

of these systems, and construction of new systems to meet the present and projected future needs of the increasing population and a higher standard of living.

Water supply systems for new communities are of prime importance and water resources are to be considered carefully when deciding the sites of such communities. Ground water sources when available as potable water are by far more economic than surface water or saline water sources. Studies and research works are to be continued to define the potential of ground water resources outside the Nile Valley and in Greater Cairo Area.

### 3.6 Present situation of Potable water Supply Systems.

For many years, public utilities did not get a reasonable share for financing the necessary operation and maintenance costs, or making extensions and new projects to cope with the demand of the increasing population every where in the country especially in large cities.

Recently special attention has been given to public utilities, especially to water supply. International and American consultants in association with Egyptian consultants, were invited by the Ministry of Reconstruction & Housing to make master Plan studies for many important water supply systems.

These studies covered Greater Cairo, Alexandria, the Suez Canal Cities, the Provincial Water Supply project including detailed study for Kafr El Sheigh and Behera governorates. These studies generally gave a full description of the existing facilities, identified deficiencies and recommended required works for rehabilitation, renewal, or extension to meet the present requirements to be included in the immediate phase program, and new staged development works to meet the requirements to year 2000.

These studies included also financial analysis and estimates of capital costs needed for implementation of the development programs recommended.

In addition to these studies, other studies have been carried dealing with the new cities. Copies of these studies are presented.

#### 4. Environment Control Measures

Environment control in new cities has been carried out through planning schemes. The location of heavy and polluting industries is taken care of within the environmental implications.



The study of climate and its requirements is reflected in the urban design of the cities. Environment matrix is developed to check any future project to know to what extent it affects the environment. Methods of environment control are recommended in the master plans.

In existing cities, health control measures carried out with respect to air, water, sewage disposal, industries, chimneys and others. However, we believe, that these measures are not carried efficiently. More action is needed.

#### 5. Summary & Recommendations.

In the field of Potable water supply in Egypt a big effort has been recently done on the way of identifying the problems and planning to solve these problems.

Through the technical and financial studies completed, the studies in progress, and those that are to be carried in addition, certain recommendation could be made. Such recommendations identified works needed for rehabilitation , upgrading, extensions of existing water supply systems, and construction of new systems to meet the present demands and the projected future demands up to the year 2000. Construction

stage schedules for the recommended programs for the immediate phase are given in the water works master plan studies.

In addition to these programs, recommendations mainly included :

- \* Water conservation program to minimise wastage of water consumption especially through consumers operation and maintenance operation.
- \* Incentive salaries to create and help to encourage trained personnel to continue their career in the water supply field completion ground water studies especially in the Western and Eastern Deserts, in Sinai and in Greater Cairo areas, to define the potential and availability of potable ground water at economic levels in these areas.














These programs are to be included and financed in the National plan to guarantee meeting the present needs and the projected future demands up to the year 2000.

