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Research Article

Environmental Impact Assessment (EIA) Guidelines for Development of Ports, Harbours and Marines along Egyptian Mediterranean Coast-A Case Study

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Abstract

The environment in Egypt is still suffering from the negative environmental impacts of the different polluting activities that did not taking the environmental issue into consideration. Also, recently there is lots of developing marine projects, which are in the planning stage and there is a need to implement the Environmental Impact Assessment EIA efficiently to achieve a sustainable development strategy to protect our environment. The coastal zone of Egypt is of great economic and environmental significance this area receives high pollution loads discharged from the main urbanized, agricultural and industrial areas. Therefore, the Study will highlight the guidelines that take into account while preparing an EIA for development of ports especially in Mediterranean Coast region and the case study at the New Damietta Port Developed area. The research steps were as follows:

- *Assessment of the Existing Environmental Conditions that will study:*
- *Impacts on the Biogeochemical environment, groundwater, Soil, coastal and marine environment (Physical/chemical impacts),*
- *Shoreline Stability and hydrodynamic Process,*
- *Impact of Air Quality and Noise,*
- *Impacts on the Biological and ecological components,*
- *Impacts on the Socioeconomic environment, Sociological, cultural components, and economic components,*
- *Prediction of impacts and evaluation of significant impact evaluation and assessment was done using matrix analysis at Construction phase, and After construction (during operation of the project),*
- *Environmental Assessment Matrix (EAM), and*
- *Social and Environmental Impact Evaluation.*

Keywords: *Environmental Impact Assessment (EIA), Environmental Baseline Survey (EBS), Mediterranean Coast Region, Egyptian Ports, Damietta Port.*

1. Introduction

According to the Egyptian environmental legislation, each new establishment or project as well as expansion of existing establishment (which is the case of the new extension of the port) must be subject to an environmental impact assessment (EIA) before a permit is issued.

The New Damietta port is situated on the Egyptian Mediterranean coast, about 37 km west of Port-Said and about 9 km of Dumyat city Fig. (1) Showing the proposed extension area of Damietta Port. It handles export of agricultural products, fertilizers, and furniture and receipt imported goods such as petrochemicals, cement, grains, flour, and general cargo with a total capacity of about 5.6 million tons annually.

Fig. (1) Showing the proposed extension area of Damietta Port (Image from Google Earth).

The EIA process is often described as an assessment of how, negatively or positively, a project affects various impact indicators. It makes sure that environmental issues are raised when a project or plan is first discussed and that all concerns are addressed as a project gains momentum through implementation. To be of most benefit it is essential that environmental assessment is carried out to determine significant impacts early in the project cycle (i.e., before and during construction works).

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Fig.1 Proposed extension area of Damietta Port (Image from Google Earth)

Once implementation of the project has commenced, the EIA should lead to a mechanism whereby adequate monitoring is undertaken to realize environmental management (Dougherty and Hall, 1995). The Environmental Statement must include:

Site selection procedure, and Specific requirements for an EIA which contain: (Executive summary, Legislative framework, Description of the proposed development, Description of the existing environment - baseline data, Prediction of impacts and evaluation of significant impacts, Mitigation measures and monitoring plan, and Environmental Management Plan (EMP))

2. Material and Methods

2.1. Assessment of the Existing Environmental Conditions (i.e. Pre-construction phase)

It is important to analyze the present environmental conditions for recording the existing status. The existing condition will consider as the background level. Any expected impacts or improvements in the conditions should be referring to the existing conditions.

2.1.1. Impacts on the Biogeochemical environment: A. Impact on groundwater:

According to the environmental baseline study, groundwater was collected from two drilled boreholes. Borehole I was dredged at the proposed area of the terminal, while borehole II was drilled west to the port. The study on the groundwater composition indicates that there is difference in the groundwater composition between the two boreholes. Table 1 shows a Levels of trace metals in the two boreholes compare to the EEAA permissible levels and the natural background. It is obvious that trace metals in the two boreholes are significantly low comparing to the EEAA permissible levels. On the other hand, the levels of trace metals in the two boreholes are higher than the natural background levels given by Salmons and Förstner (1984).

Table 1 Levels of trace metals in the two boreholes compare to the EEAA permissible levels and the natural background

Metals	Fe	Mn	Zn	Cu	Ni
Borehole I	0.645	0.0485	0.0382	0.0074	0.001
Borehole II	0.4104	0.0234	0.0401	0.0183	0.004
EEAA (mg/l)	1.5	1	5	1.5	0.1
Background freshwater*	0.055	0.006	0.01	00.1	0.0003

* Salmons and Förstner, 1984.

