

## Integrated Coastal Zone Management in Egypt: The Fuka-Matrouh project

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**Abstract.** Egyptian coastlines comprise more than 3000 km along the Mediterranean and the Red Sea. The coastal area of Egypt is under severe and increasing pressure. After passing the law on the Environment (Law 4) in 1994, the Egyptian Environmental Affairs Agency (EEAA) was designated as the responsible agency to implement this law. In this respect, the EEAA formulates the general policy and prepares the necessary plans for the protection and promotion of the environment. Also, it follows up the implementation of such plans in co-ordination with competent administrative authorities. Integrated Coastal Zone Management (ICZM) is one of the items regulated and addressed by Law 4/94. A framework programme for ICZM in Egypt was issued in 1996. This paper presents the results of a pilot project financed by the Mediterranean Action Programme Coastal Area Management (CAMP), namely 'Fuka-Matrouh-Egypt' project, and implemented by the Priority Action Plan / Regional Activity Centre. It also presents the methodology followed in the study and the experience gained nationally that would lead to the sustainable development of the northwest Egyptian Coast.

**Keywords:** CCA; ICZM; Mediterranean; SEA.

**Abbreviations:** CAMP = Coastal Area Management Programme; CCA = Carrying capacity assessment; EEAA = Egyptian Environmental Affairs Agency; ICZM = Integrated Coastal Zone Management; SEA = Strategic Environmental Assessment.

### Introduction

The Egyptian coast is characterized by its beautiful appearance, owing to a diversity of natural coastal subsystems and ecology. This natural beauty includes coastal lakes, salt marshes, mud flats, beaches and dune complexes along the Mediterranean coast and mangroves and coral reefs in the Red Sea. In December 1996, Egypt had issued its framework programme of Integrated Coastal Zone Management, ICZM. The efforts went back to May 1995, when 50 national and international experts had met in Hurghada, and recommendations and outlines of the framework ICZM programme were identified and formulated in the 'Hurghada Declaration'. The main problems facing the coastal zones in Egypt were identified as follows (Anon. 1996): shoreline erosion and flooding, irrational land use, water pollution, and deterioration of natural resources and habitats. The Institutional setting for ICZM in Egypt was set according to the law of the environment (Law 4/94). The Egyptian Environmental Affairs Agency (EEAA) was given the authority to participate with the concerned ministries in the preparation of a national ICZM plan for the Mediterranean and the Red Sea. A National Committee for ICZM had been established. This also included the establishment of a separate department of coastal and marine zone management and the divisions of the Mediterranean and the Red Sea coasts (Fawzi et al. 1996). The framework programme had three objectives. The first is a short-term objective to implement small pilot projects that vary geographically and ecologically, a medium-term objective to develop national strategies or plans focusing on the main four problems and a long-term objective to establish a National Integrated Coastal Zone Management Programme.

The Fuka-Matrouh project is considered one of the main projects in the short-term objective. The paper presents a brief outlook of the project and the experience gained from this project in establishing the future development plans along the Egyptian northwestern coast.

## Background information

The Mediterranean Action Programme Coastal Area Management (CAMP) 'Fuka-Matrouh-Egypt' project has been approved by the Seventh Ordinary Meeting of the Contracting Parties to the Barcelona Convention held in 1991 in Cairo. The project had been completed in 1998. The project area was defined at two levels, the northwestern Mediterranean coast of Egypt as the wider geographical context, and the Fuka-Matrouh area as the study area. Fig. 1 shows the boundaries of the project study area. The area is located ca. 210 km west of Alexandria. The length of the coastline of the study area is ca. 100 km. It is delineated by the city of Matrouh to the west, the Fuka area to the east, the Mediterranean Sea to the north and the 100-m contour line to the south, which runs 10 - 20 km from the coastline. This zone was once highly productive, especially during Roman times when the Romans used dry land farming practices based on the development of water resources and storage of rainwater in underground reservoirs. The project study area is scarcely populated with a Bedouin population in rural areas and immigrant populations in the towns (about 300000 people who work mainly in cattle and fruit production). The coastal strip and the adjacent marine area might be considered among the most attractive natural sites of the Mediterranean. The area is rich in cultural heritage and is a semi-desert (100 - 180 mm of rain per year),