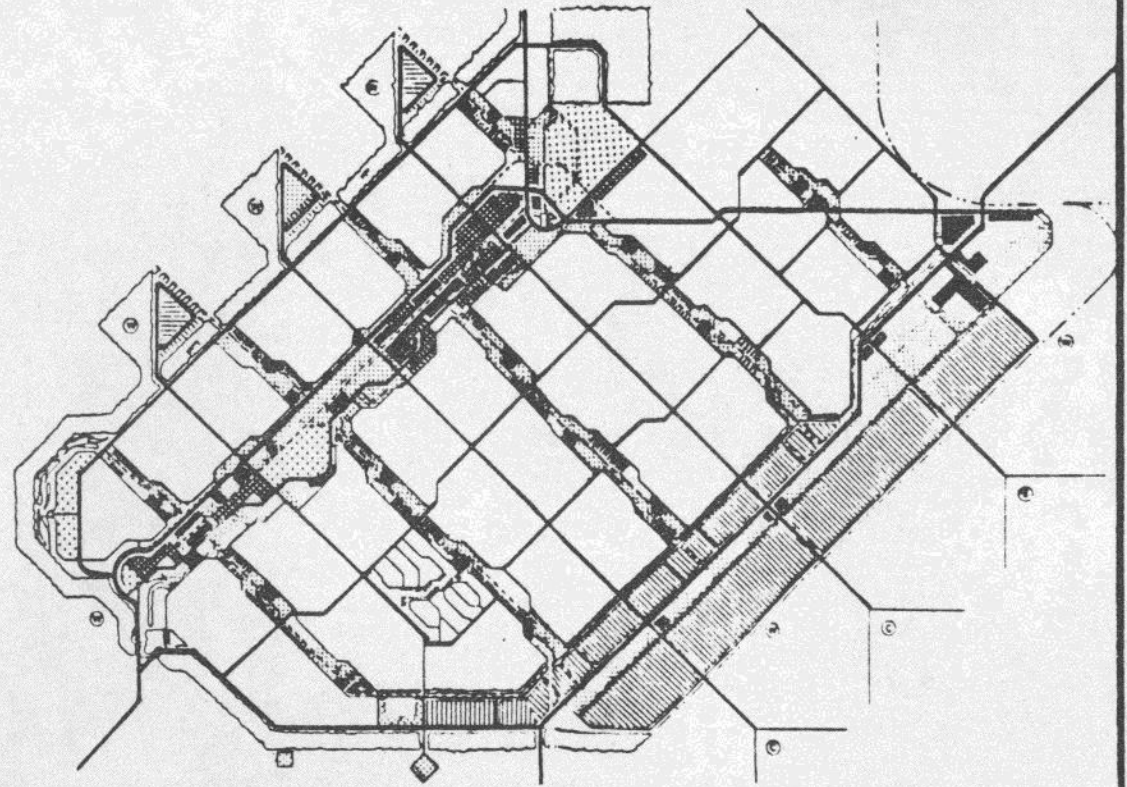
- \* It is recommended to explore water bearing formations in the Eastern deserts, it is the only source of fresh water far from the Nile water.
- \* To carry out intensive studies for salt water intrusion at the Nile Delta to protect the fresh water reservoir.



# SADAT CITY Year 25 Plan

500,000 Population

-  RESIDENTIAL
-  NATIONAL - REGIONAL SERVICES
-  CITY - LOCAL SERVICES
-  COMMERCIAL
-  TYPE 2 & 3 INDUSTRY
-  TYPE 4 & 5 INDUSTRY
-  PARKS & RECREATION
-  SHELTERBELT
-  STREETS
-  PUBLIC TRANSITWAYS
-  SOLID WASTE
-  WASTEWATER
-  CEMETERIES