B. Impact of coastal and marine environment (Physical/chemical impacts).

I. Impact on water quality

Table 2 summarizes the Marine water physical parameters and compares their levels with permissible levels and other standard levels

Table 2 Summary of Marine water physical parameters

Parameter	DO (mg/l)	TSM (mg/l)	S‰	pH	Temp (ºC)
Damietta Port	5.68 – 8.23 (6.65)	23.4 – 36.0 (29.075)	37.2 – 39.4 (38.4)	8.47 – 8.75 (8.59)	28.8 – 29.5 (29.2)
EEAA[1]	œ 4 mg/l at all time	60 mg/l	-----	6 - 9	5 ºC above the mean annual
Canada[2]	> 8.0 mg/l	Maximum increases of 25 mg/l from the background levels for any short-term (>24 H), Maximum increases of 5 mg/l for long term (>24 h to 1 30 days)	< 10% fluctuation	7.0 – 8.7 and should not vary by more 0.2 from the natural pH expected at that time	Not to exceed ± 1 ºC
World Bank/IFC[3]	---------	50 mg/l	-------	6 – 9	< 3 ºC increase

Table 3 Metals Concentrations in sea water inside the port

	Fe (ppb)	Mn (ppb)	Zn (ppb)	Cu (ppb)	Pb (ppb)	Cd (ppb)
Damietta Port	250.9	29.0	15.33	46.85	175.97	25.33
EEAA (mg/l) *	1.5	1	5	1.5	0.5	0.05
World Bank/IFC (mg/l)**	3.5	-------	2.0	0.5	0.1	0.1

* Criteria and specifications for the parameters when discharged into marine environments (concentration is in mg/l)
** World Bank: Pollution Prevention and Abatement Handbook, World Bank Group, Effective July 1998.

Table 4 Chemical characterizations for the bottom sediments.

	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)	Pb (ppm)	Cd (ppm)	TOC (5)	TPH (µg/g)
Damietta Port	3.59 – 63.2 (44.26)	268.6 – 1149.9 (830.34)	58.49 - 149.7 (87.87)	19.97 - 60.81 (41.54)	224.2- 312.5 (254.2)	1.97 – 8.64 (4.66)	1.02 – 3.73 (2.02)	2.917- 31.42 (17.0)
Dredging Area (New Terminal area) St. 7	42.399	286.61	64.16	48.81	254.21	7.14	2.36	31.42
Background levels*	4.1 %	770	95	33	19	0.17	---	-------

* Salmons and Förstner, 1984

1) TSM and pH = Criteria and specifications for the parameters when discharged into marine environments.
2) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated 2001.
3) World Bank: Pollution Prevention and Abatement Handbook, World Bank Group, Effective July 1998.

From the above table, it is clear that, the water quality in the study area is with the permissible levels for the physical parameters of marine water. It is clear that some metals are considerably high if we compare with the background levels. However, these values are normal for trace metals inside a port.

II. Impact on sediments quality

Table 4 represents Chemical characterizations for the bottom sediments in the study area. It is clear that most of the metals are higher than the natural background levels for shallow marine sediments. On the other hand, comparing the levels of hydrocarbon in the sediments of the study area with the results of Alexandria (Eastern H arbor) (Shabara, 2001), the levels at Damietta Port can be considered high. Accordingly, Sediments from Damietta Port can be ranked as contaminated with petroleum hydrocarbons.

III. Shoreline Stability and hydrodynamic Process Coastline and Seabed Changes

Coastline and seabed changes have been reported along the coastline of the Damietta harbor following construction of the harbor jetties (breakwaters). The erosion/accretion pattern is resulted from the NW wave-induced longshore current to the east. Changes in shoreline changes are also coinciding with vertical seabed variability.

D. Impact of Air Quality and Noise

The mobile lab was used for field measurements. Both total suspended particulates and particulate matter less than 10 micron (PM10) are higher than the

permissible level adapted by EEAA. On the other hand, major inorganic gases (SO_2, NO_x, and CO) are below the permissible levels for EEAA. Regarding Noise levels in the study area, a digital sound analyzer was used for measuring noise level in the study area. Noise levels exceeded the maximum permissible level adapted by EEAA.

2.1.2.2. Impacts on the Biological and ecological components:

A. Marine life assessment

The distributions of marine life parameters (Phytoplankton, zooplankton and bottom fauna) at Damietta Port were studied. Fig. 2 shows the distribution of the abundance (No. of Species) for the phytoplankton at the study area. It is obvious that high numbers of species are located outside the port basin and to the east from the approaching channel. The numbers of species decrease towards the southern end of the basin and away from the coastal area. In general, the diversity of phytoplankton recorded is very high. It seems that the barge channel has some effect on the phytoplankton distribution pattern.

On the hand, zooplankton distributions did not show the high diversity compare to the phytoplankton. Fig. 3 illustrates the distribution of zooplankton at the study area. Contrary to the phytoplankton, the zooplankton exhibited high values at the south end of the port basin and at the entrance of the port as well as at the Barge Channel.