The area faces serious threats that will be described later in this paper. The national development policy aims at strengthening development processes leading to quicker and more efficient sustainable development of the area, providing increased employment opportunities for the resident population and for the expected in-

creased number of immigrants from the Nile area. The long-term objective of the project was to propose a sustainable development concept, and to create conditions for the establishment of the process of integrated planning and management of the project area. The immediate objective of the project was to propose solutions for urgent problems in the area. Accordingly, the project envisaged the implementation of different activities such as; systemic and prospective analysis, study on implications of expected climate change, integrated planning and management study, training and application of tools for integrated coastal management. The institutional arrangements included the involvement of the Ministry of State for the Environment, EEAA, and the local government of Matrouh, different stakeholders, NGOs and local communities. A large part of the project activities were implemented by the University of Alexandria, Institute for Graduate Studies and Research, and by national teams, assisted by MAP Centres and experts.

## Study area profile

The Fuka-Matrouh area is located in the central coastal part of the Matrouh municipality, which occupies the northwestern portion of Egypt. This municipality is one of the largest in Egypt, with an area of 212000 km<sup>2</sup>, representing 22% of the area of Egypt. However, the population density is very low. According to the preliminary results of the 1996 census, the population of the municipality amounts to 212 000 which results in a population density of ca. 1 person.km<sup>-2</sup> (compared to ca. 1500 person.km<sup>-2</sup> in the Nile Valley and the Delta). The population density of the study area is ca. 10 person.km<sup>-2</sup>. The population growth rate is ca. 3% while



Fig. 1. Fuka-Matrouh, the study area west of Alexandria.

the national growth rate is 2.8%. Marsa Matrouh city and its hinterland has the biggest population concentration with ca. 90000 inhabitants, representing ca. 40% of the total municipality population, while the urban population of the municipality amounts to 76%. There are two different social groups, the Bedouins as native population, and immigrants who have migrated from the Nile Valley. The Bedouins used to live a nomadic life, but are now mostly settled in rural areas and in the desert, while the immigrants live in urban centres employed in Government services and construction. As for the educational status, preliminary results of the 1996 Census show that about 2.3% of the population had a university degree, while those who received high school certificates accounted for 18%. Illiteracy rate was found to be around 33%, whereas the remaining 46.7% were classified in the 'can read and write' category. Education has recently received considerable attention from the government. In general, pasturing was for a long time the main source of income in the municipality, but with time, agriculture has become the principal source. Since the rain plays an important role in agriculture and pasturing and determines the yield, the level of income in both branches are characterized by uncertainty. This particularly affects the Bedouins; ca. 80% of them are engaged in sheep and goat herding and cultivation of barley, vegetables and fruit trees. This fact justifies the trend to diversify economic activities and sources of income.

One of the main themes of the Government policies in the study area is to continue the development of the north coast of Egypt. This is to be carried out parallel to the development of other axes, such as the Red Sea, Sinai, and southern parts of Egypt. The ultimate target is to increase the inhabited areas to 7 - 8% of the total area of Egypt. Accordingly, the Five Year Economic and Social Plan, envisages construction of the important water supply system components, including water pipelines and water stations. The major problems and issues in the Fuka-Matrouh area can be summarized as follows:

- Uncontrolled development of tourism which mostly excludes the local population as beneficiaries while having negative impacts on environment and infrastructure;
- Complex natural conditions that require sensible agricultural policies;
- Ecologically and environmentally sensitive areas, as well as valuable cultural heritage;
- Absence of an effective land-use planning and development control system, as well as of a participatory approach in overall development planning;
- Land mines, where 17% of the world's mines are located in this area;
- Insufficient integration of policies (horizontal and vertical) among various bodies in charge of different sectors or geographic segments of the coast.