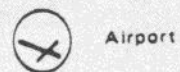


# PORT SAID master Plan

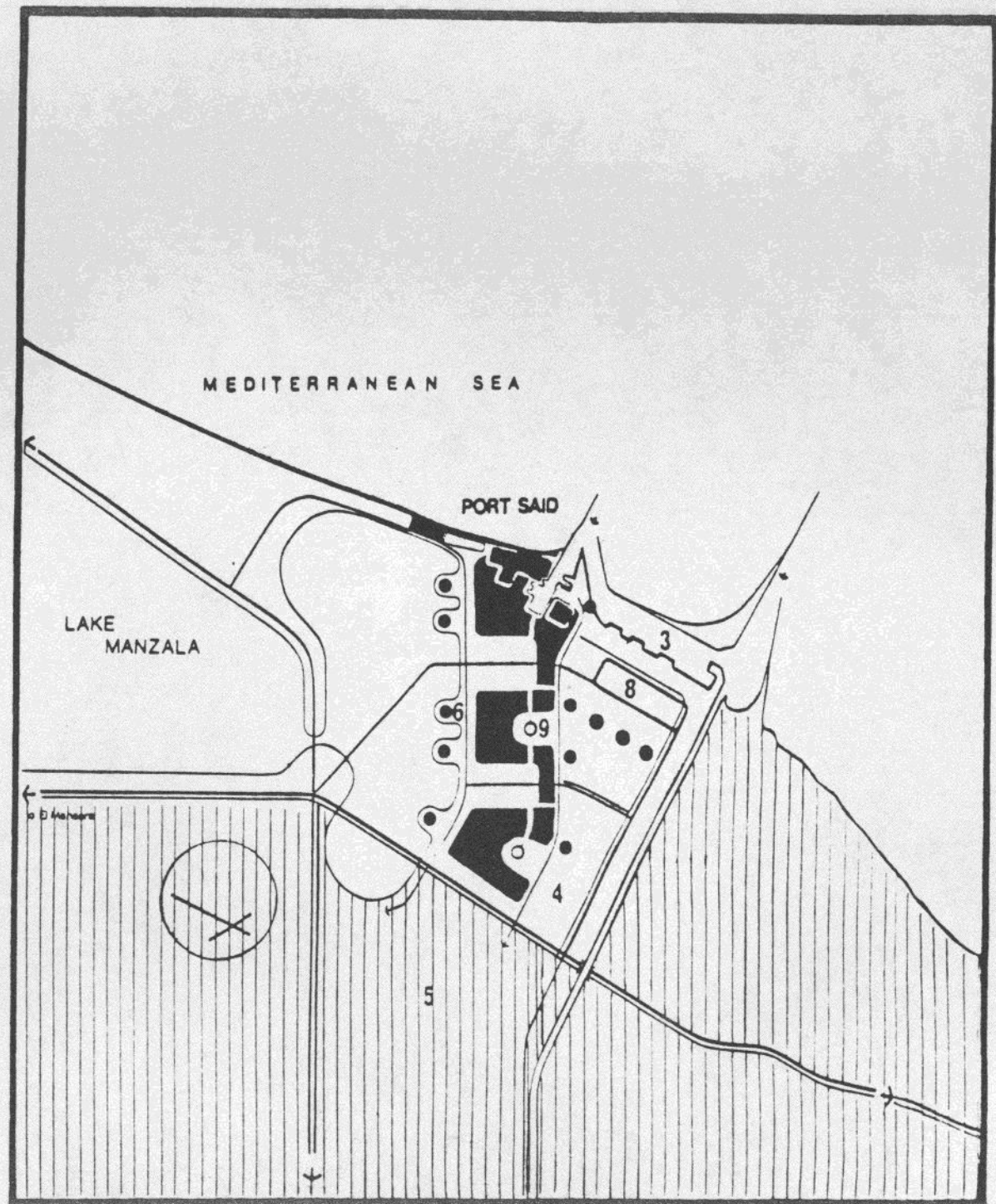
- 1 Existing urban core
- 2 Expanded urban core
- 3 New port
- 4 Broadacre industrial uses
- 5 Agriculture
- 6 Institutional and civic
- 7 Utilities tourism and recreation
- 8 Industrial estates
- 9 Waterways

