Impact of Sea Level Rise on the Low Land Area South East of Alexandria, Egypt

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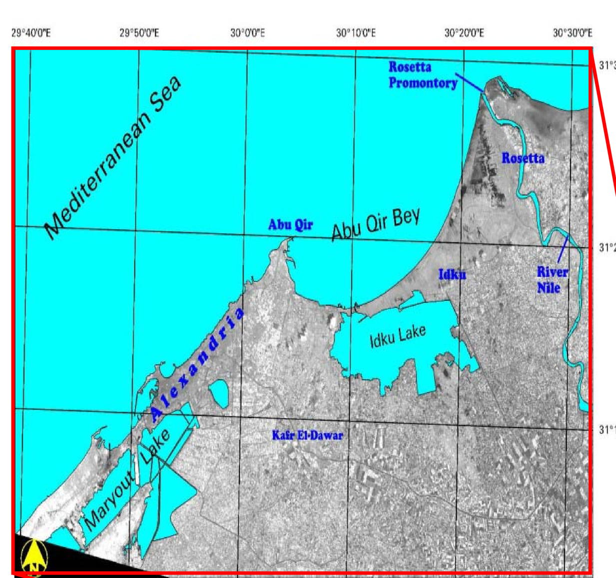
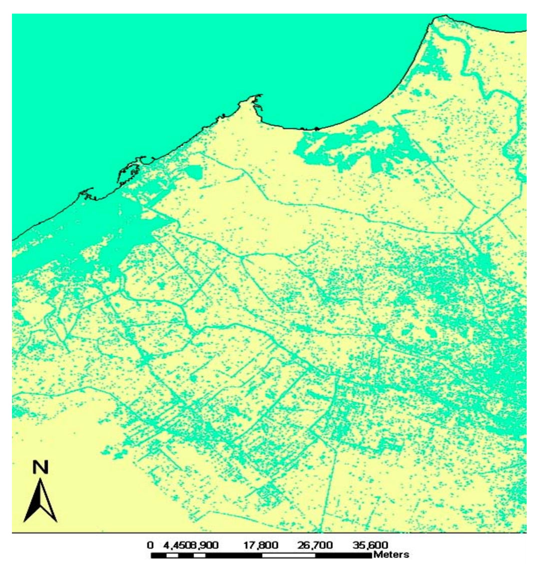
Recent observations of the mean sea level all over the world lead to a mean rise of 1.2 mm/yr during the last hundred years. The relationship between rising sea level and the rate of shoreline erosion has been formulated. A close correlation between sea level rise and shoreline retreat has been checked for the Egyptian coast using seasonal and annual variation in sea level parameters such as high high water level, low low water level, mean water level, mean high water level, and mean low water level. A study of the geomorphology of large coastal area (that is historically covered by both Lake Mareotis and Abu Qir Lagoon), including East of Alexandria city, Abu Qir city, Lake Idku, Kafr El Dawar city, and the estuary of the river Nile (Rosetta branch), has been carried out for assessment of the vulnerability of the area to the impact of sea level rise. Landsat (ETM+) data were used to identify and delineate the geomorphological features and a supervised classification technique was executed to extract an accurate and detailed land cover map. A geographic information system (GIS) has been built including layers of land cover and topography created by interpolating all the available height information. Analysis of GIS data has been carried out to assess vulnerability of various land cover classes to the possible impact of sea level rise. Additionally, existing geological and topographical maps of the areas were used as added information for elevation data, and to relate the classification results to the relief of the study area to build a GIS capable of identifying vulnerable areas to the sea level rise. Results indicate that most of the vulnerable areas are vegetated land (over 50%), followed by bare soil (over 17%) and the high density urban areas constitute about 5-6%. Vegetation below sea level representing a significant percentage of the distribution of total vegetation cover indicates that severe economic losses may incur if no protective action is taken.

Experimental Design

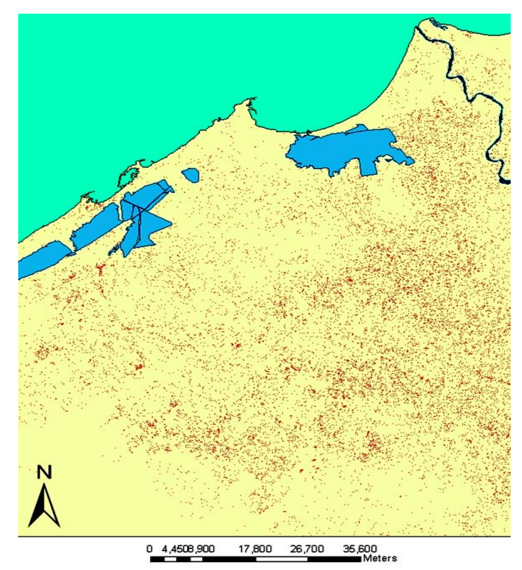
- Many steps were involved in preparing our satellite imagery including registration, rectification, spatial resolution merge and other image processing techniques
- Pre-processing of raw data to calibrate image radiometry, correct geometric distortion, and remove noise.
- Corrected images are better enhanced for easier interpretation before classification process
- Maximum likelihood classification (MLC) algorithm is used where the final classified image has a six different classes.