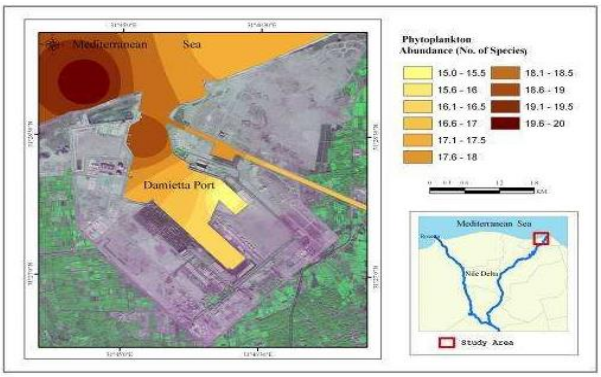


Fig.2 Distribution of phytoplankton diversity (No. of Species) in the study area

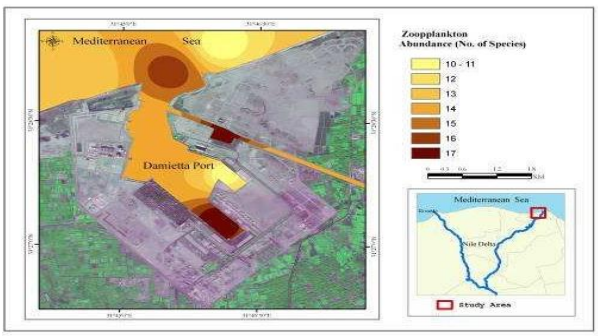


Fig.3 Distribution of zooplankton diversity (No. of Species) in the study area

Fisheries: The fishery area of Damietta is one of the most productive areas, the port basin was not considered as an important region as there is no commercial fishing within the study area, hence, fisheries are not an important issue.

B. Terrestrial Wildlife study

The wildlife study included terrestrial fauna and flora. The investigation indicated that the new proposed area for the new terminal can be considered low or moderate area from wildlife point of view. There is no important of sensitive species inhabited the area.

2.1.3. Impacts on the Socioeconomic environment

A. Impacts on Sociological and Cultural Components

Four local communities can be found in the area: a) Bedouin (Non-resident), b) Sale-People, c) Khamsa Village, and d) Nasr Village. The standard of living in the nearby area is low. Hence, the educational level is also low. It seems that no direct social effect of the existing port on the mostly nearby communities.

B. Impacts on Economic Components

All the economic components are affected positively by the existing conditions. This is expected as the port activities increase trade in the area and the nearby areas as well as the country economy.

2.2. Prediction of Impacts and Evaluation of Significant Impacts

The key problems that may cause significant impacts are the indirect and cumulative impacts as well as impact interactions from different sources. In order to have an integrated approach for the impact assessment, a simple matrix was design. This matrix was based on the concept of the Rapid Impact Assessment Matrix (RIAM) which is ideally suited to EIA where a multidisciplinary team approach is used. The Environmental matrix requires that the assessor define components that are important insofar as they are indicators of change (either positive or negative).

These components are selected from four main categories:

- Physical/Chemical: representing the natural, non-organic environment and changes.
- Biological/Ecological: containing the habitats, food chain, and species that make up the natural and domesticated flora and fauna that may be impacted.
- Social/Cultural: representing the human environment, and the cultural heritage of the societies in the study area
- Economic/Operational: containing the economic aspects of development and the operational complexities that will guarantee, or hinder, sustainability of the development in the future.

Table 5 Potential Adverse impact and its mitigation measures During Construction

Phase	Issue	Potential Adverse Impact	Impact Severity	Mitigation
During construction	**Topography**	Contour alteration	High, short-term	The study area has no any prominent landform or important geomorphic feature. Meantime, excavation and contour alteration is an essential step for construction of the new extension
		Landscape change	Moderate, short term	
	Coverage pattern & Land Use	Risk to utility services & transmission lines & pipelines	Negligible	Rehabilitation of vegetation covers along existing roads of importance again.
		Risk to commercial & Industrial units	Negligible	
		Risk to agricultural land or natural cover	Insignificant	Relocation a shift of the impacted roads southwards
		Risk to road network Wastes & dredged materials	High short-term	
	Air quality	Emission of dust	Moderate, short term	Appropriate sea and land dumping site as identified and preparing for accommodating the dredged materials.
	Water quality	Turbidity and increase suspended sediments in water	Moderate, short term	Use of appropriate methods and equipment's to minimize the expected emission. Pollution such as toxic organics and metals should not exceed risk-specific levels or reference air concentration at the receptor end as indicated by the World Bank/IFC.
		Pollution from wastewater, diesel spills from site compound and machinery	Moderate, short term	
	Traffic transport	Increase of traffic	Insignificant	Use of appropriate methods and equipment's and use of proper transport methods. Management of traffic and transportation facilities.
	Social environment & public community	Relocation of public communities/amenities	Negligible	Process wastewater, domestic sewage, and contaminated storm water and runoff must meet the World Bank/IFC and EEAA limits
	Coastal hydrodynamics Aquatic habitats	Noise Nuisance	Negligible	
		Threat to public health and safety	Negligible	Project will generate a net benefit by creating a new base area
		Change of coastline	Negligible	
		Interruption of water regime	Negligible	
		Migration/loss of habitats	Insignificant	
	Terrestrial fauna & flora	Migration/loss of habitats	Insignificant	Existing infertile base land has very limited habitat

In order to evaluate the conditions during the life cycle of the project, different components were indicated based on the environmental baseline survey. These components are considering the most important factors that may be affected either positively or negatively by the new development.

Each of the team members who shared in the scoring was asked to give a score for each component according a given scale. The scale of scoring was ranging from +5 for the major positive change to -5 for the major negative impacts, while 0 value is given to the no impact. In order to make the comparison much easier, verbal definitions were given that range from E to -E, corresponding to the major positive and major negative, respectively.

