

Land Development on the North Western Coastal Zone of Egypt

Identification of strategy land use plan

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Introduction

Egypt is an arid land with virtually 96.4% of its territory an uninhabited parts. The Nile valley and the delta area represent less than 3.6% of Egyptian land, but 60 million people inhabit this area. The expectation indicates that the size of Egyptian population will duplicate in the next 25 years

The overall growth of population and rural-urban migration flow in Egypt has resulted in a tremendous growth of the main cities. Hoping to divert the people's movement away from these urban centres, the Egyptian government organised several development programs. One of these programs is directed to the coastal zone of the western desert.

A growing human population is making demands on the coastal zone for living space, leisure and recreation, and a host of other purposes. At the same time, the coastal waters are important sources of food and other resources.

Policies at local and international levels have to be introduced and implemented to control populations and their impacts and to generate renewable resources.

Aim of this Work

The objective of this study is to identify strategies for general land use plan, which is most needed to develop this area, and presents an integrated view for planning and development.

The Conceptual Framework

The research framework comprises the following stages:

1. Collection and analysis of already existing environmental conditions (physical, ecological and socio-economic) over a specific area of the north coast.
2. Identify the potential actors to develop the study area.
3. Defining criteria of suitability to tourism, grazing and agricultural.
4. Identify the land use map using both ground surveys and available data.

The study area embraces 60km of the Mediterranean coastline. The area covered extends from Fuka in the east to Matrouh city in the west with an average depth of 20 km (figure 1). It is located within the northwestern coastal region of Egypt between latitude; north 31° 00 – 27° 45 and longitude; 27° 45 – 28° 00. The study area belongs administratively to the Governorate of Matruh.

This narrow strip consists of two main zones, the coastal plain in the north and the Libyan plateau in the south, which consists of limestone elevation that becomes higher to the south.

Studies show that given the necessary capital to provide infrastructure, a study area could be made a highly attractive for tourism development and with its investment in agriculture and grazing the nearly coastal plain could produce fruits, vegetable and crops to supply the tourist market and population (Academy of Scientific Research and Technology 1989).

As a strategic view for development of the coast is necessary, Land suitability analysis must be developed. In order to achieve sustainable development of the coastal zone, land use plan must be adopted. Land can be used for a wide variety of activities such as, among others, agriculture, forestry, recreation, industry, settlements, transportation and communication (El-Raey, M. & Other 1998). This wide range of possible purposes illustrate that land is a primary resource for most kinds of socio-economic activities, and a vital component of natural ecosystems.

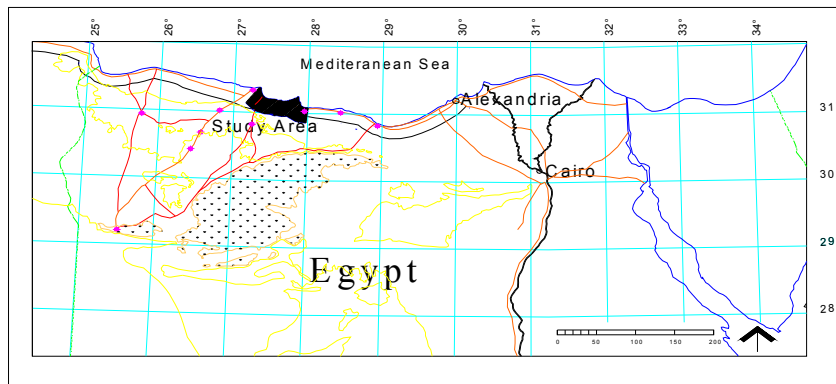


Figure 1 General Location Map.

Potential Opportunities

In this section the study identifies and examines the issues that considered of great importance in the study area. Tourism, agriculture and grazing are the main economic activities in the area. They include positive issues, that is potential opportunities.

Natural Attractions

The coastline of the area is a sandy-rocky, with projection of rocks, fine sandy beach, and shallow, clear blue water, perpetually washed by the Gibraltar current, directed from west to east. A remarkable feature of the shoreline is the succession of bays, the first of which begins east of Matrouh city and extends to Alamein. Due to the above features, the area is distinguished from other coastal areas. The coastal capes (Ras) are formed by rocky projections. The most remarkable of them is Ras El-Hekma with its elaborate location, overlooking Hekma bay to the east and Abu Hashfa bay to the west.

Overall, tourism trends in the project area can be summarized as follows (El-Bastawissi, E. 1997); about 85% can be defined as the sun-and-beach tourism (coastal belt), cultural and health-and-recreation tourism (Siwa 10%) and finally, business and transit tourism (Marsa Matrouh 5%).

Cultural Heritage

The nearest major culture heritage site east of the area is found at the Marina/Alamein some 190-km, from Marsa Matrouh and is still being excavated as it comes under extremely heavy tourist development pressure on all sides. The framework of this study area takes us as Far East as the World Heritage Site of Abu Mena, and as far south as the temple of Jup Amun in the Oasis of Amun-Siwa, and as Far West as the site of Zawiat Al-Agdab near Salum.

