

EIA Guidelines for Development of Ports, Harbours and Marinas in Egypt

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Abstract

The coastlines of Egypt comprise more than 3000 km along the Mediterranean, the Red-Sea and the coastal lagoons. Due to the increased development on the coastal zone of Egypt particularly for ports, harbours and marinas, the Egyptian Government represented by the Egyptian Environmental Affairs Agency (EEAA) had issued Environmental Impact Assessment (EIA) guidelines of such development as a tool to control the development and as a requirement of the Law for the environment. This paper presents the main features of these guidelines and the requirements for preparing an EIA for a port, harbour or a marina. The purpose of the guidelines is to outline issues, which may be relevant for the environmental impact assessment of ports, harbours, marinas and related facilities, basically during the design phase and the construction of the project.

1. INTRODUCTION

After passing the law for the environment (Law 4) in 1994, the Egyptian Environmental Affairs Agency (EEAA) was given specifically, in a broader sense, the authority to implement this law. Integrated Coastal Zone Management (ICZM), protection of water environment, Environmental Impact Assessment (EIA), environmental monitoring networks, management and supervision of natural protectorates, are amongst the areas regulated and addressed in law 4/94. In the same time the framework programme of the ICZM of Egypt had been issued in December 1996 proposing the use of EIA as a tool for environmental planning and management. In recent years, many ports and marinas are being proposed along the coastal zone of Egypt. Such developments may pose severe and increasing pressure on the coastal environment.

In 1996, the EEAA had issued guidelines for coastal development in Egypt. The main objective of these guidelines was to establish environmental regulations mainly for the increased tourist developments in the Red Sea, and introduce the basic principles to the investors in an ecologically sensitive area. These guidelines included a small section on harbours and marinas. In the past five years, the number of applications to construct marinas had increased, beside the Government had planned to construct two main ports one along the Gulf of Suez and the other is southeast of Port-Said. In 1999, the EEAA had issued EIA guidelines for the construction and operation of such developments in order to unify the applications for such a development. This guideline was an attempt to issues series of EIA sectoral guidelines that had started earlier in 1998 (Fawzi and Abul-Azm, 1998).

This paper presents the main features of these guideline and the requirements for preparing an EIA for a port, harbour or a marina and identifies some important factors to be considered when preparing an EIA study. The purpose of the guideline is to outline issues, which may be relevant for the environmental impact assessment of the design and construction of ports, harbours, marinas and related facilities. It also presents two cases of ports, which were approved in 2000 and are currently under construction.

2. GUIDELINE OUTLINES

This guideline identifies some important factors to be considered when preparing an environmental impact assessment study (EIA). Early effective consultation and technical discussions with relevant government agencies should precede the preparation of the EIA. A high priority should be given to:

- Considering environmental factors in site selection.
- Evaluating alternative sites.
- Ascertaining the suitability of the intended location.
- Early evaluation of alternatives

The analysis of alternative design, processing and management practices should consider the environmental implications of options. The justification for the selection of the preferred options should consider biophysical, social and economic factors, and the consistency with ecological sustainability principles.

The assessment process should focus on key environmental issues. These issues should be identified early in the environmental impact assessment (EIA) process, usually at a planning focus meeting and through consultation with the community. The assessment process should clearly identify the environmental (including biophysical, social and economic) costs and benefits of the proposal.

The EIA should outline commitments to the ongoing environmental management of the proposal, including monitoring.

The level of analysis of individual issues in the EIA should reflect the level of significance of their impacts. The analysis should focus on key issues. The information in the EIA should be accurate and presented clearly and concisely. There should be emphasis on quality and not quantity.

3. PORTS, HARBOURS, MARINAS AND RELATED FACILITIES

Ports and Harbours can range from small facilities accommodating trailer boats for local subsistence fishing to deep draft ports capable of handling super-tankers. Ports refer to development for larger deep draft ships requiring basin and channel depths of 10m and more. Harbours refer to facilities designed for light draft vessels needing basin and channel depth of 5 to 10 m. Marinas are identified as shore-side facilities for mooring recreational boats, and including water-based as well as land-based facilities for boats and boat-users. Whatever its size or configuration, a port, harbour or marina will have some common attributes. The most essential purpose is the provision of a sheltered area for boating or shipping-related activities. The basis of ports, harbours and marinas development is access to the sea, economic values, subsistence and recreational activities. Objectives are to provide safe and sufficient facilities for fishing, shipping trade, or transportation. Throughout the remainder of this document, these facilities are referred to by the generic term "ports". The facilities may include:

- Berthing, mooring and docking facilities.
- Navigation and safety facilities such as channels, breakwaters, groins, navigational markers
- Facilities for ship wreck, dry storage facilities such as hard stands, stacks, racks, cradles, hoists, cranes, straddle-carriers, fork-lifts
- Boat maintenance, repair and construction facilities such as dry-docks or floating docks, slip-ways, mechanical and electrical or instruments workshops, storerooms (inc. for chemicals), boat washing facilities

- Services such as refuelling facilities, fuel storage, pump-out facilities, waste collection, treatment or disposal facilities, water storage and supply facilities, fire control services, amenities
- Parking, passenger or heavy vehicle access, public access, landscaping.
- Commercial and retail service facilities, food outlets, and boat sales
- Ferry, boat hire and charter services
- Related tourist or accommodation facilities, boat club facilities.

4. INITIAL SITE ASSESSMENT

An initial assessment of the intended location can help ensure that the proposal can be operated in an environmentally acceptable manner. An initial site assessment can provide a basis for the comparative evaluation of potential sites. It is recommended that an initial assessment be undertaken before committing to a particular site or proceeding with a more detailed assessment in an EIA. This could be done by walk through assessment, initial data collection and basic modeling. Matters to consider in an initial location assessment are shown later and this list is not necessarily exhaustive.

When assessing, if a proposed site is acceptable, consideration should be given to its compatibility with surrounding land uses. Consideration may need to be given to acquiring sufficient land to provide adequate on-site separation from nearby sensitive land uses. Such separation can help minimize impacts and maintain the amenity of the surrounding areas. Factors to consider in determining appropriate separation distances include:

- the character of the surrounding environment and its sensitivity to impact
- the characteristics of the impacts, in particular their predictability
- proposed impact mitigation and management strategies and their predictability.

However, separation distances should not be viewed as the primary means of ameliorating impacts as this can lead to unnecessary land sterilization. Instead, separation distances should be thought of in the context of a location attribute providing confidence that the amenity of existing land uses can be maintained. The EEAA does not accept impact reduction solely by separation distances for coastal erosion, loss of habitat, or water pollution. Therefore, the role of site separation as an impact mitigation measure should simply reinforce the impact mitigation measures provided by other means. Matters to be Considered in Initial Site Assessment

- a) Operational Requirements: Sufficient land area for present and future expansion, proximity to market and availability of services supplied (power and water).
- b) Topographic and meteorological assessment: Effect of rainfall patterns or prevailing wind directions likely to cause management difficulties or local climatic conditions result in microclimatic conditions adversely impacts on the community.
- c) Water Issues: Any site constraints on-site water management difficult (including surface or ground water), flooding, maintenance dredging and effect of tides on flushing.
- d) Flora and fauna issues: Natural vegetation or coral reefs, wetlands, littoral rainforest or sea-grass affected.
- e) Geological or soils issues: Topography or geological characteristics, which will cause difficulties in managing impacts (subsidence, slippage, seismic), soil contamination or poor soil strength problems and sediment management, erosion protection.
- f) Transport issues: Capacity of the road network, truck traffic, avoidance of residential areas, hospitals, schools and commercial areas, parking access and constraints.
- g) Community issues: compatibility with surrounding land use, Effect on aqua-culture, fish breeding or fishing grounds, compliance with dust, noise or water quality requirements, health risks, effect on heritage, visual impacts and access to public land.
- h) Cumulative issues: Is the proposal at this site likely to contribute to any existing cumulative problems

5. SUMMARY OF EIA REQUIREMENTS

A summary of the specific requirements for an EIA for a port is provided below. All issues identified will not have the same degree of relevance for all proposals. Depending on the characteristics of the proposal, some of the requirements may be more relevant to specific cases. The EIA should be tailored to the specific proposal and should focus on the key issues.

- I. Executive summary
- II. Legislative Framework, which include; analysis of relevant legislation (National, Regional and International), and list of approvals and licenses required.
- III. Description of the proposed development, which includes Location and planning context, Site description and local informa-

tion, Objectives of the proposal, Description and layout of the proposed port and associated facilities, Site preparation and construction, Infrastructure considerations, Other similar facilities in the locality, and Consideration of alternatives and justification for the preferred alternative.