During the present study, impact evaluation and assessment was done using matrix analysis at two stages of the project cycle. ***These are:*** *Construction phase, and After construction (during operation of the project).*

Impact Evaluation during construction phase

The main construction operations involved with the offshore / marine activities include the following: construction of new facilities , Dredging works. , Other related works (e.g. road, infrastructure, etc.). The results of the matrix analysis during the construction phase were based mainly on the analysis of the environmental condition at present and expectation based on the quantitative analysis of different environmental parameters. Hence, the results obtained during the matrix analysis reflect the impacts that might be happened during construction.

For the Impacts on the Physical/Chemical components

Four out of the fourteen PC components fall within the range band of No Changes. The PC components fall

within the *negative impacts.* The impacts range between *moderate negative impacts* (change in land use and sediment dumping) to *negative change* (Change in port water volume). For the No impact components, the predication was based on the construction of the new terminal only.

Impacts on the Biological/ecological components

Five BE components were in the range of *no impacts.* The other components were identified as negative to slightly negative impacts. The negatively impacted components are those associated with sediment and water quality such as effect of coastal productivity, marine biodiversity and marine fisheries. It is important to mention that these impacts are mostly temporary impacts and the conditions may return as it was before construction.

Socioeconomic Impact Evaluation

Positive impacts are expected to the economy and social components due to the construction activities where there will be an increase in employment activities. On the other, the negative impact on visual environment in the area is also expected, however with a temporary nature.

Impact on Social and cultural components

Five components are falling with the No impact range band. Slightly positive impacts on the nearby communities are expected. Due to the need of the access rout, positive impact is expected. Negative impact is expected on the aesthetic landscapes. Impacts on the landscape during construction may originate from the direct construction work for the temporary facilities.

2.3. Environmental Assessment Matrix (EAM)

The key problems that may cause significant impacts are the indirect and cumulative impacts as well as impact interactions from different sources. In order to have an integrated approach for the impact assessment, a simple matrix was design. This matrix was based on the concept of the Rapid Impact Assessment Matrix (RIAM) which is ideally suited to EIA where a multi-disciplinary team approach is used. It allows for data from different sectors to be analyzed against common impacts criteria within a common matrix, thus providing a rapid and clear assessment of the major impacts (Pastakia and Jensen, 1998). The RIAM requires that the assessor define components that are important insofar as they are indicators of change (either positive or negative). *These components are selected from four main categories:*

- Physical/Chemical: representing the natural, non-organic environment and changes therein
- Biological/Ecological: containing the habitats, food chain, and species that make up the natural and domesticated flora and fauna that may be impacted upon
- Social/Cultural: representing the human environment, and the cultural heritage of the societies in the study area
- Economic/Operational: containing the economic aspects of development and the operational complexities that will guarantee, or hinder, sustainability of the development in the future

Table 6 Components used for the impact assessments

	Physical and chemical components (PC)
	Components
PC1	Noise Pollution
PC2	Dredging and sediment transport
PC3	sediment dumping
PC4	Change in coastal geomorphology
PC5	Effect of coastal erosion
PC6	Water Quality
PC7	Sediment Quality
PC8	Sedimentation/Siltation
PC9	Persistent Organic Pollutants
PC10	Soil Pollution
PC11	Change in Port water volume
PC12	Changes in the agricultural land
PC13	Seismic Risk Assessment
PC14	Effect on Ground water quality
PC15	Land Disturbances
PC16	Change in land Use
	Biological and ecological components (BE)
	Components
BE1	Changes in Vegetation Cover
BE2	Changes on the terrestrial Fauna
BE3	Changes in Fisheries
BE4	Changes in Marine Biodiversity
BE5	Changes in Bottom fauna
BE6	Changes in coastal productivity
BE7	Changes in the terrestrial Biodiversity
BE8	Changes in Primary Production in the port area
BE9	Effects on the offshore communities
BE10	Changes in Domestic animals
BE11	Impact on the Bird life
	Sociological and cultural components (SC)
	Components
SC1	Loss of housing
SC2	Loss of Public Building
SC3	Changes in Access Routs
SC4	Changes in Aesthetic Landscapes
SC5	Changes in quality of Life
SC6	Effects on the nearby communities
SC7	Changes in Educational levels
SC8	Changes on human Health
SC9	Changes in Local communities
SC10	Impact on Archeological sites
	Economical and operational components (EO)
	Components
EO1	Changes in the local incomes
EO2	changes in Employment
EO3	Business expansion
EO4	Changes in the county income
EO5	Changes in Export and Import
EO6	Cost on Maintenance operation
EO7	Changes in the tourist-generated income
EO8	Cost of Restoration of environmental loss
EO9	Changes in Local trade
EO10	Changes in industry

It is important to mention that the impact evaluation was based on quantitative analysis of the present condition, as well as prediction analysis for the future condition based on the EBS. Since, the contributors for the scoring are the key persons who did the EBS; the scores which were given also depend on the existing and predicting conditions and expert assessment.

