry of Land Reclamation, Ministry of Electricity and Energy, Ministry of Transport and Maritime Affairs, and the General Organization for Industry, working together with the Ministry of Development. The most important tasks of these institutions will be as follows:

- Executing feasibility studies and pilot or trial programs that will confirm, modify, or negate the proposals incorporated in the approved strategy
- Implementing certain preliminary programs, including:
  - acquisition or reservation of sites for tourism and industry
  - attraction of public, private, and international investment
  - initiation of workers' housing projects
  - establishment of immigration and manpower training programs
  - completion of certain critical elements of infrastructure (water, power, and transport to key locations)
- Finishing reconstruction projects consistent with the approved strategy
- Becoming fully operational in Sinai, including monitoring and information functions, and the preparation of inputs for the next Five-Year Plan.

Phase One is scheduled to be completed within three years of the adoption of the strategy, and to coincide with the end of the current Five-Year Plan. It may be worthwhile to consider scheduling a major review conference or seminar to evaluate the progress of Sinai development at that point in time.

The general objective of Phase Two is the establishment of productive activities in each of the five subregions. The possibilities are described in Volume III. Establishment of active economic life in each subregion will be accomplished by an even-handed allocation of investments and projects to each of them according to their land capabilities and proposed development through the year 2000. During this phase there will be a good deal of Government intervention in most sectors, although this is expected to be temporary and can begin to be relaxed in the 1990s. Most apparent on the ground will be the establishment of new communities in the Northwest, Uplands, and Southwest Subregions. These will not be like the large satellite cities surrounding Cairo, but agricultural, industrial, and holiday villages fitted to the resources of each particular location, providing services, infrastructure and manpower needed to develop those resources.

The key economic activities during Phase Two will be as follows:

- Establishment of (and foreign investment in) commodity producing industries

- The opening of mines
- Construction of processing plants for hydrocarbons (petrochemicals) and other mineral resources
- Establishment of a university and other socio/cultural institutions
- Completion of all facilities needed to expand international trade.

These programs and projects will need to be started prior to 1992 in order for the 2000 targets to be achieved during the subsequent phase.

For the Northeast, Southwest, and Southeast Subregions the establishment of international trade will be important to the achievement of their Phase Two targets and essential for the achievement of Phase Three targets. If Egyptian foreign trade is not growing rapidly, the strategy may require significant revision at that time. South Sinai is more affected by this factor than North Sinai.

During Phase Two, it is assumed that Sinai will receive a high level of support from the Government. Phase Three may see a reduction in the share of this special treatment; therefore, the status of the national economy will become even more important to Sinai. Many observers expect that ten years hence there will be a great deal more overcrowding in Nilotic settlements; if that proves to be the case, then settlements in Sinai could offer a viable outlet for overcrowding elsewhere, provided investment programs scheduled for Phase Two have been completed. Expatriate Egyptians looking for jobs back in Egypt would also find Sinai ready to welcome them. A major review of plans can be expected between 1990 and 1992 to consider these and other relevant factors.

Phase Three offers the first major opportunity to begin to reap the benefits of the strategy, although full maturity and a self-sustaining growth are not foreseen until after 2000. During Phase Three the more or less separate economies of the distinct subregions will consolidate and begin to support each other. The heavy hand of planned growth can be relaxed, and the Government's role can be more limited, intended mainly to solve key problems and to support positive trends. During the first half of Phase Three, say 1993 to 1997, work will still be necessary to complete the basic infrastructure system, additional new communities will be initiated in order to complete the dispersed settlement system, and major manufacturing facilities begun in the previous phase will come on line.

During the latter half of Phase Three some tendency toward a concentration of jobs and population can be expected. Once the dispersed settlement pattern is established, a tendency for new immigrants to favor the more successful of the settlements is probable. The government need not try to resist this unless settlements actually lose population. Should some settlements begin to lose population, special programs may be called for to help extend their economic base. If this is not done, the Government's goal of a dispersed pattern of permanent settlements could be jeopardized.

## 5.9 OPTIONS OF THE RECOMMENDED STRATEGY

The Recommended Strategy may be likened to the armature on which a sculptor shapes clay or plaster. Over the years the future of Sinai will be detailed by thousands of do/don't and either/or decisions, but the basic shape will be defined by the strategy. During the process of moving from the alternative strategies of Volume VI to the Recommended Strategy, several spatial

and temporal concepts were set aside because of technical or policy considerations; some of these options can be kept in mind for possible use when and if experience suggests that the approved strategy should be revised.

### 5.9.1 Northwest Subregion

An important premise in formulating the recommended settlement pattern was that Ismailia will expand eastwards across Lake Timsah after 2000 and become the capital of the subregion. It is at the center of the area, and Ismailia has the facilities needed for such a role. Should this option not be feasible, Hamdi New Town and El Qantara are the likely candidates to carry major "central place" functions.

Northwest is the subregion most dependent upon new towns: El Tina, Firdan, Hamdi, Ayun Musa, and New Mit Abul Kom (which is already being settled). Only El Qantara and Baloza at the northern edge are well established. The phasing of all this town-building activity requires a careful decision process. We have suggested that Ayun Musa be given priority, because El Qantara can serve the El Tina Plain and other nearby areas, at least during the early stages of development there. It may be preferable from an economic point of view to be a bit late rather than early in starting construction of a new town, so long as the site is reserved for uses intended in the long run.

### 5.9.2 Northeast Subregion

The Mediterranean Coast Subregion stretches about 180 kilometers from Romana to Rafah. At present 55 percent of its population is at El Arish, 15 percent to the west, and 30 percent to the east. This reflects the better climate to the east and the former importance of the Israeli market. The basic phasing option is whether to emphasize early investments around Bir El Abd/Bardawil (100 kilometers closer to the Suez Canal) or to follow up on the earlier success of the Sheikh Zuwayid/Rafah Strip. The cost and market advantages are with Bir El Abd; productivity and climate favor Rafah. The decision could involve development of energy resources and tourism as well as irrigation and fishing.

### 5.9.3 Uplands Subregion

The Uplands plateau is more than 41 percent of Sinai and does not have the same spatial limitations as do the constrained coastal plains. The most significant option open for consideration is whether to stop Nile irrigation at Bir El Thamada, as recommended, or to extend it down the Wadi El Bruk to El Hasana, and much farther east to El Quseima. A decision regarding these options, as described in Volumes III and V, would take into consideration not only initial production experience with irrigated crops elsewhere in Sinai and the actual costs of Nile water conveyances but also any success in improving the grazing economy (based on revegetation and development of local ground and surface water resources).

Wadi Hema, due east of Gifgafa, is another option for Nile irrigation. Here 15,000 to 20,000 feddans might be irrigated eventually, closer to the Nile than El Hasana but at a higher elevation. It is close to Gebel Maghara energy for pumping the water and could have good road access to Cairo and El Arish.

Depending on the timing of other developments (before or after the year 2000) either Bir El Thamada or El Hasana would have the best location to serve as "capital" of the Uplands. Bir El Thamada has the best accessibility prior

to 2000; the Ras Taba/El Arish axis will favor El Hasana, as would a decision to mine iron ore at Gebel El Halal.

As in Northwest, new towns offer site and timing options in the Uplands. The plains near El Maghara and El Sirr are proposed sites for new towns, one fairly early, the other later in the planning period. El Hasana and Bir El Thamada could be resited to some environmental advantage. Some of the activities proposed near Ras Taba may be partially relocated from Southeast to the Uplands (see Volume IV, Chapter 4). The timing of new towns in the Uplands should be decided in concert with the decisions for new town construction in the Southwest and Northwest.

The major option remains grazing or irrigation in the Eastern Uplands and that decision will depend on the successes and failures of the late 1980s, both in tapping local groundwater and in improving systems for managing livestock on a sustainable basis.

#### 5.9.4 Southwest Subregion

The Consultant has recommended a new town, ten kilometers or so from the present of Abu Rudeis, to be the principal city of South Sinai. Feasibility studies may find that this investment will hinder or slow down rather than aid development. An urban pattern in Southwest with Ras Sudr, El Tor, and Abu Rudeis/Abu Zenima being relatively equal (with some summer functions in Wadi Feiran) could turn out to be a more efficient pattern.

The recommendation that Nile water be available for irrigated agriculture only as far as Abu Rudeis and the Wadi Feiran Delta areas was based on concern for the high cost of importing Nile water and the difficulty of getting a new type of agriculture started in a harsh climate. Should costs be lower and early off-season crop sales prove promising, carrying Nile water to the El Qaa Plain and Ramlet Himeiyir beyond Umm Bugma may be worthwhile before (rather than after) 2000. Surely, sooner or later the El Qaa Plain will flourish, and agriculture there expand beyond the limitations of local groundwater supplies. Halophytic agriculture deserves special attention in this area.

It is a basic concept in Southwest that the economy and settlement pattern should be based on an early transition in energy usage from oil/gas to coal, geothermal, and solar/wind energy. The Southwest is too easily perceived as a petroleum-based economy. Its long-term future lies in the diversity of its diverse touristic attractions, mineral deposits, and agricultural soils. Therefore, each major development decision needs to be made with an eye on the long-term which will be so sharply different from the present "transient" economy of petroleum extraction.

#### 5.9.5 Southeast Subregion

This narrow strip of coastal ledge has but few options. Sharm El Sheikh is the capital and has the largest amount of space for expansion. However, Nuweiba is better located as a distribution center for both commodities and education. This is a basic and early option.

Ras Taba can be either a satellite of the Aqaba metropolis or a rather small tourist center. The high risk involved in the first option has convinced the Consultant to leave the choice open for urgent further study. Before making final designs for the highway and ferry-landing, the feasibility of placing industrial and commercial facilities near Ras El Naqb airport should be studied thoroughly.

## 5.10 COMMENTARY

At present, Sinai imports much of the food it requires; however, a considerable improvement in food production is possible and is one of the intended results of the Recommended Strategy. However, the Consultant does not recommend nutritional autarchy; the proposed strategy emphasizes trade in food as well as other products, on the understanding that Sinai can produce some crops far more efficiently than others which are better raised along the Nile. Since a high level of agricultural production is possible, the Consultant recommends that Sinai import mainly water rather than food. In this way the Recommended Strategy foresees a significant improvement in Sinai's food security, especially as far as the production of foodstuffs is concerned. Moreover, the North is expected to produce a surplus that will more than feed the South, including military personnel and tourists. Sinai can also export specialty items and off-season crops.

Four of the five subregions have adequate and convenient resources from which to fabricate shelter (rocks, bricks or blocks). The Northwest Subregion will have to import some materials from its eastern foothills or across the Suez Canal. There is no intrinsic reason why shelter should cost more in Sinai than in the rest of Egypt. Establishing a shelter construction industry of an appropriate scale within target dates is a priority task. High shelter costs would otherwise slow down development and reduce Sinai's competitive position vis-a-vis external markets.

The Strategy emphasizes a diversification of the economy in every subregion. This seems much more possible in the north than in the south. The Southeast economy, with the exception of Ras Taba, will continue to be dominated by tourism, a sector that is always somewhat unstable, since consumer tastes and fashions change. The economy of the Southwest will, for a long time, be dominated by hydrocarbons and other minerals; here, prudence suggests that early efforts to introduce agriculture and manufacturing in both the southern subregions are entirely appropriate, as are plans to expand tourism in the Southwest.

The economies of northern Sinai have a greater capacity to respond to changing market conditions, and their flexibility will be further enhanced by the programs and projects included in the Strategy (*i.e.*, assured water supply, marketing facilities, relatively secure domestic tourist income, and abundant energy). The development paths of both the North and the South will be facilitated by any success of Egypt as a whole in increasing trade with its Middle East neighbors.

The Consultant has considered the implications of expanding or cutting back on development targets (see Volume III, Appendix A). Higher targets may be based on early successes, the discovery of a higher level of land capability and water availability than assumed by SDS-I and/or the moving up of the kind of options mentioned in the preceding section. Depending upon the reason for an increase or cutback of the targets, one or two of the five subregions' plans might be expanded or cut back, but such adjustments need not affect all subregions equally. For instance, should the cause for adjustment be a change in policy regarding Nile water, the eastern half would not be severely affected; should there be a change in policy regarding petroleum marketing, only the Southwest need be affected; and so forth.

The Consultant concludes that 1990/91 is likely to be the critical year in which to review the Strategy from a long-term perspective. Are targets being met? Are they achieving the larger goals? Have the assumptions proved to be sound?

## 5.11 CONCLUSION

The central questions asked of SDS-I by the Government may be paraphrased: "Can development and settlement of the Sinai Peninsula help us achieve national goals? If yes, in what ways? and to what extent within this century?" The Consultant's answer to this set of questions is strongly affirmative. By adopting the Recommended Strategy the Government of Egypt can take a significant step toward achieving the national goals listed in Chapter 3. More specifically, the contribution to be expected from Sinai can be summarized as follows:

### Social

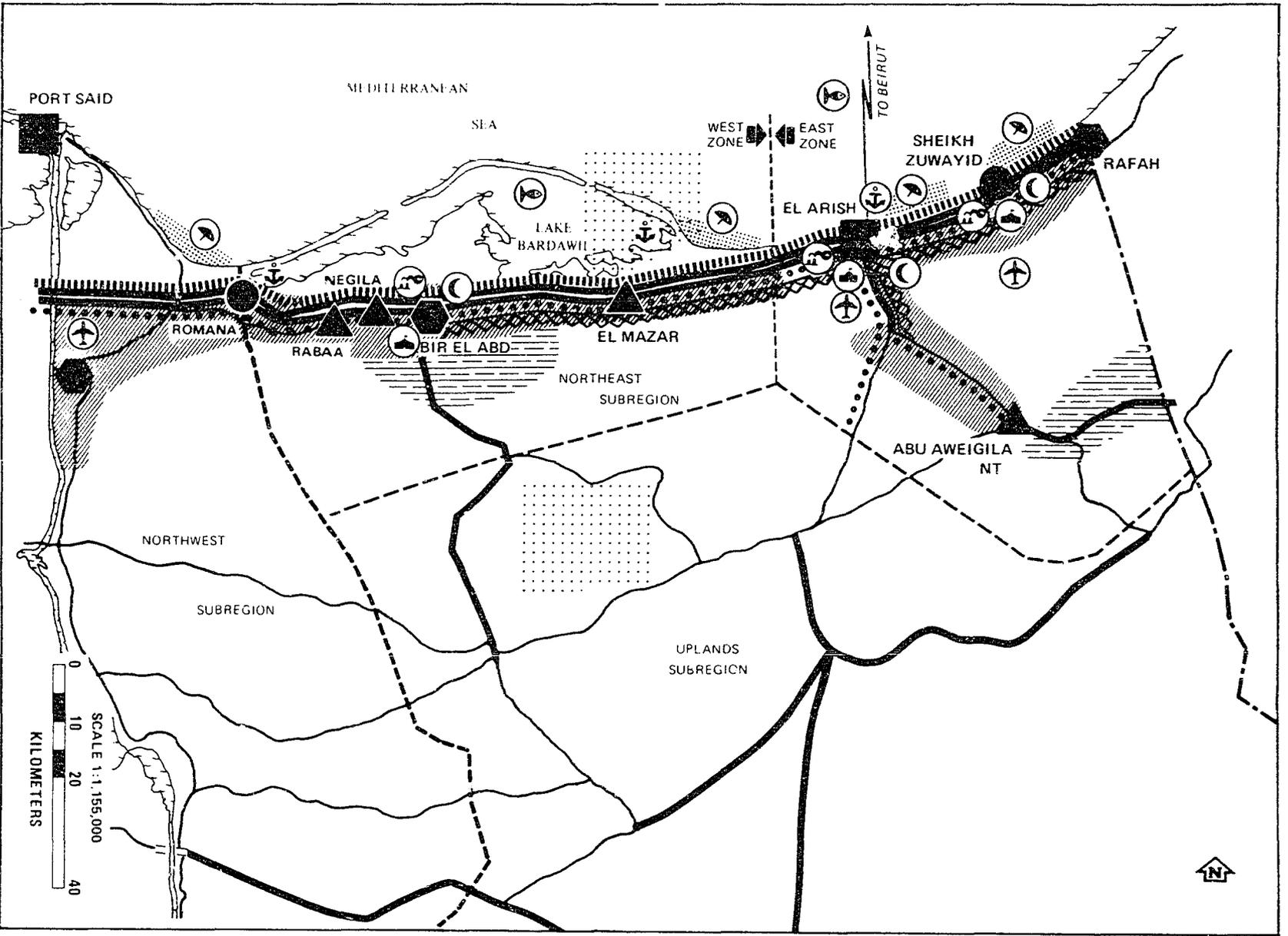
- Improved quality of life, for all Egyptians: The diversity of the Sinai landscape offers an alternative lifestyle for resident Egyptians as well as a holiday location.
- Slower population growth, especially in Cairo and the Delta: Sinai can be developed to attract 400,000-600,000 net immigrants, by the year 2000, thus relieving some of the congestion elsewhere.
- Reversal of the "brain drain": Sinai offers good locations to establish modern industry, tourism, research and education facilities, all of which have the potential of attracting back to Egypt citizens who are now working outside.

### Economic

- Industrial development, including foreign participation: Sinai's mineral resources, coastal plains close to international shipping lanes, and proximity to the Arabian Gulf by land and sea offer Egypt an opportunity to advance toward its goals of increasing exports and increasing foreign investment in industry, tourism and specialty agriculture.
- Foreign aid reduced, later eliminated: Increased exports and nutritional self-sufficiency will reduce the dependency on foreign aid. Development of Sinai can contribute to both; therefore, it can help the nation to move beyond the need for aid.
- Expanded private sector: Once water is provided on a sufficient scale from the Nile, Sinai offers excellent opportunities for private investment in tourism and is considered a good location for private investment in manufacturing (including in free zones), mining, housing, and other construction, as well as in agriculture.

## Strategic

- Food self-sufficiency: Development of irrigated agriculture in Sinai would extend the total cultivated area in Egypt significantly, contributing to production of foods for local consumption and export.
- Integration of remote areas into the mainstream: Sinai has been a remote area. This report defines a path to end its remoteness from Egypt and the rest of the Middle East. Thus, developing Sinai is a primary action for the nation to achieve this goal. Plans towards this end are spelled out in Volume VI.