Handicrafts and Agro-Industry

According to the raw materials, which are available in the area, such as palm trees leaves, olive, fig, and other agriculture products; handicrafts and agro-industry could be of great benefit to the local peoples and the development projects in the region. The agro-products could be olive, olive oil, dry fig, dray mint, dray palm, or some nuts. It could be also, some medical herbs, which are of great economic value.

The women of the region mainly undertake handicrafts and agro-products. To a large extent they depend on agricultural and animal raw materials (like wool). The most important of these products are wool and cotton carpets, blankets and tents, spinning wool, leather curing, embroidery and sewing; picking olives, drying peppermint, and producing olive oil; breeding poultry and rabbits.

Socio-economic Potentials

The results of the 1996 Census shows that Matrouh governorate had a population of 211,866 inhabitants. Marsa Matrouh city and its hinterland had the biggest concentration of population 80,279 inhabitants, representing about 40% of the total governorate population (Agency for Public Mobilization and Statistics 1996). Areas such as El Alamein had only 5800 inhabitants, accounting for no more than 2.7% of total governorate population.

We may conclude from the 1996 Census analysis that the population of the northwestern coast (NWC) region has certain characteristics that could be summarized as follows

- High percentage of population under 15 years, and low percentage of working population in the productive age, compared with the national standards.
- Low educational standards, and high illiteracy, which reached 75% of the population
- Despite the fact of the small size of the population, it should be necessary to depend on local skills in traditional agriculture and husbandry grazing, also in trade and commerce. Their long acquired experience will enable them in playing an important role in developing and financing different projects.
- It is likely that members of a single family would be willing to cooperate in communal development. These might include setting up of services, housing and water and/or management
- The dominance of extended families living together as a community is an asset implementation, particularly of model trials and action area projects where the target community would belong to a single family.
- Income of needy families could be supplemented by agro-processing and traditional handicrafts, which are usually made by women. These can include among others, the production of jam, cheese, carpets and blankets, as well as the breeding of poultry and rabbits.
- Older women have more mobility and decision-making privileges. They, rather than younger women could be better targets for training.

In general, the population in 2010 is expected to be 190,000 for Marsa Matrouh, and 63,000 for other towns and villages between El Alamein and ElSalloum, a total, which will exceed 250,000 including the transient population. This means that more than 75% of the population will be concentrated in the Governorate capital.

Development pressure will be in the urban centres versus the under population in rural areas which include all the resources bases of the NWC region (Ayyad 1995).

In general, pastoralism has been for a long time the main source of income in the northwestern coastal region of Egypt, but with time, agriculture has become the principal source. Because rain plays an important role in agriculture and pastoralism and determines the yield, the level of income in both is characterized by uncertainty. This fact justifies the trend to diversity the activities and accordingly the sources of income:

Agriculture and Pasture

For purposes of agricultural classification, the region can be collapsed into three production strips (FAO 1970, ILACO 1976, PACER 1986):

a) Coastal cultivation strip: This strip extends from the seashore 5 to 10 km inland, including the beach and the coastal plain. Annual rainfall is about 150 mm.

Cultivation of orchards and vegetables predominate especially in the deltas of wades. The inhabitants are settled. It constitutes 5% of total land.

b) Inland mixed production, grazing/cropping (barley) strip: South of the coastal strip, between 5-15 Km from the coast. Annual rainfall is 100-140 mm Soils are poorer. Grazing (especially sheep and goats) and cropping are the main activities. Inhabitants are sedentary. It constitutes 22% of total land.

c) Inland grazing (Rangeland) strip: This strip lies between 15 and 50 km from the seashore; annual rainfall is from 50-100 mm. Grazing predominates, with some cropping. It constitutes 73% of total land.

Tourism

The study area is a very promising area for tourism activity. There are some attractive properties in the area (Hasanain, M and El-Halaby 1669) such as:

1. Resort villages along the Mediterranean coast.
2. Siwa oasis, near the area
3. Alamien area and its Second World War sites.

Also, the mild wind speed, moderate temperature degrees, and low humidity levels are another attractive forces for tourism. Still now the tourism activities in the area still below the expected, regarding to the characteristics of the area.

Small Industrial Activities

The study area is a rather undeveloped area reflecting the global situation in the Matrouh Governorate. Significant efforts to make things better have been made by national and international organizations through direct investment, “know how” transfer and education. Due to the lack of fertile land, water and adequate technologies, this area will no doubt, continue to search for new methods and means for efficient economical development and better living conditions.

Limiting Factors

In this section the study identifies the existing or potential problems and obstacles that may affect development plans in the area.

Water

Three possible sources of water are available: surface water, groundwater and water from other facilities:

Surface water

The surface water in the area is very limited in magnitude as it originates from the rainfall of the winter season. In the extreme southern portion of the area, where the landscape is elevated but almost flat in topography, water of the rainfall is partially lost through evaporation and the rest infiltrates into the shallow soil where it may subsequently either be lost by evaporation or utilized by some native vegetation. On going northward, the landscape shows some wadi catchments areas. Runoff is possible after rather heavy rains, and a considerable amount of water may percolate to deeper soil layers.