Table 7 Conversion of Environmental Scores (ES) into Range Bands (RB)

Range value (RV) (Alphabetic)	Range value (RV) (Numeric)	Description of range band
E	5	Major positive change/impact
D	4	Significant positive change/impact
C	3	Moderate positive change/impact
B	2	Positive change/impact
A	1	Slight positive change/impact
N	0	No change/status quo/not applicable
-A	-1	Slight negative change/impact
-B	-2	Negative change/impact
-c	-3	Moderate negative change/impact
-D	-4	Significant negative change/impact
-E	-5	Major negative change/impact

Impact on Social and cultural components

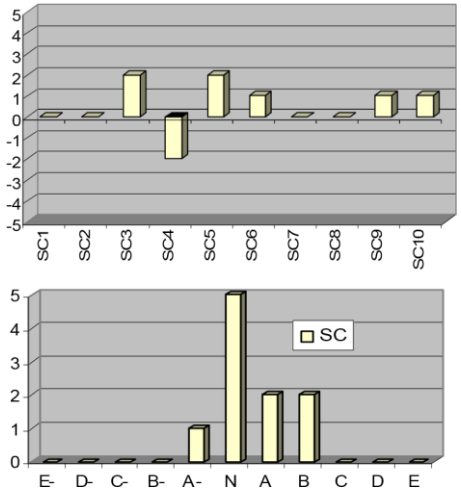
Table 8 illustrates the results of the matrix for the social and cultural components. Five components are falling with the No impact range band. Slightly positive impacts on the nearby communities are expected. Due to the need of the access rout, positive impact is expected. Negative impact is expected on the aesthetic landscapes. Impacts on the landscape during construction may originate from the direct construction work for the temporary facilities.

Temporary construction may include, temporary roads and tracks, weatherproof sheds for storage of materials and equipment's, temporary wiring, connections and extension for electric power supply, temporary pipe-work for fresh water supply from the main permanent water supply pipeline at Damietta Port, storage area for fuel used by the constructor and temporary housing for labors accommodations.

Table 8 Sociological and cultural components (SC): opt 1, during construction

	Components	RB
SC1	Loss of housing	N
SC2	Loss of Public Building	N
SC3	Changes in Access Routs	B
SC4	Changes in Aesthetic Landscapes	-A
SC5	Changes in quality of Life	B
SC6	Effects on the nearby communities	A
SC7	Changes in Educational levels	N
SC8	Changes on human Health	N
SC9	Changes in Local communities	A
SC10	Impact on Archeological sites	A

Graphical Presentation

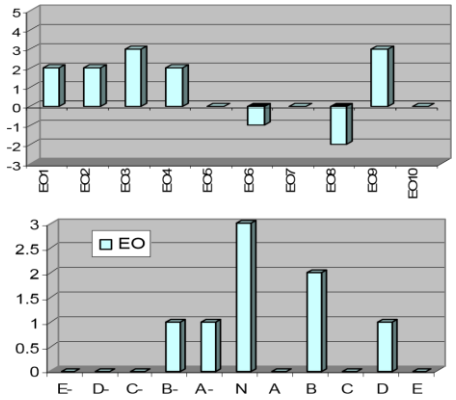


Range Band

Table 9 Economical and operational components (EO): opt 1, during construction

	Components	RB
EO1	Changes in the local incomes	B
EO2	Changes in Employment	B
EO3	Business expansion	D
EO4	Changes in the county income	B
EO5	Changes in Export and Import	N
EO6	Cost on Maintenance operation	-A
EO7	Changes in the tourist-generated income	N
EO8	Cost of Restoration of environmental loss	-B
EO9	Changes in Local trade	C
EO10	Changes in industry	N

Graphical Presentation



Range Band

Table 10 Summary Construction Related Impacts

Identification of Impact	Significance of Impact	World Bank/IFC PS- Guidelines	Mitigation Advice	Residual Impact
Temporary loss of modified habitat, flora and fauna	Slightly negative (-A). The site is not deemed to contain sensitive organisms.	Avoid, minimize, mitigate	Minimizing losses through best management practices.	Slightly negative impact (-A) will remain, Likely to be no additional impacts
Water quality - Increased suspended sediments (TSS)	Moderately negative (-C) due to dredging processes, which will increase TSS	50 mg/l	, Best practice dredging operations as highlighted in mitigation section (e.g. optimizing cutter head speed and ensuring pumping capacity meets production; , Monitoring of resulting silt plumes to ensure 'acceptable' level (<50 mg/l according to WB/EEAA) of TSS is attained (refer to mitigation section, for details) , Appropriate use of silt trap, water box, weir arrangement or similar for storm drainage system.	Impacts minimized to Access Channel which is routinely dredged for maintenance purposes. The impact is temporary and will self-re-store. Habitat will self-restore Slightly negative impact (-A) will remain
Impact of increased TSS on marine ecology	Slightly negative (-A). The ecology of the area is not deemed significant; hence, impact is minimal	50 mg/l	See above for mitigation	Reversible, no impact will remain
Sediment deposition on marine habitats	Slightly negative (-A). The ecology within the area is not deemed to be significant	Avoid, minimize, mitigate	See above for mitigation; the dredging materials management plan will provide details that minimize impacts.	Slightly negative / no change will remain
Impact on navigation	No impact. The study area is not located within main navigational routes.	Avoid, minimize, mitigate	Marine vessels will follow correct navigational rules.	No significant impact
Impact on Noise	Negative impact (-B). Noise level is expected to increase due to the on-shore and marine works.	70 dB	Noise pollution is expected to be localized and not affected the nearby communities. The best management practice for minimizing noise level should be used. Monitoring equipment's should be installed to indicate that noise levels are within the acceptable limits. The site is within the operating port, Pile driving is not anticipated	Negative impacts, but it is temporary and restricted to the construction works.
Effect on ground water	Negative impacts (-B).	Avoid, minimize, mitigate	The quality of ground water will not be significantly affected by the dredging processes since salt water intrusions already occurs due to the shallow ground water table, there are no downstream users of groundwater and groundwater is not used for drinking or agricultural uses.	Negative to slightly negative, the water will be self-recovered once construction is completed
Construction camps	No significant impact or positive impact	Avoid, minimize, mitigate	No impact on the social components, but some positive impact on the economy and local economy. No mitigation required	No significant impact

