

### **3.1.2.1.3. Industrial and commercial units**

Industrial and commercial units form the second largest land uses in the study area after agriculture and cultivation. Industrial activities inside the port are restricted to the petrochemical and LNG complexes, which lie at the western side of the port. Outside the port, the industrial activities are very limited. It is of note that no one industrial activity was observed in the immediate vicinity of the port.

On the other hand, most of the commercial activities outside the port are concentrated near the main gate. Large number of timber-yards, open and roofed storage sites are widespread at this area. Associated with these activities some other services and activities such as artisanal food stores, trade of construction materials, etc.

Inside the port, storage facilities such as storage sites, bins, tanks and compartments are the most dominant commercial coverage pattern throughout the port area. Storage oil and gas tanks and compartments are more concentrated at the northwestern part of the port. In addition to these facilities, there are some other open sites being used for storage of other by-products and general cargos.

### **3.1.2.1.4. Road and rail network**

The port is served by a very good road network. Inside the port area, there are different types of roads serving the port amenities and connecting between the different platforms and activities inside it. These include the main arterial road which connects the port's main Gate and Ras El-Barr Gate with the other parts of the port. The route of this road begin from the main gate where it runs in E-W direction across the port before it branches to the right where it ends at Ras El-Barr Gate and to the left where it ends at the barge Canal. This 2-lanes road has a total width of 55 m in average.

The road network inside the port includes also some secondary roads which connect the

different terminals and berths of the port with its main road. Secondary roads normally are less in width than the main road and composed of only one lane.

Unpaved tracks are widespread also in the port, as well as in the surrounding area. They are more common in the undeveloped and waste lands and usually used as short-cuts for accessing villages and other places.

Outside the port, the area is being also served by a good road network. This network is comprised of three main roads in addition to indefinite number of secondary roads and unpaved tracks to serve the residential and commercial units which are scattered around the port land. The main roads are represented by Ras El-Barr Road which passes near the port in NNE-SWW route before its deflection at Ras El-Barr Gate towards the northeast and again at the southeastern corner then towards the north where it is heading to Ras El-Barr resort. The second main road is the international coastal road which approaches the port at its western side, then it runs after that parallel to western side of the port before it branches at the southwestern corner of the port into two branches. The port and its associated units and activities are being served by a third asphalt road. This road passes parallel to the fence walls where it is connected to the port road network at gates and entrances of the port amenities and units.

In addition to these motor-roads, the port area is served also by a good rail network. This network is composed of the main railway which runs parallel to the southern side of the port in a NE-SW direction. The main railway branches at almost equal distances to three perpendicular sub-lanes running in NW-SE route and serving the different cargo berths of the port.

### **3.1.2.2. Dumping sites and waste lands**

Dumping is a widespread activity inside the port as well as throughout the surrounding area. Therefore, it is not surprising that the dumping sites and waste lands constitute one

of the most frequent and widespread classes in the study area, in general. Not less than 14 dumping sites could be delineated in the study area, both inside and outside the port (Fig. 4).

Inside the port, most of undeveloped bare land is currently being used for dumping of solid wastes and demolition materials. The largest of them occur at the western part of the port, behind the containership area (DS-8 in Fig. 4). It occupies an area of about 210 000 m<sup>2</sup> and accommodate solid wastes of building demolitions, marble boulders, and large stones.

The most extensive dump site in the study area is located outside the port north of the barge canal (DS-1 in Fig. 4). It occupies an area of about one million square meters and is being used for disposal of dredged sediments and subsurface soil excavated during construction of the barge canal.

Other dump sites outside the port include two localized dump sites (DS-2 and DS-3) at the western bank of the barge canal behind the industrial free zone, and another site northwest of the port and west of the water treatment facility of the LNG complex (DS-7). All of these sites are also being used for disposal of dredged materials. In addition to this, there are some other limited dump sites distributed randomly throughout the port area e.g. DS-5, DS-6, DS-9 (Fig. 4).

Outside the port, most prominent dumping sites are located southeast of the port near the entrance of its main gate (DS-13 and DS-14). Field check revealed that they accommodate subsurface soil and dredged material which seem to be excavated during construction of some commercial buildings and houses in the nearby area. Table 1 lists locations of all delineated waste lands along with their areas.

### **3.1.2.3. Water bodies**

The water class of the study area is comprised of the open seawater, the navigation canal and basin of the port. The water areas in the port area and its vicinity can be sub-classified into the following categories:

#### **3.1.2.3.1. Marine area**

This includes the nearshore water area outside the port. The nearshore and offshore waters off the port's coast is part of the Mediterranean Sea and hence, should be affected by the east-trending longshore current which dominates the whole southeastern Mediterranean.