**FIGURE 5.7**  
**RECOMMENDED STRATEGY:**  
**NORTHEAST SUBREGION**  
**SPATIAL HIERARCHY AND LINKAGES**

For legend to map, see Figure 5.11, Page 5-32

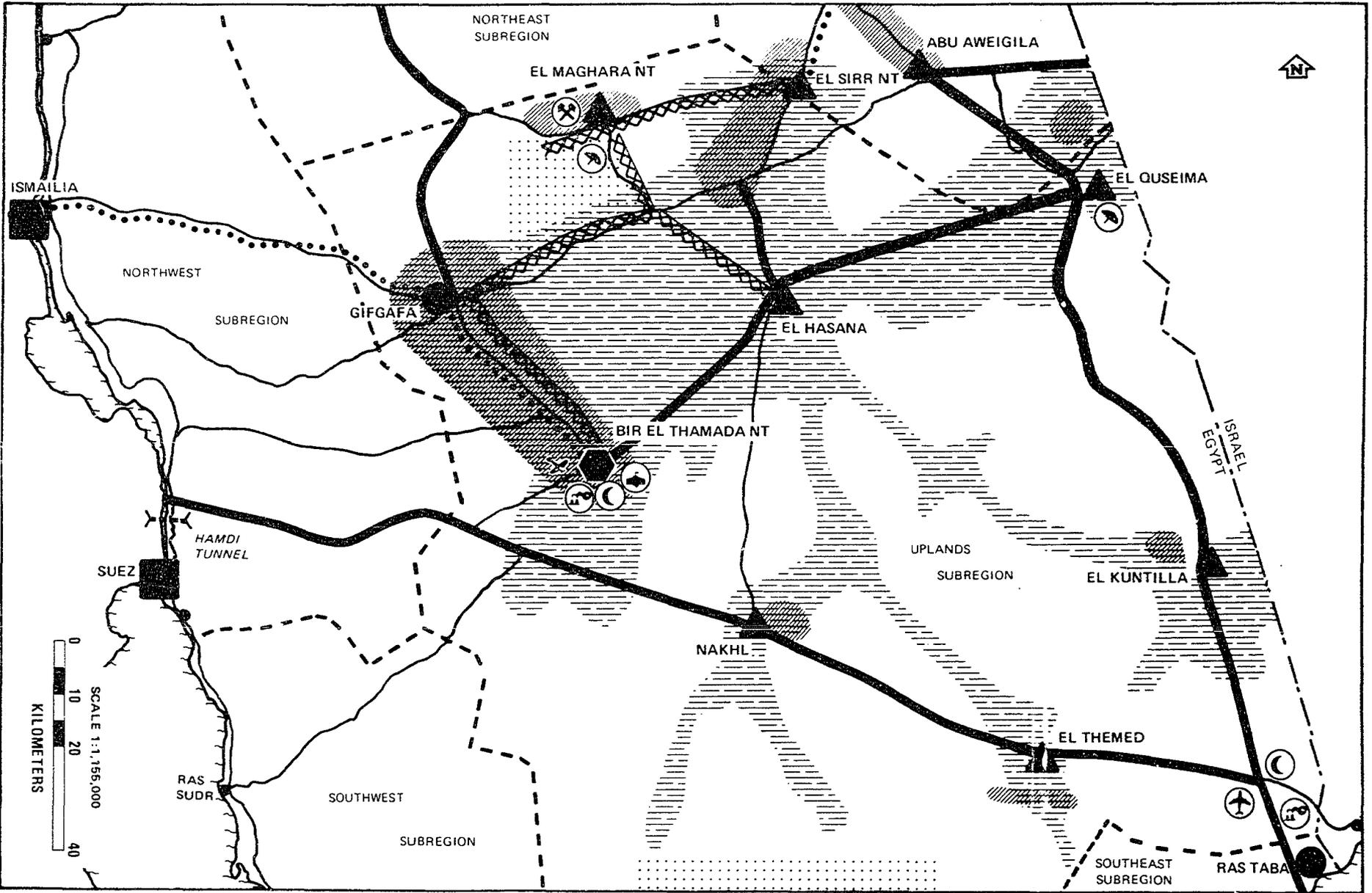
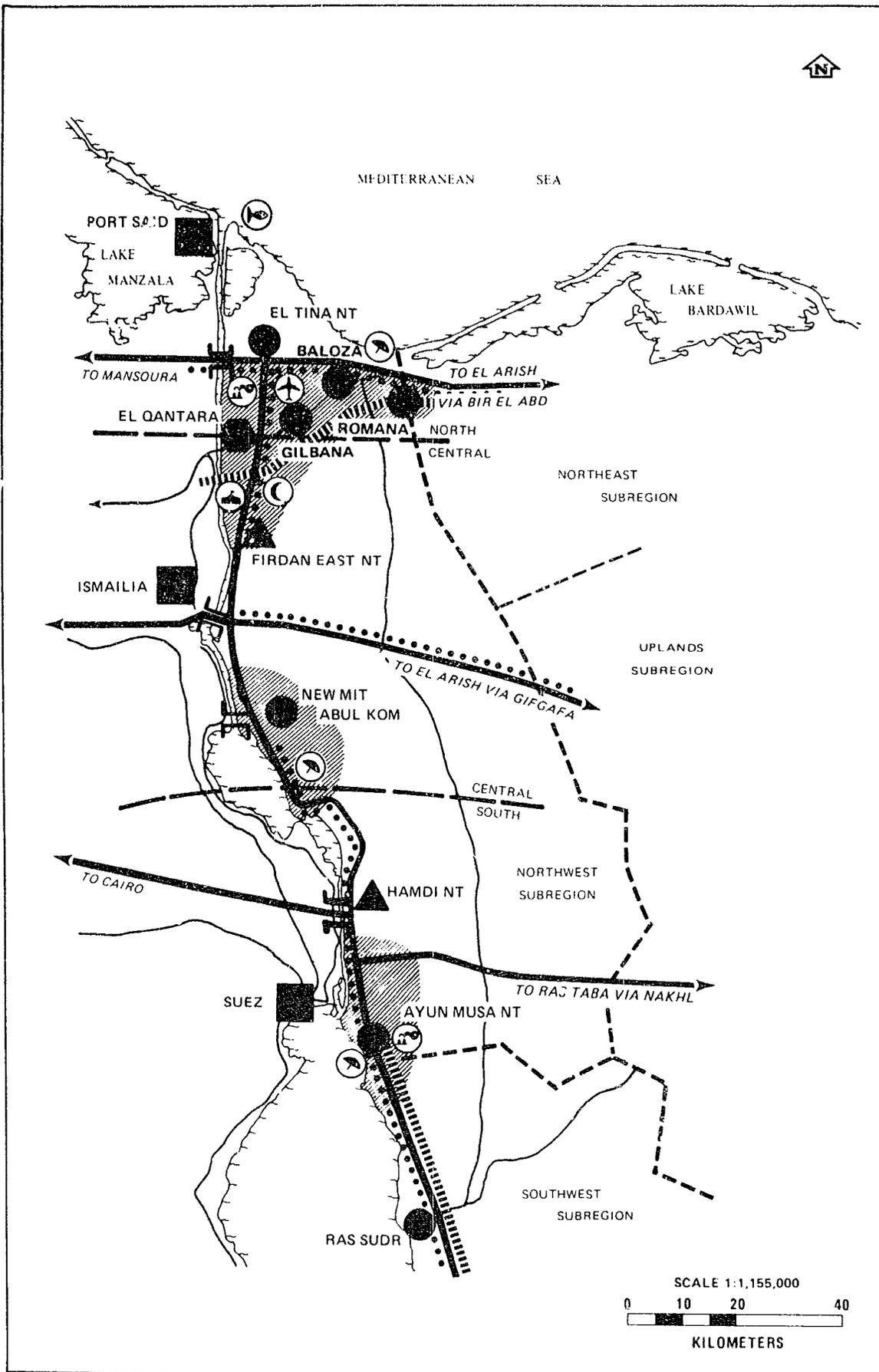


FIGURE 5.8

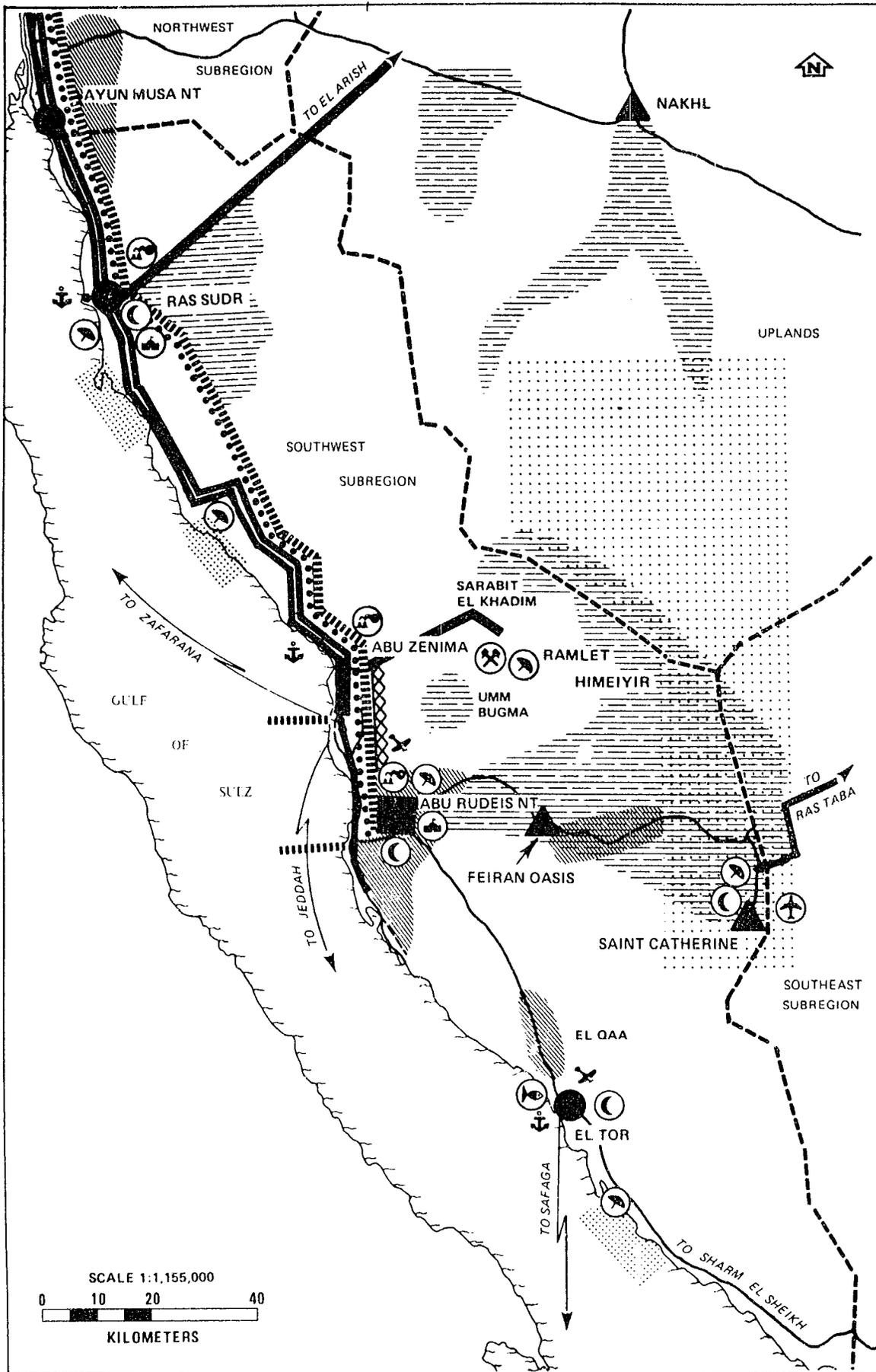
RECOMMENDED STRATEGY:  
UPLANDS SUBREGION  
SPATIAL HIERARCHY AND LINKAGES

For legend to map, see Figure 5.11, Page 5.32.



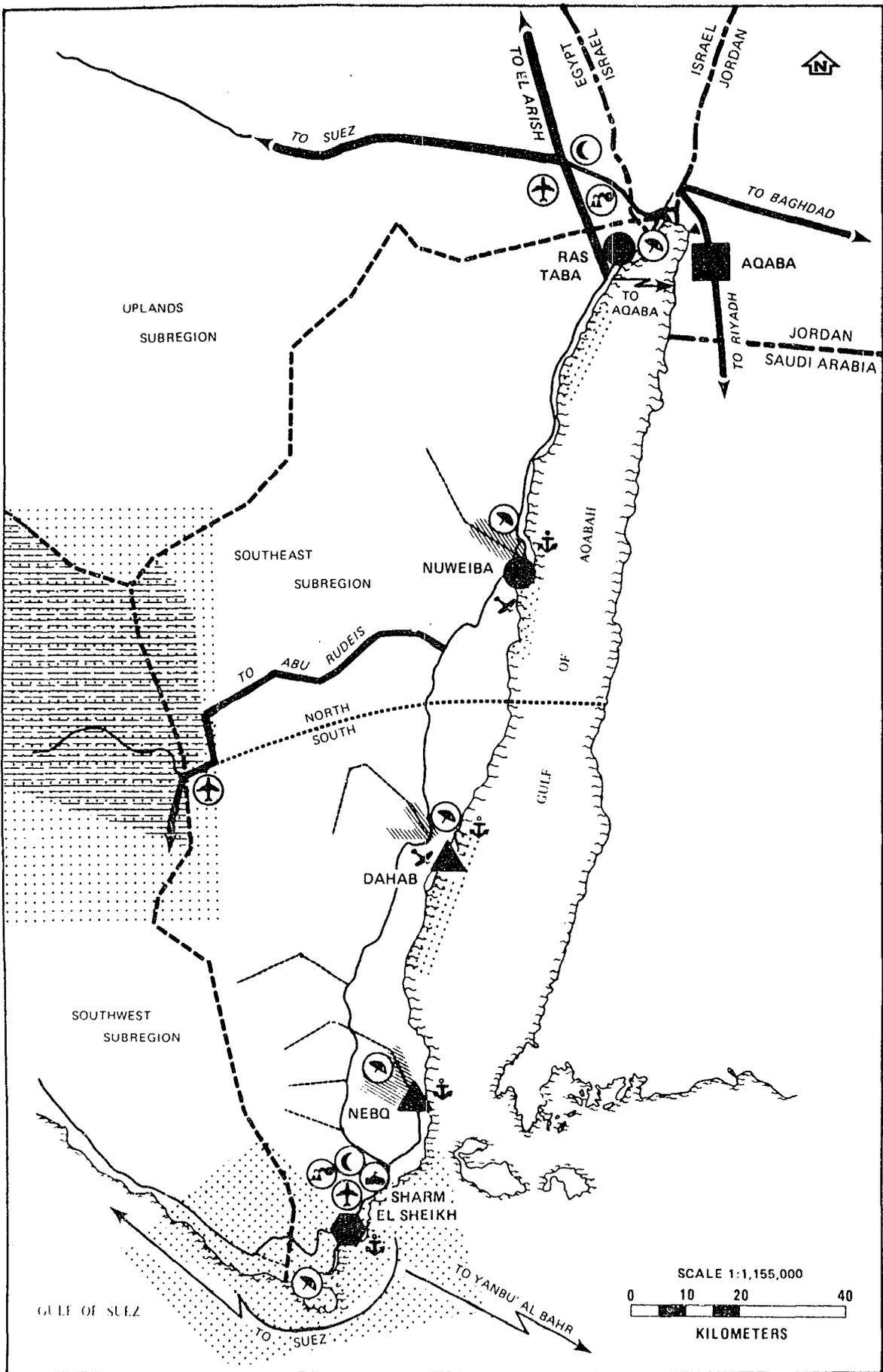
For legend to map, see Figure 5.11, Page 5.32

**FIGURE 5.6**  
**RECOMMENDED STRATEGY:**  
**NORTHWEST SUBREGION**  
**SPATIAL HIERARCHY AND LINKAGES**



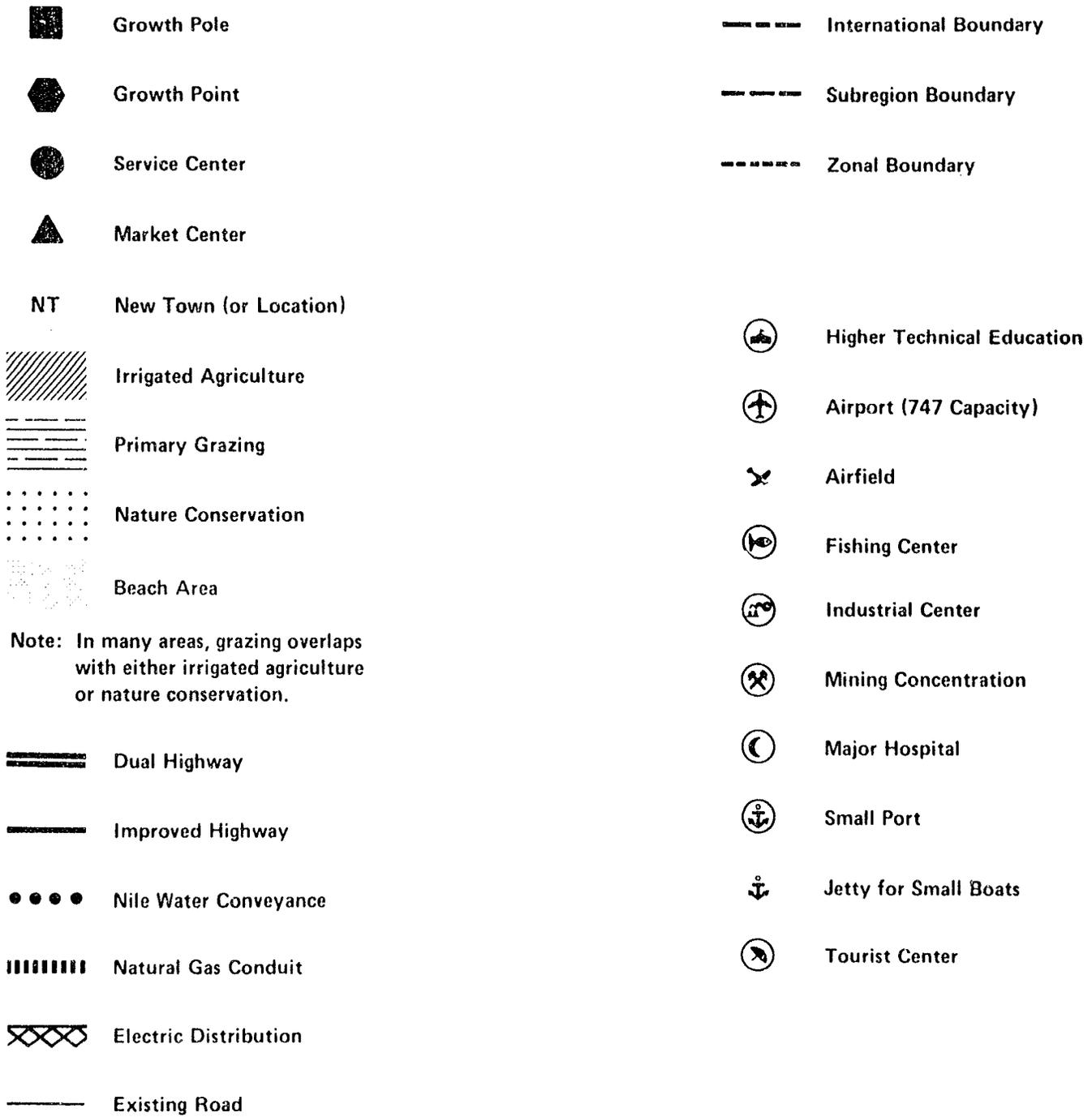
For legend to map, see Figure 5.11, Page 5-32.

**FIGURE 5.9**  
**RECOMMENDED STRATEGY:**  
**SOUTHWEST SUBREGION**  
**SPATIAL HIERARCHY AND LINKAGES**



For legend to map, see Figure 5.11, Page 5-32.

**FIGURE 5.10**  
**RECOMMENDED STRATEGY:**  
**SOUTHEAST SUBREGION**  
**SPATIAL HEIRARCHY AND LINKAGES**



**FIGURE 5.11**  
**LEGEND FOR THE MAPS OF THE 5 SUBREGIONS**

## 6.0 EXECUTION

### 6.1 INTRODUCTION

The Recommended Strategy includes at least ten and possibly eleven\* new towns (one of them, a resited Abu Rudeis, is expected to be a city of over 50,000)\*, about 200,000 feddans of irrigation (in several locations), industrialization at the scale of 47,255 jobs, and about 5,600 hotel rooms as well as 18,000 holiday village residential units, all to be fully operational within 17 years. The population will accordingly explode from 172,000\*\* to nearly one million, an average increase of almost 50,000 a year (10 times the present rate of growth). The average rate of growth will have to be over 10 percent a year, which is two and one-half times as fast as Cairo and Alexandria have been growing. This two-digit growth rate has been achieved and maintained by only the most successful developing regions in other countries.

Achieving these targets will require exceptional management, organization, and precision in execution (Volume II). This chapter summarizes the most important programs--those which have the greatest impact on other programs and projects and on the budget needed to finance the settlement of Sinai.

The proposed development will be possible only if there is synergistic interaction amongst social, economic and physical programs. The integrated output must be greater than the sum of the individual inputs. The managers of the development strategy must intervene actively to achieve sound economic, spatial and physical development.

The Recommended Strategy adopts the so-called Growth Pole development model. The Recommended Strategy provides for each of the five subregions to develop economically with normally rural and normally urban economic functions fully integrated or linked. Neither rural nor urban activities dominate. Import substitution will be as important as exports and emphasis will be placed on self-reliance in food, education, and health services, consistent with Egypt's national policies of dispersal and decentralization.

It is recognized that one of Sinai's most serious handicaps in its effort to achieve rapid and sustained development is the absence of economies of agglomeration or juxtaposition. Sinai lacks the urban concentration that can support and generate a synergistic diversity of activities: producing, fabricating, packaging, shipping, repairing, designing, advertising, and training. Therefore, as an interim step on the path to full development, the Strategy recommends particular attention be given to the creation of growth poles, growth points, and other centers of development.

Within each of the five subregions, one city or town is selected to receive the key development inputs that will contribute to economies of agglomeration. These selected locations will serve all other settlements in the subregion.

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\*Volume IV, Chapter 4: Abu Aweigila, Abu Rudeis (the proposed new city), Ayun Musa, Bir El Thamada, El Hasana (resiting probable), El Maghara, El Sirr, El Tina, Firdan, Handi and Ras Taba.

\*\*Population estimate based on surveys in 1981 and the Census conducted by CAPMAS in 1982, covering North and South Sinai Governorates.

<u>City/town</u>	<u>Subregion</u>	<u>Principal economic base</u>
El Arish - Growth pole	Northeast	Agriculture
Abu Rudeis - Growth pole	Southwest	Industry
El Qantara - Growth point	Northwest	Agriculture
Bir El Thamada - Growth point	Uplands	Agriculture
Sharm El Sheikh - Growth point	Southeast	Tourism

Subsidiary growth points and development centers are also foreseen in each subregion. For instance, in the Northeast Bir El Abd and Rafah are growth points, subsidiary to El Arish. In the Northwest Ayun Musa (a service center) is subsidiary to El Qantara. In the Southeast the Ras Taba service center will be subsidiary to Sharm El Sheikh.

When designing and directing specific projects to implement this strategy, the management guideline will be to build up the five principal locations so that they lead and service each subregion with as many types of activities as necessary and feasible, and then to disperse activities and functions as soon as practical to other growth points and service centers. This general management approach would be followed in the promotion of economic activities (both "leading" and secondary production), in providing social services (especially education and health) and in creating infrastructure (to link and spatially organize communities and sectors). The next section considers the implementation strategies for each of these three categories.

## 6.2 FOUR KEY PRODUCTION PROGRAMS

Four production programs need to get started or be expanded to an appropriate scale, because only these programs have the capacity to generate sufficient employment, to spin off other economic activities (i.e., have a multiplier effect) and to provide the economic foundation for permanent settlements on the scale required. These programs are in the following areas:

- Industry
- Irrigated agriculture
- Rural development
- Tourism.