Impact on the Economy and operation components

Table 9 illustrates the resulting environmental scores during the construction phase. Only the negative impact is due to the cost of maintenance activities. No change is expected at the construction stage is expected in the export and import activities, tourist activities and effect on industry. On the other hand, significant positive to slightly positive impacts are expected on the activities related to the investment (e.g. Business expansion, country income, new employments, etc.). These scores were based on the fact that during construction, the trend of exporting and importing will be the same as it was before.

Table 10 illustrates the types of impacts related to the construction processes. It is important to mention that most of the impacts can be decreased or mitigate by following up the recommendation and the suitable mitigation measures.

2.4. Social and Environmental Impact Evaluation during Operation, Op. 2. Post-construction Operational Phase

In general, during operation most of the impacts (long-term impacts) are likely to be due to the navigation, loading and unloading processes. No obvious changes or impacts are to be expected in comparison with the construction phase.

During the operation of the new cargo containers terminal at Damietta, solid wastes and liquid effluents will be generated.

The waste arising generated by ships can be usually divided into 2 categories: operational waste, and accidental pollution. Operational wastes will include fuel residues and small spillage during loading and unloading although this is not likely associated with container terminal operations. This minimizes the opportunity for accidental pollution. To secure waste treatment for the waste residual which cannot be handled aboard, the port will have sewage facilities that are connected to the Damietta Port Authority main system,

Accidental pollution is caused by spills resulting from accidents such as grounding or collision with a fixed structure of another vessel. These incidents are extremely rare and unpredictable, although the potential for such incidents is significantly reduced by implementation of proper management and Safety and Health Environmental practices. Spill contingency planning is a key technique by which authorities ensure they are prepared in case of a serious incident.
It is not anticipated that there will be any disposal of ballast water due to container terminal operation, however, it is important to control the disposal of ballast water if any. This ballast water could add some exotic species, which may have cause an ecological unbalance in the area. The port administration will apply the environmental legislations and laws in order to control the impact from illegal disposal.

All components considered for the construction phase were taken into account for operation phase. Only the degree of impacts (scores) will be changed according to the long-term effects. It is clear that most of the bio geophysical impacts are in the range of negatively impacted (-B). On the other hand, major positive to slightly positive impacts are expected for the economic/operational and economic/cultural components within the socioeconomic subsystem.

The increase in the impervious surface area due to the construction of the new terminal would increase the volume of runoff from the area. Runoff from new roads and new terminal would cause some increase in some contaminants such as oil and metals from vehicle brake dust and ship loading processes. Oil and grit separators will be design and connected to the drainage system prior to the discharge to the sea. Emergence sewers should be designed and connected to the main sewers system.

A. Impacts on the Bio geophysical components

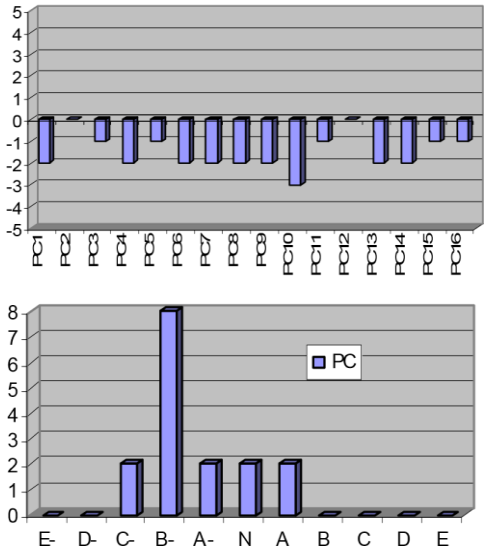
Impact on physical/chemical components

Table 11 illustrates the environmental scores for the physical/chemical (PC) components. No changes in the area of agricultural land is expected, however, other components exhibit negative impacts ranging from moderate impact to slightly impacts. These negative impacts are expected due to the increased activities within the port area.

Table 11 Physical and chemical components (PC), Opt2: post construction phase

	Components	RB
PC1	Noise Pollution	-B
PC2	Dredging and sediment transport	-A
PC3	sediment dumping	-A
PC4	Change in coastal geomorphology	-B
PC5	Effect of coastal erosion	-A
PC6	Water Quality	-B
PC7	Sediment Quality	-B
PC8	Sedimentation/Siltation	-B
PC9	Persistent Organic Pollutants	-B
PC10	Soil Pollution	-C
PC11	Change in Port water volume	-A
PC12	Changes in the agricultural land	N
PC13	Seismic Risk Assessment	-B
PC14	Effect on Ground water quality	-B
PC15	Land Disturbance	-A
PC16	Change in land Use	-A

Graphical Presentation



Range Band

B. Impact on the socioeconomic subsystem

Impacts on Biological/ecological (BE) components

Table12 represents the environmental scores for the BE components. Only coastal productivity is estimated to have No change, the rest of the BE components are expected to have negative impacted ranging from slightly negative to negative changes.