People store the surface running water in underground tanks (Roman reservoirs), 36 of which still exist in the area. The storable volume of drinking water is estimated to be 10,000 M³/year (PACER 1986). It should be possible to organize the use of surface water within the following projects:

Groundwater

Relatively large quantities of groundwater are found at depth in rocks ranging in age from Cretaceous to Miocene, but the quality of the water is brackish to highly saline and is not suitable for agriculture. The depth of the water table varies from less than 1 m to more than 50 m. The quality of the water in the several aquifers in the area varies widely. Water quality also varies with seasons. Inventory and local studies of groundwater were undertaken by governmental and international agencies. The overall picture of groundwater however, is not clear.

Other Water Facilities

Treated water is pumped from the Alexandria distribution network into two pipelines running parallel through the Mersa Matrouh Governorate. The average capacity of that pipelines is about 8000 m³ in autumn to 10600 m³ in Summer (Information and decision Support Centre 1998). Water is served to customers along the pipeline from Alexandria to Marsa Matrouh. Consequently, insufficient water often activities at Marsa Matrouh via railroad tanker cars and private trucking companies. Most tourism facilities, oil companies, and construction activities that do not have a dependable connection to the pipeline, use the private trucks for water supply.

Sewage Collection and Treatment

Communities' settlements along the coastline do not have any sewage systems or treatment plants. Sewage is collected in septic tanks and it percolates through sand and likely to reach the beach. So far, the waste water for the population in towns is discharged directly into creeks and practice no sanitary sewage disposal except a few who have private separate units (Ministry of Planning 1997).

Energy

In Marsa Matrouh, natural gas is distributed in containers and mainly household energy source. The electrical distribution cables are in a poor conditions and cause frequent electricity cut-offs, but there is a plan to replace the present cables. Power supply system services of the study area are provided by the national authorities. However, all farmers rank shrubs and wood as the primary sources of fuel for cooking and heating. Kerosene is ranked as a secondary source. However, the use of shrubs for cooking and heating contributes to the devastation of the natural vegetative cover, which in turn leads to soil erosion.

Road Network and Transportation

It should be mentioned that planning and construction of roads does not take into consideration the catchment areas of wadies. These roads intercept the flow of surface runoff and cut off parts of the natural catchments areas. Furthermore, the road is also exposed to potential destruction in the event of a flood.

Local tourists (90% of the tourists received by Marsa Matrouh) arrive to the area by railroad or by the main highway. International tourists arrive by plains via Alexandria or Cairo. If the area is to be developed for international tourism, technical conditions of Matrouh airport ought to be improved.

There are also a large number of small tracks linking the roads extending through the desert. While most of them are just unpaved tracks, they serve in linking settlements and groups of houses.

Communication Systems

The whole area is served by the radio-link system. There are 8,000 telephone lines in Marsa Matrouh, all of which are already utilized. Communication services are provided by national authorities.

Health

- Poor staffing and equipment of existing facilities.
- Poor knowledge of the population in preventive care and basic health requirements especially for infants.
- Inadequate vaccination campaigns and routine mother and child care.

Social Services

- Regulations for social development cooperatives are not adapted to local conditions especially in terms of literacy and accounting (banking) requirements.

Services

- Hindered access to services, especially for residents of the North Plateau and the South Plateau, due to limited capacity for children to walk and limited mobility of women.
- Absence of incentives for skilled professionals to serve in the project area.
- Social obstacles affecting female professionals. Education.
- High rate of illiteracy, especially among adult women.
- Poor attendance of girls at schools mostly due to poor attitude of the society towards the education of girls.
- Poor quality of teaching in all subjects, but more so for applied education subjects due to the irregular delivery of books, lack of economic incentives for teachers, and the inapplicability of subjects taught to local social and environmental needs.

Solid Waste Collection and Disposal

Waste collection system in the project area more than needs improvement as immediate action. A dumpsite must be allocated (now all the solid wastes are dumped in the south part of the Governorate in an empty desert area).

Solid Waste Collection and Disposal

Existing institutions suffer from a number of deficits and contribute to some problems in the study area. These include:

- Non-existence and/or uncertainty of individual land ownership, especially for barley cultivation and rangeland, are handicaps for long-term investments, which are necessary for increasing agricultural output or decreasing the misuse of natural resources.
- Concentration of foreign projects on the coastal roads, mainly due to easy access and concentration of strong built
- Not all settlements are within administrative village boundaries and therefore lack village council representation and boundaries of villages are inconsistent with tribal boundaries.
- There is too little coordination on the regional and local levels between plans for different sectors especially agriculture, Urban and tourism requirements. There is no common information pool for the Governorate and furthermore, the Governorate has no planning unit capable of reviewing and coordinating such plans.

Land Development Strategies

The general principles for coastal management options always begin with an assessment of the existing situation and a historic review of the coast. The purpose of the planning system is to regulate the development and use of land in the public interest. The fundamental requirement of the legislation is that development may not be undertaken without planning permission.