#### **3.1.2.3.2. Port basin**

This includes the water area inside the port basin beginning from limits of the entrance channel to limits of the General Cargo berth. This basin has a total area of 3.81 km<sup>2</sup> and is being used for berthing and mooring of commercial ships (Fig. 2).

#### **3.1.2.3.3. Barge canal**

A man-made barge canal has been established in the port area so as to connect the port with the Damietta branch of the River Nile. The idea beyond this is to reduce cost of transportation through navigation by barges and small ships. The barge canal extends in NW-SE direction for about 4.5 km east of the port. The canal has a width of 90 m and water depth of 5 m. The length of its main basin is about 400 m, whereas its width varies between 150 to 220 m to make it wide enough to receipt barges and navigation ships of small to medium-size vessels (Fig. 2).

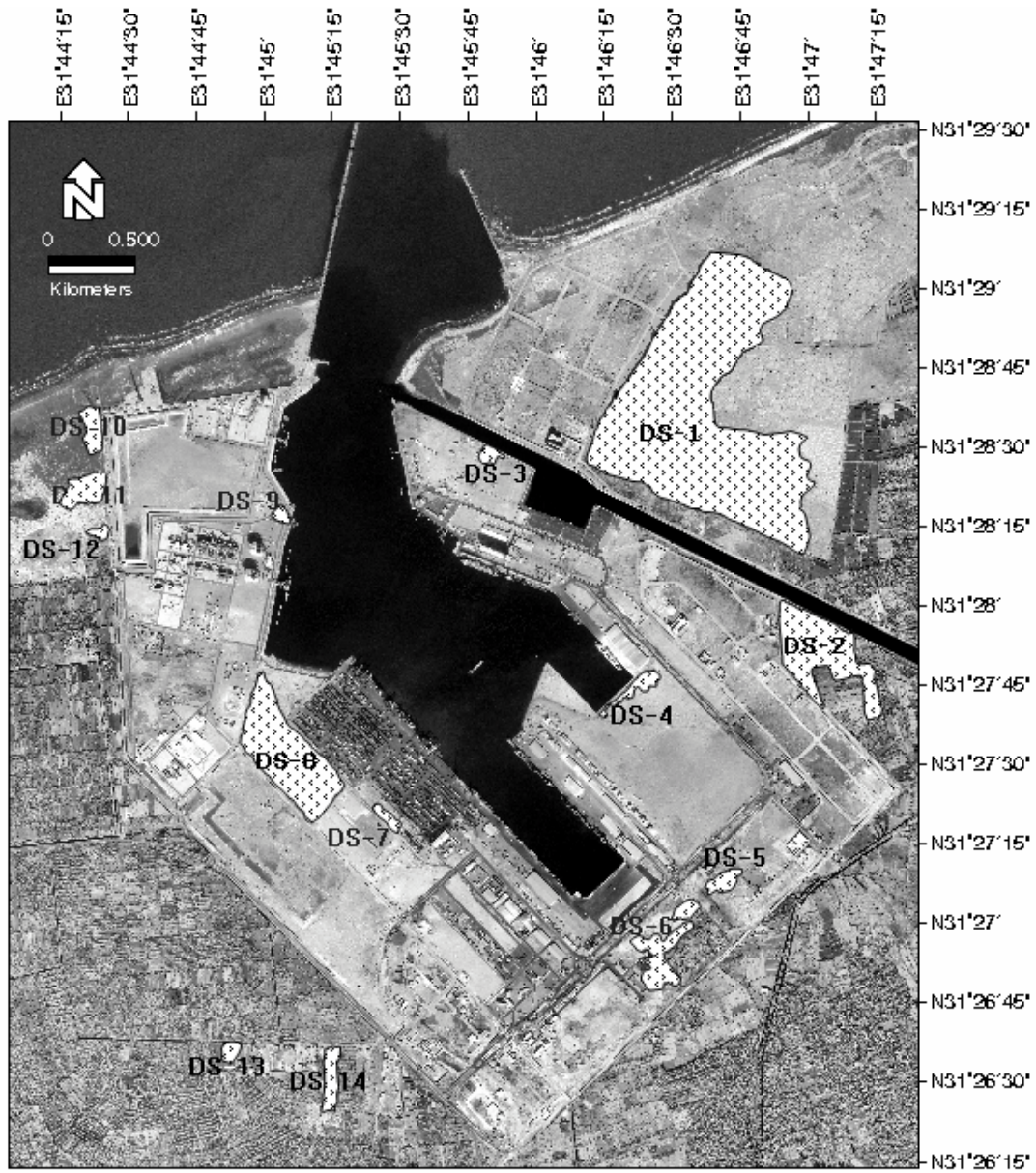


Fig (4). Location and distribution of the waste lands and dumping sites throughout the study area.