— Regional roads

— City roads



Airport

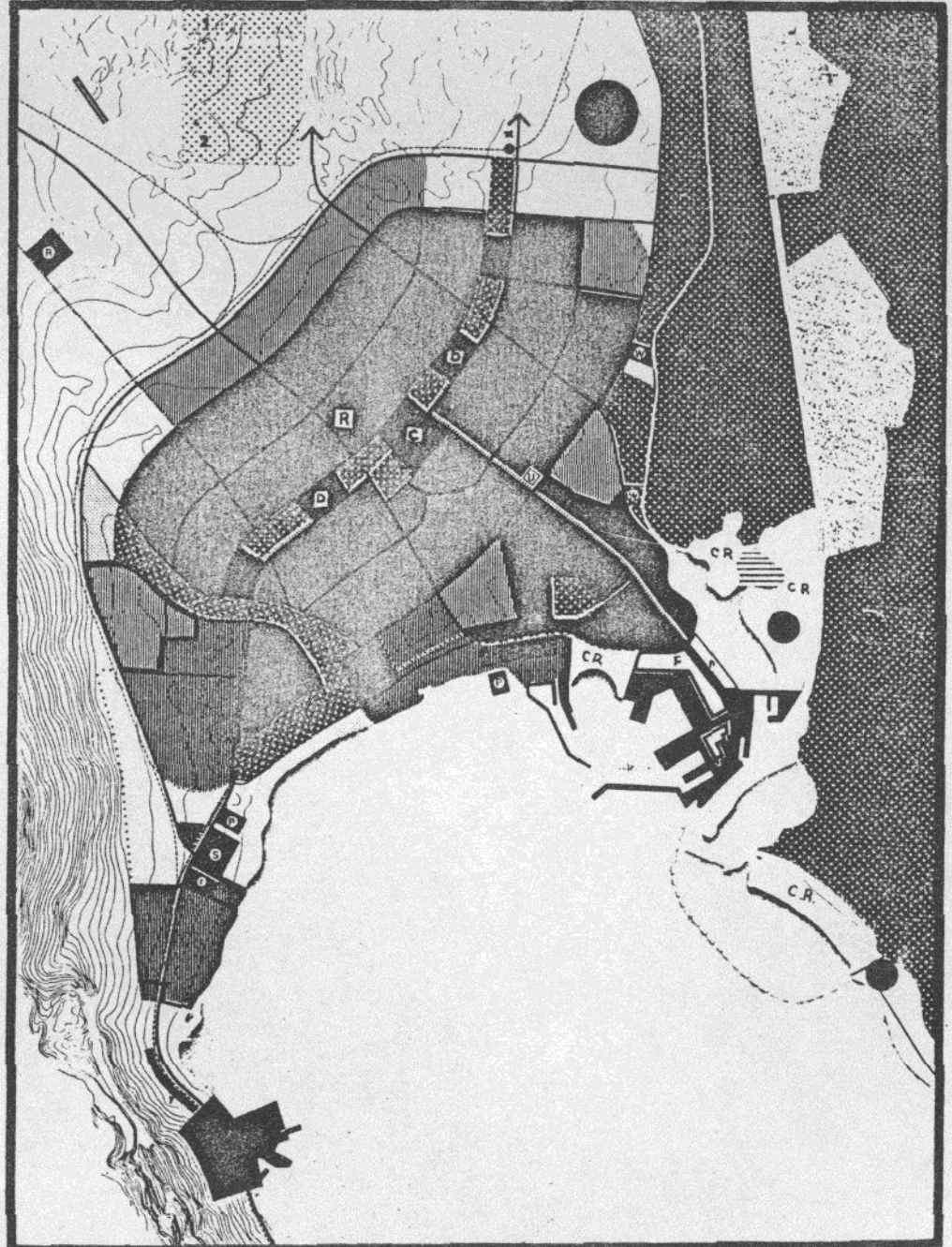




# Suez Master Plan

- |                                  |                            |
|----------------------------------|----------------------------|
| Residential Areas                | Water Treatment Plant      |
| Light Industry                   | Primary Roads              |
| Heavy Industry                   | Future Rapid Transit Route |
| Ports                            | Railways                   |
| Free Zones                       | Railway Station            |
| Central Business District        | University                 |
| District Centre                  | Refuse Disposal            |
| Sewage Plant                     | Coastal Recreation         |
| Power Station                    | Cemetaries                 |
| Urban Open Space and Agriculture | Military Airport           |

1 0 5  
Kilometres



- \* To investigate the best and safe means on how to exploit and manage the ground water aquifers at the west desert.
- \* Protection of ground water reservoir against different types of pollution is strictly recommended.