Current Strategies

Recently, increased attention has been given to the relation between land use planning and environmental quality (Ministry of Planning 1997).

To facilitate the decision-making process, data for different plans must be presented in a form, which allows comparison between uses, based on some common measure of performance.

The environment should be protected in such a condition and to such a degree that environmental capacities are maintained over time: at least levels sufficient to avoid future catastrophe, and at most at levels which give future generations the opportunity to enjoy an equal measure of environmental consumption (UNEP 1995).

The agriculture and grazing activities are the economic basis of development, because these activities are:

- The pole of the socio-economic life in the study area.
- Encouraging population to settle in the area.
- The main activities that have enormous development potential due to the specific characteristics of the study area.
- The main sectors that have numerous cross relations and interdependence.

With tourism now a major international economic activity, and with the World Tourism Organization (WTO) expecting to become the major activity by the next years.

Comments

The tourist sector is one of the leading economy sectors in Egypt. In eighties and nineties tourism growth rate was 13.6% almost 2.5 times more than the world average. Moreover, on the level of government policy, tourism is placed very high in development goals. Today in Egypt, it is easy to invest in tourism from the administrative point of view.

The natural characteristics of the shoreline of the study area allow tourism to be developed. Supported by water activities and the three S (Sun, Sea, Sand) and clean environment with high water quality. The hinterland with its remarkable wadies and small oasis is another tourist natural feature of the area. Existing local activities can be upgraded and developed into tourist attractions e.g. horse breeding and camels. The existence of some of the historic sites and monuments that can work as added attractions.

The projects of agriculture, grazing and related activities should integrate with the tourism activities, which are capital intensive, in the form of a cluster of touristic areas that will have the agricultural and grazing surroundings, necessary for providing the tourist with food and folkloric souvenirs and create reciprocal relationships.

The development process will never achieves its targets without the conscious, active participation of the local citizens, and their full approval of the intent of the authorities undertaking the development and reconstruction programs (Johnny, Å.2000).

Actors

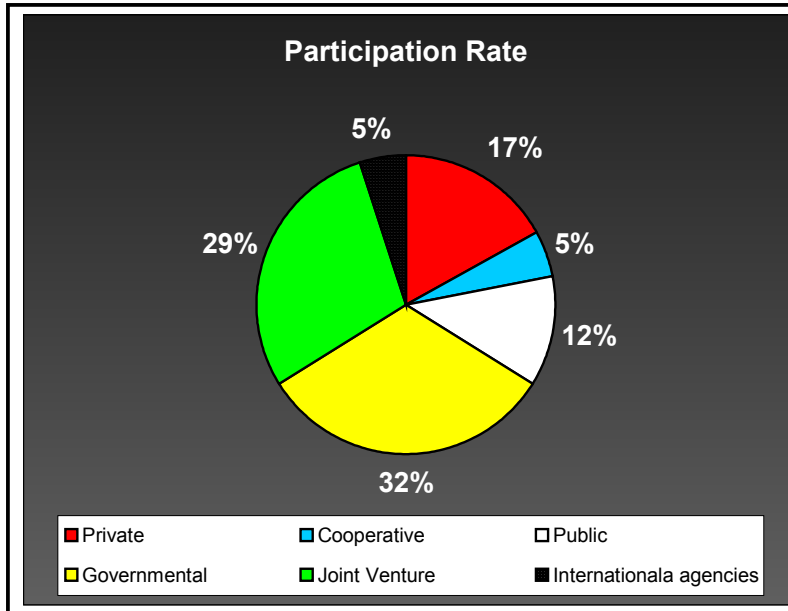
The comprehensive development process requires the corporate efforts of all parties, but they are not expected to be all of the same relative importance in different sectors. Therefore, every sector will have to define a matter, which should not limit the capability of the sector to change leadership from time to time according to the phased development of the sector. Exemplary question in this respect would be; who will undertake the land reclamation project in the area: public sector, cooperatives, investment companies or it will be left to the local efforts. Similarly, we may ask; who will undertake the execution and management of the proposed touristic projects: international tourism companies, joint ventures, private companies or public sector?

Current Role of Actors

It is evident that there are large natural potentials for developing the agricultural, pasture and touristic projects in the study area. The financial possibilities, however becomes a real limitation in the light of the required volume of investment. The following considerations have been taken into account in formulating the criteria of financing and administration of the plan:

- Diversity of the possible financing and administration agencies (public sector, government sector, cooperative sector, private sector, foreign joint ventures sector, international agencies and international fund for construction and development).
- Diversity of the sources of financing and administration with regard to specialities or investment and administration priorities where most of the investors are concentrated in tourism and industries while the governmental sector is concentrating on infrastructure and public services.

- Diversity of different management types for the development projects
- Figure (2) shows the distribution of the actors' participation according to governmental primary studies (PACER 1986, Ministry of Planning 1997), and within the previous considerations the following conclusion could be mentioned:
- The governmental sector is representing almost 32% of the total capital requirements, this investment is basically directed to the agricultural investments for the extension of main canal from the west of Delta to the study area, in addition to the infrastructure and public services sectors in general and in contributing to the housing sector.