Industry is in the front rank because the productivity per LE invested and the return on investment are best. The fast-growth economy needed to fuel the strategy must have a broad range of industries.

Irrigated agriculture will provide employment, food, raw materials for industry, and exports. The process of introducing irrigation is a long one, and will have rather slow initial returns on investment. The required chain of activities includes soil studies, water conveyance design and construction, land preparation, crop establishment (based on adaptive research), processing and storage plants, and penetration of distant Egyptian and export markets.

All the areas away from the coasts call for rural development programs, which also include a cluster of activities, including water-wells, dams, dikes, cisterns, warehousing (some cold), transport services, training, credit, marketing, small animal production, agro-forestry, revegetation of grazing lands, renewable energy, improvement of livestock and crop varieties, poultry, self-help housing, and small-scale mechanization. Rural development

is a collection of mundane, mostly small, projects that can convert a relatively stagnant subsistence economy into one of substantial growth.

Tourism in Sinai is complex (though not as complex as rural development) and requires a complex execution program. In the Southeast the market is for prosperous travelers from Saudi Arabia, Japan, and Europe. In the Northwest the market is the Cairene weekender. In the north and south Uplands the market is the archaeologist and hiker; and on the Mediterranean, the price-conscious "packaged" European. Execution requires a diverse staff with specialists for each market, since each group has special requirements.

### 6.3 FIVE KEY SERVICE PROGRAMS

Five service programs provide strategic support to the four production programs:

- Completion of the peninsula's transport and communication systems
- Attraction and training of manpower
- Promotion and achievement of exports (beyond petroleum)
- Housing, relying heavily on self-help programs
- Land development for tourism, industry, and new settlements.

The first priority is to have a telecommunications system that connects all settlements to each other and to all of Nilotic Egypt and the Middle East. Another high priority is to build the highway system from Suez and El Arish through to Aqaba (connected by ferry at Ras Taba). A dispersed pattern of permanent settlements will not carry a fast-growth economy without excellent communications.

Studies indicate not only that Egypt is short of the skills needed to staff Sinai's growth, but also that Nilotic Egyptians will not move to the harsh Sinai climate unless there are wage and other incentives. All other programs will be delayed if manpower development is not implemented successfully and continuously from the start.

Sinai must participate in Egypt's export program as soon as possible and at an accelerating pace; fishing, agriculture, mining, and manufacturing will count on export markets to maintain the high earnings required to achieve the reinvestment necessary to keep the economy (and employment generation) growing at a fast pace. High earnings associated with exports will encourage Sinaians to keep on reinvesting and expanding.

Housing can be a bottleneck to rapid growth, particularly in a harsh arid climate that requires imported potable water. Housing programs, including self-help programs for both workers and government servants, will be given high priority.

The Recommended Strategy and Volume III identify potential locations for holiday villages and industrial zones and parks. Volume VI identifies new settlements and offers guidelines for selecting their sites. It is critical that local governments acquire these sites (after further planning) and hold them vacant until they are "ripe" for development. The urgency is clear in cases such as Ayun Musa and Abu Rudeis. In the case of touristic sites the potential for early small-scale or non-touristic development, which can spoil the resource, may be less apparent during a casual site visit but is equally

critical. Sites for new towns are perhaps more important, but generally do not have the same time pressure.

#### 6.4 SPATIAL DISTRIBUTION OF EXECUTION EMPHASIS

The Recommended Strategy includes a dispersed pattern of permanent settlements as a primary objective. Therefore, large settlements do not receive preference over small ones, except insofar as they have a service role in support of smaller settlements within a hierarchical settlement system. The spatial development pattern recommended will not work without a "hinge" at Ras Taba to link the Southeast and Northeast economies and societies and a link at Ras Sudr to link the Southwest and the Northeast through the Uplands. El Quseima and El Kuntilla both have good, though minor, development resources, including ground and surface water. Their economies are diminishing because they have recently lost Israeli markets. Urgent rural development investments are needed in order to avoid a set-back and to prepare the stage for a significant acceleration in economic growth in the eastern Uplands.

The tourism potential from Cairo and the Delta may be more immediate than from the international market and will provide quicker returns that make greater use of local inputs. Therefore, execution of holiday village projects at Romana, the Bitter Lakes, and Ayun Musa have a high priority. The same can be said, on a smaller scale, of Gebel El Maghara, where tourism should be planned in detail prior to the beginning of the coal mining operations, or an opportunity may be missed.

Irrigation has top priority in Gifgafa and Abu Rudeis, because there is none there at present; getting it started is urgent in order for agriculture to contribute to a more balanced growth pattern as soon as possible. At the same time, delivering Nile water to Rafah also has high priority, in order to keep a productive system going and allow for further expansion, while protecting the shallow groundwater aquifer, which is reportedly overpumped. Here, there may be a temporary possibility of trading Sinai hydrocarbons (especially gas) to Israel in exchange for water, at least for the next few years.

Low income housing programs are particularly important in the Southwest, the Southeast, and the Uplands; they would assist in holding the small population there and be consistent with the Bedouin tradition. These programs may be expected to emphasize do-it-yourself plans and to include special credit facilities. Manpower recruitment and training programs should be given first priority in and near El Arish; these can be combined with export promotion programs to the extent that demand and productivity permit.

#### 6.5 PHASES OF DEVELOPMENT

The managers of the Sinai settlement program will have a quite different set of priorities from one five-year phase to the next. They should always choose to focus their tasks ahead of development, so that they can lead it. This will require assigning their planners to make plans for one phase beyond the next as well as being aware of the next set of development priorities. Simply stated, an industrial site in one phase and an industry constructed in the next will require both manpower and export programs in the third, and probably environmental-quality programs no later than the fourth. (Table 6-1.)

##### 6.5.1 PHASE ONE (through 1986/87)

The most difficult management problems during the first phase (in the light of other priorities) seem to be these:

Table 6-1

Development Priorities by Phase

	<u>Priority Sectors</u>	<u>Construction Emphasis</u>	<u>Management Priority</u>	<u>Planning Emphasis</u>
<u>PHASE I</u>				
1982/83-	-Rural development	-Ferry crossings	-Regional Agency	-Reserve key touristic, agricultural, industrial sites
1986/87	-Tourist marketing	-Highway network	-Information, monitoring systems	-5 subregional plans
	-Agricultural research	-Telecommunications	-Agricultural, industrial credit	-Groundwater research
		-Wells, small dams, cisterns	-Industrial promotion policies	-Water master plan
		-Resorts for domestic tourists		-El Arish detailed plan
				-Abu Rudeis new town
<u>PHASE II</u>				
1987/88-	-Irrigated agriculture	-Water conveyances	-Water systems	-Settlement plans
1991/92	-Industrial promotion	-Industries	-5 economies	-Irrigated agriculture
	-Manpower and immigration	-New towns	-Job creation	-Export programs
		-Tourist hotels	-Locational patterns	-Watersheds
			-Build local enterprises	-Social development
<u>PHASE III</u>				
1992/93-	-Agricultural processing	-Agricultural projects	-One economy	-Energy after petroleum
2000	-Petrochemicals	-Energy systems	-Exports	-Health and education
	-International tourism	-Heavy industry	-Maintenance systems	-Sectoral policies
	-High-tech industry	-Water, sewerage systems	-Revenue generation	-Regional economy
		-100,000 housing units	-Preserving high quality of tourism	-Infrastructure for population beyond one million
		-Harbors		
<u>PHASE IV</u>				
After 2000	-Specialized agriculture	-Recycle, reuse water	-Style of life	-Urbanization
	-Infrastructure	-Recreation, conservation	-Participation in decisions	-Transport and communications
	-Higher education and research	-Canal tunnel or bridge	-Environmental enhancement	-Maintaining economic growth
		-Improved housing	-Reassign interim Regional Agency to permanent institutions	-Aging population
				-Review sub-plans and opportunities

- Setting up the right kind of institutions and staffing them
- Establishing a monitoring system with a data base
- Organizing the necessary finance and credit systems.

Those three systems (organization, information, and credit) are prerequisites for the rapid development called for in the strategy, since they must precede the creation of the production and service sectors discussed above.

During the early days, construction should change its primary emphasis from major coastal highways and administrative infrastructure toward a more complex network of roads, telecommunications, small water works (some in isolated places), and the acquisition and preparation of sites for tourists (including holiday villages) and industry.

Once the strategy is adopted, more detailed plans will be needed promptly in specific areas to define the scale and pace of development for the remainder of the century. During this phase the key objective is to "shrink" Sinai by introducing modern telecommunications and a complete network of roads.

#### 6.5.2 PHASE TWO (1987/88-1991/92)

During the late 1980s and early 1990s, with all essential systems operating, the executives' focus will be on starting up or redirecting five subregional economies. The task is that of creating jobs and attracting skilled workers, particularly for industry and tourism; most projects involving irrigated agriculture will come on line toward the end of this period or later in the 1990's.

During this phase the big construction program will be building the large water conveyances to Rafah, Abu Rudeis, and Bir El Thamada. These "billion LE" projects will be part of Sinai's construction boom, which will also include new mines, major resource-based industry, both domestic and international tourist resorts, and the beginnings of new towns. Having established the necessary institution and completed their "master plans", the planners will concentrate on exports, agricultural crops, towns and villages, and the social problems of very rapid growth.

During this phase the key objective is to "green" Sinai by delivering Nile water to the Northeast as far as Rafah, the Southwest as far as Abu Rudeis, and the central plateau as far as Bir El Thamada and Gifgafa.

#### 6.5.3 PHASE THREE (1991/93-2000)

During the 1990s all production sectors should be fully operational; therefore, the management focus will shift to the linkages among the five economies, monitoring successes and bottlenecks, and expanding the export of products to the most profitable markets.

Construction emphasis will gradually switch from water conveyances to the completion of complex agricultural projects and the second-level infrastructure systems, including energy and potable water. A key management problem will be determining which of the many legitimate demands for funds are best responded to in order to advance development most efficiently towards its goals. During the first two phases, there was an infrastructure bias. Now, financial resources have to be more carefully directed to the right use, in the right place, at the right time, for the best productive return. The

monitoring process will be more important than any time before or later. Sinai's production will far exceed its consumption during this phase, and in order to achieve development targets, exports will be of the essence.

At the end of Phase Three, the Recommended Strategy foresees a population of nearly one million. By this time population pressure on Nilotic Egypt will be much greater than it has been in the 1970s and early 1980s, and undoubtedly Sinai will be expected to absorb a second million in the early decades after the year 2000.

#### 6.5.4 PHASE FOUR (after 2000)

Phase Three, when complete, will have introduced development to all parts of Sinai. The development executive can then turn his attention to other regional priorities such as quality of life, participatory decision-making, environmental quality, and longer-term concerns such as energy after the petroleum resource is exhausted. Sinai's economy is built on its land, its energy and its scenic resources; and long-term survival on the peninsula will depend upon protecting those resources.

#### 6.6 MONITORING SYSTEM

The rapid introduction of development in Sinai will place pressures on many systems and resources. Not all these pressures can be forecast by time and place; therefore, a sensitive monitoring system will be needed to signal to executives where and when manpower, investment, equipment, or regulations are required. Factors that should be monitored more or less frequently include manpower, groundwater, climate, housing, imports, transport, health, tourists (by type), exports, water consumption (by user), telephone calls, electricity consumption (by user), vegetation, water pollution, and land values. The usual schedule of such monitoring by the Central Agency for Mobilization and Statistics (CAPMAS) and the various responsible ministries will not be at all frequent enough for the pace of development called for by the Recommended Strategy. On the other hand, with a population of 172,000 in the early 1980's, monitoring these various factors in Sinai is not going to be a very difficult job to initiate, once it is planned in detail and well organized.

The information needed to "fine tune" development and execution plans will require measurements of most of the relevant factors from two to six times a year. In some cases the information can be collected daily but analyzed only after a couple of months. Detailed climate information, however, may be required daily by modern farmers.

Monitoring systems deal with two types of evaluation (Figure 6.1):

- Performance evaluation
- Strategic evaluation.

Performance evaluation assesses the progress of implementing the strategy and the impacts of its implementation, both positive and negative. Strategic evaluation measures whether or not the achievement of the strategy's targets, in terms of kilometers of highway or jobs in a sector, is in fact achieving the broader goals established by the Government. Less frequently, strategic evaluation also measures whether or not the assumptions of the Strategy, regarding the context within which the strategy is operating, have remained the same, and whether new, previously unforeseen factors have arisen, which are making the strategy (and its attendant plans) more or less feasible.

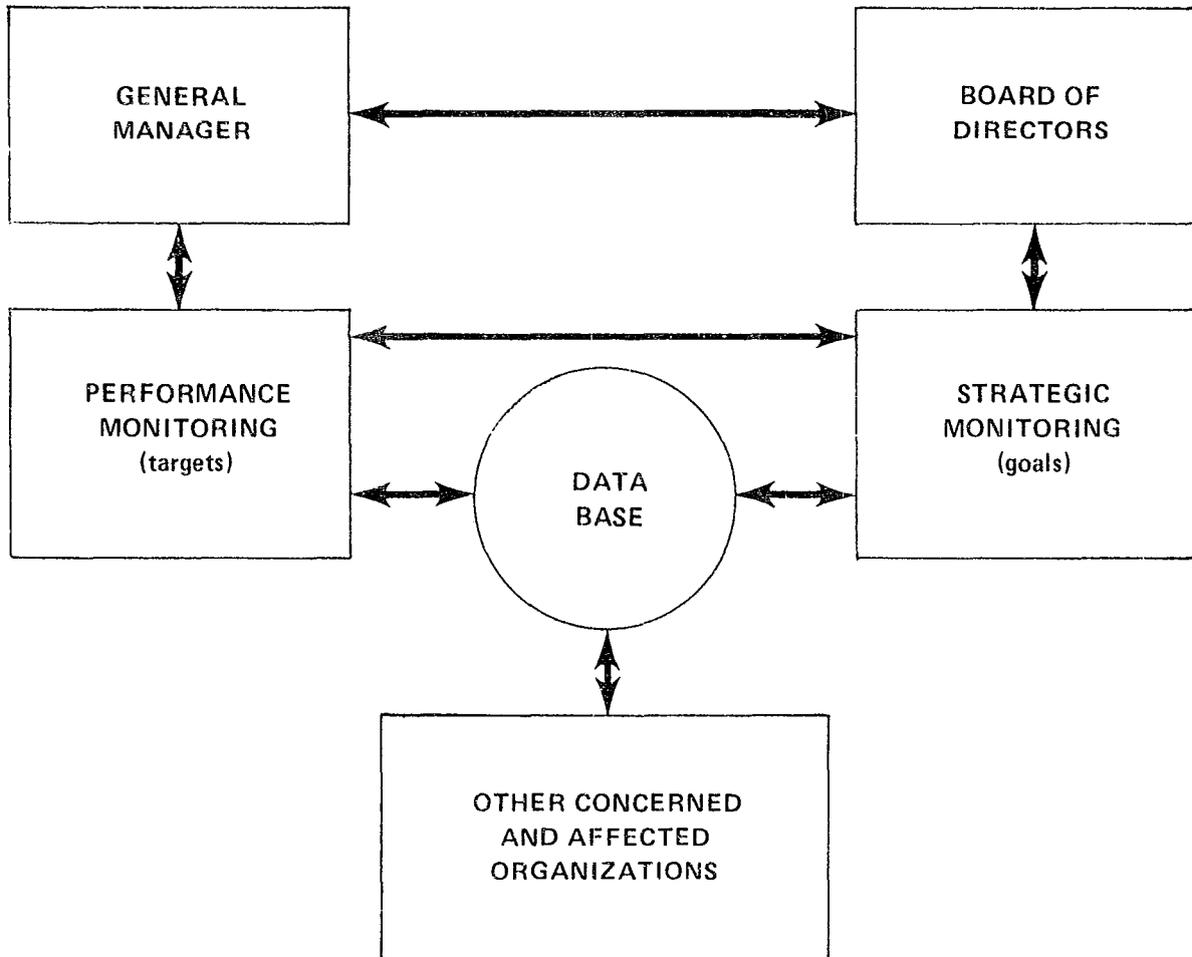


FIGURE 6.1

MONITORING THE SINAI REGIONAL DEVELOPMENT STRATEGY  
 (Responsibility and Primary Information Flow)

Performance evaluation can be readily initiated, building on activities of the Sinai Development Authority. Strategic monitoring requires a different set of social and environmental indicators and much more interpretation of the data collected. A common criticism of development programs worldwide is that they achieve project targets but fail to benefit their target population. The careful synchronization of massive infrastructure and internal migration programs requires frequent review to assure that they are in fact harmonized in Sinai, so that the intended productivity does occur.

Strategic monitoring begins with the eight goals set by the Steering Committee and the nine working hypotheses or assumptions about exogenous factors, as defined in Chapter Three. Annual strategic monitoring would seem prudent, followed by prompt reconsideration of major implementation programs and projects.

Both performance and strategic monitoring require a small, but comprehensive and up-to-date information system. Monitoring itself can, and should, contribute to keeping the data base both up-to-date and relevant.

An example of performance monitoring is the oversight by the Irrigation Ministry of its land reclamation projects. Strategic monitoring regarding these projects might be done by the Planning Ministry to measure whether or not these land reclamation projects are contributing adequately to the nation's overall development objectives. In Sinai the SDA might do performance evaluating, and a monitoring unit in the Ministry of Development the strategic evaluations.

Figure 6.1 illustrates four basic principles:

- Performance monitoring reports to a CEO (Chief Executive Officer)
- Strategic monitoring reports to a policy board
- Performance and strategic monitoring staffs interact and support each other
- Monitoring contributes to and uses a common data base with other concerned agencies.

## 6.7 INVESTMENT REQUIREMENTS

Budgets for regions that have been selected for extraordinary development within a National Plan should be measured in the investment per capita of their final population, rather than their beginning population, as is the case with developed regions where no major change is planned. Thus, the development or investment budget for Sinai should be considered in terms of its year 2000 population of a million, at the same time as the capital budget for Tanta or Cairo is considered in terms of their 1982 population. It would be impossible for Sinai to achieve substantial development if investment were to be allocated on the basis of its current population of 172,000 spread over an area of 61,000 square kilometers, when the average governorate in Egypt already has a population of a million in an area of only a few hundred square kilometers.

Within almost every region countries find that it serves the national purpose to invest in certain facilities that do not serve that region directly; for example, a national port, a military base, or a university. Coastal regions, and particularly peninsular regions (82 percent of Sinai's borders are coast), are often the recipients of such national level facilities. In the case of Sinai, there are some well-known examples.

Table 6-2

Summary of Investment Plan, 1983-2000(LE million)

	<u>Gross investment</u>		
	<u>Total</u>	<u>1983-91/92</u>	<u>1992/93-2000</u>
National System, subtotal	<u>6,816</u>	<u>2,258</u>	<u>4,558</u>
Production sectors, subtotal	<u>3,100</u>	<u>450</u>	<u>2,650</u>
Petrochemical complex	2,500	300	2,200
Other heavy industry	600	150	450
Service sectors, subtotal	<u>3,716</u>	<u>1,808</u>	<u>1,908</u>
Main highways, harbors	185	125	60
Telecommunications	204	54	150
Electricity generation*	1,000	1,000	--
Bulk water conveyances	2,235	585	1,650
University	80	40	40
Parks/nature reserves	12	4	8
Regional System, subtotal	<u>4,452</u>	<u>2,103</u>	<u>2,349</u>
Production sectors, subtotal	<u>2,662</u>	<u>1,335</u>	<u>1,327</u>
Agriculture	912	400	512
Industry and mining**	750	495	255
Tourism	350	140	210
Other production and services	650	300	350
Service sectors, subtotal	<u>1,790</u>	<u>768</u>	<u>1,022</u>
Roads, harbors, airports	110	60	50
Telecommunications	204	49	155
Electricity/gas (mostly distribution)	508	289	219
Higher education***	24	6	18
Hospitals***	291	66	225
Community infrastructure	134	62	72
Housing	519	236	283
Production sectors, subtotal	5,762		
Service sectors, subtotal	5,506		
Grand total	<u>11,268</u>		

\*Mostly for distribution west of the Suez Canal

\*\*Excluding petroleum

\*\*\*Other education and health care are included in community infrastructure

Sources: Volume III, Chapter 6, and Volume VI, Chapter 3.

- The Hadj highway from Suez via Nakhl and Ras El Naqb to the Gulf of Aqabah and Mecca
- The Suez Canal
- Military facilities (including airports)
- The petroleum industry
- Gebel El Maghara coal
- The proposed Ayun Musa 1200-megawatt electrical plant
- A proposed petrochemical plant
- The proposed conservation areas to protect historic treasures (like St. Catherine) and natural resources (like coral on the seacoast).

All of these take advantage of Sinai's location or resources with but little direct return or benefit (or even jobs) and at some cost to Sinai, such as pollution and lost opportunities to do something else.

Many items in the investment program are for activities that will provide "production" facilities, defined broadly to include agricultural fields, hotel rooms, industrial equipment and many other items. We have aggregated these separately in the budget; they are expected to be commercially viable (and therefore "self-financing") and can be decided upon or evaluated quite differently from either national-level investments or "service" investments.