## Project objectives and contents

The overall direction and goal of the Project is the future sustainable development of the area. Accordingly, the final project output, which is the integrated management plan, should incorporate all the knowledge gained by individual activities, and propose a concept of sustainable development of the Fuka-Matrouh area.

An important long-term objective of the Project was to establish the system of integrated planning and management of resources in the area, as well as to support efforts towards the development of a national coastal management programme. Following this objective the project team members were trying to move from strictly reactive actions as a response to emergency situations to comprehensive understanding of the coastal environment and social processes taking place there. This understanding is the prerequisite for the move from reactive, *ad hoc* measures to preventive actions, which are always cheaper and safer than rectifying environmental damages later. The immediate objective of the Project was to provide solutions to development and environmental problems of the most urgent nature, which could be implemented in the short term.

The Fuka-Matrouh Project ensured implementation of a number of activities belonging to the four main Project components, as follows:

1. Prospective analysis
  - Systemic and prospective analysis, development/environment scenarios;
  - Study of the implications of climatic changes in the coastal area of Fuka- Matrouh.
2. Integrated planning and management program
  - On-the-job training on the methodology of ICAM;
  - ICAM Planning Study for the study area;
  - Application of tools and techniques for coastal management, such as GIS, training, CCA for tourism activities, and Strategic Environmental Assessment (SEA).
3. Legal instruments and institutional structures
  - Identifying the status and development of environmental legislation and institutional framework,
  - Defining specially Protected Areas and implementation of the respective protocol.
4. Sectoral planning (operational activities)
  - Study soil erosion, desertification and water resources,
  - Assessment of natural resources and soil conservation by remote sensing.

## Project methodology, tools and procedures

The Fuka-Matrouh Project planning process followed a general methodology delineated in the beginning of the project, which was adapted to the local conditions and developed further during the project implementation. Apart from that, individual activities used specific methods of work, procedures and techniques that were suitable for the topics of those activities. Generally speaking, the project was composed of two groups of activities. The first group is sectoral based and focused on individual issues, which primarily form the analytical phase of the planning process. The second group of activities integrate information and knowledge gained from the analytical phase in the form of outputs, including the ICAM Study, CCA and SEA. The first group resulted in the comprehensive production of precise and value-free information to support decision and policy making in the second stage of the planning process. The second phase of the planning process synthesized the collated information and produced an integrated physical development strategy at a regional level (ICAM planning study), and formulated a management strategy, action plans, and implementation guidelines.

Although the project has a local character, when considering and evaluating development options of the study area, significant inputs were required on national and regional levels. This pertains in particular to the national policy for population decentralization from the Nile Valley, which designated the Mediterranean coastal zone as one of the immigration areas to which that population is directed. There is also a policy of allocating tourist capacities for the domestic population at the Mediterranean coast. The former is reasonable and cannot be reproached, while the latter cannot be easily avoided under market economy conditions, so it has to be directed and managed appropriately.

Implementation of the ICAM Planning Study was made easier through the EEAA and ICZM Framework ICZM Programme for Egypt (EEAA 1996). This had defined the basic institutional and legal arrangements, and both the Fuka-Matrouh project and the ICAM planning study fit into that framework. With regard to individual activities, some of them brought innovative methodologies and tools that proved to be useful and applicable to the typical conditions of the Mediterranean coast of Egypt.

## Results of individual project activities

### *Systemic and prospective analysis*

The Study elaborated on the interactive relationship between development and environment from a long-term perspective, and took into account future plans for the area and the global and regional trends and impacts. Geographic reference was made to cover a wider area namely the Matrouh municipality and the Mediterranean coast of Egypt. Considering the future development paths, the analysis took into account global and regional trends and impacts, and identified conflicting zones, sectors and key actors, as well as needed adjustments.