Figures 2 Actors participation.

- The role of the private and cooperative sectors is dedicated to agriculture, animal productions, poultry, and handcrafts, in addition to the rural housing. It is expected that these two sectors will contribute together some 22% of the participation needs of the development plan.
- The public sector participations are about 12%. They are allocated basically for land reclamation and in housing.
- Joint venture sector is representing 29% of the total participation resources most of which is allocated for tourism as joint ventures with specialized international companies in the construction and administration touristic resorts and the local companies that in addition to the joint ventures working in land reclamation through investment companies. Also some productive projects those are capital intensive and working in providing services for the touristic sector (cattle farms, mixed fish culture, poultry and eggs production, and dairy factories, etc) are financed by joint ventures
- The international funds are expected to contribute considerably in the fields of infrastructure and grazing and environmental development with potential of 5% of the total financial requirements.

Proposed Role of Actors

The studies commit it selves to the strategy of enabling all key actors in the public, private and community sectors to play an effective role – at the national, state/provincial, metropolitan and local levels – in land development.

The Government

The Government at the appropriate levels, including local authorities and other interested parties, with the support of the relevant international should support the efforts of human settlements to establish sustainable land-use patterns and planning and, to that end, should:

- a) Establish priorities for regional infrastructure investments based on opportunities for economic return, social equity and environmental quality;
- b) Promote efficient and accessible land markets that are responsive to demand and meet community needs;
- c) Develop, with the participation of all interested parties, comprehensive and environmentally sound land-use strategies at the local level;
- d) Pursue policies for water resources management that are guided by the broader consideration of economic, social and environmental sustainability of human settlements at large, rather than by sectoral considerations alone;
- e) Develop, where appropriate, fiscal incentives and land-use control measures, including land-use planning solutions for more rational and sustainable use of limited land resources;
- f) Encourage partnerships among the public, private and voluntary sectors and other interested parties in managing land resources for sustainable urban development;
- g) Develop and implement integrated coastal zone management plans to ensure the proper development and conservation of coastal resources;
- h) Promote adequate financial and legal support for the effective protection of the cultural heritage;
- i) Promote incentives for such conservation and rehabilitation to public, private and non-profit developers;
- j) Encourage the private sector to develop and strengthen contract-based wholesale markets and marketing intermediaries for rural products so as to improve and/or establish a cash-flow and futures contract economy in rural areas;
- k) Develop and/or strengthen, as appropriate, in cooperation with relevant United Nations bodies, within their respective mandates, as well as associations/networks of local authorities and other international associations and organizations, global and easily accessible information.

Private Sectors

The private sectors should:

- a) Implement sustainable urban development policies that take account of and respond effectively to the needs of locally owned enterprises, and are not detrimental to the natural and human environment;
- b) Offer opportunities for economic activities by facilitating the access of new and emerging businesses, and small and medium-sized enterprises, including the informal sector, to credit and finance, and by streamlining legal and administrative procedures;
- c) Assist informal sector enterprises to become more productive and progressively integrated into the formal economy (Johnny, Å.2000).

Cooperative Sectors

The cooperative sectors should:

- a) Support training programmes for administrators and civic officials at all levels as appropriate, to enhance leadership qualities and promote the inclusion of women and young people in staff structures and decision-making (Wong Jere, A.2000);
- b) Consider establishing private-public, community sector, business and economic forums to exchange management know-how and experience;
- c) Consider developing mediation programmes to resolve conflicts, including those between competing actors over access to and distribution and use of resources in human settlements and train civil society in their use;
- d) Incorporate a gender perspective in policy, planning and management strategies;
- e) Develop or, where necessary, create a core of professional staff that includes women, trained in the areas of planning, environmental management, engineering, transportation, communications, social services, development of primary infrastructure, and emergency planning, and with the skills to work together to address major planning issues in an integrated way (Göran, T. 1996).

Public Sectors

The public sectors to facilitating access to adequate housing for all and the development of sustainable human settlements should:

- a) Set up structures for the selection of best practices, with the participation of non-governmental organizations active in the development field;
- b) Promote the dissemination of best practices, selected locally, nationally and regionally in an integrated manner;
- c) Developing planning and policy-making procedures that facilitate partnership and cooperation between Government and civil society in human settlements development;
- d) Encouraging business enterprises to pursue investment and other policies, including non-commercial activities that will contribute to human settlements development, especially in relation to the generation of work opportunities, basic services, access to productive resources and construction of infrastructure (Johnny, Å.2000).
- e) Enabling and encouraging trade unions to participate in the generation of work opportunities under fair conditions, the provision of training, health care and other basic services, and the development of an economic environment that facilitates the achievement of adequate shelter for all and sustainable human settlements development.

International Agencies

The international agencies should support the government in their efforts to develop the study area within a framework of enabling strategies. The international agencies should promote:

- a) Encouraging and supporting the use of appropriate construction technology and the production of local building materials, as well as supporting the development of international, sub regional and regional networks of institutions involved in research, production, dissemination and commercialisations of locally produced building materials;
- b) Continue to support technical cooperation programmes aimed at preventing and mitigating the effects of natural and human-made disasters;
- c) Develop the full and effective implementation of the habitat Agenda at the national level.