Roughly half of the Sinai investment plan consists of items in the National and Regional Service categories. These are the items needed to provide a base for the productive investment, and to help peninsular Egypt catch up to Nilotic Egypt in its level of services. These budget categories are dominated by infrastructure in the sense of both utilities and social services or amenities.

Nations may designate certain regions for special development for political, strategic, social or economic reasons, or for any combination thereof. In the instance of Sinai it is the Consultant's understanding that the reasons are not primarily economic. As a development planner, the Consultant's role is to advise the Government on an investment path which achieves its overall strategic objectives at reasonable cost and from which it can recover its investment in due course, not necessarily as quickly as possible.

The budget items categorized "national" are not the subject of a cost-recovery within Sinai, any more than they would be in any other region in Egypt, even though they are located in Sinai. In fact, because of some negative impacts, Sinai may have a theoretical claim for compensatory credits.\*

Investments in Sinai production facilities need be no higher per job or per unit of production than elsewhere in Egypt. This is true for agricultural land, as well as hotel rooms and shoe factories. However, agricultural land is unlikely to be as productive per feddan in Sinai as it is in Nilotic Egypt,

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\*Mining and petroleum extraction to date has benefited all Egypt more than it has Sinai.

at least not in the first years of cultivation. In this instance, the Government has a clear choice of removing nonagricultural uses from productive Nilotic land to Sinai, or continuing to replace high-quality Nile Valley agriculture with factories and roads and shifting agriculture to relatively poor peninsular and other "desert" soil. Eventually, as the population grows, substantial feddanage of Sinai soil will quite probably be needed to fulfill the national goal of food security. Sinai could house a population of a million by the year 2000, with a smaller investment, however, if existing industry from the Delta were shifted to the peninsula rather than taking more Nilotic land out of production.

To justify the large agricultural investment requires taking a long-range national outlook, rather than a traditional economic one. The SDS-I team has not compared agricultural investment opportunities in Sinai to those in other regions of Egypt but has measured the returns on investment for various crops within Sinai. Sinai has a locational advantage over much of Egypt for certain crops at certain seasons as well as for certain manufactured products for export.\*\*

Infrastructure costs in Sinai are going to be somewhat higher for rural services than for Nilotic Egypt. Sinai is an arid, mountainous region and the provision of water, electricity, telecommunications, and roads will cost more than for a flat region on the banks of a river. Egypt is studying each of its desert regions in turn to measure their capacity to accept an extension of the national way of life and to absorb surplus population. Sinai offers some amenities of climate and coast not available in other regions. The SDS-I team has not compared the costs of infrastructure of this desert region to that of others. But there is no obvious reason why unit costs in Sinai should be substantially higher. Moreover, it does seem reasonable to consider that the eventual settlement of Sinai is inevitable and desirable, especially if Egypt's population is to double; therefore, the decisions to be concerned with now are how and when, rather than if. To plan for fairly quick settlement of a population of about one million by the year 2000 is to open up the opportunity for substantial economies of scale, which would not be possible with lower targets and a slower pace of development.

In sum, Egypt's investment in Sinai's development is one from which the country as a whole will receive long-term returns, but it should not be justified solely on an economic opportunity or return-on-investment basis. A highway to an area that has 50 to 100 persons per square kilometer is more economic than a highway through an area of 2 to 4 persons per square kilometer; both of these population densities occur in Sinai. Clearly, Nile water delivered to the eastern end of the Hamdi tunnel costs less than it does 150 kilometers down the coast around Abu Rudeis. Small diesel electric plants on the Gulf of Aqabah are not as efficient as the 450 megawatt Abu Sultan plant at Deversoir. Thus, there are great disparities in service costs amongst the subregions and zones. As much as possible, the development patterns and proposed economic activities have coped with these characteristics.

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\*\*The expectation that the other markets in Middle East and the region as a whole will remain net-importers of foodstuffs for generations to come is also a relevant factor to be considered in evaluating the proposed strategy of Sinai.

The analysis in Appendix A of Volume III estimates returns that could be generated during the planning period by the recommended investment in Sinai. The analysis identifies annual investment allocations proposed by the Recommended Strategy and calculates the "capital recovery" to be expected under different interest rate assumptions, given the standard life expectancy of each class of investment. Based on this illustrative analysis, it would be possible, theoretically, to execute the proposed LE 11 billion development program over a period of 17 years with a net outlay of less than LE 4 billion and (for all but the first two years of Phase II) less than LE 400 million per year, provided all returns generated by the recommended program were to be reinvested in Sinai.

The investment requirements estimated here (and presented in more detail in Volume III) define a path whereby Sinai can achieve full standards of rural and urban services by the year 2000. During the first two phases of development, however, not all settlements will have the same level of services. Priority has been given to production investments. Infrastructure services are to be extended to Sinai's growing population on a step-by-step basis with the intention of reaching levels of service by the year 2000, which are comparable to (and competitive with) those available in Nilotic Egypt.

## APPENDIX A

### LIST OF REPORTS, WORKING PAPERS AND OTHER WRITTEN SUBMITTALS

The Sinai Development Study - Phase I called for the Consultant to deliver certain memoranda, reports and working papers to the Ministry of Development. The following list begins with various reports or papers, many of which were deliverables specifically mentioned in the Contract; the list continues with Working Papers, most of which were optional under the Contract. Included as Working Papers 32-47 are reports submitted as part of the original Draft Final Report of April, 1982, which were later filed as "working papers" when it was decided to recast and rewrite the DFR in 1983, incorporating additional analyses of land capability and spatial alternatives while providing a substantially revised synthesis of information in the earlier reports. The last items listed below were submitted to the Steering Committee for review and comment mostly during the period February-May, 1983, while preparing the second Draft Final Report.

#### Reports and papers

- Data List, Planning Information Needs, Draft Data Matrix (January 1981)
- Economic Criteria Memorandum (January 31, 1981)
- Preliminary Drilling Program for Hydrogeological Investigations (January 31, 1981)
- First Project Summaries Report (February 28, 1981)
- First Status Report (March 15, 1981)
- Early Action Tourism Recommendations (March 31, 1981)
- Data List, Planning Information Needs, Draft Data Matrix - Revised (March 31, 1981)
- Base Maps and Mapping Standards (Land Capability Analysis) (April 4, 1981)
- Tourism Study of North Sinai Coast/Early Tourism Report and Proposal for North Sinai Tourism (January 15, 1981 and May 4, 1981)
- Second Project List Report (May 10, 1981)
- Well Drilling Program (May 23, 1981)
- Meteorology Network Project Discussion (May 24, 1981)
- Mapping and Data Collection - Definition of Standards (January 1981 and May 1981)
- Map Progress Report (July 7, 1981)
- Final Project List Report (October 31, 1981)
- Sinai Information System User's Manual, four volumes (April 30, 1982)

## Working papers

- No. 1 - Sinai Bibliography (December 23, 1980)
- No. 2 - Bibliography on Geology and Other Earth Sciences (March 1981)
- No. 3 - Bibliography on Nuclear Materials (March 23, 1981)
- No. 4 - Sinai Mineral Resource Exploration & Development Plan (April 15, 1981)
- No. 5 - Environmental Working Paper (April 28, 1981)
- No. 6 - Initial Environmental Examinations Working Paper (April 28, 1981)
- No. 7 - Preliminary Summary of Findings on Population in Sinai (June 22, 1981)
- No. 8 - Preliminary Summary of Alternative Development Strategies for Sinai (May 14, 1981)
- No. 9 - Initial Energy Resources Assessment (May 15, 1981)
- No. 10 - Preliminary Tourism Strategy for Sinai and Recommendations for Future Action (June 10, 1981)
- No. 11 - Livestock Production in Sinai - A Preliminary Assessment (June 22, 1981)
- No. 12 - Agricultural Support Infrastructure in North Sinai (not submitted)
- No. 13 - Preliminary Evaluation and Recommendations Regarding Groundwater Conditions at El Arish (June 30, 1981)
- No. 14 - Settlement Survey of Social and Economic Activity in Sinai (August 12, 1981)
- No. 15 - Energy Resource Assessment and Energy Requirement Evaluation (August 31, 1981)
- No. 16 - Recommended Physical Planning Standards for Development of Major Sinai Settlements (September 26, 1981)
- No. 17 - Draft Monograph (August 19, 1981)
- No. 18 - Crop Production in Sinai (September 26, 1981)
- No. 19 - Controlled Environment Agriculture in Sinai (October 1, 1981)
- No. 20 - Status Report on Alternative Development Strategies for Sinai (September 30, 1981)
- No. 21 - Desalinization Possibilities in Sinai (not submitted)
- No. 22 - Shifting Sands in Sinai (not submitted)
- No. 23 - Agriculture Potential and Prospects in Sinai (October 11, 1981)
- No. 24 - Review of Existing Sinai Transport Systems (October 29, 1981)
- No. 25 - Sinai Cloud Seeding Potential (November 21, 1981)
- No. 26 - Aspects of Land Settlements in Sinai (November 19, 1981)
- No. 27 - A Summary Statement on the Industrial Sector (November 15, 1981)
- No. 28 - Inventory of Tourism Places of Interest in Sinai (December 21, 1981)

- No. 29 - Land Classification and Capability in Sinai  
(December 31, 1981)
- No. 30 - The Public Administration of Development in Sinai: Current Practice  
(December 31, 1981)
- No. 31 - Review of Migration Movements in Egypt with Policy Implications for  
Sinai Development (February 1, 1982)
- No. 32 - Draft Report on a Development Strategy for Sinai (April 1982)
- No. 33 - Water Resources (April 1982)
- No. 34 - Hydrogeological Information Cards (April 1982)
- No. 35 - Agriculture and Fisheries (April 1982)
- No. 36 - Industry (April 1982)
- No. 37 - Minerals (April 1982)
- No. 38 - Energy (April 1982)
- No. 39 - Tourism (April 1982)
- No. 40 - Population Issues (April 1982)
- No. 41 - Environment (April 1982)
- No. 42 - Fourth Project List and Studies (April 1982)
- No. 43 - Index to Map Standards and Glossary (April 1982)
- No. 44 - Information Management (April 1982)
- No. 45 - Preliminary Map Portfolio (April 1982)
- No. 46 - Public Administration (April 1982)
- No. 47 - Community and Regional Infrastructure (as observed in Mid-1981)  
(April 1982)

Papers submitted for review and comment in 1983

- Revised Map Standards (February 6)
- Initial Data Book (February 16)
- Land Capability Findings, including a Technical Annex with 22 colored  
Maps (February 26)
- Outside Factors that Influence Sinai Development (February 27)
- Draft Statement of Goals and Objectives (March 7)
- Alternative Strategies for the Development of the Sinai Peninsula until  
the Year 2000, with two Technical Annexes (March 7)
- Trade-Offs Among Development Objectives (March 16)
- Second Status Report, including an Annotated Outline of the Second  
Draft Final Report (March 17)
- Preferred Strategic Path to Development (March 28)
- Spatial Strategy Maps and Physical Plans (March 10 and 30)
- A Short List of Goals for Sinai's Development until the year 2000,  
following evaluation of responses to a March 16 questionnaire on  
the Relative Importance of Regional Objectives (March 30)

Agriculture and Tourism Issues (April 10)

Land Capability Worksheets for El Arish, Great Bitter Lake, Ayun Musa, Ras Taba, Abu Rudeis and Nuweiba (April 19)

Tourism Land Capability Analysis (April 20)

Tourism "Desk Top" Studies (April 30)

Goals Evaluation of the Recommended and the Alternative Sinai Development Strategies (April 30)

Note on the Preferred Strategy, containing preliminary projections regarding land use, employment, population and investment costs as well as illustrative maps (May 24)

Comments on Port Said Governorate Projects in Sinai (November 17)

Note on Investment Requirements and Financing for the Strategy Recommended to Settle Sinai (December 8)

## APPENDIX B

### LIST OF MAJOR PROJECTS/PROGRAMS AND RECOMMENDED NEXT ACTION STEPS

This Appendix lists major projects or programs recommended for implementation as part of the Strategy for the settlement and development of Sinai. The projects are discussed in one or more places in this seven-volume Report. A comprehensive summary list is presented here largely as a convenience to officials charged with execution of the Recommended Strategy; from it the more general reader will have a sense of the Strategy as a whole and will also learn the magnitude and diversity of the task to be managed.

The projects and programs summarized in this list constitute the main body of work necessary to implement the Recommended Strategy. The list restates many of the recommendations presented in working papers and memoranda during 1981 and 1982, responding to the requirement to identify early projects and actions which will have a high development impact. Such projects have been incorporated into the Recommended Strategy, not always in their original form. In many cases the terms listed are described more fully in the documents of origin; others are projects proposed by an implementing agency, and a more detailed description will be with that agency.

It has been considered useful to describe projects in terms of their contribution to the Recommended Strategy. The Consultant sees their greatest value as part of that larger strategy. Many projects on the list were conceived originally in sector studies; others emerged as Alternative Strategies were formulated with emphasis on ensuring active development of each sub-region. Thus, each project has value within its sector and within the Strategy. Many would also have high value on their own; some others would not.

The projects summarized here should all become elements in sectoral, sub-regional and local plans. Therefore, the list will be useful in reviewing and monitoring those plans. If any project is not included, there should be a clear and compelling reason for its exclusion. Most listed projects are vital to Sinai achieving its full development potential.

The investment plan of Volume III estimates the financing required to implement these projects. When individual proposals are prepared in greater detail, they should become part of the Sinai development plan, be incorporated in relevant budgets, and be subject to the monitoring process recommended as part of the overall strategy.

This Appendix is divided into sections as follows:

#### Production Sectors

- A - Rural development
- B - Irrigated agriculture
- C - Industry and mining
- D - Tourism

## Service Sectors

E - Water

F - Transport and communications

G - Energy

H - Community infrastructure, including health and education

## Overall Management

I - Land use management

J - General policies

There is obvious overlapping among these categories--water projects are closely linked to irrigated agriculture, town plans under "land-use management" are closely associated with community infrastructure. In preparing the list the Consultant endeavored to avoid repetition with rare exceptions; moreover, in the interest of brevity, most linkages between projects are not stated explicitly, since they are usually obvious. During actual implementation it is to be expected that some entries listed in this Appendix will be combined with others; in other instances items grouped together here will be separated--for example, to be accomplished in different time periods or by different agencies.

A note explaining codes is found overleaf. Each project is coded by type of action recommended, subregion, phase, and national vs. regional scale.

## EXPLANATORY NOTE ON CODES

- Column 1 - Type of action recommended now:
- "U" means project is currently underway
  - "IT" means project is considered an initial task which can be taken up now without much further study ("fast track" procedures). Many are proposals of agencies already active in Sinai.
  - "FE" means prefeasibility, feasibility, design, engineering or similarly detailed study is recommended--perhaps the first or next in a sequence of such studies. Some studies will be quite specialized, requiring oversight of specialists at the concerned ministry, experts at a university, or (in very few cases) expatriate consultants. These studies are recommended when projects have achieved some consensus, seem fairly certain to go ahead, but require further analysis or detailed preparation, design and costing.
  - "PP" means pilot project to test or demonstrate a concept before widescale replication is attempted. Some programs are expected to require rather long-term testing and fine-tuning before they can be adopted on a wide scale. Many of these concepts already have wide support but need early testing so that proposals, including sites, staffs, budgets and other details, can be prepared for inclusion in the Five-Year Plan beginning 1987/88. Pilot projects begun now will assist in preparing realistic proposals.
  - "PL" means plans or planning, generally in the physical sense but also including master plans for subjects like transportation or water. Generally, it will be best to assign planning exercises to the regular staff of agencies working in Sinai with whatever outside assistance those agencies require.
  - "GS" means a more general study to improve the information base for planning in Sinai or to analyze a particular problem or policy issue. These general studies should not hold up other action. As a rule they need to be started soon and finished soon, since the subject matter has important implications for overall plans.

Column 2 - Subregion: NW is Northwest, NE is Northeast, UP is Uplands, SW is Southwest, SE is Southeast, and P is peninsula-wide

Column 3 - Phase: I is through the Egyptian fiscal year 1986/87 when the current Five-Year Plan ends; II is 1987/88-1991/92; and III is 1992/93 through the year 2000. The phase noted is when construction or full-scale implementation is scheduled to begin; by definition the action recommendation is what needs to be done in the next 2-3 years to prepare for implementation whenever it is planned, keeping in mind the very different time-schedules required to start a pilot project compared to completion of a series of complex feasibility and engineering studies.

Column 4 - National (N) or Regional (R) project in terms of scope and financial responsibility.

## A. RURAL DEVELOPMENT

Project: Next action steps	1	2	3	4
1. <u>Agricultural research</u> : Prepare detailed program emphasizing (a) incentives to bring senior scientists and other professional staff to live and work in Sinai; (b) selection of 8-10 priority programs--for example, dates, olives, barley, vegetables, range/forage, halophytes, grapes, oil-seeds, (fruit/nut) trees; and (c) building extension staff and network of private farms for trials.	IT & FE	P	I	R
2. <u>Dates, olives, barley improvement</u> : Even without much further research, production of several important crops can be increased by additional plantings of higher-yielding varieties and other improved practices. Processing facilities and marketing organizations could have beneficial impact on production; study best way to establish.	IT  FE	P	I II	R R
3. <u>Livestock modernization</u> : Organize range management associations; improve breeding practices, watering places and forage; initiate projects to demonstrate better range management. Consider return to "hema" system.	IT & PP	UP & P	I	R
4. <u>Livestock modernization</u> : Survey existing organizations, prepare sector plan to increase livestock production for implementation after immediate rehabilitation program. Consider grain storage (both traditional and modern techniques) for livestock, feed lots, expansion of dairy herds, etc.	FE	P	II	R
5. <u>Poultry production</u> : Broilers first, eggs later. Meets local need for perishable foods at favorable conversion rates; low water user; short production cycle; good income to producer. Promote rapid expansion through agricultural credit and extension institutions.	IT	P	I	R
6. <u>Meat production</u> : Prepare plans including model enterprise budgets to expand meat production near major settlements.	FE	P	II	R
7. <u>Poultry and small animal production</u> : Study particular circumstances of SE Subregion and hotelmarket for products. Recommend production units and credit, marketing, and training needed.	FE & PP	SE	II	R

RURAL DEVELOPMENT (continued)

Project: Next action steps	1	2	3	4
8. <u>Aquaculture</u> : Prepare action plan to introduce in Sinai practices proven successful elsewhere in ARE; identify areas (for example, clayey El Tina soils; also El Qaa Plain and near Sharm El Sheikh) best suited for aquaculture; consider proper combination, if any, with other cropping for individual farmers; prepare to reuse urban wastes.	FE & PP	P  NW SW SE	I  I I I	R  R R R
9. <u>Red Sea fisheries</u> : Consider prospects beyond Gulf of Suez and implications for El Tor, Sharm El Sheikh, etc.	FE	SW & SE	II	R
10. <u>Lake Bardawil fishing</u> : A thriving industry is being maintained by keeping inlets open and improving marketing, fishing, etc.	U	NE	I	R
11. <u>Mariculture</u> : Especially in coral reef, areas and coastal lakes like Bardawil and Malaha.	PP	SW (SE)	II	R
12. <u>Lake Malaha rehabilitation</u> : Quickly prepare and adopt program to rehabilitate lake fishing potential; also, consider salt works repair, migratory birds, and tourism.	IT	NW	I	R
13. <u>Tree planting</u> : Prepare program to organize local populations to plant and maintain trees for various purposes--wind-break, fuel, watershed management and other erosion control, and crops (dates).	FE	P	I	R
14. <u>Grain production and storage</u> : Prepare program to increase production and improve storage.	FE	P (NE)	II	R
15. <u>Vegetable and other perishables production</u> : Expand quickly near major settlements; organize reliable, profitable export markets; serve growing tourist trade.	IT	P	I	R
16. <u>Rainfed agriculture</u> : Continued study of rainfed agricultural potential will be given high priority in the agricultural research and extension programs, particularly as ancient water-management techniques are revived.	FE	P	II	R

RURAL DEVELOPMENT (continued)

Project: Next action steps	1	2	3	4
17. <u>El Arish-Rafah Strip</u> : Comprehensive assessment of existing production and preparation of plans to utilize labor, soils, water and other production capacity more fully. Consider how Rafah Strip successes could be replicated elsewhere in Sinai.	U (FE)	NE	I	R
18. <u>Oasis/Microclimate agriculture</u> : Do experiments. Keep current with world literature. Seek broad range of measures to mitigate harshness of arid, desert climate, including tree belts and better siting of settlements.	PP GS	UP P	II II	R N
19. <u>Recycle tourist wastes for horticulture</u> : Consider possibilities.	FE	SE	II	R
20. <u>Land tenure</u> : Study alternatives and their agricultural implications, especially when applied to large reclamation projects and other new settlement areas.	GS	P	II/ III	R
21. <u>Halophytic agriculture</u> : Do research and initiate pilot projects to demonstrate possibilities of profitably growing trees, shrubs, grasses and other crops using brackish and other saline water, both in coastal areas and inland.	FE PP GS	P	I II	N
22. <u>Small-scale renewable energy generation</u> : Research and pilot projects could be in all subregions although most urgent requirements are in smaller communities of UP and SE. (See item 5 under Section G - Energy below.)	FE PP	UP SE	I II	R
23. <u>Handicraft production and marketing</u> : Recent growth suggests a much wider opportunity for these activities to increase rural incomes and employment. (See item 15 under Section C - Industry below.)	U FE	P	I II	R
24. <u>Potable water systems</u> : Most settlements need wells, pipes, cisterns and other improvements to ensure basic water supply and sanitation for all residents.	U	P	I II	R