### *Implications of climatic changes*

Due to the rising sea level the eastern part of the coast would be subjected to coastal erosion processes including flooding of backshore areas and depressions, whereas slight impacts are expected at the western part of the coast owing to its topography. Change in rainfall and increase in evapo-transpiration may lead to a reduction of cultivated areas, and agriculture is likely to change towards even more intensive farms. Temperature rise will cause higher energy demands (air conditioning) for new developments, in particular in the tourism sector. The change in climate is not expected to have any significant impact on the evolution of population distribution and demographic trends in the area.

### *Soil erosion, desertification and water resources*

In the activity 'Assessment of Natural Resources and Soil Conservation Issues Supported by Remote Sensing' an integrated survey of land resources was carried out. The applied methodology combined high-tech remote sensing technologies with field surveys and laboratory analysis, which together enabled a cost-effective way to provide comprehensive information on soil capabilities in a relatively large area. This information, in turn, proved to be a significant contribution to the land-use planning process. The basic study was performed in two pilot zones representative enough to enable transfer of results to the wider study area. The product of the activity was information on soil agriculture potential (derived from a number of input data, such as slope, texture, depth, rainfall, salinity, sodicity and other chemical and physical properties). This information enables an optimization of the land-use conflict resolution process, such as agriculture and grazing, tourism development and agriculture, or protection and delineation of ecologically sensitive areas such as salt marshes.



### *Assessment of natural resources and soil conservation issues*

This study provided an integrated survey of land resources of the study area (Anon. 1999c). The applied methodology included the use and interpretation of satellite images, field survey, laboratory analysis and additional processing, as well as corrective image interpretation. The final product of the activity is a land system map composed of three Geographical Regions, 12 Land Systems and 25 Landscapes. The activity proved to be a cost-effective way of obtaining synthesized information on land resources of the Fuka-Matrouh area, and their suitability for different potential uses. Such an application brings more rationality into the land-use planning process.

### *Especially protected areas – Marine/terrestrial ecosystems and cultural heritage*

The first task was the identification of the main terrestrial and marine ecosystems, and determination of the level of their ecological sensitivity. On the terrestrial side, seven habitats were identified with information on status, distribution and ecology including the need for further research because of the lack of baseline information. Management measures have been proposed with regard to grazing control, as well as propagation of multipurpose and native species. A detailed survey of the wider area on the marine turtles nesting occurrence (Gulf of Hekma, Abu Hashafa Bay) was performed. A wider area was examined for cultural heritage (east, west and south of Matrouh) where the major sites were analysed (Abu-Seir, Marina El Alamein, Cleopatra Bath, Agiba Site, sites in the Oasis of Siwa). Finally, the management measures were proposed including the definition of the site zoning, with a core area, exclusion zone, buffer zone, and approaches and service area. In addition, other management measures were discussed, such as potential revenue generating facilities.