The general effect of the recommended programs will be improved health, appearance occupational safety and economic productivity of the urban population in the Country.

## VI Energy

### 6.1 Renewable Energy in Egypt

#### Solar Energy for New Communities.

##### Introduction :

Egypt is located in the corner of Africa roughly 1100 km North to South and about the same from East to West, lies between 22° and 32° latitude, with a mean longitude of 30°. The Mediterranean Sea bordering on the north and the Red Sea on the east. Due to this location it has, Egypt has excellent climatic conditions for direct solar energy applications such as water heating, crop drying and wind energy for power generation. Recorded solar data show that there are over



3400 hours per year of solar availability in the north and 3900 hours in the south. The average annual solar insolation is  $800 \text{ kJ/cm}^2$ .

In addition to this high solar insolation, Egypt has two regions with potential wind energy usages, namely: along the Mediterranean and the Red Sea coasts. Annual energy output in these areas is estimated to be about 650 kwh per sq. meter of windmill swept area. These coastal area have, therefore, sufficient wind velocities ( average ) to operate wind turbine pumps and generators.

Egypt is mostly desert except for the valley and delta of the Nile River running from South to North. There are no other significant sources of surface water in Egypt. The population numbers about 40 million growing at a rate of 2.3% per year, and 95% of all Egyptians are crowded into the Nile Valley and the Nile Delta regions which comprise 4% only of the total area of the country and 90% of it is uninhabited desert.

Many of Egypt's future needs stems from its rapid population growth and the resultant stress this places on land use, urban growth, industrialization plans and economic needs, energy resources and other requirements. The population is expected to reach 66 Millions by the year 2000, even with early and effective family planning programs.

The country is almost 57% rural, but rapid population growth as well as rural immigration have led to a strong trend towards urbanization. About one third of the population now lives in the cities of Cairo and Alexandria, and continuing immigration is expected to increase urban pressure.

Egyptian Western Desert and the Sinai Peninsula have an estimated potential for housing ( 14–24) Million persons. The total load requirements for these new communities in the Western Desert and Sinai is estimated to exceed 4000 MW by year 2020.

Both solar and wind energy can be expected to provide a significant part of this energy in the Mediterranean Northwest Coast. Along this coast, wind energy has been and will be useful in pumping water for small irrigation efforts. The water table is close to the surface and quality of water is adequate.

The Red Sea coast situation is quite different. There is almost no rain, and no significant known water aquifers. Thus, wind energy though plentiful, but cannot be useful for irrigation or water pumping. In such areas, where oil and gas are available, hybrid gas–wind electric power generation is attractive, thus substituting the diesel oil now being used for electricity generation in this region.



- Solar Energy In Egypt.
- (For New Communities & New Towns).

The Egyptian Government is establishing new communities and in developing new cities in remote areas such as; Western Desert, the New Valley (El Wadi-El Gedid) and Sinai.

Some of these new communities and towns will be in need of new resources of energy, as it is unpractical or sometime uneconomical to construct the infrastructure required for conventional energy plants and systems in such places. In addition it is a government policy to free up additional conventional energy resources for future needs and or for export to help in bringing more foreign exchange capital required for the government development plans.

Therefore, renewable energy can be competitive with conventional energy means as far as the following phases of utilizations are concerned :

- \* Electric Generation for isolated areas
- \* Domestic water heating
- \* Space heating/ Cooling
- \* Refrigeration
- \* Food Drying
- \* Other Food Processing

- \* Water pumping
- \* Desalination
- \* Mechanical Processes
- \* Industrial Process heat

Comparative economic analysis of renewable energy and conventional energy options is based on international energy pricing and not based on government policy of subsidising basic commodities as Mazout for energy generation or Kerosene for domestic use. However, any subsidies required to make renewable energy competitive with conventional energy is one-time capital subsidising rather than a continuing one.