- IV. Description of the existing environment-Baseline Data, which includes Land surface issues, Shoreline changes, Hydrological issues, Water quality and waste management issues, Air quality, Noise, Visual problems, Flora and Fauna issues, Social issues, Land transport and parking issues, Water transport issues, Heritage issues, Hazards material, and Economic issues.
- V. Prediction of impacts and evaluation of significant environmental impacts, which includes, Overview of the affected environment, Overview of the methodology used to identify and priorities issues, Outcome of the previous process, and Impact assessment.
- VI. Mitigation measures, and monitoring plans which includes; Mitigation measures and monitoring, and Compilation of mitigation measures.
- VII. Environmental management plan, which includes, environmental management outline and monitoring outline

6. SPECIFIC REQUIREMENTS FOR EIA

This section of the paper will present mainly the environmental impacts and the environmental management plans proposed in the guidelines. The following impacts would be discussed utilizing different modeling tools.

6.1 Impacts to be considered in the EIA

(1) Land surface

- Potential direct or indirect disturbance or alteration (above and below water)
- final surface characteristics (above and below water).

(2) Shoreline

- Potential impacts of structures on the shoreline resulting from changed sediment transport patterns
- Coastline changes including prediction method and description of the model used, calibration and validation of the model
- Advection/ Dispersion and plume modelling must be used to estimate the rate of suspended sediment during dredging and its possible effects on near by marine life.
- Changes in water movement patterns, and

sediment transport processes and mechanisms from dredging and maintenance of structures and boating activity

(3) Hydrology

- Potential impacts on structures such as bridges.
- Impact on flood regime
- Potential impacts from flooding or rising water tables.

(4) water quality and waste management:

- Direct or indirect impacts, reversible or irreversible impacts should be specified and discussed.
- Modelling is needed to verify the water quality inside the port, this should include the model selection and verification.

(5) Air quality

- Baseline data on the ambient quality of the air, including consideration of prevailing meteorological conditions and topographic features which may influence noise impacts
- Projected emission and deposition rates
- Frequency and times of emissions

(6) Noise

- Baseline data on the existing acoustic environment including the consideration of prevailing meteorological conditions and topographic features which may influence noise impacts
- The proposed hours for construction and operation including land and water traffic movements
- Predicted noise levels at potentially affected sites, including dwellings, adjacent recreation areas, sensitive natural areas.

(7) Visual

- The facility form, bulk, colour, reflectivity
- Lighting from security requirements or night operations
- Boat mooring and movements
- The clearing of vegetation

(8) Flora and Fauna

- Potential impacts on fauna and flora: either directly through removal by clearing or dredging, or indirectly by; sedimentation, access to light, induced bank collapse, a change in substrata, effects of boat wash, changes in water quantity, quality, movement or groundwater regime;
- The sensitivity of species or communities to disturbance; the potential impacts of disturbance on biodiversity; the potential for recolonization following any disturbance
- The significance of flora for other biota, in-

cluding biota not directly affected by the proposal but which interact with potentially disturbed flora.

(9) Social

- Health and safety
- Employment
- Disabled access and access to public land and waterways.

(10) Land transport and parking

- Assessing the impact of traffic generated by port construction and operation on the local and regional road network.
- Estimating the average and peak parking demand for vehicles and trailers.

(11) Water transport: Impacts due to increased navigation in the area.

(12) Heritage

- Assess the significance of any heritage items identified on the site.
- Assess the potential impacts on the heritage significance

(13) Hazardous material on site: the impacts of hazardous material in the site.

(14) Economic

- Potential economic impacts on other industries both within the immediate locality and the wider community, such as tourist facilities, agriculture, aquaculture, commercial fishing, boat building
- Potential impacts on land values.

(15) Cumulative impacts

- Existing or past marine operations in the same location or the immediate vicinity; other forms of industry in the vicinity which may have similar impacts
- Loss of access to public land and waterways.
- The advantages or disadvantages of clustering port operations or marine activities in the area
- The compatibility of mitigation measures.

6.2 ENVIRONMENTAL MANAGEMENT OUTLINE

The management strategy should demonstrate that sound environmental practice would be followed during the establishment, operation, rehabilitation and end use of the port. This should include:

- Management of construction impacts, if appropriate, erosion and sedimentation management and re-vegetation plans for areas disturbed by construction activities
- Management of operational impacts, if ap-

appropriate include details of: materials management on site, including petroleum products, chemicals and fuel, water and air quality management; transport and parking management, maintenance and site security plans, and contingency plans to respond to emergencies, incidents or any breakdown in environmental performance.