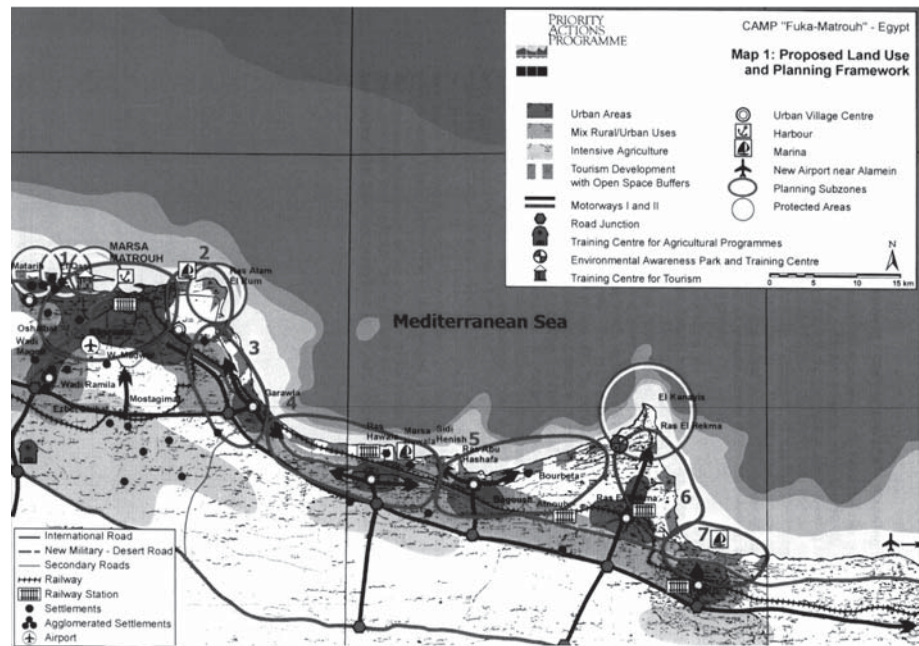
### *Geographical Information Systems (GIS)*

A significant aspect of the coastal profiling phase was done through the use of (GIS) as a principal tool of environmental information management. Building upon this system, the Project ensured GIS support for most of the activities. The main product of the activity is a geographic database developed for the study area, which covers main natural, physical and socio-economic features of the area. The main application developed within this activity was land suitability analysis the results of which were used as important inputs for land

classification schemes prepared as a part of the ICAM study. This activity also included training and education of local teams, which enabled the team members to carry out specific tasks based on accepted methodology and brought them to a desired level of efficiency.

### *Carrying capacity assessment for tourism development*

Carrying capacity assessment for Tourism Development was an activity that applied the carrying capacity concept (Anon. 1999d). While the concept is not new, its application in the Fuka-Matrouh Project was specific, trying to avoid mechanical calculations that pretend to deliver its outputs (usually a quota system to limit numbers of visitors) with cold objectivity. Instead, in addition to physical factors, CCA in the Fuka-Matrouh Project tried to introduce socio-economic and cultural parameters to the analysis. Although these parameters are less prone to quantification, it turned out that they were crucial for the definition of the carrying capacity of tourism development in the study area. The existing tourism development patterns of the Fuka-Matrouh coastal area (dominated by secondary residence resorts for the domestic population) tend to produce tourist saturation of the area in a relatively short period. Three possible scenarios of future tourism development were considered: (1) continuation of the existing trend of almost uncontrolled development with short-term benefits and extensive use of resources; (2) an enclave concept of tourism development – tourism oasis for foreigners with low contributions to the local economic development; (3) balanced, sustainable tourism development. The sustainable option is based on a tourism product designed to attract domestic as well as the international market and, as a result, to extend the tourist season, which has been recognized recently. Carrying capacity related to this option was further elaborated using three main categories of parameters: (1) physical-ecological parameters; (2) socio-cultural parameters; (3) political economic parameters. Finally, the estimated maximum accommodation capacity of the entire area is between 80000 and 100000 beds. Having in mind the existing accommodation capacities together with the so-called ‘tourist resorts’, the future commercial tourism development can count on additional 40000 to 50000 beds. This, together with other relevant information, was an important input for planners in the preparation of the integrated coastal management planning study for the area.



**Fig.2.** Development concept proposed for the Study Area.

### *Integrated Coastal Management Planning Study of Fuka-Matrouh*

The ICAM planning study synthesized all the knowledge and recommendations gained by individual activities and sectoral studies (Anon. 1999b). The study identified the main development issues, and the stakeholders that need to participate in the planning process. The topics that were studied include population, resources, employment, industry, transportation, social services, conservation and landscape. While all these topics had to be looked at in order to anticipate future demands for land, the study suggested that the capacity of the local authority planners to influence development pattern had been limited since they were under control of other, higher-level Government departments, and the private sector interests. The study analysed the overall development opportunities as well as constraints and threats, and formulated a number of scenarios for the Fuka-Matrouh area future. In addition, using the outputs from preceding activities, particularly CCA for tourism development, the study formulated the overall structure or framework for future development extending to the year 2020.

