

**Implementation of Geographic Information System and  
Remote Sensing Techniques to Assess the Socio-economic Impact of  
Sea Level Rise over Alexandria Coastal Region**

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Alexandria governorate is located on the western edge of the Nile delta coast. From a geomorphological perspective, it is expected to be less vulnerable to Sea Level Rise (SLR) than the delta proper. However its high population, variable topography and enhanced socioeconomic activities make the impact of accelerated SLR of particular concern. The water front of Alexandria extends for over 42 km from Abu Quir bay to the east to Agami to the west. The city is the most important import/export link between Egypt and Europe.

In order to estimate accurately the impact on the lowlands, Geographic Information System (GIS) and Remote Sensing (RS) analysis have been applied ( PARKER, 1988 ). Data over the governorate of Alexandria were digitized manually for each district and topographic map and fed to a microcomputer (IDRISI version 3.2 software). A Multi-Spectral Scanner (MSS) satellite image has been classified for landuse classes and compared to latest available information on landuse data.

Digitized files were transferred from vector to raster form ( HOGG *et al.*, 1986 ; VALENZUELA *et al.*, 1986). Images were then scaled, registered and checked for ground truth observations. A number of control points were used for careful verification. Analysis and interpretation were done using the GIS display for each individual information.

A socioeconomic questionnaire is designed for inhabitants of the lowlands, to measure their awareness and to obtain information on the response, hence a better feeling of the extent of the loss due to SLR could be reached at. The preliminary questionnaire is carried out based on person to person interviews.

An estimate of the impact is obtained based on GIS analysis of the topographic map. It is concluded that all Alexandria beaches are vulnerable to 1m SLR. In addition, three zones are found to lie below sea level : Ameria district lies between 0 and -2m contour, Montaza district lies between 0 and -1m contour, Center district lies between 0 and 1m contour. In addition, lake Mariout lies between -1m and -3m contour levels (Hydraulic pumps are continuously operating to keep the level of water in the lake below 2.8m under sea level, so as to reduce inundation and salt water intrusion caused by rise of lake level).

In order to assess the impact of SLR on industrial and agricultural activities, landuse maps were overlain on topographic maps. It is concluded from the analysis that a large percentage of the area of the governorate lies below the sea level and a population of about 2.0 millions live below the 1m contour elevation. In addition, the agriculture, industrial, and residential sectors are most vulnerable to inundation due to SLR respectively. However, the value of the potential loss in industrial and residential sectors may exceed that of the agriculture sector.

An estimate, based on GIS analysis of population landcover, and landuse is obtained. It shows that the total vulnerable area to 1m SLR is of the order of 1300 km<sup>2</sup> and a population of about 2 million people will be directly affected. A population exceeding 8 million people is predicted for Alexandria in the year 2030. Results indicate that, a population of over 4 million will be directly at risk due to SLR in the year 2030 (if no action is taken).

An investigation of the awareness and response of population to SLR over vulnerable area has also been carried out. Preliminary results, based on interviews with 200 random sample of people, indicate that less than 20% of the inhabitants will be willing to move away from the area.

Periodic nourishment and building of some dykes in location vulnerable to saltwater intrusion is believed to be best choice for saving Alexandria beaches and lowlands.

#### REFERENCES

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