## B. IRRIGATED AGRICULTURE

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Semidetailed soil studies</u> : Studies underway to determine best sites for irrigated agriculture will be expanded to all subregions, according to schedule proposed in Recommended Strategy.	U	NW	I	R
	IT	& NE	I	R
	IT	P	II	
2. <u>Northeast Coast</u> : A series of major conveyances are included in the Recommended Strategy. Studies will select soils, design conveyances, determine optimum cropping patterns, etc. The first major conveyance of irrigation water to Rafah is scheduled to be under construction by 1985 and completed in 1987. Includes Qantara-Baloza, Romana-El Mazar, El Arish-Rafah Strip, Lower Wadi El Arish areas referenced in Table 4-6, Volume III, p. 4-17.	FE	NE	I	R
3. <u>East of Bitter Lakes</u> : Reclamation already underway. Over 10,000 feddans will be under water by 1984; 30,000 feddans planned. Perhaps more could be served by siphons already installed; this possibility can be studied as part of detailed planning for extension of reclamation work in this area.	U	NW	I	R
	FE	NW	II	R
4. <u>El Qaa Plain</u> : Study will determine aquifer potential, best soils to irrigate, cropping patterns, settlement plans, land tenure policies, marketing arrangements, etc. Later development with Nile water can also be considered preliminarily, including possible conveyance under the Gulf of Suez. Pilot farms already operating in 1983.	FE	SW	II	R
5. <u>El Tina Plain development</u> : Comprehensive plan will show canal alignments, first 20,000 feddans of reclamation areas, highway, new town, possible airport and where agriculture fits best as well as plans for land preparation, water management, salinity control, cropping, etc.	FE	NW	I	R
6. <u>Ayun Musa development</u> : Largely for export crops. So-called East Suez area. Detailed feasibility and engineering study along lines noted for other projects.	FE	NW	II	R

IRRIGATED AGRICULTURE (continued)

Project: Next action steps	1	2	3	4
7. <u>Wadi Feiran Pipeline Service Area</u> : The Recommended Strategy calls for major Nile water conveyance from Deversoir (or some other take-off point) south to Wadi Feiran. Studies are needed to indicate which specific tracts will be developed for what crops, under which irrigation regime; costs, settlement patterns, and nonagricultural water required will also be studied.	FE	SW	II	R
8. <u>Western Uplands</u> : Major conveyances and pumping stations will bring Nile water to most promising and accessible Uplands soils. Studies will determine alignment of conveyances, construction schedules, service areas, costs, cropping patterns, settlement plans, land tenure policies, marketing arrangements for a series of projects to be implemented over a 10-15 year period. First priority to Gifgafa; later Wadi El Bruk (Bir El Thamada area), El Sirr Plain and Wadi El Hema will be studied; finally other areas noted in Table 4-6, Volume III, page 4-17.	FE	UP	II	R
9. <u>Agricultural research</u> : Also referenced under rural development. Will be particularly important to intensive cultivation practices with irrigation. Research will include vegetables like tomatoes, cucumbers, okra, etc., alternative techniques of irrigation, and halophytic agriculture using brackish and other saline water (including seawater) to grow trees, shrubs, grasses and other crops.	FE	P	I	R
10. <u>Survey of Middle East and Mediterranean markets</u> : For high-value export crops from intensive irrigation schemes.	PL	P	II	R
11. <u>Controlled environment agriculture</u> : Select sites and prepare plans for capital-intensive, water-conserving agriculture of high-value crops, mainly for export and tourist markets.	PP	P	II	R
12. <u>Groundwater irrigation Master Plan</u> : Once the exploratory drilling program has reached conclusions regarding groundwater potential, a Master Plan for irrigated agriculture based on groundwater can be prepared. The Plan will consider recharge and other interaction between Nile water transferred to Sinai and groundwater, since both sources will be used for agriculture in places like El Arish and perhaps several others.	PL	P	II	R

IRRIGATED AGRICULTURE (continued)

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
13. <u>Wadi El Gerafi</u> : Extensive reclamation may be possible with groundwater. Detailed studies will be prepared if exploratory drilling confirms suitable groundwater supplies.	FE	SW	III	R
14. <u>Ramlet Himeiyir</u> : In this area good soils suggest reclamation would bring a good return, if water can be delivered at reasonable cost. This optional addition to the Recommended Strategy will be the subject of careful study in the 1990s.	FE	SW	III	R

### C. INDUSTRY AND MINING

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Industrial promotion program</u> : Policies to bring a wide range of manufacturing activities to Sinai will be developed; administrative responsibility for creating and managing the program will be assigned, possibly to a new Regional Development Agency.	IT	P	I	R
2. <u>Quarrying and other production of construction materials</u> : Given the construction boom already under way, every effort will be made to develop local sources of materials, both to minimize construction costs and to promote economic activity and settlement through this "backward linkage" which takes advantage of Sinai's natural resource base. Experimental use of some local materials will be encouraged in government projects.	FE	P	I	R
3. <u>Industrial zones</u> : El Arish, Sheikh Zuwayid, Bir El Abd, El Shatt, Ras Sudr, Abu Rudeis, Ras Naqb and several other towns are planned to cater to significant industrial activity, for which space will be set aside, including possible industrial estates and/or free zones specializing in export. (See also "Land-use Management" section below.)	FE	NW & NE	II	R
4. <u>Ferromanganese mine and processing</u> : Feasibility study continuing.	U	SW	I	N
5. <u>Gebel El Maghara coal mine</u> : Feasibility study nearing completion; decisions will follow regarding output, markets, transportation, financing and development schedule.	U	UP	I	N
6. <u>Salt works at Lake Bardawil</u> : First stage under construction; upon completion of three stages will be nucleus of chemical manufacturing complex.	U	NE	I	N
7. <u>Development Bank</u> : The recently established bank in El Arish will expand (or be replicated) to offer financial and technical assistance in all five subregions. Consultants (for example, Cairo based engineers and financial analysts who have helped the Abu Dhabi Fund and similar institutions) could increase the effectiveness of this institution, which will be encouraged to adopt a proactive attitude toward industrial promotion and growth.	U	NE	I	R

INDUSTRY AND MINING (continued)

Project: Next action steps	1	2	3	4
<p>8. <u>Petroleum development</u>: Continued expansion of Sinai's most important extractive industry. will emphasize (a) creating permanent communities where workers and their families contribute to settlement and growth of the peninsula, (b) making gas widely available for water pumping, electricity generation, desalinization, manufacturing and other energy uses as well as export (to Jordan and Israel as well as west of the Canal) and (c) using oil and gas as feedstocks for industries locating in Sinai.</p>	U	SW, NW NE	I	N
<p>9. <u>Mineral survey</u>: Systematic geological surveys, followed by exploration in promising areas, are expected to reveal opportunities for additional mineral production. Should involve all five subregions and also the Red Sea floor where other developers are reporting promising results. A regional office of the Geological Survey in Abu Rudeis or Umm Bugma is recommended.</p>	GS & IT	P  P	I  I	R  R
<p>10. <u>Tax Policies</u>: A review of tax policies will prepare recommendations to improve incentives to private investors, including foreign partners. Present rules, based on the petroleum industry, where risks are less, are judged inadequate for many other minerals.</p>	GS	P	I	R
<p>11. <u>ORDEV Loan Development fund</u>: Adaptation of general rules will be required to serve the particular circumstances of Sinai.</p>	IT	P	I	R
<p>12. <u>Food processing industries</u>: The success of some large land reclamation projects will depend on complementary development of processing and marketing facilities. Processors may wish to assume major responsibility for specific reclamation areas, especially in the Northwest and Northeast Coast Subregions.</p>	FE	P	II	R
<p>13. <u>Mining projects</u>: Gypsum, kaolin and glass sand are among the most promising of many minerals to be produced in Sinai.</p>	U & FE	Main- ly SW	I	R
<p>14. <u>Export marketing services</u>: Export from Sinai may be the key to rapid growth of many manufacturers, as well as to fishing, agriculture and mining enterprises. Special programs will be undertaken to raise consciousness of these opportunities and to provide technical (or financial) assistance.</p>	FE & PP	P	I	R

INDUSTRY AND MINING (continued)

Project: Next action steps	1	2	3	4
<p>15. <u>Handicrafts and small-scale industries:</u> From a solid beginning in El Arish a few years ago, handicraft production can expand in all parts of the peninsula. Particularly in remote areas, these activities can provide a significant share of cash income. Program emphasis will be to widen the market and diversify designs.</p>	PP	P	I	R
	&	esp.		
	FE	NE SE		
<p>16. <u>Petrochemical complex:</u> Sinai has many advantages as the location for the petrochemical complex Egypt proposes to build in the 1990s and will be one of the sites considered as project details are worked out.</p>	FE	SW	III	N
<p>17. <u>Cement Manufacturing:</u> Close to raw materials and energy supplies, Sinai will make a contribution to meeting national cement requirements, perhaps enabling Egypt to export at the margin rather than continuing a net importer. Other building materials will also be manufactured in Sinai for local sale and export, fostered by the intensive building boom projected for late 1980s and early 1990s.</p>	FE	SW or NE	II	N
<p>18. <u>Gypsum processing:</u> Studies to verify a larger market for a variety of gypsum products and to evaluate alternative sites will assist in making better "developmental" use of material Sinai has in abundance.</p>	FE	SW	II	R

D. TOURISM (see also "Land Use Management")

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Aqabah tourism marketing</u> : Active promotion will restore high occupancy levels in tourist facilities along the Aqabah Coast and provide a basis for expansion of investment there. Consider special marketing to exploit coral reef opportunities fully.	U FE	SE (SW)	I	N N
2. <u>Mediterranean Coast tourism</u> : Proposals from several consulting firms are being evaluated; project will prepare a plan for tourist development along the coast both east and west of El Arish with a view to integrating tourism with industry, agriculture, and various other activities and urban functions in the area and providing a basis for rapid acceleration of tourist visits and hotel investment.	U	NE	I	R
3. <u>Holiday villages at Bitter Lakes and Ayun Musa/Ras Misalla</u> : Rapid development of these areas, close to the Delta and Cairo, will occur in response to demand from Egyptian tourists. Careful site planning and land development are essential to reaping full long-term benefits from these developments. Study will include site plans, functions, prices, most promising markets.	FE	SW	I	R
4. <u>Cultural/historical areas</u> : Immediate steps will be taken to reserve areas around all cultural/historical sites, even those which seem rather remote prospects for significant development, so as to forestall later conflict. Responsibility and adequate staff will be assigned to manage (and where appropriate develop) these areas. Eventually, the availability of a number of smaller sites will tend to encourage tourists to lengthen their stay in Sinai; the sites can be strung together in circuits for the more adventuresome tourists while others visit only a few as pleasant side trips from the beach. An administrative unit will be created, perhaps in each governorate, with sufficient manpower and financial resources to care for several dozen sites of significant importance and to provide adequate protection for and information about other sites, of which more than 300 have already been identified.	IT	P	I	R

TOURISM (continued)

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
5. <u>Special infrastructure</u> : Attention will be given to preparing authoritative guidebooks for both local and foreign tourists, to posting signs on roads and at tourist sites, to training and certification of competent guides, to improving border crossing procedures and facilities, and to providing rest stops for light refreshments.	IT	P	I	R
6. <u>Market Studies</u> : The domestic and Middle Eastern markets are least well known in terms of potentials for Sinai. Knowledgeable expert staff will prepare a series of marketing studies and market promotional plans to ensure good use of existing facilities, to point the best direction for further investment, and to monitor tourists' acceptance of Sinai services, their willingness to recommend Sinai to their friends, and their plans to return.	GS	P	II	R
7. <u>Club Med type of facility</u> : One of first investments in additional capacity for the area will be studied as part of the larger plan for addition tourist capacity in the Subregion.	FE	SE	II	R
8. <u>Gebel El Maghara tourism</u> : Mountain tourism is new in Egypt but offers opportunities. Plans are needed for a relatively small development, initially catering to day-trippers from the Suez Canal Region and Cairo. Could be an important source of diversification and growth to this area, even though small by overall Egyptian tourist industry standards. Pharonic and other remains of interest as well as mountain air and scenery.	FE	UP	II	R
9. <u>Local tourism</u> : A Master Plan, complete with site drawings, appropriate development policies and effective administrative support will be prepared to bring together work done for Ayun Musa, El Arish, Bitter Lakes, Gebel El Maghara, Romana, and similar locations and to provide the basis for long-term planning and development guidelines to make full use of Sinai's many year round attractions for Egyptian tourists. Appropriate marketing of these facilities will be included in the Plan. Emphasis will be put on early aquisition of possible sites, leasing policies, improved access, small boat harbors, satellite hotels, and simplified customs and entry procedures both by land and by sea, so that tourists from neighboring countries can also use some of these resorts.	PL	P	II	R

TOURISM (continued)

Project: Next action steps	1	2	3	4
10. <u>Holiday village at Romana</u> : Rapid development of this area, close to the Delta and Cairo, will occur in response to demand from Egyptian tourists. Careful site planning and control are essential to reaping full long-term benefits. Plan should be integrated with projects in the El Tina Plain, including the new highway proposed directly west from Balozza to Mansoura (with a new Canal crossing and quicker access to and from Port Said) and the proposed new airport.	FE	NE	II	R
11. <u>Pelusium</u> : Plans for this historic site will be developed to complement proposals for agriculture, aquaculture and other productive activities on El Tina Plain and for beach development at Romana Beach.	FE	NW	II	R
12. <u>Sarabit El Khadim</u> : The possibility of developing this historic site will be thoroughly investigated. See Nagel's Guide, page 740 and following.	FE	SW	II	R
13. <u>Ein Guderat</u> : Solomon's fort and Moses' springs provide another opportunity to develop a site in ways that help diversify both the local economy and Sinai's inventory of tourist targets.	FE	UP	II	R
14. <u>Marsa El Att Bay Marina</u> : Study to determine size and timing of boating facility to help broaden tourist potential and local market benefits of this beautiful area.	FE	SE	II	R
15. <u>Hamman Faraun Health Spa</u> : Alternative sites will be considered but this seems the most likely place to test the market for health and hot-springs tourism.	PP	SW	II	R
16. <u>Tourist circuits</u> : Plan and initiate a variety of "packages" of touristic activities connecting Sinai, Jordan, and Upper Egypt, including sites of three great religions, beach and water sports, and other points of historical and recreational interest.	FE	P	I	N
17. <u>Wildlife tourism</u> : Study special market for tourists interested in birds, endangered species, and other wildlife; prepare marketing and on-site plans to serve this group of tourists.	FE	P	II	R

E. WATER

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Exploratory well drilling</u> : Initial phase being implemented with financial assistance from EEC; results critical to more detailed development planning in areas where groundwater is expected to be available, mainly from deep aquifers. Additional exploration programs expected to follow current phase, possibly continuing for the rest of this century in order to study each subregion and deeper aquifers; exploratory drilling, analysis of results, develop production, monitor results, regulate off-take; organizational and financial support at Governorate and markaz levels recommended.	U	P	I	R
2. <u>Potable water for Bir El Abd Markaz</u> : Pipeline serving North Coast settlements as far as Bir El Abd, complete with storage in each town, planned to be in operation in 1983.	U	NE	I	R
3. <u>Potable water for El Arish</u> : 700mm pipeline to be constructed in next few years and will be expedited as much as possible because the health and livelihood of the large El Arish population is already threatened by overpumping of groundwater.	U	NE	I	R
4. <u>Potable water to Abu Rudeis</u> : Through Hamdi Tunnel. 500mm line being designed.	U	SW	I	R
5. <u>Rafah Strip wells and storage tanks</u> : Are being restored despite delay due to initial lack of electric pumping.	U	NE	I	R
6. <u>Potable water for Bir El Thamada</u> : The idea is to explore the possibility of taking water available through the Hamdi Tunnel to Bir El Thamada and then, through an existing pipeline, to Gifgafa.	IT	UP	II	R
7. <u>Nile water conveyances</u> : Major systems intended for irrigation are referenced under "Irrigated Agriculture" although they are intended to serve all sectors. Study is needed of all engineering possibilities as well as potential production resulting from various alignments. Take-off points merit special study to determine whether water can reach proposed settlements in the Southeast more economically under the Canal or the Gulf of Suez. Minia, Maadi, Beni Suf and Cairo are among take-off points to be considered.	FE	all but SE	I, II, III	N

WATER (continued)

Project: Next action steps	1	2	3	4
8. <u>El Arish aquifer management</u> : Monitoring use limitations and recharge plan are recommended. Organization needed to take responsibility for a potentially very dangerous situation. Geophysical surveys will extend from El Arish through the Rafah Strip.	IT & FE	NE	I	R
9. <u>Repair and upgrade wells and cisterns</u> : A peninsular program will restore and upgrade old wells and cisterns, particularly in the Uplands and livestock grazing areas.	IT	P	I	R
10. <u>El Salaam Canal</u> : Plans to extend it into El Tina Plain and beyond will be confirmed and then worked out in detail. Special attention will be given to determining where in Sinai it will be best to use a canal and where a pipeline.	IT	NW & NE	II & III	N
11. <u>Meteorological monitoring and weather modification</u> : A more extensive, reliable network of meteorological stations will be installed at an early date. Later all settlements will record meteorological data. Research including tests of various cloud-seeding techniques will be accomplished. Rainfall and runoff projections for particular areas will be prepared.	PL	P	I	R
12. <u>Repair or upgrade dams and reservoirs</u> : The recommendation is to experiment with the restoration of some old dams, perhaps with some modest redesign, before preparing a peninsula-wide program of dam renovation and construction. Large and small structures can both be considered. Wadi Sudr and Wadi Hadira (Southwest Subregion) are candidates for early study.	IT	NE mainly	II & III	R
13. <u>Small dams</u> : Wadi El Hadira and Wadi El Gerafi present opportunities for small dam construction as a means to promote development and settle a larger population. Other small hydrological basins will be studied and runoff measured routinely. More generally, spreader dams (Wadis El Hasana, El Hegayib, El Bruk, Geraia, and El Ruaq are among areas that may offer sites) and terracing offer opportunities in many sites and merit preparation of a government program of financial and technical assistance to individuals and communities which could benefit.	FE	P	I	R

WATER (continued)

Project: Next action steps	1	2	3	4
14. <u>Master Plan</u> : A preliminary version will be prepared within 2-3 years--as soon as results are available from exploratory well drilling, further analysis of Nile water conveyances, and review of the Recommended Strategy. The Water Master Plan would be subject to major review and revision after another 5 years of experience in development in Sinai.	PL	P	II	N
15. <u>Mist and dew at higher elevations</u> : How much more agriculture or grazing will they support, if any?	PP	P	II	R
16. <u>Water management organization/authority</u> : Water is a critical element in Sinai's future. A peninsular organization is recommended to plan and manage water resources comprehensively.	IT	P	I	R
17. <u>Desalinization</u> : Analysis of processes and energy sources appropriate for various candidate sites, especially to treat brackish groundwater.	FE	P	I	R
18. <u>Flood hazards</u> : Better forecasting of washouts and other flood hazards.	GS	P	I	R
19. <u>Use of saline waters</u> : Study all aspects of current research and practical application for using brackish water, seawater and other salty water--for instance, in waste disposal, industrial cooling, halophytic or biosaline agriculture, and irrigation.	GS	P	II	R

F. TRANSPORTATION AND COMMUNICATIONS

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Telecommunications systems</u> : Rapid expansion will be imperative to overcome the sense of remoteness and isolation as well as to facilitate administration and economic life.	U	P	I, II,	N R
2. <u>Suez Canal ferries</u> : Standards will be set and then capacity increased to provide service at that standard. One recommendation is that no one should wait longer to take a ferry than to use the Hamdi Tunnel; others suggest no one should wait longer than 15 or 30 minutes, except possibly between midnight and 6 a.m. Ferry service has improved greatly in the last three years but apparently not as rapidly as demand for it. SCA clearly qualified to provide whatever level of service Government decides on and will finance.	U	NW & all	I	N
3. <u>Road maintenance</u> : Strengthen organizations at governorate (and markaz) level so that surfaces of all major highways are maintained to a 100 kph safe driving standard, and drifting sand is cleared within 24 hours. Requires interim actions while long-term solutions are studied (e.g., to prevent sand drifts and potholes)	IT	P	I	R
4. <u>Hadj highway (Suez-Ras Taba)</u> : Alternative alignments will be studied with development potential, not former traffic patterns in mind. The possibility of postponing the hard-surfacing of this road, which could save up to 50 percent of initial cost, will be considered in order to complete a fast gravel road quickly and provide the opportunity for traffic to build. Construction will be completed by 1987 or 1988.	FE	NW	I	N
5. <u>Ras Taba-Hadj highway link</u> : This important link will be engineered and build even before the Hadj Highway itself is completed to permit the Ras Taba area to take advantage of rapid economic growth in neighboring countries sharing the Gulf of Aqabah-Upper Red Sea area. The link will provide vital access to the airport at Ras Naqb, the upland plateau beyond, possible sites for industrial activity, and part of the rationale for harbor development just south of Ras Taba.	IT	SE	II	N
6. <u>Aqabah-Suez ferry services</u> : Overnight service is expected to be very popular with tourists as well as convenient for other travellers.	FE	SE & SW	II	R