The development concept proposed in the Fuka-Matrouh project, Fig. (2) (Anon. 1999a), is the result of considerations not only about the resources and processes within the study area but also about the whole Mediterranean coast of Egypt, its development potentials as well as present development trends. This concept envisages the creation of an important development centre in the western coastal region. The proposed con-

cept aims at a comprehensive development of the western coastal region. This regional development concept has the following objectives:

- to support the national population decentralization policies;
- to support the idea of the North African coastal transportation and development corridor;
- to enable spatial dispersal of international tourist development;
- to introduce measures and technologies to develop most of the land suitable for agriculture, mostly Bedouin communities;
- to ensure diversification of the tourist product and activities;
- to ensure protection of the area's natural and cultural heritage;
- to promote mixed-use, linear concept of peri-urban villages east and west of Matrouh city, with tourism installations closer to the waterfront, residential or rural areas behind, and agriculture and light industry.

### *Strategic Environmental Assessment (SEA)*

SEA is another innovative tool applied in the Project, which enables the assessment of cumulative, secondary, long-term or delayed impacts. The need for this tool emerged after analyzing the tourism development trends along the coastline of the study area. It will also provide an opportunity for responsible authorities to anticipate cumulative impacts of a number of similar projects, which, if considered individually, may not impose dan-

ger to the environment, but assessed as a whole may show a quite different picture. The matrix method was used in predicting the magnitude and significance of various activities contained in the ICAM on the natural and man-made environment. The considered human activities are classified into six classes: transportation, urbanisation and services, industrialisation activities, agriculture and related activities, tourism activities, and complementary activities. The proposed development of the area includes the development of five new tourist coastal subzones, which together with the greater Marsa Matrouh area will attract ca. 100000 tourists. The local population is planned to increase to 380 000, making a total population of 480000. The population increase is accompanied by the development of appropriate infrastructures, such as a road network, utilities network and various services. Such tremendous population increase would generate a large volume of waste, both solid and liquid. Construction of residential and tourist houses, as well as infrastructure objects will affect the soil and existing watercourses. In order to avoid severe degradation of the, so far, virgin environment due to waste generation, appropriate infrastructure should be developed before the development of sub-zones and the planned residential, tourist and industrial capacities. Since the area is lacking in fresh water it would be reasonable to consider water re-use after appropriate treatment rather than its discharge into the sea. Before any decision on development will be taken, as a general rule, an Environmental Impact Assessment for each project should be implemented.

The proposed development of the area may create severe conflicts with the local population (Bedouins), with their culture, life style and traditional activities. To avoid the conflict, negotiations with tribe representatives at an early stage of project preparation would be mandatory.

#### *Integration of the Fuka-Matrouh project into the national ICZM*

The national ICZM Plan should be the umbrella document that guides the overall coastal development. The coastal management process requires preparation of a number of other plans such as; strategic or operational plans / integrated (comprehensive, multi-sectoral), or subject (sectoral) plans at national, regional and local levels.

The Fuka-Matrouh area is a good example of an area where an integrated coastal management plan is needed because of negative development trends, conflicting issues/users and complex management problems. The wider Matrouh area (including the Project area), besides the need to be covered by a regional-level integrated

plan, requires the preparation of a sub-regional plan. A regional plan is often the most difficult scale of coastal plan to develop. It bridges the gap between tangible local issues and strategic national guidance. A regional plan is also the first planning level, which is sufficiently detailed to become spatially oriented. In addition, the regional level ICZM planning process is very complex in terms of horizontal integration of sectoral competent authorities, usually ministries which will implement relevant policies. Participation in the planning process of all levels of government, including local stakeholders (municipality level), is another essential component of the planning process. This so called vertical integration among administrative levels is even more important at the implementation stage.