Impact on the social/cultural (SC) components

Table 13 illustrates the scoring for the SC components for post-construction phase. Negative impact is expected on the access route due to the increase of transportation processes. This can be overcome if the planned increase in the access routes is properly included in the developments. Four factors are estimated to have no changes; other components are ranging from significant positive impact to slightly positive impacts.

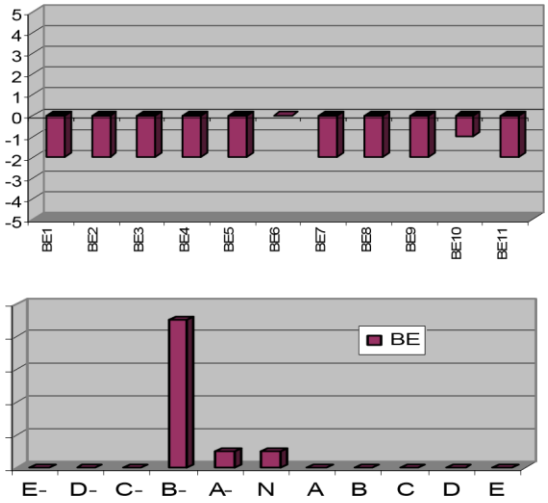
Impact on the Economic/operational (EO) components

Table 14 illustrates the major positive changes are expected on most of the EC components only the cost of restorations of environment is still with no change. Other EO components are ranging from major positive to significant positive changes.

Table 12 Biological and ecological components (BE) Opt2: post construction phase**.**

	Components	RB
BE1	Changes in Vegetation Cover	-B
BE2	Changes on the terrestrial Fauna	-B
BE3	Changes in Fisheries	-B
BE4	Changes in Marine Biodiversity	-B
BE5	Changes in Bottom fauna	-B
BE6	Changes in coastal productivity	N
BE7	Changes in the terrestrial Biodiversity	-B
BE8	Changes in Primary Production in the port area	-B
BE9	Effects on the offshore communities	-B
BE10	Changes in Domestic animals	-A
BE11	Impact on the Bird life	-B

Graphical Presentation

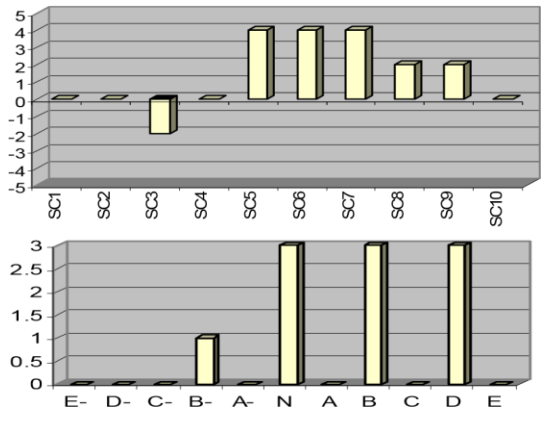


Range Band

Table 13 Sociological and cultural components (SC) Opt2: post construction phase.

	Components	RB
SC1	Loss of housing	N
SC2	Loss of Public Building	N
SC3	Changes in Access Routs	-B
SC4	Changes in Aesthetic Landscapes	N
SC5	Changes in quality of Life	D
SC6	Effects on the nearby communities	D
SC7	Changes in Educational levels	D
SC8	Changes on human Health	B
SC9	Changes in Local communities	B
SC10	Impact on Archeological sites	N

Graphical Presentation

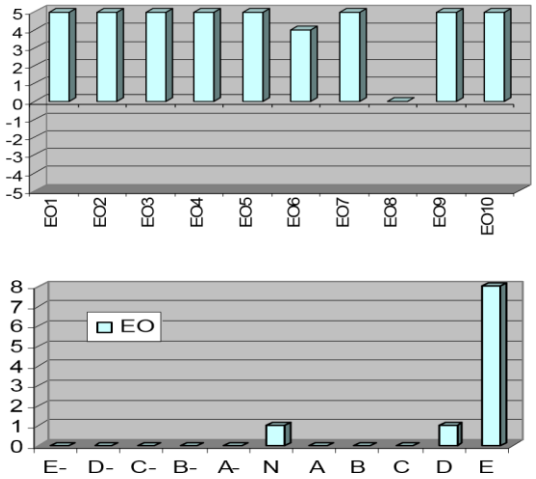


Range Band

Table 14 Economical and operational components (EO) Op 2: post construction phase

	Components	RB
EO1	Changes in the local incomes	E
EO2	changes in Employment	E
EO3	Business expansion	E
EO4	Changes in the county income	E
EO5	Changes in Export and Import	E
EO6	Cost on Maintenance operation	D
EO7	Changes in the tourist-generated income	E
EO8	Cost of Restoration of environmental loss	N
EO9	Changes in Local trade	E
EO10	Changes in industry	E

Graphical Presentation



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3. Mitigation Measurements

One of the key objectives of this report is to provide useful information regarding the proposed construction and operational regime impacts of the development on a number of parameters. This chapter highlights key mitigation and recommendations necessary to reduce socioeconomic and environmental consequences.