- Strategies to feed information from the monitoring program back into the management practices and action plans to improve the environmental performance and sustainability of all components of the scheme.
- Training programs for operational staff and incentives for environmentally sound performance.
- An indication of how compliance with licensing and approval requirements will be achieved and due diligence attained.
- If applicable, reporting mechanism on environmental performance and performance bond and relevant performance parameters.

6.3 MONITORING OUTLINE

This program should be carefully designed and related to the predictions made in the EIA and the key environmental indicators that would demonstrate the potential ecological sustainability of the proposal. The EIA should outline the need for and use of any proposed monitoring, monitoring intervals and reporting procedures. Parameters that might be relevant include:

- Performance indicators in relation to critical operational issues including: quality of water discharged or leaching to groundwater, surface water or soil, noise and air quality, and any relevant public health indicators.
- Waste management; performance indicators in relation to recycling and reuse.
- Monitoring of complaints received.

The program outline should describe the following monitoring details:

- The key information that will be monitored, its criteria and the reasons for monitoring (which may be compliance with regulatory requirements).
- The monitoring locations, intervals and duration.
- Procedures to be undertaken if the monitoring indicates a non-compliance or abnormality.
- Internal reporting procedures and links to management practices and action plans.

- Reporting procedures to relevant authorities and, if appropriate, to the consent authority and the community.

7. CASE STUDIES

This EIA guideline had been adopted in 1999 and applied to two main ports and several marina proposals that were presented to EEAA since 1999. This section discusses briefly the two main ports that were proposed namely, El Sokhna Port and East Port Said Port as depicted in Figure (1).

7.1 East Port Said Port

The aim of the project is to construct a Container Terminal in the development area of Port Said (Haskoning et al., 2000). The project comprises a container terminal with four berths. It is designed to handle about 1.1 million moves a year starting by 9 cranes in the first phase which will extend to a number of 12 cranes in the second phase.

The terminal has a length of 1200 m in the North-South direction along the berth and 535 m in the West-East direction from berth to land side border. The area is divided from berth to land side border for three different destinations; the apron, 35m, the stacking area, about 400m, and the parking, gate and building area, about 100m.

The project is to be realized in two stages; the first stage, about 67% of the stacking area and the parking, gate and building area, and the second stage, the remainder of the terminal. The first phase of the terminal will be constructed in a manner to allow its extension to the South in the second phase.

The terminal will be operated with 27 rubber tire gantries, RTG's on fixed runways. The RTG's can stack 1 over 5 and reach 7 containers wide. The RTG's are fed by 54 tractors handling about 120 chassis. Empty containers are stacked by 3 forklift trucks. In addition 4 reach stackers are employed.

7.1.1 Existing environmental settings

The area to be occupied by the proposed containers terminal is not considered to have specific important ecology.

The survey showed no evidence to wildlife activities. Birds found in the arid region and their count prove that the arid region does not support a food source of the birds nor used as breeding site. No signs of vegetation exist at the project site. This is mainly due to the high salinity of soil and the intrusion of seawater.