The average annual amount of energy received in the northern part of Egypt is 5.73 kwh/day/sq. m. , 88 to 95% of which is received as direct solar rays. The daily period of sunshine varies between 9 and 11 hours. In Cairo and on the Mediterranean Coast, there are around twenty overcast days per year. Conditions; of course become even favourable going towards the South, as mentioned before.

There is, as stated above, a key element in government planning aimed at decentralization and a strong concentrated policy to avoid overpopulation in the Nile Valley and in the Delta Zone through the creation of the new development areas.



- New towns located few dozen kilometers from Cairo ( Tenth of Ramadan City , Sadat City .... etc.) are being constructed. A population of one million inhabitants is projected for each of these cities in the year 2000 ( 250,000 housing units ).
- The Canal Zone, where population is projected to rise from a 1976 level of 890,000 inhabitants to 3,112,000 in the year 2000. Also there is large land reclamation and irrigation program which calls for the development of 140,000 feddans by the year 2000 within this Zone.
- The Mediterranean Coast, where the present population of 130,000 should rise to a minimum of 675,000 in the year 2000 ( 110,000 housing units ). There are also about 75000 feddans in this region, 300 km away from the Nile that require irrigation water.
- Development plans have been made also for Sinai, the Red Sea Coast and in the southwest High-Dam lake area South of Aswan High-Dam. There is now aiming to develop the lake its shores to create new settlements for fishermen. Projects for land reclamation are also considered around the lake shores and the khores.

The development of Egyptian renewable energy resources for new Communities and Towns are desirable for the following reasons :

- A. Egypt's "Solar energy" resources are greater than fossilfuel deposits; ( Oil, Gas and Coal ).  
Any additional use of solar energy serves to save reserves of conventional fuels to be used profitably for exportation or to be kept as a reserve of increasing value.
- B. Regional development efforts; as mentioned before, have led the authorities to "reconstruct the map of Egypt" by working against the present trend of concentration in the Nile Valley. Solar energy can contribute to the development of new zones, in remote desert area.
- C. A major reconstruction and restoration effort is in progress in the country, and one of its components is the vast Housing Program of the Ministry of Housing and New Commities in which solar energy can play an important role for domestic applications.
- D. Direct uses of solar energy (e. g. water heating, pumping, water desalination, crop drying, food storage;..... etc) can serve to slow down the rate of penetration of rather



expensive electrical power systems and can serve directly in final energy form and therefore attenuate some of capital investment requirements which generally give a comparatively low returns.

- E. Certain Solar-Energy application technologies are ready accessible to Egypt, even the short term ( flatplate collectors ). The development of solar energy industry therefore, not only saves oil but also, creates more jobs opportunities.

### Possibilities For Integrating Solar Energy And

#### Classifications Of Needs

The needs that could be met using solar energy for New Communities and New Town can be one or more of the following:

- Electrical
- Mechanical ( pumping )
- Heat energy ( up to 100 °C ), low-temperature heat drying, water desalination, air conditioning and before all water heating.
- Medium-temp. heat energy ( upto 300 °C ), e. g. for industrial uses, water desalination, air conditioning and refrigeration.

### Solar Energy Uses for Specific Location Remote Areas.

The most important factors for development in these desert remote areas are mainly :

- a) Lack of electricity and fresh water.
- b) The high cost of producing mechanical power.

Therefore, utilization of solar energy in such areas will be oriented towards :-

- Sea water or brakish water desalination along the Mediterranean and Red Sea Coasts and Sinai.
- Water pumping from medium depth and deep wells in the Western Desert and in Sinai.
- Refrigeration for products, and fish storage near fishing centers.
- Electrical power requirements for lighting and communication purposes.
- Air conditioning.
- Crop drying.

However, a map for solar Energy Potentials "In Egypt" is as shown in Fig. (1).

Depicted also in Fig. (2), the Aswan High Dam lake with the existing and expected developing projects.