Mitigation refers to measures, which will in some way reduce or ameliorate the adverse impacts of a development on an existing environmental resource, whilst compensation refers to the provision of a replacement for the resource to be lost which will equal or exceed its original value. There are many forms of mitigation measures available. These could include, for example:

- Minimizing the area of land-take from environment and features of value;
- Improving the quality or increasing the extent of valuable environment and features after development, through appropriate management or input of resources;
- Timing or phasing the development to avoid certain key times of year, such as breeding seasons etc;
- Maintaining or increasing the connectedness of habitats on the site, perhaps through additional planting of trees and shrubs.

There are essentially three types of compensation measures available for environment. These are: environment creation; environment re-creation; and environment enhancement.

According to the EEAA guidelines of port and marinas construction projects, the proposed project is classified as environmental category C. This implies that it wouldn't involve significant environmental problems in any phase of its construction.

4. Environmental Action Plan (EAP)

Monitoring of the following parameters will commence prior to construction activity starting and should continue after it has finished.

1) Monitoring the shoreline around the new terminal. This activity will be coordinate with DPA and will take place before construction, after construction, six months after construction, and annually afterwards.
2) The terminal basin should be re-surveyed within 24 months following the start of operations to determine the rate of sedimentation and based on this survey, a long-term maintenance plan can be coordinate with DPA.
3) Water quality in the new terminal basin and the sea (Oxygen, Suspended Solids, Phosphates, Nitrates, Biological Oxygen Demand, and Chlorophyll a), should be monitored immediately after construction and if testing reveals in excess of international standers, every three months thereafter.
4) Measurements of sources of noise not to exceed the standards in the executive regulation of Law 4/94. This is particularly important during construction, any source found to be operating above the required standards should be closed down and not restarted until repairs are made to allow standards to be met or a replacement found
5) Weekly monitoring of sediment plume entering the water from the terminal construction. The same advantage point should be used each week and photographs taken to establish the extent and direction of any plume.
6) The new terminal management should also keep records of a) fuel analyses to demonstrate that the sulphur content of the fuel used is at or below the specified levels mentioned in Law no. 4/94 and to demonstrate equipment is operating within manufacturer's specifications.
7) Significant environmental matters, including monitoring data, water quality, shoreline changes,

accidents and occupational illnesses, and spills, fires and other emergencies.

Conclusions

The result was Environmental Impact Assessment (EIA) Guidelines for Development of Ports, Harbours and Marines along Egyptian Mediterranean Coast of a new evaluation approach, which is EIA. In the beginning the EIA evaluation approach was developed to evaluate the impact from activities already established to introduce mitigating measures. But the most important EIA is that carried out before the construction of an industry or the approval of an activity which may cause adverse environmental impacts. There are some difficulties in implementing EIA procedures in some developing countries due to several factors such as the lack of data and information required for EIA.

In general, during operation most of the impacts (long-term impacts) are likely to be due to the navigation, loading and unloading processes. No obvious changes or impacts are to be expected in comparison with the construction phase.

During the operation of the new cargo containers terminal at Damietta, solid wastes and liquid effluents will be generated. The waste arising generated by ships can be usually divided into 2 categories: operational waste, and accidental pollution. Operational wastes will include fuel residues and small spillage during loading and unloading although this is not likely associated with container terminal operations. This minimizes the opportunity for accidental pollution.

In order to protect the Egyptian natural resources, the government issued the law No. 4/1994 concerning the environment. According to the law, all the new activities and industries must be subjected to EIA before licensing the establishment. The law identified the activities and industries subject to the EIA according to basic controls such as the type of the activity and the site of the establishment.

The EIA done before the construction of the fixed link included the dredging work and reclamation, the impact on the traffic development, the blocking effect of the fixed link, the air pollution from the fixed link and the noise and vibration.

The area needs EIA to the intended projects and activities before their construction to protect the sensitive environment from any adverse impacts. The development of the North Gulf of Suez through the EIA procedures will give the area a promising future and will reserve it to our next generations.

6. Recommendations

It is recommended the following recommendation for better EIA implementation

- Egyptian Environment Law 4 for year 1994 should contain a specific degree for marine structures also marine development precautions to environment
- There must be a regional cooperation between Mediterranean region in carrying out the EIA as the pollution may be caused from a transboundary industry. In addition to the harmonization of the EIA legislation there must be cooperation in their implementation.
- To facilitate the implementation of the EIA procedures the general public must be aware of the impacts of the development projects on their environment. There must be an active public participation in the EIA procedures and in each new development project there must be a chance to receive the ideas and proposals of the general public as the public participation may provide a source of information on local values and it can aid in establishing the creditability of the planning and assessment process.
- The Egyptian government with its municipalities and different state agencies shall cooperate to make any data and information required for the EIA available.
- The planners must be sufficiently aware of the environmental problems such awareness can be improved through cooperation programs with the more advanced countries in the environmental issues to exchange the experiences.
- To have a good EIA system the EEAA must have a strong monitoring and feedback procedure to ensure that the EIA requirements are enforced
- The EEAA must prepare and train a sufficient number of experts whom are properly qualified with the required experience to implement the EIA all over Egypt.

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