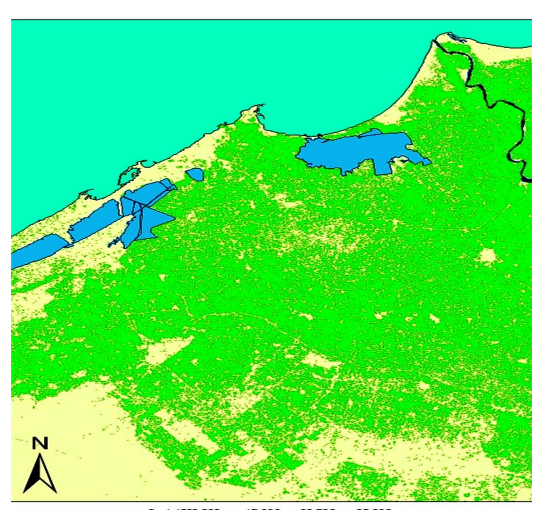
(a) Water Bodies (including all water bodies such as River Nile, Sea, Lakes,etc.) (b) Wet Vegetation (mainly the brackish water vegetation and some inland vegetation like Rice) (c) Vegetation (all types of vegetations and fruits as well) (d) Ploughed Fields (agricultural lands prepared for plantation and has a small percentages of natural vegetation) (e) Bare Soil (includes all areas with no vegetation cover and no land uses) (f) Urban (includes fabricated high density urban areas, medium density urban areas, low density urban areas, and slums and rural areas)



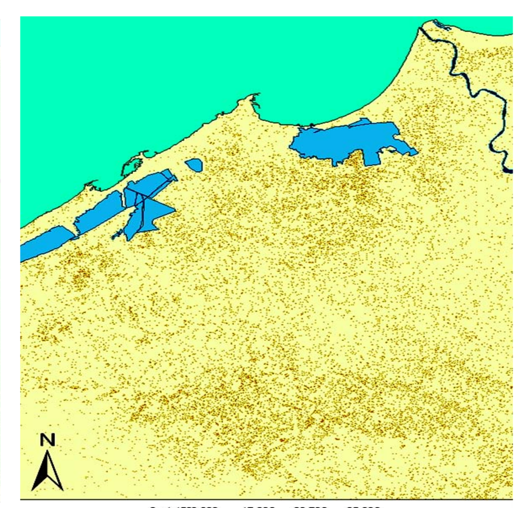
Land Cover class "Water Bodies"



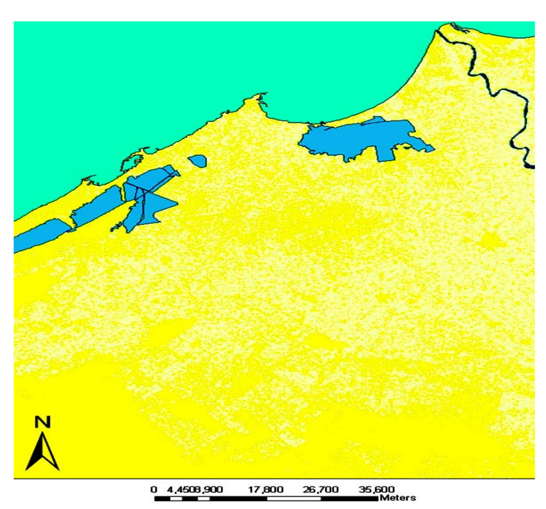
Land Cover class "Wet Vegetation"



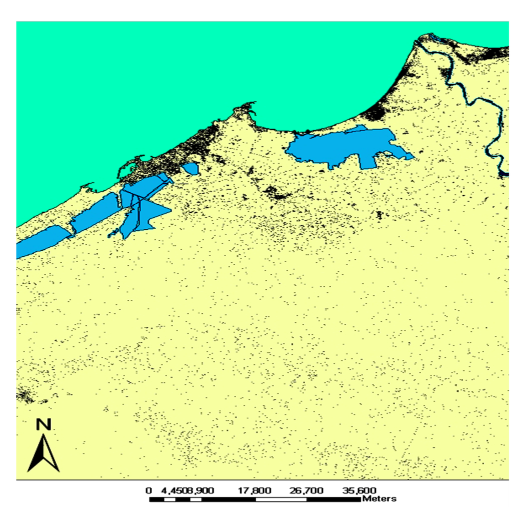
Land Cover class "Vegetation"