Design Principles

Common sense planning norms constitute set of reasons for the importance of diversity. From the land-use point of view, at least three working principles or norms, when implemented, would result in a more diversified landscape. The author in cooperation with Mr. El- Raey El- Kaffas S. has developed these land-planning principles as follows:

- i.* Development should be discouraged in areas of significant resource value.
- ii.* Development should be discouraged in areas of natural and manmade hazard.
- iii.* Development should be encouraged in areas best suited for it.

Methodologies and Tools

We can look at the land use in terms of potential uses and the optimum criteria of those uses and thus find areas where they can best be fulfilled within the allowable level of disturbance. 'Capability' usually refers to a scientific evaluation of land in terms of its capacity for change, whereas 'suitability' is related to the criteria for specific uses and social values in relation to capability.

Land Suitability Analysis using Map Overlays Technique

The map overlay technique is a procedure for synthesizing the spatial data used in land use planning (El- Raey, M.; et al 1997). It involves four steps:

- 1 Identify factors to be included in the planning exercise;
- 2 Prepare an "inventory map" for each factor showing how it varies over the study area;
- 3 Create composite maps by overlaying two or more inventory maps; and
- 4 Analyse the composite maps to make inferences relevant to land use planning.

This technique, termed Geographic Information Systems (GIS), involves the use of computers for the management and processing of spatial information.

In this study, it is intended to use GIS functions and tools in handling spatially geo-referenced data. It is also intended to use the techniques of remote sensing in obtaining information by analysing data acquired by remote sensors. Ground surveys data were used to collect Census-like and related tabular data. It used to update map data and as a supplementary data in the classification process.

Data collection

The data of the study area were found available on different forms. Cartographic maps remotely sensed and tabular data are collected, as well as, a field survey.

Cartographic maps

The main sources of these maps are the Military Survey Authority (MSA), the General Authority for Geologic Survey (GAGS), Land Use Planning and Environmental Monitoring (LUPEM), the Academy of Scientific Research and Technology (ASRT), and the Governorate of Matrouh. Cartographic maps first collected are found to represent the following:

- 1 Topographic maps, which contain data on, contour elevations, wadis, ground reservoirs, transportation networks (roads and railways), and location of towns and villages.
- 2 A map is obtained from the GAGS, which contains data on Archaeological sites.
- 3 A map is obtained from ASRT, which contains the different soil types in the study area.
- 4 A map is obtained from the Information centre of Matrouh Governorate which contains the administrative boundaries of Fuka and Ras El-Hekma. This map also contains locations of existing resort villages.
- 5 A map was obtained from LUPEM and contains information about tribes and tribe settlements and the corresponding land ownership.

The field survey:

Main objectives of the field survey were to verify the main land use patterns existing in the study area and the socio-economic characteristics of Fuka-Matrouh area. Visiting the study area and going around it during administering the questionnaire with the relevant maps and the satellite images, gives details of the main land use and land features



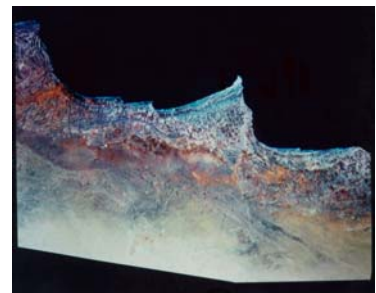
Tabular data:

The socio-economic characteristics of the study area were mainly obtained from tabular data collected and published (Census 1996). These data include data on population density distribution, age, sex, and main activities.

Data are also collected on educational centres, schools, hospitals and health care centres, telephone lines, transportation network, and administrative services. These data are obtained from the Information Centre of Matrouh.

Digital remotely-sensed imagery:

A satellite image acquired by the Thematic Mapper (TM) sensor on Landsat satellite is available for the study area. The TM image was acquired on April 15th, 1992. The satellite image is originally classified into 15 land cover classes. The 15 land cover classes are further reduced by reclassification to the four general vegetation types covering more than 95% of the study area. These classes are: Orchard, Barley, Dense Range, and Unvegetated Areas.



Data Input

Maps of the study area are available with alternative scales. These maps are also different in their level of detail. The following is a description of the different data layers included in the GIS:

- 1 Base map data: This includes data layers for control points (tics) and basic topographic features.
- 2 Elevation map: Determines the contour lines of the study area.
- 3 Wadis map: Determines Wadis and streams location and lengths.
- 4 Soil type: here are no accurate data to support conservation efforts of soils. The soil map of Academy of Scientific Research and Technology with scale 1:50,000 was used.
- 5 Farms map: Which determines location of orchard farms
- 6 Wells map: Which determine the locations and ownerships of water wells.
- 7 Cisterns: It is with the same items of wells database.
- 8 Tribes: This coverage is delineating the boundaries between different tribes communities.
- 9 Archaeology sites map: This includes known archaeological sites.
- 10 Centres: It includes: (a) towns; such as Ras-El-Hekma and (b) Villages.
- 11 Local administrative units: Determines the boundaries, which appear as the "Zemam" and "Cordon" of towns.
- 12 Administrative jurisdiction: This includes jurisdiction units of the study area; local administration units, Authority of Tourism Development and Authority of Possession Government.
- 13 Paved roads: this includes roads network map of the study area, based on the most recent map of military survey.
- 14 Railway: Determines Alex-Matrouh railway.
- 15 Morphology coverage: Morphology is obtained by both traditional mapping based upon field observation and T.M. classified satellite image. Field observation was applied with several relieves. Thirteen classes were determined.
- 16 Aspect map: The aspect map is used to show the prevailing direction that the slope faces at each pixel. This layer is classified to nine classes, (North, Northeast, East, Southeast, etc.).
- 17 Land-cover map: The satellite image is transferred to an image of vegetation and land cover themes. The classified output image was then converted from raster format to vector format accepted by ARC/INFO (ESRI 1990).

Attribute data: Attribute data could be attached to each geographic entity during the input phase. It is not efficient to enter large numbers of complex non-spatial data interactively. In general, it is better to assign attribute data to the spatial ones after their encoding

Suitability Analysis

A geographic information system has been built based on all possible and available data on physical, and socio-economic aspects of the study area area. Each of the layers in the geographic database contains specific information required for site suitability analysis.

In this section, the analysis process is described briefly, stating with the identification of the objectives and criteria to be used; e.g. physical, legal, and environmental criteria. This is followed by a spatial land suitability analysis in order to identify potential areas suitable for different uses.

Criteria for site suitability analysis

This study determine the suitable land of uses depend on the main activities in the study area; agriculture, pasture and the new activity, tourism.

The ultimate objective of the suitability analysis is to identify suitable sites for new tourism development in the study area integrated with existing activities. Suitability depends on the characteristics of the site itself and on the locations of the other facilities, as well as requirements to minimize negative environmental impacts.

The legal and environmental criteria include buffer generation is a geographic operation used when the analysis requires the identification of the area surrounding geographic feature. Buffers are used mainly to protect natural features.

- The legal criteria used in the suitability analysis, based on Egyptian laws, include:
 - i. Location of any construction must be beyond 200m (beach set back) of the shoreline i.e. according to Environment law no 4/1994

ii. Development must be set beyond 50m of the highways (road shoulders) railways and major roads.

- The environmental criteria used in the suitability analysis, based on soil type include:

The type of soil is an important criterion. It is necessary to choose soil types suitable for each activity of agriculture and pasture. It is natural to develop agriculture on the best land first, that is land, which is most easily cultivated, most fertile. Uncultivable soil will be then assessed for their suitability for tourism development.

- Development to existing cultivated land and pasture areas, which extracted from ground survey, cartographic maps and the satellites image.

- Certain criteria, suggested by the scientific issues include:

- i. Sites must be beyond 50m of historical sites
- ii. Sites must be beyond 50m of wadies and wells.
- iii. Sites must be beyond 50m of wells
- iv. Slope suitability is also an important criterion. Slopes for construction purposes should not exceed 13%

According to these criteria, areas suitable for various uses are identified in terms of location; area and general characteristics the processes are as follows:

- i. The suitable land for agriculture gives the highest weight, secluded step selected suitable area for pasture with weight less than agriculture weight. The remaining areas include the land for tourism.
- ii. Determine the stable slope; which includes suitable land for tourism development.
- iii. Extracting buffer zones of the study area and determine suitable land.

Figure (3) illustrates flow chart of site suitability analysis model (Shalaby, A. 1996).