All the integration issues mentioned when describing the regional level planning are typical of the whole coastal management process, and show the need for real power of the entities in charge for providing integration. The planning and policy making process are needed to be integrated, co-ordinated, and harmonized. To this end, power of the existing agencies should be balanced with the real operational powers of co-ordinating bodies such as the NC ICZM. While the project has provided a comprehensive scientific and technical analysis, and proposed a sound and ambitious development concept, there are numerous administrative and socio-political issues that need to be resolved if the coastal management goals are to be achieved.

#### **Conclusions and Recommendations**

The paper has presented the activities of the Fuka-Matrouh CAMP project and the relation between the project results and the ICZM framework programme of Egypt. The project gives a list of recommendations for follow-up action plans. Those follow up activities are currently being implemented by the Government. A short-term action plan at the municipality level includes:

1. Guidelines for regional planning
  - Establishment of a municipal Coastal Planning Commission;
  - Preliminary designation of specially protected areas;
  - Preliminary designation of land suitable for agriculture;
  - Control of tourism development projects.
2. Preparation of the General Structure Plan of the Municipality Coastal Area
  - Considerations on national policies (population redistribution, tourism development);
  - Local population projections;

- Tourism development carrying capacity;
- Land classification schemes (main land uses according to land suitability analysis);
- Infrastructure development.

The medium and long-term actions (Mediterranean coastal region of Egypt) include:

#### 1. Preparation of the ICZM Plan for the Mediterranean coastal area

- Policy oriented research of critical issues;
- Protected areas (natural and cultural);
- Protection against coastal hazards and effects of climatic changes;
- Coastal land-use planning (including Strategic Environmental Assessment).

#### 2. ICZM Plan Implementation Process

- Institutional arrangements for implementation;
- Human capacity building (on regional and local levels);
- Preparation of the regional, sub-regional and local land-use plans;
- Legal provision for Strategic Environmental Assessment;
- Environmental information management (including GIS and RS);
- Monitoring and evaluation (feedback process);
- Environmental education and participation programmes.

#### 3. Sectoral Projects

- Renewable energy project;
- Coastal Environmental Information System based on GIS and RS technologies;
- Low cost wastewater treatment technologies;
- Regional oil spill response programme;
- Food processing and agromarketing centre;
- Handicraft centre.

#### References

- Anon. (Egyptian Environmental Affairs Agency) 1996. *Framework Programme for the Development of a National ICZM Plan for Egypt*.
- Anon. 1999a. *Coastal Area Management Programme (CAMP), Fuka-Matrouh-Egypt, Final Integrated Report*. PAP/RAC, MAP, UNEP, Split, HR.
- Anon. 1999b. *Coastal Area Management Programme (CAMP), Fuka-Matrouh-Egypt, Integrated Coastal Area Management Planning Study*. PAP/RAC, MAP, UNEP, Split, HR.
- Anon. 1999c. *Coastal Area Management Programme (CAMP), Fuka-Matrouh-Egypt, Assessment of Natural Resources and soil conservation issues in the coastal area of Fuka-Matrouh*. PAP/RAC, MAP, UNEP, Split, HR.
- Anon. 1999d. *Coastal Area Management Programme (CAMP), Fuka-Matrouh-Egypt, Carrying Capacity Assessment For Tourism Development*. PAP/RAC, MAP, UNEP, Split, HR.
- Fawzi, M.A., Abul-Azm, A.G. & El-Sayed, M.Kh. 1996. *Integrated Coastal Zone Management: An Egyptian experience. Proceedings of an International Workshop On The State-Of-The-Art Of ICZM in The Mediterranean and Black Sea (MED & BLACK SEA ICZM 96), November 2-5, pp. 263-274. Turkey.*

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