**Table (1): Locations and areas of waste lands of the study area, as given in Fig. (4).**

<b>Waste Land</b>	<b>Location</b>	<b>Area (m<sup>2</sup>)</b>
DS-1	31:28:38N / 31:46:33 E	1,011,502
DS-2	31:27:53N / 31:47:03 E	158,205
DS-3	31:28:27N / 31:45:50 E	7,622
DS-4	31:27:41N / 31:46:19 E	13,584
DS-5	31:27:08N / 31:46:44 E	12,672
DS-6	31:26:56N / 31:46:27 E	50,036
DS-7	31:27:19N / 31:45:29 E	8,021
DS-8	31:27:30N / 31:45:09 E	209,680
DS-9	31:28:16N / 31:45:05 E	6,128
DS-10	31:28:32N / 31:44:24 E	25,314
DS-11	31:28:20N / 31:44:23 E	30,889
DS-12	31:28:13N / 31:44:26 E	4,767
DS-13	31:26:35N / 31:44:55 E	8,374
DS-14	31:26:35N / 31:45:18 E	26,873

#### **3.1.2.3.4. Irrigation canals & drains**

With exception of the newly constructed navigation canal which connects the port area with the Damietta branch, there is no any another drainage or navigation waterway inside the port. Outside the port, the cultivated land around the port is being served by a good drainage system and large number of agricultural canals and drains. The most prominent and the closest of them to the port is the Sayalla Canal which lies south of the port and runs with Ras El-Barr Road in a NNE-SSW route before it deflects at the southeastern corner of the port towards the north.

#### **3.1.2.4. Bare land**

Barren lands comprise these lands which either devoid of any activity or still

untouched such as beaches and backshore areas. Most barren lands are concentrated outside the port area near the coast and mostly composed of abandoned or undeveloped land. Outside the port, the barren lands are very limited and composed of abandoned land that used to be cultivated for agricultural crops. The bare land of the study area can be sub-categorized as following:

##### **3.1.2.4.1. Undeveloped land**

This consists of the areas devoid of any activity or even any characteristic land cover. This class includes therefore the clear-cuts and transactional lands that are likely to change or be converted to other uses in the near future.

#### **3.1.2.4.2. Coastal plain and beaches**

The coastal plains and beaches north of the port are still undeveloped and devoid of any land use or human activity. The coastline of the study area is sandy, gently curved with a general NNE-SSW orientation. The width of the coastal plain ranges from 0.2 to 2.0 km. However, large tracts of the beach especially west of the eastern jetty and east of the western jetty are embanked with stones and sea-blocks for giving them further protection against hazards of erosion and storm waves. It is of note that the coastal plain at the northwestern part of the study area is inundated by seawater due to overtopping of the incoming waves or through infiltration at sabkha areas.

#### **3.1.2.5. Vegetation**

The vegetation class represents one of the major and most widespread classes throughout the study area. Vegetation of the area can be broadly categorized into:

##### **3.1.2.5.1. Natural vegetation**

This includes the perennial shrubs and bushes which grow up sparsely distributed throughout the study area. They in general have no environmental value and grow randomly without a definite pattern or alignment. Natural vegetation within the port is restricted to basically undeveloped areas and bare ground. Most abundant natural vegetation cover in the study area occurs outside the port on the eastern bank of the artificial barge canal mostly in form of saltmarsh shrubs. Sparse halophytes and sabkha shrubs were also observed throughout the backshore area of the western jetty.

##### **3.1.2.5.2. Agriculture**

This subclass is very widespread in the vicinity of the port area but it is almost absent inside the port. The cultivated fields in the area surrounding the port, especially from the

south, form a continuous fabric of characteristic pattern. Vegetation inside the port appears as discontinuous parcels around some administrative buildings as well as along both sides of the main road inside the port. It is composed mostly of horticulture plants, palm trees, and grassland.

Outside the port, most of the land is arable and cultivated with annual and permanent crops e.g. rice, corn, wheat, fruit trees (mainly banana), palm trees, etc. Non-irrigated arable land and garden zones around administrative pastures are included also in this subclass. It is of note that rice cultivation and banana fields are the most dominant agricultural activities in the study area.

#### **3.1.2.6. Sand dunes**

##### **3.1.2.6.1. Nabkhas/embryo dunes**

Nabkhas are common small sand dunes formed around plants. Wind blown sands begin to accumulate and rise up when it is obstructed by plants (shrubs or trees) or any similar obstacle. Individual plants must reach 10 - 15 cm in height before they can effectively trap sand. Despite being stabilized, they change their orientation with change direction of the winds.