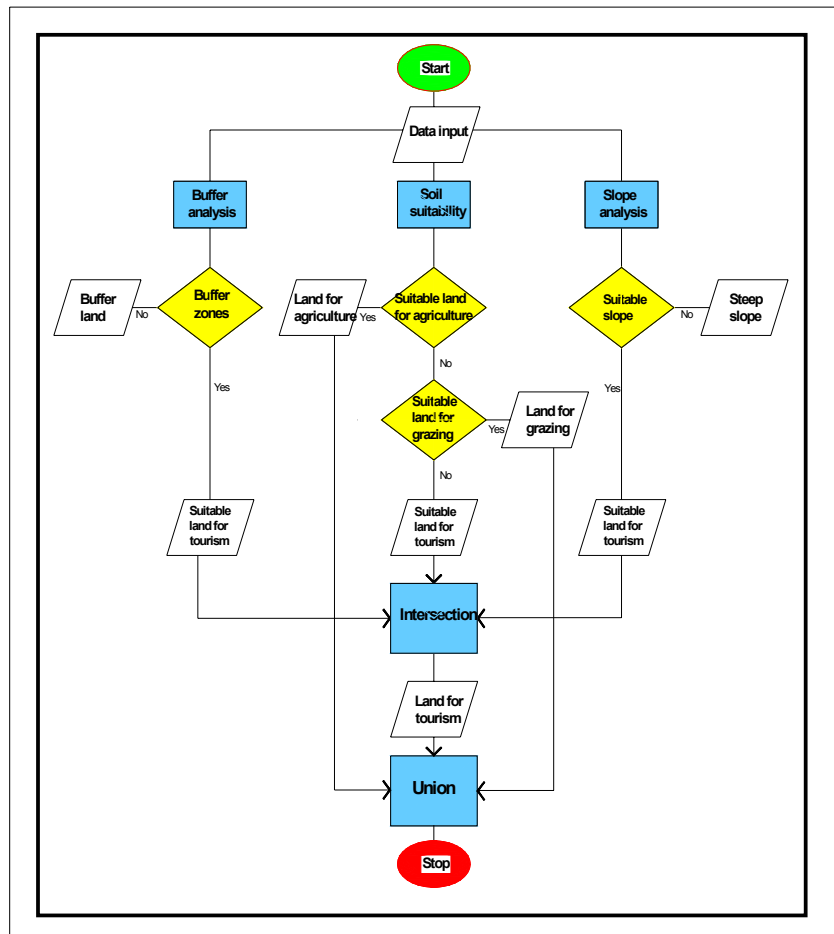


Figure 3 illustrates flow chart of site suitability analysis model.

Conclusion and Recommendations

The focus of management plan in the coastal strip is, therefore, the preservation of the environmentally sensitive areas such as the coastal wetlands and lagoons and implementation of coastal tourist developments in harmony with natural coastal ecosystems. The focus of management on the intermediate zone is water, services and land management. Since fresh water availability is the limiting factor in the study area, the balance among main activities (tourism, agriculture and grazing) will be carried out based on carrying capacity assessment. Appropriate Environmental impact analysis has to be carried out before realization of the plan. The projects of agriculture, grazing and handicrafts should integrate with the tourism activities, which are capital intensive, in the form of a cluster of tourist villages that will have agriculture surrounding, necessary for providing the tourists with food and folkloric souvenirs.

It is conceivable that the comprehensive development process requires the corporate efforts of all these parties, but they are not expected to be all of the same relative importance in different economic sectors. Therefore, every economic sector will have to define the party that will lead the investment in its domain, a matter that should not limit the capability of the sector to change leadership from time to time according to the phased development of the sector.

The role of women must be carefully considered in the development programs. As women are responsible for the daily running activities of the household including the preparation of food, the mailing of carpets, and sometimes cultivating small patches of vegetables and breeding poultry, they are, at least, indirectly responsible for significant positions of the in-kind income of the family.

The Main Development Programs:

The following are the main programs for development the study area:

Detailed Land use Planning

The hierarchy of land use planning systems needs to be improved in order to provide local land use planners with guidelines they could follow.

Accordingly, the following concepts of the plan are seen to be of great importance:

- 1 The plan must be flexible.
- 2 It must act gradually to allow for uncertainties and lack of correct information.
- 3 It must be monitored and periodically revised and amended to reflect newly established trends and acquired experience.
- 4 The staff should be recruited from local population and services should be mobile.
- 5 Infrastructure should be self-sustained.
- 6 Efficient use of local resources is necessary.
- 7 It is necessary to integrate the tribal system into the decision making process.

Upgrading Water Supply System

For sustainable development of the area to take place, it is essential that projected water demands and supplies are worked out carefully. Two types of water are needed: one for agricultural and domestic needs and the other for drinking. Since the quality of the latter must be under control, filtering or recycling units are required. Some form of water management must be exercised for drinking water supplies.

Institutional Capacity Building

One of the most serious problems of the study area is the lack of infrastructure and institutional capabilities. It is therefore mandatory to start development of various systems such as:

- 1 A Geographic Information System must be built and consulted for proper decisions in the area.
- 2 A Centre for integrated management (agriculture, grazing, land-use, socio-economic) and education must be developed.
- 3 Health and medical services must be provided. Technical schools for exploitation of renewable energy resources such as solar and wind energies, must be initiated.
- 4 Upgrading Matrouh Water Authority

- 5 A centre for environmental monitoring, assessment and law enforcement must be developed.

Timing

In order to ensure that future development in the project area is soundly based and that it proceeds efficiently, there are certain actions, which should be undertaken, as soon as possible. While recommendations for these actions are an integral part of the development plan, their urgency in some cases, and their proven suitability for the area and acceptance by the population in other cases, indicates that they should not be postponed until the Development Plan is ratified and put into effect.

Of the most important plans, which should be implemented immediately is the socio-economic awareness program. This is actually because it is prerequisite to any development program. It takes relatively longer time to have an outcome, and it is useful and pays back whether we have other programs in operation or not.

Programs of water supply, institutional capacity building and land use planning together with preservation of cultural and ecological sites must be developed concurrently in an integrated fashion. Failure of having concurrent development of these programs may present serious threat to the sustainable development due to over exploitation of shortsighted private investors.

The development of self-supporting activities as well as the tourism national and international marketing plans would start once the infrastructure has been completed.

Finally, the proper organization of an international fund- raising campaign, including voluntary contributions in kind and labour will be one of the major inputs throughout all phases of planning, design and implementation of the proposed projects.

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