F. TRANSPORTATION AND COMMUNICATIONS (continued)

Project: Next action steps	1	2	3	4
7. <u>Rural roads</u> : LE 10 million is allocated until 1991/92 and an equal amount after that to improve rural roads as required to serve areas developing on the basis of dams, groundwater, handicrafts, light industry, tourist points of interest or minerals.	IT	P	II, III	R
8. <u>Bir El Abd-Gebel El Maghara-Gifgafa road</u> : The study will emphasize choice of alignment and engineering standards to minimize duning and other hazards that have closed this useful link between coast and hinterland.	FE	NE	I	R
9. <u>Fishing ports</u> : Port facilities for fishermen are being improved at El Arish and El Tor. Additional facilities may be desirable at Sharm El Sheikh and elsewhere on the Gulf of Aqabah, and also between El Tor and El Shatt in the Southwest.	U	P	I	R
10. <u>El Tor harbor</u> : Improvements designed mainly for fishermen in the Gulf of Suez may assist in extending the catch well into the Red Sea and in facilitating passenger and freight service to Suez and to export markets. Ecological analysis will be useful with emphasis on both wind and Gulf currents.	U	SW	I	R
11. <u>Ras Sudr harbor</u> : A substantial improvement in port facilities may be required to accomplish the industrial, mining and other objectives of the Recommended Strategy. The possibilities for expanding port services at Ras Sudr, Abu Zenima, and alternative sites will be considered as part of a "contingency plan" in case substantial additional harbor services are needed for the petrochemical complex and/or other major products.	FE	SW	II	R
12. <u>Ras Taba harbor</u> : Exact site selection and development plan. Could be Mersa Marakh or any other bay within 15-20 kilometers. Demand analysis will be completed first; then design studies once the best site is decided.	FE	SE	II	R
13. <u>Ras Taba-Aqaba international ferry</u> : Regular goods and passenger services will integrate Ras Taba and developments proposed in that corner of Sinai to take advantage of dynamic activity in neighboring countries. Ferries will carry trucks, buses, cars, freight and people. Truck terminals will be established at Ras Taba, Nuweiba and Sharm El Sheikh.	FE	SE	II	N

F. TRANSPORTATION AND COMMUNICATIONS (continued)

Project:	Next action steps	1	2	3	4
14.	<u>El Tor-Safaga and Ras Sudr-Zafarana ferries:</u> Plan and institute this service needed by new settlers in Sinai as well as tourist circuiters.	FE	SW	II	N
15.	<u>Small lake and sea harbors:</u> A peninsular study is recommended to identify and compare potential sites and to recommend guidelines for their development. A fishing port or quay at Lake Malaha will be one suggestion considered.	FE	P	II	R
16.	<u>St Catherine-Muweiba road:</u> This link between two of Sinai's most popular tourist areas, when improved, will save visitors hours of uncomfortable travel.	IT	SE	I	R
17.	<u>El Arish-Mansoura highway:</u> Study alternative alignments across or near El Tina Plain, including a new Canal (ferry) crossing; engineer highway to be completed early in the next Plan period. Road will provide much improved access to and from Port Said, the main port of entry/exit for North Sinai goods from/to international markets. Direct route between equally fast growing Rafah Strip and East Delta communities will benefit both regions. Roadway embankment likely to form part of poldering structures needed for agricultural development of El Tina Plain and plans should be integrated with agricultural and other economic development schemes in this zone.	FE	NW	I	N
18.	<u>Abu Rudeis-El Arish:</u> Study and decide alignment of major NE-SW connector, perhaps through Ras Sudr and Bir El Thamada; complete any remaining sections before 1990.	FE	NE UP SW	II	R
19.	<u>El Qantara-El Arish highway:</u> Realignment and reconstruction will be completed as soon as possible to make this vital link as fast and safe as possible and to cater to rapidly increasing day and night traffic.	U	NE (NW)	I	N
20.	<u>Ismailia-Gifgafa-El Arish highway:</u> Reconstruction of this important inland road is well advanced, providing quick access to Uplands.	U	NW UP	I	R
21.	<u>Umm Bugma-Abu Rudeis road:</u> This road needs significantly improved maintenance in the short-run. Meanwhile, alternative alignments will be studied.	FE	SE	II	R

F. TRANSPORTATION AND COMMUNICATIONS (continued)

Project: Next action steps	1	2	3	4
<p>22. <u>Ras Taba-El Arish road</u>: Preliminary inspection of the terrain indicates this will be an expensive road to build, but some link paralleling the international border is considered essential to complete the perimeter road system and link NE and SE subregions through UP as well as useful in opening up promising pockets of agricultural and tourist activity that will support settlements in the area. This road will also improve NE access to Middle East markets. Study will compare alternative alignments (and designs) from the point of view of both initial cost and development potential.</p>	FE	NE UP SE	II	N
<p>23. <u>Local transport companies</u>: Governorates will encourage local businessmen to develop trucking services not merely within the peninsula but to carry goods into and away from Sinai. Credit institutions will be encouraged to finance local goods haulage and busing services.</p>	IT	P	I	R
<p>24. <u>Master Plan</u>: The study will bring together air, sea, and land connections, including links to Cairo, the Delta, Qena, Beni Suef, Riyadh and Baghdad, and provide the basis for planning transport and related investments in the 1990s. In short-term plan include recommendations for an 18-month program to clear any roadways of the old system which are still blocked by sand unless the connections are no longer of any conceivable use.</p>	PL	P	II	R
<p>25. <u>Airport improvement</u>: It is Sinai's good fortune to be extremely well endowed with airports, considering its very low current population. This advantage will be maintained and put to development use in the tourist and goods export sectors. Major airports will be surveyed to determine maintenance and modernization requirements for the expected increase and diversification in traffic.</p>	FE	P	II	R
<p>26. <u>El Qantara-B loza airport</u>: Study will select and reserve an appropriate site to provide international air service to this zone of Sinai and the Suez Canal Region.</p>	FE	NW	III	R

## G. ENERGY

### Project: Next action steps

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Rehabilitate Abu Zenima power plant</u> : A quick study is recommended to determine what it will take to rehabilitate this plant, originally commissioned in 1967, and to see if it is more economic to buy a new plant for the ferromanganese project and other demand developing in this zone.	IT	SW	I	R
2. <u>Natural gas pipeline between Bitter Lakes and Port Said</u> : In construction to make Sinai gas available to serve burgeoning demand west of the Suez Canal.	U	NW	I	N
3. <u>Ayun Musa generating plant</u> : Feasibility study initiated to consider a 600MW (initial) to 1200MW plant, based on El Maghara and/or Australian coal, which might also include desalinization. Output would be largely exported to Suez City and rapidly growing industrial areas nearby but would also provide power in adjacent zones of the Northwest and Southwest Subregions. Alternative locations will be considered, including Ayun Sukna.	U	SW	II	N
4. <u>Natural gas connections</u> : Study will determine whether Deversoir, Hamdi or some other point is best for a connection between Sinai and the Delta.	FE	NW	I	R
5. <u>Small scale wind and solar energy applications</u> : Wind in the south and in certain mountain passes can be harnessed for pumping and other productive purposes. Solar possibilities occur throughout the peninsula, and will be particularly valuable in places remote from conventional power sources. Although Sinai is energy rich with oil, gas, and coal (and possibly uranium), preparation for the post-petroleum world is recommended. Special attention will be given to monitoring results, expansion, and problems for at least the initial 5 years.	FE PP	UP SE	I II	R
6. <u>Gebel El Maghara mine-mouth plant</u> : Once it is decided to mine coal at El Maghara, consideration will be given to a mine-mouth steam-powered generator and to the question of how large a service area it could handle economically. Air cooled units are likely to be most suitable in this area where cooling water is scarce. Gifgafa, Bir El Thamada, El Hasana, El SIRR, and Gebel El Maghara irrigation are among the potential markets to be served by this electricity.	FE	NE	II	R

## G. ENERGY

Project: Next action steps	1	2	3	4
7. <u>Gas-fired generator at Abu Rudeis</u> : This feasibility study will also consider the desalinization option, given the even higher projected cost of importing Nile water. Power in this area will serve a rapidly growing community as the petroleum and other mining industries assist in building permanent communities and in the development of local supplies of both foodstuffs and industrial products.	FE	SW	II	R
8. <u>Gas-fired generator at Bir El Abd</u> : The study of this possibility will consider whether or not desalinization can be included economically, given the abundance of gas and the relatively high cost of water imported from the Nile system. The alternative of exporting gas to the Delta or foreign markets to the east will also be considered.	FE	NE	II	R
9. <u>Solar Pond Technology</u> : Lakes Bardawil and Malaha seem well suited to this newly proven technology. Even though Sinai appears rich in conventional energy sources, particularly petroleum and coal, development of solar pond techniques in situations which seem so well suited to it will be a prudent investment to prepare for the post petroleum world.	FE	NW	II	R
10. <u>Geothermal potential</u> : Hammam Faraun and Hammam Saidna Musa are two sites to be studied for geothermal potential. Los Alamos Laboratory experts in dry rock geothermal technology (still experimental) consider Sinai a most promising area for that technology when it is developed for economic use.	FE	SW	III	R
11. <u>Subregional systems</u> : Design one or more systems to serve each subregion during the interim period while loads are building up and until a more unified system (grid) emerges around the year 2000.	FE	P	II	R

## H. COMMUNITY INFRASTRUCTURE, INCLUDING HEALTH AND EDUCATION

<u>Project:</u>	<u>Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1.	<u>El Arish Master Plan:</u> Zoning and infrastructure are urgent needs in the El Arish Medina (extending roughly 20 kilometers in all directions but north. A structure plan is being prepared by Prof. Barrada for GOPP; complete plans are needed to effect modernization of the city (without losing its charm) to handle a rapidly growing population, tourist demand and the large amount of potential industry--all without disrupting the agriculture which already flourishes.	PL	NE	I	R
2.	<u>Abu Rudeis Siting and Plan:</u> Study alternative sites for a large city to replace the present Abu Rudeis-Abu Zenima sprawl, in order to make better use of land resources (for example, by preserving touristic and agricultural possibilities), to provide a more attractive and comfortable living for residents of the area (including hopefully thousands of immigrant families from Nilotic Egypt), and to encourage the growth that seems possible and desirable for this petroleum and mining center - a potential "Southwest Counterweight" to the dominance of El Arish in the Northeast. Decide site, design town for rapid growth, initiate construction in cooperatin with oil and other industries in the area.	PL	SW	II	R
3.	<u>Self-help housing program:</u> In Ismailia and many other communities worldwide, programs which emphasize self-help have proven themselves effective in encouraging people to build homes for themselves in accordance with a pattern that serves the long-term needs of the community. As settlements in Sinai expand rapidly, the Consultant recommends that Governorates emulate the Ismailia model and find ways for communities to plan and build their own futures, with technical guidance but minimal financial support for the public exchequer. Long-term (mortgage) credit and hire purchase arrangements will be fostered. Good rules of land tenure, assistance with construction, and development of local low-cost materials will also assist.	PP	P	I	R
4.	<u>Pilot villages:</u> New settlements (or neighborhoods or older towns) will be built in accordance with ecological principles believed to be correct for Southern Sinai, the coast and/or the Uplands.	PP	P	II	R

Project: Next action steps	1	2	3	4
5. <u>Secondary schools</u> : will be built centrally in every subregion and one for every 100,000 population. Technical courses, especially industry, agriculture and construction, will be emphasized.	IT	P	II, III	R
6. <u>Colleges (vocational/commercial/technical)</u> : Feasibility study, which should be associated with a government task force (so personnel can learn by doing), will stress training in technical subjects needed by the new Sinai. The required number and type of these schools (taking students after 9 grades of elementary and intermediate education) must be determined.	FE	P	I	R
7. <u>Schools</u> : Good schooling can be a positive pull factor attracting migrants. Poor schooling certainly discourages in-migration and encourages out-migration. Governorates will make every effort to ensure that schools in Sinai are at least on a par with learning opportunities in Nilotic Egypt.	IT	P	I, II, III	R
8. <u>University</u> : Detailed plans are needed to implement the concept of a Sinai University of 8,000 students by the early 1990s. Subjects like petroleum engineering, range management, marine ecology, mineral geology, and export marketing that have immediate relevance in Sinai will be emphasized. Since the ARE is expanding university places by several thousand each year, it is appropriate that Sinai be the site of one such expansion, provided it fits the overall Education Plan of the country and caters to Sinai's particular needs.	FE	P SW	II	N
9. <u>Hospitals</u> : Provide one hospital centrally in each subregion. Basic unit of the health system will be local polyclinics, at least during initial years of mainly scattered populations. Mobile units will work from hospitals and clinics.	IT	P	II	R
10. <u>Health and nutrition survey</u> : Clearer understanding of current health and nutrition conditions will assist in preliminary design of relevant food production, health services, and other basic remedial programs for the new Sinai.	GS	P	I	R

COMMUNITY INFRASTRUCTURE, INCLUDING HEALTH AND EDUCATION

(continued)

Project: Next action steps	1	2	3	4
11. <u>Sewage</u> : Major settlements (El Arish today, others in the 1990s) will require systematic treatment of sewage and solid wastes. Alternative technologies appropriate to water-scarce areas will be studied, and recommendations prepared for each settlement of over 20,000.	FE	P	I	R
12. <u>Housing building materials</u> : Each subregion will be surveyed to determine the best sources of building materials for internal subregional use and for export to neighboring subregions.	FE	P	I	R
13. <u>Brickmaking materials</u> : Most likely sources of brickmaking materials are in older terraces of south Sinai wadis, from shale near Gulf of Suez coast (Ras Sudr and Ras Misalla), Umm Bugma area, and the north end of El Qaa Plain.	FE	P	I	R
14. <u>New settlements</u> : Ten (possibly 11) new towns are foreseen in the Recommended Strategy. First, sites must be selected; later town plans will be drawn up consistent with each town's proposed function. Then plans for each settlement will be laid out--initially, a core around which significant expansion will occur; later, a much larger area will be needed to absorb the continually expanding functions and population. An organization is needed to handle the formidable load of new town planning and at the same time to assist more settled communities prepare for rapid growth. A very rapid expansion of population is foreseen for Sinai, much of it in towns and cities. Regional or governorate authorities must have their own staff capacity to handle this work.	PL	P	II	R
15. <u>Settlement plans</u> : Can be scaled for year 2020 "optimum" population, maximum productive output and minimum ecological damage but only built or upgraded for a lower population by the year 2000 and until the actual population increase is seen to exceed projections.	PL	P	II, III	R
16. <u>Sites for Hamdi East (new town)</u> : One of several sites to be identified for new towns in Sinai.	PL	NW	II	R
17. <u>Site for Firdan-East (new town)</u> : One of several sites to be identified for new towns in Sinai.	PL	NW	III	R

## COMMUNITY INFRASTRUCTURE, INCLUDING HEALTH AND EDUCATION

(continued)

Project: Next action steps	1	2	3	4
18. <u>Sarabit El Khadim</u> : Preliminary design sufficient for land reservation and other zoning initially. Later more detailed plans to expand economic activity in this area and make the ancient site readily available to tourists.	PL	SW	II	R
19. <u>Larger Ras Taba area</u> : It is recommended that extraordinary efforts be made to develop Ras Taba as a hinge between SE and UP subregions. A comprehensive study will be useful to bring together various elements already suggested-- harbor to south, industrial zone on a plateau to the northwest, civilian (including industrial) use of Ras Naqb airport, ferry service to Jordan and other neighboring countries, influence of Hadj road - potential vs. probable.	PL	SE UP	III	R
20. <u>El Tor</u> : General town plan for the capital of the South Sinai Governorate. Also site selection for two or three beach and coral sites that can be developed for tourism.	PL	SW	I	R
21. <u>Functions of hinge settlements</u> : Towns like Ras Taba, El Arish, El Qantara, and Ras Sudr play a hinge role in the settlement pattern. More detailed understanding of their functions is needed as a guide to planning their further growth.	PL	P	II	R
22. <u>Southeast Subregion</u> : Study will focus on (a) ways to integrate both boom conditions in Aqaba (Jordan) and (b) designing a new settlement to accommodate a large increase in tourists and residents despite the scarcity of flat land.	PL	SE	II	R

# I. LAND USE MANAGEMENT

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Land Development Program</u> : Land development programs in other rapidly growing economies such as Korea have proved to be a powerful means of rationalizing land-use and bringing revenue to local authorities. Early launching of such a program in Sinai will be very valuable, given the rapid increase in population and economic activity that is planned. It will be especially important to reserve land for tourism, agriculture, and industry, thinking in terms of the year 2000 and beyond, rather than the more immediate future.	IT	P	I	R
2. <u>Dualing Suez Canal</u> : When plans of the Suez Canal Authority are finalized, it will be possible to incorporate the needs of this important national (and international) project into physical plans for the Northwest, which is projected to be the most rapidly growing Subregion of Sinai in terms of population.	U	NW	II	N
3. <u>Ayun Musa and Bitter Lakes</u> : Set aside land for domestic tourism. Plant and maintain trees in those areas. For Bitter Lakes develop a comprehensive plan, including a recreational marina.	IT	NW	I	R
4. <u>El Shatt and Qantara</u> : Set aside ample land for industry. Establish guidelines to control air and water pollution.	IT	NW	I	R
5. <u>El Arish and Sheikh Zuwayid</u> : Set aside land for tourism, industry, and agriculture.	IT	NE	I	R
6. <u>Bir El Abd</u> : Set aside land for industry.	IT	NE	I	R
7. <u>Romana</u> : Set aside land for tourism.	IT	NE	I	R
8. <u>Ras Misalla, between Ras Sudr and Abu Zenima, near El Tor, St. Catherine, and Sarabit El Khadim</u> : Set aside land for tourism.	IT	SW	I	R
9. <u>Mountain Conservation Zone</u> : Establish for the area above 1000 meters above sea level. Also establish conservation areas around Gebel El Maghara and El Tih/El Iqma Plateaus.	IT	SW SE UP	I	R
10. <u>Ras Mohammad coastline</u> : Establish conservation zone both onshore and offshore. Ditto beach and coral to the north.	IT	SE SW	I	R
11. <u>Wildlife and bird sanctuary at Lake Bardawil</u> : Establish and maintain sanctuary needed during annual migrations. Encourage appropriate tourist facilities.	PP	NE	I	R

Project: Next action steps	1	2	3	4
12. <u>Settlement site selection</u> : Ten or more new settlements and much rapid expansion of existing townsites are foreseen in the Recommended Strategy. A review of the proposed pattern of dispersed settlement in four or five different "urban design zones" and the criteria for siting modern settlements with multiple functions, including industry, will be followed by studies to identify specific alternatives, to compare them and to recommend actions needed to care for a year 2000 population of one million. Current settlements of the Uplands will give clues regarding characteristics most likely to be associated with success there.	GS	P	I	R
13. <u>Comprehensive environmental management plan</u> : Revegetation, pollution control, dune management, cloud-seeding, conservation of coral, flora, fauna and historic monuments and related concerns will be brought together under a single organization, or at least coordinated; protection against degradation and active programs to enhance the environment will require full-time attention of a directorate within a more general development agency or as a separate entity. Monitoring environmental change will also be handled by this organization, working closely with water management authorities where their responsibilities overlap, recognizing that environmental management in Sinai will be very different, because its ecology is different, from policies and procedures for Nilotic Egypt. Remote sensing technology may assist in monitoring environmental changes.	PL	P	I	R
14. <u>Sand dune intrusion</u> : Study and experiment with options to defend roads, agricultural lands, settlements and other places against drifting sand.	PP	P	I	R

Project: <u>Next action steps</u>	1	2	3	4
15. <u>Windbreaks and agroforestry</u> : Plant and maintain trees, partly as windbreaks, partly for erosion control. Coordinate with watershed management and similar projects. Determine how to tap deep aquifer after rooting started with Nile water. Study all possibilities for microclimate improvements.	PP	P	I	R
16. <u>Mangrove forests</u> : Clean up, maintain, and expand.	IT	SE	I	R
17. <u>Coastal surveys</u> : In addition to immediate remedial and protective measures a careful survey of coasts will be conducted to determine best beach resort areas, possible port and harbor sites, wave erosion or pollution problems and to prepare at least a preliminary Master Plan.	GS, PL	P (except UP)	I	R
18. <u>Revegetation in interdunal areas</u> : Experiment using both indigenous and imported plants to reverse desertification trends of recent generations. Coordinate with other programs to make good use of ground and surface water for conservation purposes.	PP	P	I	R
19. <u>Indigenous vegetation</u> : Study potential for better developmental use, perhaps after varietal improvement, of indigenous flora. Consider medicinal plants, already inventoried by the Suez Canal University studies.	GS	P	I	R
20. <u>Hazardous waste disposal</u> : Identify sites suitable for hazardous waste disposal, including imported waste as a distant possibility.	FE	NW	I	R
21. <u>Halophytic forestry</u> : Introduce and cultivate trees, shrubs and grasses that thrive in salty environments (includes expansion of mangroves per item 16 above).	GS PP	P	II	R