Land Cover class "Arable Land"

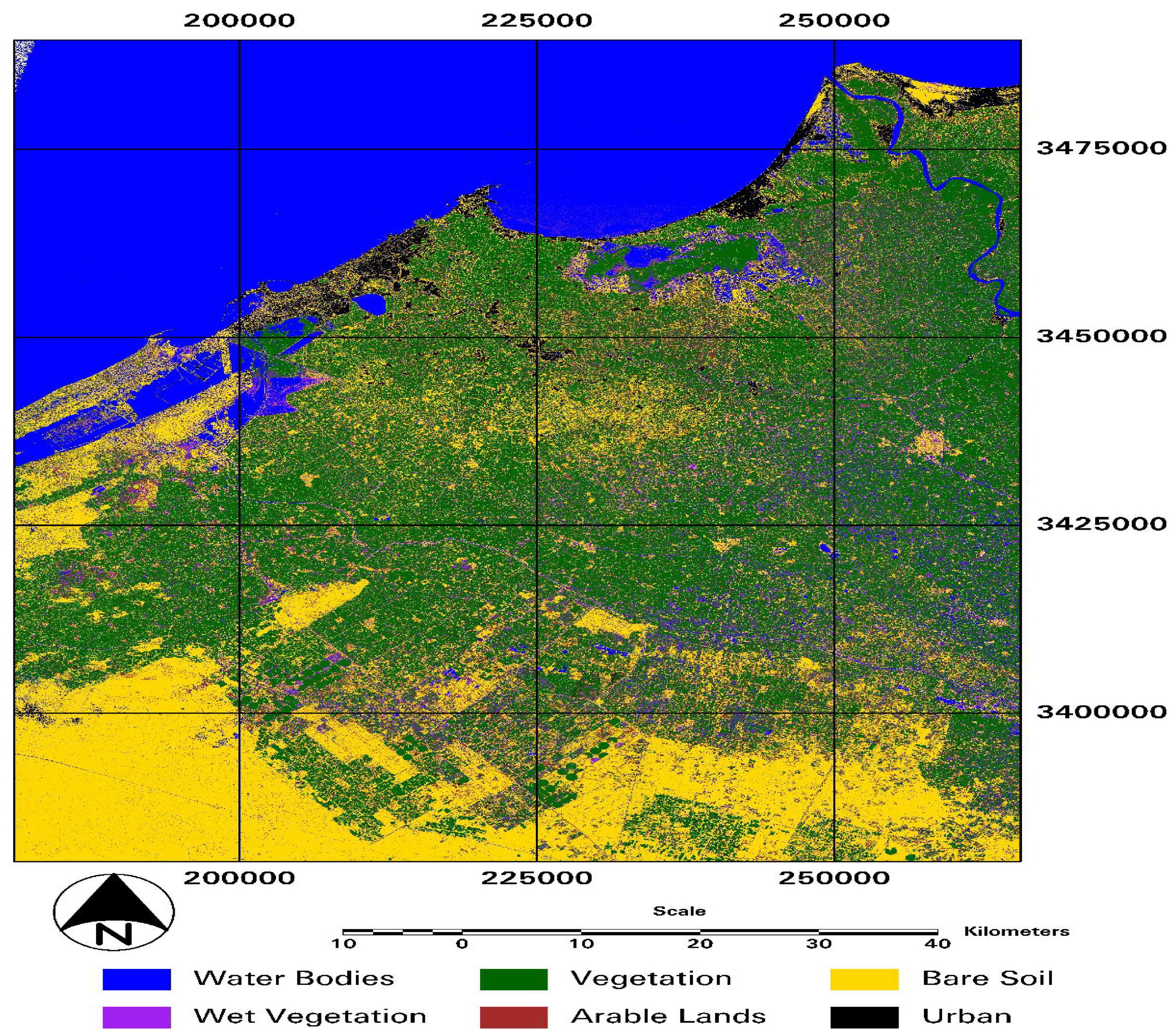


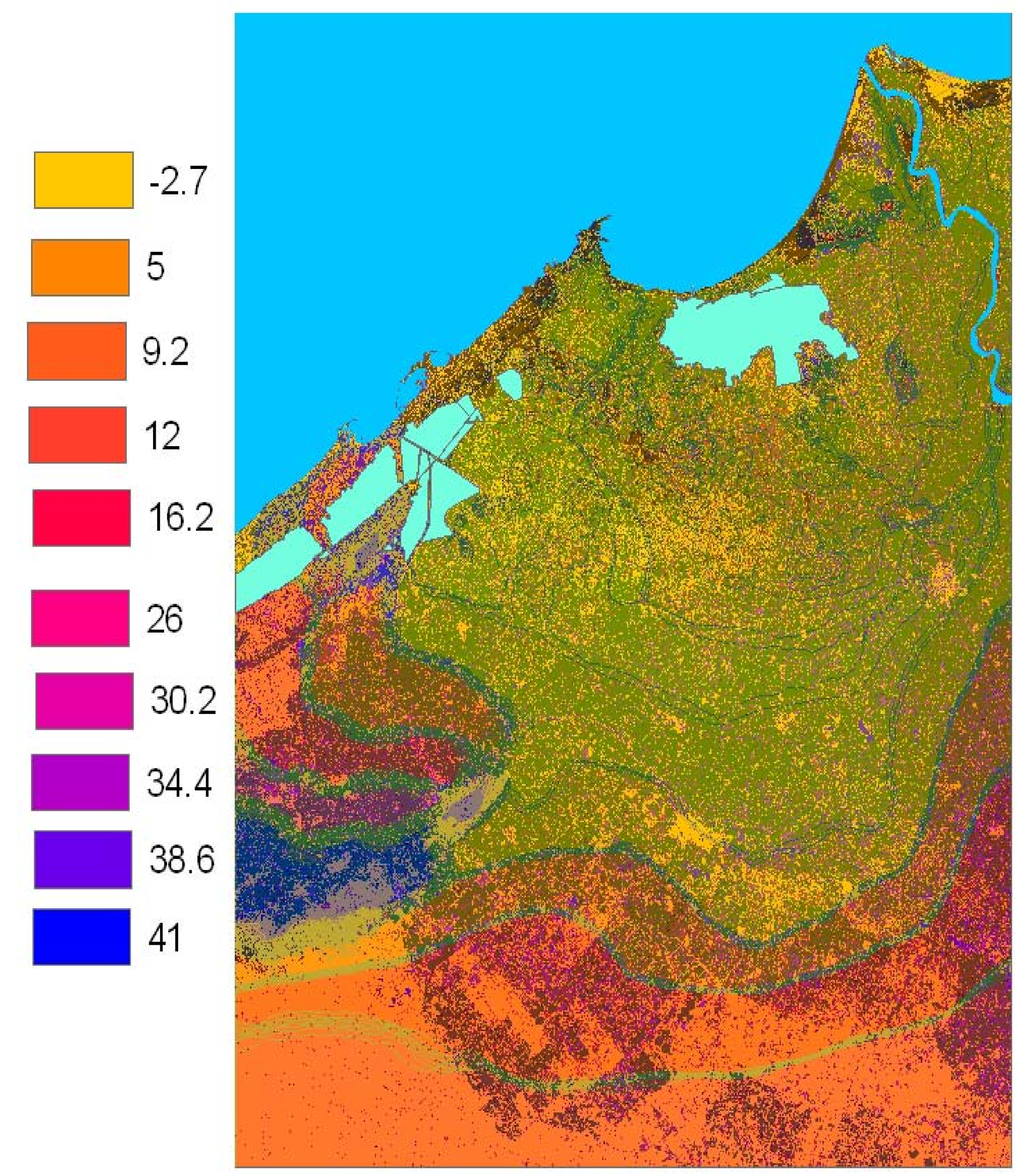
Land Cover class "Bare Soil"



Land Cover class "Urban"

Supervised Classification Results





It is clear that there are large differences in the percentage values in each elevation level that reflects the interaction between the various land cover types and its elevation, hence, the status of each land cover type could be measured and its vulnerability to the expected sea level rise could be identified.

Conclusions

This work identified and assed distribution of low land areas:

- Areas with elevation averages 2.7 and 2.0 meters below mean sea level is dominated by "vegetation" land cover (about 52% and 66% of the total area), followed by "bare soil", "urban", and "arable lands" constitute 19%, 8% and 5%, and 20%, 5% and 4% respectively.

Those results indicate that the area have an environmental problem and needs urgent plans for protection, risk reduction and adaptation measures against impacts of sea level rise and the risk of high storms and salt water intrusion such as:

- Monitoring and assessing capability for water logged areas, salt effected lands and slum areas
- Development of a socioeconomic awareness program for stakeholders and decision makers
- Development of agricultural and municipal infra structure and waste water treatment facilities
- Development of an action plan to be followed for upgrading the region making use of the immense touristic resources of the region
- Land filling of weak tunnels, implementation of sewerage systems, upgrading of land drainage systems and raising of awareness of stakeholders and decision makers

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SIXTH FRAMEWORK PROGRAMME