Nabkha dunes were observed only in the undeveloped land south of the Grain berth inside the port. Their heights don't exceed 50 cm despite their widths may extend up to 3 meters. Ground survey showed that they are composed preliminary of well sorted fine- to medium-grained sand.

##### **3.1.2.6.2. Barchan dunes**

Barchan or crescent-shaped dunes form where wind primarily blows from one direction and where there is little or no vegetation present. A small field of crescent sand dunes was reported outside the port, definitely east of the navigation channel. Remote sensing measurements show that this field occupies a triangular area of about 550 x 450 x 250 m dimension and lies about 1800

m northeast of the project site on the eastern bank of the barge canal. Barchan dunes at this area can be as wide as 28 m, and as long as 15 m and up to 4 m in height but they vary in general between 18 and 25 in width, 10 and 15 m in length, and 3 and 5 m in height.

#### 4. SUMMARY AND CONCLUSIONS

Land-uses and cover types of the New Damietta port area has been investigated using high resolution recent image from the QuickBird satellite (0.6 to 2.4 m resolution), in conjunction with field observations and ground survey. Application of the standard image interpretation techniques and classification methods was of much help for mapping and description of the main classes and features of the study area.

Results of image analysis show that the port area is dominated by built-up area and man-made cover types, rather than natural land covers. Prominent surface features of the area include: port area, bare land, water bodies, road and rail network, vegetation and sand dunes. The area includes also various types of land use e.g., commercial and industrial, agriculture and mixed crops (corn, rice, green leafy, bananas, etc.), residential fabrics and dumping sites.

Importance of this study refers to the fact that the port area is a fast-growing area and therefore, is expected to experience wide scale changes in its landscape, terrain uses during the next decade. Assessment of the present surface characteristics and coverage pattern in this area therefore, is essential and critical for future land-use planning, as well as, for proper management of the area, in general. In view of this, it is recommended to update the information on land-uses and land cover types of the port area every on regular basis.

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#### REFERENCES

- Blodget, H.W., Taylor, P.T., Roark, J.H.: 1991, Shoreline changes along the Rosetta–Nile promontory: Monitoring with satellite observations, *Marine Geology*, **99**: 67–77.
- Digital Globe Inc.: 2006, *QuickBird Imagery Products: Product Guide* (Revision 4.7.1), 77 pp.
- El-Asmar, H. and White, K.: 2002, Changes in coastal sediment transport processes due to construction of New Damietta Harbour, Nile Delta, Egypt, *Coastal Engineering*, **46**: 127–138.
- El-Asmar, H.: 2002, Short -term coastal changes along Damietta-Port Said coast Northeast of The Nile Delta, Egypt, *J. of Coastal Research*, **18** (3): 433–441.
- El-Raey, M., Sharaf El-Din. S. H., Khafagy, A. A., and Abo Zed, A. I.: 1999, Remote sensing of beach erosion/ accretion patterns along Damietta - Port Said shoreline, Egypt, *Int. J. Remote Sensing*, **20** (6): 1087-1106.
- European Community: 1993, CORINE Land cover-Guide technique, Office des Publications Officielles des Communautés Européennes.
- Frihy O. E.: 1988, Nile Delta shoreline changes: aerial photographic study of a 28-year period, *J. of Coastal Research*, **4**:597–606.
- Frihy, O.E., Fanos, A.M., Khafagy, and A., Komar, P.D.: 1991, Patterns of nearshore sediment transport along the Nile Delta,

- Egypt, *Coastal Engineering*, **15**: 409–429.
- Frihy, O., Dewidar, M. Kh., Nasr, S., and El Raey, M.: 1998, Change detection of the northeastern Nile Delta of Egypt: shoreline changes, spit evolution, margin changes of Manzala lagoon and its islands, *Int. J of Remote Sensing*, **19**: 1901–1912.
- Klemas V., and Abdel Kader A. M.: 1982, Remote sensing of coastal processes with emphasis on the Nile delta. *In: Proc. Int. Symp. on Remote Sensing of Environments*, Cairo, 27 pp
- Smith, E. S, and Abdel Kader, A.: 1988, Coastal erosion along the Egyptian Delta, *J. of Coastal Research*, **4**:245–255
- Volpe, F.: 2004, Use of QuickBird satellite data for urban environments, *Urban data management symposium*, Chioggia (Italy).
- White, K and El-Asmar, H.: 1999, Monitoring changing position of coastlines using Thematic Mapper imagery, an example from the Nile Delta, *Geomorphology*, **29**: 93–105.