## J. GENERAL POLICIES

<u>Project: Next action steps</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. <u>Establish planning and executive agency with sufficiently comprehensive powers:</u> A new management system will be required to execute projects supporting a revolutionary transformation of socio-economic life and a large population, composed mainly of Nilotic Egyptians.	IT	P	I	N, R
2. <u>Evaluate and adopt the Recommended Strategy:</u> A strategic framework is essential for making decisions about individual projects, to ensure consistency with the nation's long-term goals for Sinai, to screen out off-target activities, and to maximize complementarities.	IT	P	I	N
3. <u>Draw up an implementation plan:</u> Emphasis on (a) manpower, (b) information, (c) budget and (d) facilities.	PL	P	I	N, R
4. <u>Information facility:</u> An information center with all research data, newspaper articles, etc. on Sinai will be established. Some commonly referenced files can be computerized within a year or two to facilitate up-dating and further planning studies.	IT	P	I	R
5. <u>Immigration program:</u> Information centers will be established in source governorates; reception centers will be established in major centers best able to receive immigrants. Initial experience through pilot projects will yield valuable inputs for use in fashioning the more comprehensive and more aggressive program needed to achieve Phase II and Phase III targets.	IT, PP, PL	P	I	R
6. <u>Manpower plans:</u> Once a strategy is adopted as the framework for medium-term development, its manpower implications will be analysed more precisely. Emphasis will be on determining which skills will be most needed, how to recruit and/or train for them, and what arrangements will encourage providing them by means of permanent settlers rather than temporary workers.				
7. <u>Sample surveys:</u> Continuous surveys will be conducted to track a number of social and economic phenomena, especially demographic trends.	GS	P	II, R III	

GENERAL POLICIES (continued)

Project: Next action steps	1	2	3	4
<p>8. <u>Development review conference in 1990/91:</u>            Major review of Strategy and its plans (a) to adjust course, if necessary, and (b) to get ready for the next Phase of development. Before the 1992/93-96/97 Plan is formulated a major review of the Strategy will permit incorporation of lessons of the 1980s and whatever adjustments seem advisable to avoid either over- or under-building in Phase III, when a large percentage of all Recommended Strategy investment is scheduled to take place.</p>	PL	P	I, R II	R
<p>9. <u>Internal/External migration patterns and manpower programs:</u> A study of experience elsewhere will yield valuable information on how to avoid errors in the design of migration programs. Migration patterns must be clearly understood by development managers in Sinai. Migration trends relevant to Sinai and for ARE generally should be monitored closely to prevent problems that could affect achievement of national goals for Sinai.</p>	GS	P	I	N
<p>10. <u>Food Security:</u> Prepare and adopt a comprehensive plan covering storage and distribution as well as production and nutritional health programs to make Sinai self-sufficient in perishables and a net-exporter of foodstuffs (selling more specialty items than the food grains and other bulk commodities it must buy). The proper combination of modern agriculture and animal/fish husbandry will require a different strategy than Nilotic Egypt, aimed at increasing peninsular self-reliance and contributing to national food security.</p>	GS	P	II	R

APPENDIX C  
SINAI'S FIVE SUBREGIONS

To assist the 1983 land capability study, Sinai was analyzed in terms of subregions, based largely on groups of watersheds but also considering other land features. At an early stage in the analysis, four subregions were considered, one facing each coast; much of the statistical analysis was completed in terms of these four subregions. Later, on advice of the Steering Committee and greatly to the benefit of the final strategy, the Consultant split the original Northeastern (or Mediterranean) subregion, so that the Uplands area (defined mainly by the Upper El Arish Basin) became the fifth subregion and the Northeast subregion was limited to lower elevations along the coast.

These subregional divisions are used to assist the analysis of Sinai's resources and the formulation of spatial plans for development of the Peninsula. Subregions do not have and are not intended to have administrative significance, even though there is some rough correspondence between these subregions and governorate boundaries. Much of the Northwest subregion is administratively the responsibility of the Canal Governorates (Suez, Ismailia, and Port Said); all of the Northeast subregion and much of the Uplands is administratively the responsibility of the North Sinai Governorate; and the Southwest and Southeast subregions are included along with the southern triangle of the Uplands subregion in the South Sinai Governorate (see Figure E.2).

In the text of some supporting volumes of this Report there are a few passages, drafted relatively early in 1983 and including the initial analysis of "three alternative development strategies", which refer to only four subregions. Even then, however, the Northeast subregion was divided into Uplands and Coastal zones; as noted earlier, what was referred to initially as "Northeast-Uplands" was later promoted to subregional status for the final synthesis and presentation of a Recommended Strategy.

1.0 SUMMARY OF FINDINGS

Sinai is a large and diverse region--about 61,000 square kilometers of broad plains and high mountains with Mediterranean to tropical, arid climates. The Sinai region is unified by its boundaries (three seas, a busy Canal and an international border) rather than by its elements or internal geography. Each of the subregions has been defined in terms of watersheds, settlements, roads, ports, climate, topography, geology, vegetation, soils, water resources, energy, population, economic activities, cultural or natural sights, and ecologically sensitive areas.

North and south, east and west are sharply and widely divided by high, barely penetrable mountains, and diverse climates. The eastern portion of the Mediterranean Coast supports over 50 persons per square kilometer. In the vast Uplands there is less than one person per square kilometer. Less than 5 percent of the Southeast is relatively flat land, whereas most of the Uplands plateau is flat or rolling. Within a half hour's drive in the south the climate changes from tropical to temperate.

As is clear in the subregional descriptions which follow, the high central mountains divide Sinai into five quite different subregions, and its geological heritage has endowed each subregion with a distinct set of develop-

ment potentials. Therefore, a strategy for the development of Sinai will be a composite of what initially are five separate, albeit complementary, development strategies.

## 2.0 THE SUBREGIONS

The following sections describe the subregions in terms of their estimated population and known resources as of the early 1980's, suggesting major opportunities for development, including several of the possibilities which are incorporated in the Recommended Strategy.

The approximate areas and populations of the subregions are as follows:

<u>Subregion</u>	<u>Approximate area</u>		<u>Estimated population</u>	
	(000 km <sup>2</sup> )	(Percent)	(000)	(Percent)
Total Sinai	<u>61.0</u>	<u>100.0</u>	<u>171.9</u>	<u>100.0</u>
Northwest	6.7	10.9	14.4	8.4
Northeast	6.3	10.3	117.4	68.3
Uplands	25.3	41.6	19.2	11.2
Southwest	12.8	21.0	17.8	10.3
Southeast	9.9	16.2	3.1	1.8

### 2.1 Northwest (Suez Canal) Subregion

#### Area

Approximately 6,656 square kilometers (10.9 percent of Sinai), including Lake Malaha, Lake Timsah, Bitter Lake, and Little Bitter Lake.

#### Settlements

North (Port Said Governorate): El Qantara, Gilbana, Balozza and a new community planned at El Tina. Central (Ismailia Governorate): New Mit Abul Kom and a new community at Firdan-East. South (Suez Governorate): New communities at Ayun Musa/El Shatt and Hamdi-East.

#### Estimated Population

14,429 (2.2 per square kilometer).

#### Climate

There is more rainfall in the north and more wind in the south. Rainfall varies from 60 to 30 millimeters per year from Port Said to Suez. Summer temperatures are moderate on the Mediterranean Coast and hot on the Gulf of Suez. The mean maximum July temperature is 30 to 35°C; the January mean is 15 to 20°C. Overall the climate is harsh but the abundant coastlines in all zones offer some relief.

#### Landscape and Minerals

The entire east bank of the Suez Canal is bordered by a flat, mostly sandy plain extending back 10 to 20 kilometers; about 40 percent of the area is below 100 meters elevation. Along the eastern border are steep slopes

including the famous Sinai passes--Mitla, Giddi, and Khatmia. North of Ismailia/Firdan and southeast of Hamdi there are extensive moving dunes from 5 to 15 kilometers east of the Canal to the hills.

Natural gas has been found east of the Bitter Lakes and it seems likely that more will be found at the Mediterranean coast. There is some coal in thin veins near Ayun Musa. Building material resources are on the eastern border, whereas the development potentials are in the west.

### Soils and Water

Soils with good to fair potential for irrigated agriculture are found scattered throughout the 150 kilometer stretch from Lake Malaha to Ras Misalla, south of Ayun Musa. There is less groundwater available in the Northwest than in any other subregion in Sinai, and it is not near the better soils. Nevertheless, the famous springs at Ayun Musa (like the shallow wells in Ras Misalla) could support the domestic needs of a population of a few thousand, as can the shallow aquifer near Baloza. Surface water potentials are minimal due to the flat landscape and porous soils.

### Flora and Fauna

Lake Malaha is famous for flamingos and other migrating birds. The most common indigenous animals are rodents and small reptiles. Fox and antelope are present but scarce. The most famous plants are the palms of Ayun Musa. Vegetation is sparse throughout the subregion and particularly in the dunes.

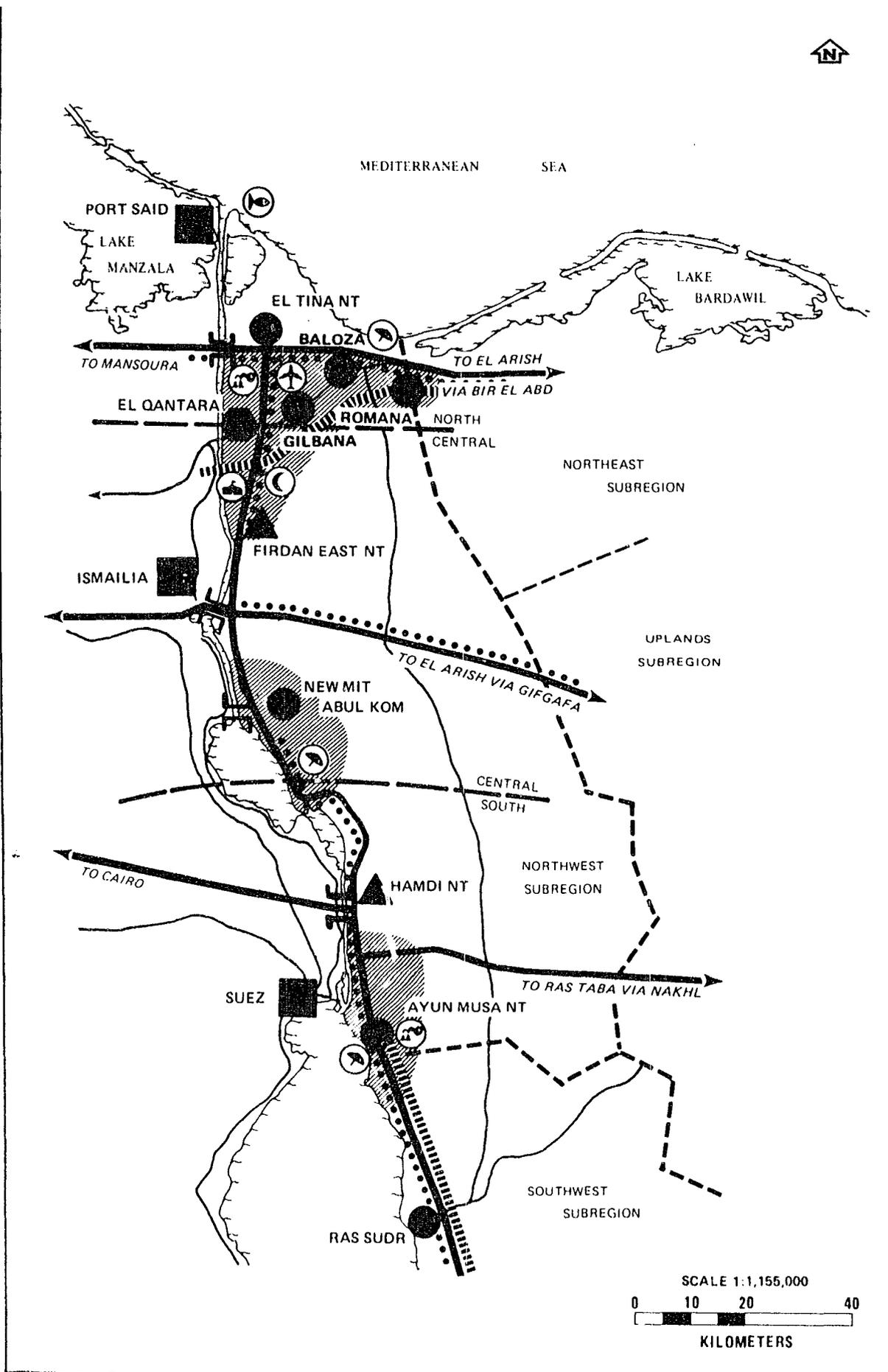
### Infrastructure

One of the seven wonders of the modern world (the Suez Canal) dominates the subregion's infrastructure. Second in importance is the recently completed, two-kilometer Hamdi Tunnel, near Suez. The highway from El Qantara to Ras Misalla (120 kilometers) was mostly in poor repair in 1981 but has since been improved greatly. There are siphons under the Canal at El Qantara and Deversoir, and water is also piped through the Hamdi Tunnel. There is a hospital at El Qantara but no other major institution.

### Economic Activities

El Qantara is being relocated and rebuilt. Baloza is expanding rapidly as the Northeast economy reorients from east to west. Irrigated agriculture east of the Bitter Lakes, started in 1965, is expanding rapidly from only a few hundred feddans to 30,000. Modern economic activity is more or less limited to these two locations; grazing continues in the eastern hills and among the dunes.

Development potential (illustrated in Figure C.1) is dominated by irrigation. Proposed developments would improve land in order to provide agricultural produce to rapidly expanding Canal cities and other markets in Nilotic Egypt as well as to new holiday villages recommended in coastal sites in or near this subregion. As the Gateway to Sinai and the east bank of the Suez Canal, the Northwest subregion has a secure future.



For legend to map, see Figure C.6, Page C.15

**FIGURE C.1**  
**RECOMMENDED STRATEGY:**  
**NORTHWEST SUBREGION**  
**SPATIAL HIERARCHY AND LINKAGES**

## 2.2 Northeast (Mediterranean) Subregion

### Area

Approximately 6,254 square kilometers (10.3 percent of Sinai).

### Settlements

West: Romana, Rabaa, Negila, Bir El Abd, and El Mazar.

East: El Arish, Sheikh Zuwayid, Rafah, and Abu Aweigila.

### Estimated Population

117,425 (18.8 per square kilometer in the subregion as a whole and over 50 per square kilometer in the El Arish - Rafah Strip).

### Climate

The climate is Mediterranean, cooler in summer and warmer in winter than the rest of Sinai. Mean annual rainfall varies from about 60 to over 300 millimeters between Romana and Rafah. There is some cloud cover on more than two-thirds of the days in winter and spring; the summer is clear and dry.

### Landscape and Minerals

The coastal plain is characterized by vast sandy beaches, sandy plains, and areas of both moving and fixed dunes. The dunes are more likely to be moving in the western drier portion of the plain. Coastal Lake Bardawil is shallow. It stretches for about 76 kilometers, and its maximum width is 20 kilometers; the submerged portion covers about 640 square kilometers.

There is oil/gas near Lake Bardawil and sulfur near Sheikh Zuwayid.

### Soils and Water

Soils rated "good" for irrigated agriculture are found in the eastern zone in lower Wadi El Arish and in a strip along the coast from El Arish to Rafah. The soils in the western zone are of lesser quality, the better ones being primarily aeolian sand sheet.

Along the entire coast and lower Wadi El Arish, life depends on the shallow Quaternary aquifer. There is evidence that it is being over-pumped at present. The soils suitable for agriculture far exceed the available water for irrigation. Some Nile water has been trucked in for household use in recent years; a major new pipeline to Bir El Abd was completed in 1983 and other pipelines are under construction.

### Flora and Fauna

Along the entire coast are sand dunes and salt marsh vegetation, which becomes quite dense in the eastern quarter. Behind this there is grassy vegetation east of El Arish.

Lake Bardawil is a major fishery and a resting place for migrating birds.

## Infrastructure

There are airports with 747 capacity at El Arish and El Jura (south of Sheikh Zuwayid), and an airstrip at Bir El Abd. A small port is under construction at El Arish. The coastal highway generally is kept in good repair. El Arish has a variety of service facilities appropriate to a city in the 50,000-100,000 class. About three-quarters of Sinai's scarce telephones and two-thirds of its very limited electricity were accounted for by El Arish in 1981.

## Economic Activities

With more than two-thirds of Sinai's population, the Mediterranean coast has a complex and rapidly changing economy: irrigated agriculture, grazing, fishing, tourism, small-scale manufacturing, and orcharding. There was some economic growth during the 1970's, based on Israeli markets; this resulted in a situation of some economic dislocation in the early 1980's. The proposed pattern of development is illustrated in Figure C.2.

### 2.3 Uplands Subregion

#### Area

Approximately 25,376 square kilometers (41.6 percent of Sinai).

#### Settlements

West Zone: Gifgafa, Bir El Thamada and a new community at El Maghara.

East Zone: El Hasana (probably relocated to a new site nearby), El Kuntilla, El Themed, Nakhl, and new communities at El Sirr, and El Quseima.

#### Estimated Population

19,238 (0.8 per square kilometer).

#### Climate

The eastern Uplands, including El Quseima and El Kuntilla, have a considerably higher rainfall (from 60 to 20 millimeters) than the west near Gifgafa and Bir El Thamada. Rainfall is higher at higher elevations such as Gebels El Maghara and Hallal. Both summer and winter temperatures are lower than on the coastal plains at Ayun Musa or Ras Taba. The mean temperature in July is 30°C; in January the mean is 15°C.

#### Landscape and Minerals

The Uplands are mainly above 300 meters and reach over 1,000 meters at El Igma in the south. The terrain is mostly rolling with inselbergs near the north. The central plateau is an area of shifting dunes, deep erosion, and wide wadi beds. Development potential is illustrated in Figure C.3.

The Uplands minerals include coal at Gebel El Maghara and iron at Gebel Hallal. The iron ore has not been found to be economic to date.

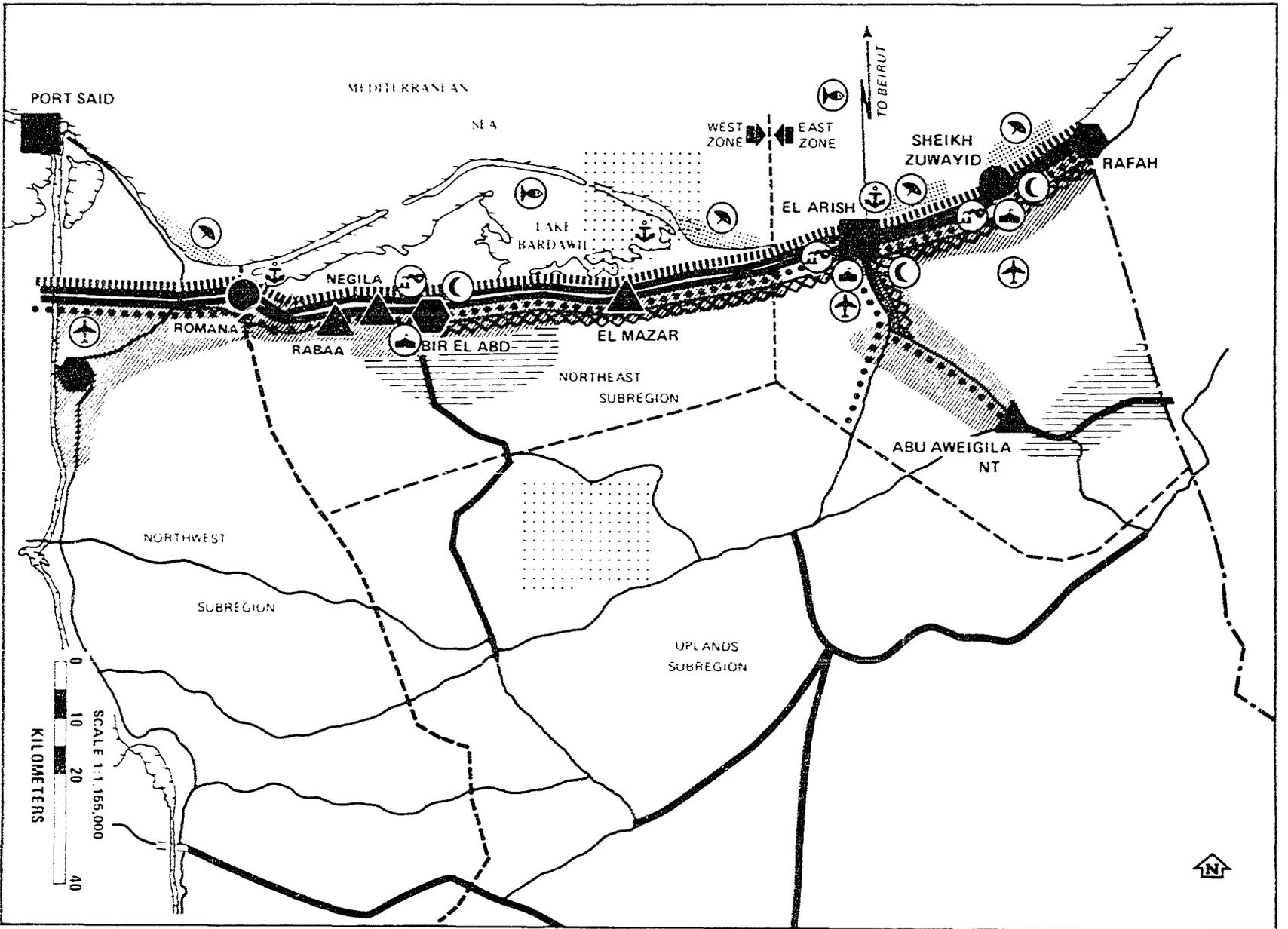


FIGURE C.2  
 RECOMMENDED STRATEGY:  
 NORTHEAST SUBREGION  
 SPATIAL HIERARCHY AND LINKAGES

For legend to map, see Figure C.6, Page C.15

## Soils and Water

Upland soils are rated "good" for agriculture along major wadi channels and "fair" in some lesser wadis.