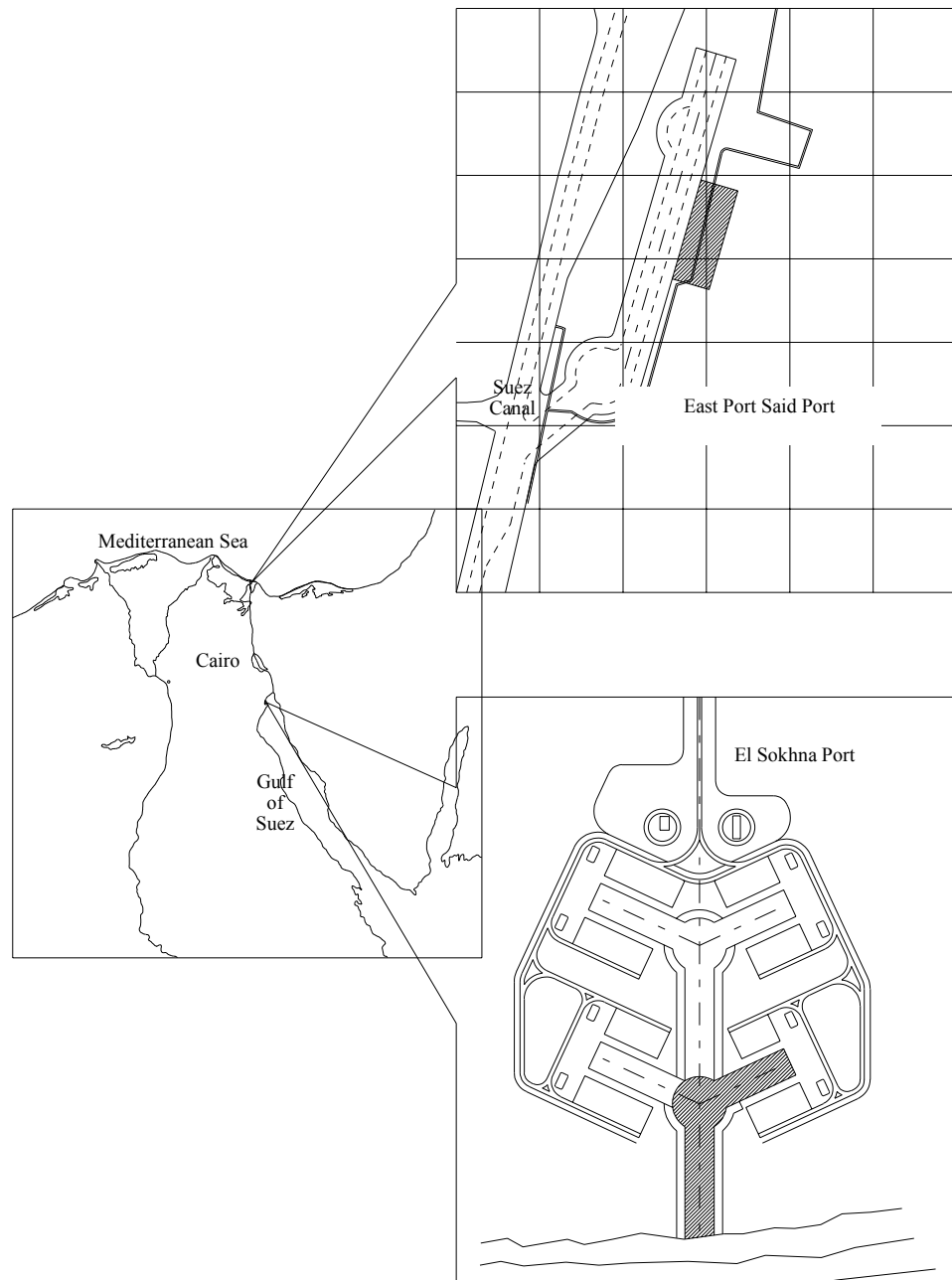


Figure 1: General Layout for El Sokhna and East Port Said Port

7.1.2 Human Activities

Currently there is no sign for any human activities at the project site, except for the construction activities of the quay wall that are presently carried out at the shoreline. The nearest urban area is Port-Fouad, which is separated from the project area by the Suez Canal by-pass. Port-Said is concentrating on the development of the Eastern part of Suez Canal Branch. The main feature of this development is the construction of a harbor and a transit station for containers. This is considered to be one of the main Egyptian National Development Project that will eventually affect the Egyptian economy in general and Port-Said's economy in particular.

7.1.3 Potential Impacts and Mitigation.

Impact on Local Ecology: The project will have no significant impact, as there is no wild life detected in the project site. Hence no mitigating measures are required.

- **Water and sediment quality:** minor spill of lubricant, oils and other chemicals are likely to have a negligible impact on water quality after clean upland/or dilution and dispersion, but they would be undesirable. A volume of about 2,500,000 m³ of dredged soil will be removed from the site and disposed off at a designated site located nearby. The soil is being used beneficially to construct part of the access road to the container terminal from the south.
- **Surface Water Drainage:** With any large development there is the potential for uncontrolled surface water drainage to adversely affect the quality of nearby receiving water. In the case of the proposed terminal, the risk of seawater pollution is high and this will be controlled before discharging to the sea.
- **Domestic Sewage Drainage:** It will be connected to a wastewater network.
- **Noise and Heritage** are not considered major issues in this development.
- **Traffic issues:** This will cause pressure on existing roads, and a separate network is proposed before full operation of the Port.