There is a considerable potential for capture of runoff water by dams and dikes. Existing dams have a mixed, generally disappointing history; cases of siltation and washout are common. More detailed study and planning is indicated.

There are shallow aquifers in some wadis but the quantities of water are not substantial. More substantial quantities are available in deep aquifers, which would involve quite high costs for pumping. Overall, there is much more potential in the soils than there is in the water of the Uplands.

## Flora and Fauna

There are unique flora and fauna ecologies on the northern inselbergs and the high southern plateaus; it is recommended that these be conserved for future generations without limiting current economic development potential.

## Infrastructure

The Uplands has one major airport, Ras El Naqb, at its southeastern corner. There are smaller airfields at Gifgafa and Bir El Thamada. There are good highways from El Arish to El Quseima, El Hasana, and Gifgafa and from Bir El Thamada to Ras Sudr, and Gifgafa/Gebel El Maghara. Greatly improved roads are planned near the eastern border from El Quseima through El Kuntilla to Ras El Naqb and across the center from Nakh1 to Ras El Naqb. Settlements in the Uplands subregion survive on their own wells, and a few have their own electrical power plants.

## Economic Activities

The current economy is dominated by grazing with strong support from "dry" or rainfed agriculture (dates, olives, and barley). The Uplands subregion has a stable, ancient economic base that can be enhanced. It is lightly settled (less than one person per square kilometer) and is at present a barrier to the linking of North, South, East, and West Sinai, since roads and telecommunications do not continue through it in good condition. Interpretation of satellite photography tells us that overgrazing has recently been most common close to the border with Israel. While settlements in the Uplands have some vacant structures, construction of new community facilities, such as schools, clinics, and civil-service housing, is urgently needed and has been initiated.

The economic potential of the Uplands is similar to that for any unexceptional arid zone--a rural development theme with exceptions for exploitation of Gebel El Maghara coal, promotion of mountain tourism (serving the Canal cities barely an hour's drive away), and provision communications services (especially along the Hadj or trans-Arab highway from Suez to the Gulf of Aqabah).

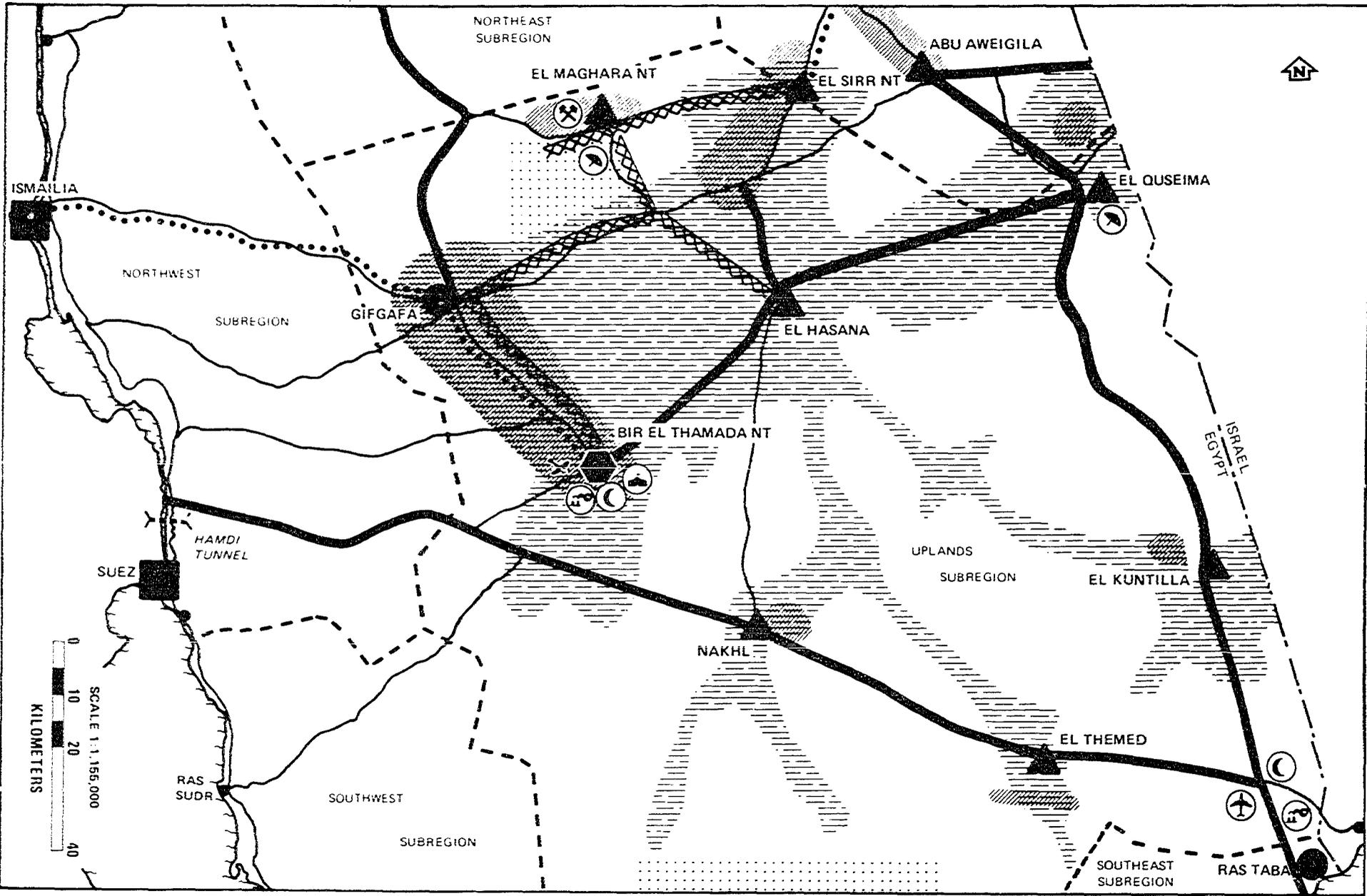


FIGURE C.3

RECOMMENDED STRATEGY:  
UPLANDS SUBREGION  
SPATIAL HIERARCHY AND LINKAGES

For legend to map, see Figure C.6, Page C.15

## 2.4 Southwest (Gulf of Suez) Subregion

### Area

Approximately 12,826 square kilometers (21.0 percent of Sinai).

### Settlements

North: Ras Sudr, Abu Zenima, and Abu Rudeis.

South: St. Catherine, Feiran Oasis, and El Tor.

### Estimated Population

17,808 (1.4 per square kilometer).

### Climate

There are two distinct climates: dry, tropical coastal plain and temperate mountain climate. The mean temperatures in July are 35°C on the coast and 20°C in the mountains; in January, 20°C on the coast and 5°C in the mountains. The coast is windy, both seasonally and daily, providing good wind energy opportunities and occasional sandstorms.

### Landscape and Minerals

About 16 percent of the area is on the coastal plain. The mountains soar to 2,500 meters at Gebel Musa. Coral reefs parallel much of the coast and extend westwards across the Gulf from Ras Mohammad towards Hurghada.

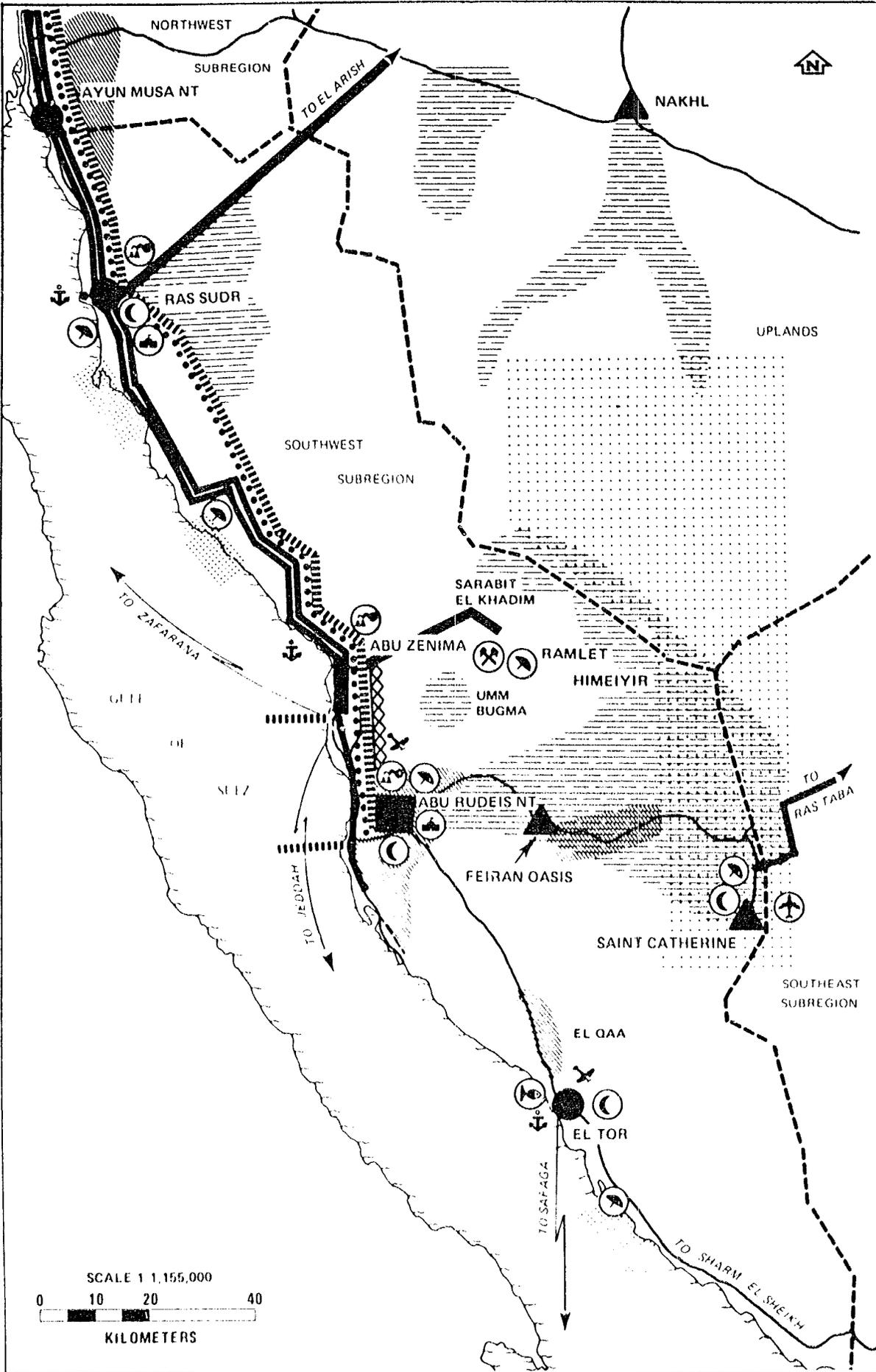
This subregion is a warehouse of mineral deposits. Petroleum is providing export earnings for Egypt, and gas is also available for further exploitation. The area is rich in gypsum and may have potash and phosphate. Manganese, kaolin, turquoise, and glass sand have been mined. There are also small deposits of copper, sulfur and other minerals. (Figure C.4)

### Soils and Water

The coastal plain and the larger wadis have some soils that are suitable for irrigation. On the El Qaa Plain these coincide with a shallow aquifer. Therefore, it can be said that the soils of the Southwest are better in the south. Near Abu Rudeis, where water has been delivered by ship, there is good groundwater which could be used to irrigate a narrow plain with adequate soils for some crops. Agriculture is also practical near Ras Sudr, despite a high water table, and in several other locations.

### Flora and Fauna

The coral off the coast is being damaged by oil pollution; there are already some dead coral reefs near Suez. The coast at Abu Rudeis has a serious infection of urban sprawl. St. Catherine will soon be overcrowded. Pharaonic remains at Wadi Maghara have recently been spoiled and more are being damaged at Sarabit El Khadim. The rich natural and cultural heritage of this subregion is under stress and needs protection.



For legend to map, see Figure C.6, Page C.15

**FIGURE C.4**  
**RECOMMENDED STRATEGY:**  
**SOUTHWEST SUBREGION**  
**SPATIAL HIERARCHY AND LINKAGES**

## Infrastructure

There are small seaports at Ras Sudr, Abu Zenima, Abu Rudeis and El Tor, and airstrips at Abu Rudeis and El Tor. The coastal highway is first class, as are the roads from Abu Rudeis to St. Catherine and from Ras Sudr to Bir El Thamada. Social infrastructure includes three hospitals and a secondary school.

## Economic Activities

Petroleum extraction dominates the economy. Next in line is tourism, focused on St. Catherine. Bedouin life goes on in the hills, based on grazing and limited groundwater irrigation, especially in the wadis. Mining activity (for example, kaolin, glass sand, and turquoise) is growing, and there is some fishing in the Gulf.

In a world growing short of minerals the potentials for the Southwest subregion are good in all major sectors, if and when the subregion receives an adequate supply of fresh water. The first major pipeline (through the Hamdi tunnel) is planned mainly to bring drinking water as far south as Abu Rudeis.

### 2.5 Southeast (Gulf of Aqabah) Subregion

#### Area

Approximately 9,895 square kilometers (16.2 percent of Sinai).

#### Settlements

North: Ras Taba and Nuweiba.

South: Dahab, Nebq and Sharm El Sheikh.

#### Estimated Population

3,100 (0.3 per square kilometer).

#### Climate

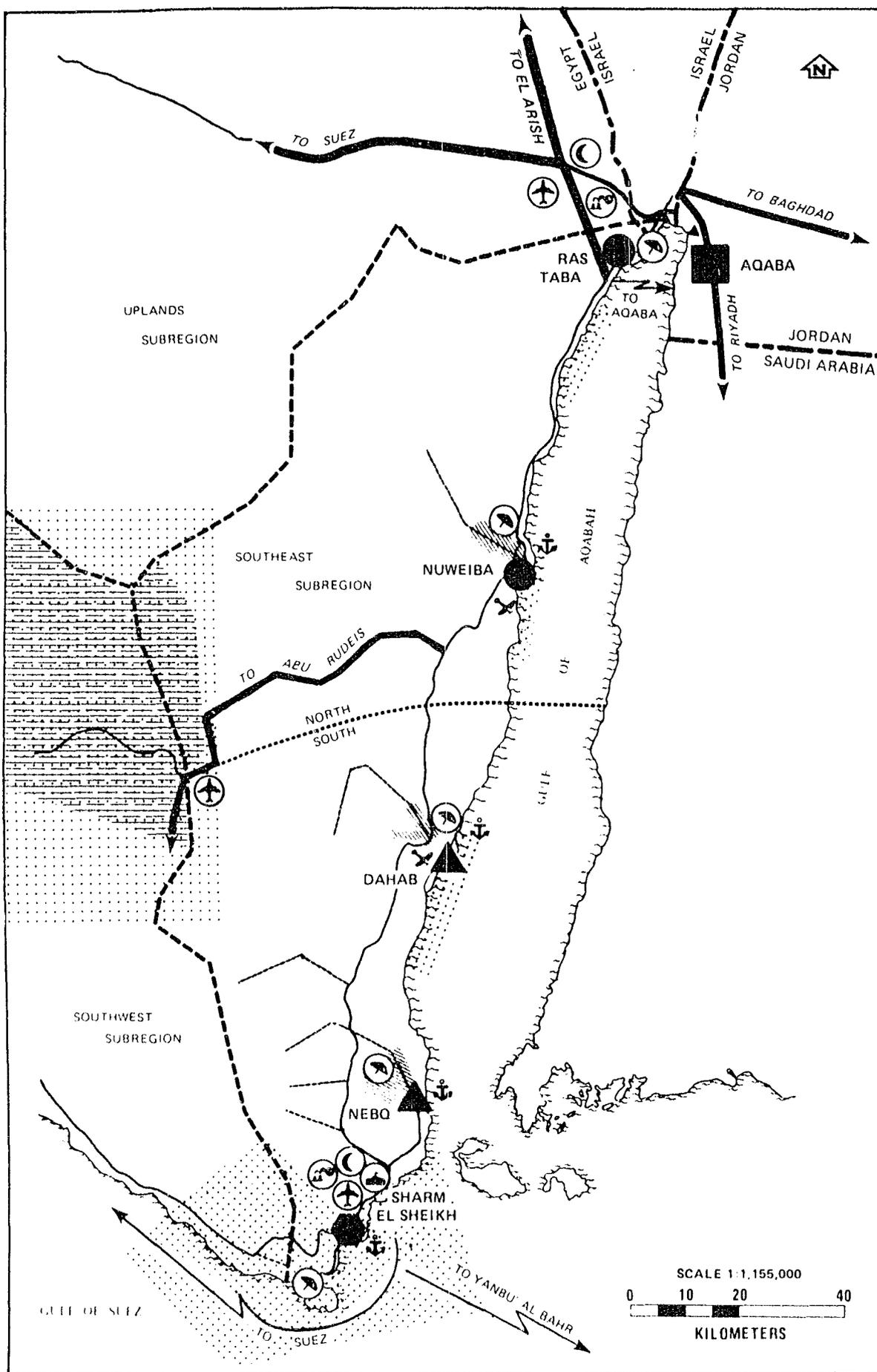
The Southeast subregion has two climates, tropical coastal and temperate mountain. The mean temperatures in July are 30°C on the coast and 20°C in the mountains; in January, 20°C on the coast and 5°C in the mountains. The climate is pleasant, particularly in winter along the coast.

#### Landscape and Minerals

About 5 percent of the subregion is flat land along the 230-kilometer coast, much of it between Sharm El Sheikh and Nebq. The mountains soar to over 2,600 meters and plunge 1,800 meters into the depths of the Gulf, past coral reefs of a world class. There are potash deposits in the south and phosphates in the north. Development potential is illustrated in Figure C.5.

#### Soils and Water

There are coarse, irrigable soils in a few small wadis and on the small coastal plain near Sharm El Sheikh. There are also deep aquifers with good quality water; however, the amounts are not likely to be enough for even the few hundred feddans of agricultural soil. Tourism and light manufacturing can



For legend to map, see Figure C.6, Page C.15

**FIGURE C.5**  
**RECOMMENDED STRATEGY:**  
**SOUTHEAST SUBREGION**  
**SPATIAL HIERARCHY AND LINKAGES**

be partially provided for; desalinization projects to provide supplementary supplies have been initiated.

### Flora and Fauna

The coral and mangrove swamps off the shore are critical to the survival of the ecology and the tourist trade.

### Infrastructure

There is a good highway from north to south, large airports at Sharm El Sheikh and Ras Taba, and small-boat ports at Nebq and Sharm El Sheikh.

### Economic Activities

Beach tourism is well established. In addition there is some grazing and horticulture. There is a potential for much more winter tourism, a bit of fishing (Gulf of Aqabah and Red Sea), and intensive (greenhouse) agriculture. At Ras Taba a terminus of the Hadj or trans-Arab highway will generate much additional economic activity. The main cultural attraction is Gezira Faraun near Ras Taba--a coral island with Crusader and Mameluke ruins. Sharm El Sheikh seems likely to be a center for tourism, administration, and defense.

Development in the Southeast will be constrained by the lack of good flatland. The development strength of the subregion is in its location close to Saudi Arabia, its good winter climate, and the terrestrial and marine scenery.



Growth Pole



Growth Point



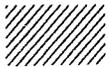
Service Center



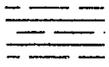
Market Center

NT

New Town (or Location)



Irrigated Agriculture



Primary Grazing



Nature Conservation



Beach Area

Note: In many areas, grazing overlaps with either irrigated agriculture or nature conservation.



Dual Highway



Improved Highway



Nile Water Conveyance



Natural Gas Conduit



Electric Distribution



Existing Road



International Boundary



Subregion Boundary



Zonal Boundary



Higher Technical Education



Airport (747 Capacity)



Airfield



Fishing Center



Industrial Center



Mining Concentration



Major Hospital



Small Port



Jetty for Small Boats



Tourist Center

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