7.2 El Sokhna Port

The project area is located at the northwestern coast of the Gulf of Suez (Khalaf et al. 2000). The planned project entails the dredging and construction of coastal engineering works of an inland port at El Sokhna Development Area.

This port will consist of an access channel, a turning basin and berthing facilities. The access channel will extend to a depth of 17m, and will be 250m wide. The turning basin is 650 m in diameter and the berthing basin is 350m wide.

Dredging will be carried out to a level of -17m CD, the coastal engineering works will include the construction of breakwater and slope protection works. In order to protect the internal basins from waves and the approach from sedimentation due to the littoral drift, two breakwaters will be constructed. The total length of the northeast breakwater is 770m (from + 2.50m CD to -6.30m CD), while that of the southern breakwater 680m (from +2.50m CD to -5.20m CD). The axis of each breakwater is at 350m from the axis of the channel. This distance takes into account the possible future widening of the channel to two-ways configuration.

The port will include four cargo terminals and a livestock feedlot. The terminals are; a container terminal, a bulk terminal, a general cargo terminal and fertilizer terminal. A private company including managing of environmental issues will manage the port. The initial capacity of the container terminal is 200,000 TEU, increased to 450,000 TEU. The bulk terminal initially will be developed for handling scrap (1 million ton per year) and will be extended with conveyor systems and stockpiling equipment in the future for handling and storage of iron ore, pellets and coal. The general cargo will have an initial capacity of 1 million tons per year, expandable to 2 million tons. The fertilizer terminal is designed for a throughput of 300,000 tons per year, expandable to 600,000 tons per year.

A separate Environmental management plan (SWC B.V, 2000) had been submitted to EEAA for approval after the EIA for the constructions had been approved by the agency. Major issues regarding this project were mainly; hydrology issues, proximity to reef, increased amount of dredging (about 26,000,000 m³) and proximity to tourist areas. If operated successfully it will have a positive economic and social benefit to the nation and the area in particular.

8. SUMMARY AND CONCLUSIONS

This paper presents the main features of guidelines and the requirements for preparing an EIA for a port, harbour or a marina, the guidelines were published by the EEAA in 1999. The guidelines identify some important factors to be considered when preparing an EIA study and suited specifically to the environmental conditions and laws of Egypt. The purpose of the guideline is to outline issues, which may be relevant for the environmental impact assessment of the construction of ports, harbours, marinas and related facilities, basically during the design and constructions phases of the project. This guideline has been consulted several times in the past few years, particularly for the decision making of two main ports and several marinas.

The paper has presented a case where the guidelines prove to be successful in implementing the law for environment and the preparation of an important tool for planning.

ACKNOWLEDGMENT

The authors wish to thank the Support for Environment and Management Project to the Egyptian Environmental Affairs Agency (SEAM Project to EEAA) for the information provided in this paper.

REFERENCES

- Arab Republic of Egypt, Cabinet of Ministers, Egyptian Environmental Affairs Agency, Environmental Management Sector, 1996, "Guidelines for Egyptian Environmental Impact Assessment".
- Arab Republic of Egypt, Cabinet of Ministers, Egyptian Environmental Affairs Agency, Environmental Management Sector, 1996, "Framework programme for the development of a national ICZM plan for Egypt".
- Arab Republic of Egypt, Cabinet of Ministers, Egyptian Environmental Affairs Agency, Environmental Management Sector, 1999, "Environmental Impact Assessment Guidelines for Ports, Harbours and Marinas".
- Fawzi, M. A., and Abul-Azm, A. G., "EIA Training For Touristic Coastal Development in Egypt", Proceedings, Conference on Education and Training in Integrated Coastal Area Management, The Mediterranean Prospective, IC-COPS, Genoa, Italy, 25 - 29 May 1998.
- Haskoning, Posford Duvivier, and Pacer consultants, "Environmental Impact Assessment of Container terminal Port Said East Port", Report, December 2000.
- Khalaf, F. I., Azab, M., and Sogreah, "Environmental Impact Assessment of the Dredging and Disposal Activities and the construction of Breakwaters of North El Sokhna Port", Report, March 2000.
- Larry W. Canter, 1996, "Environmental Impact Assessment", McGraw-Hill International Edition.
- SWC B.V., "Environmental Impact Assessment of the Port and Cargo Terminals in The Port of El Sokhna", Report, June 2000