



Mapping and Assessment of Sand Encroachment on the Nile River, Northern Sudan, by Means of Remote Sensing and GIS

Elmuiz Mohammedsaeed Eljack^{1,2}, Elmar Csaplovics¹, Hassan Elnour Adam^{1,3}

¹Technical University of Dresden, Institute of Photogrammetry and Remote Sensing, Germany

²University of Khartoum, Faculty of Agriculture, Sudan

³University of Kordofan, Faculty of Natural Resources, Forestry and Range Department, Sudan



Tropentag, September 14-16, 2010, Zurich, Switzerland,
"International Research on Food Security, Natural Resource Management and Rural Development"

Introduction:

The Nile River provides life and prosperity to the countries along its course. It is constantly impinged up on by wind-driven sediments. The wind deposited sediments present an immediate threat to the river as well as its inhabitants. Sand encroachment is one of the external factors, which caused morphological changes to the Nile River particularly in Northern State, Sudan. The development of remote sensing and Geographic Information System (GIS) techniques opened a new area in assessing and mapping methodologies. In the study area (Merowe region) understanding the sand encroachment is vital for mitigating the potential sand threat to the Nile. It is well known that the cultivable land extends only for a few hundred meters along the Nile banks, therefore its clear how serious is the problem of sand encroachment towards the Nile River in such areas.

Material and methods:

Multi-temporal remotely sensed data of landsat MSS (1972), Landsat TM (1987) and Landsat ETM+ (2001) covering the study area were procured, processed and analyzed. Emphasis was placed on the detection of changes through merging of multi-date images.

Supervised classification and change detection were used for the images.

Field observations and ancillary data were used in image classification and mapping.

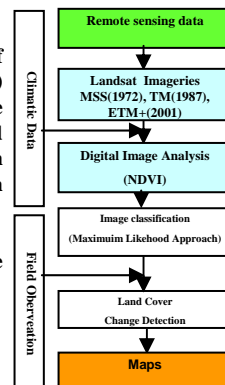
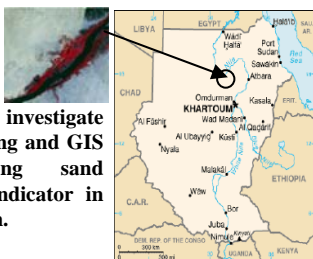


Chart of Research methodology

Objective of the study:

The objective of this study is to investigate the potential use of remote sensing and GIS in assessing and mapping sand encroachment as desertification indicator in Nile River, Northern State, Sudan.



Location of the study area

The study was conducted in Kannar area in Northern Sudan on the eastern bank of the Nile River.

Post-classification method was used to detect changes in land cover classes in the area, the method focuses on the analysis differences of land cover classes of three independently classified images.



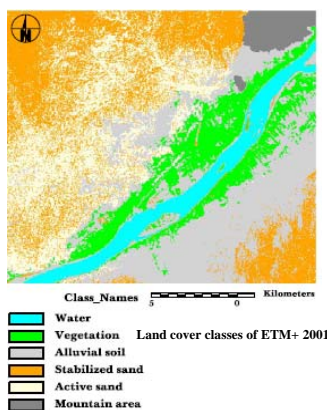
Sand encroachment to date palms at the Nile River, Sudan



Sand encroachment towards the Nile River, Sudan

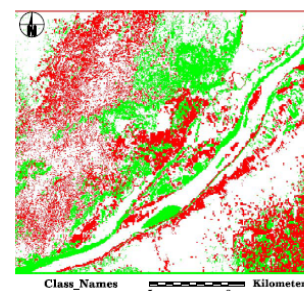
Results:

The results of supervised classification was represented including the change detection of the remotely sensed data of MSS, TM and ETM+ imageries for the years 1972, 1987 and 2001, respectively. The classification was based on the field verification and the selection of training samples. The three images have been classified into five classes.



Distribution of land cover percentage in Kannar area at the Nile River, Sudan

The change detection found that 23% and 18% are increased and decreased respectively, while 60% of the area remains unchanged.



Change detection between 1972 and 2001

Class Name	1972	1987	2001
Water	8.08	6.73	6.64
Vegetation	9.04	9.59	11.95
Alluvial soil	32.11	28.53	28.50
Active & stabilized sand	47.28	52.15	49.88
Mountain area	3.13	3.03	3.03

The study showed that the erosional forms (sand dunes active and stabilized) in the area in 1972, 1987 and 2001 cover about 47.2%, 52.2% and 49.9% of the total area, which indicate that half of the area is affected by sand encroachment. This degradation is related to wind erosion (physical environment and harsh climatic conditions) and human misuse (e.g. cultivation).

The sand encroachment choked the Nile River course. The continuation of this phenomena in the same manner, will change the Nile River course as had happened in the far past.

Conclusions:

- Sand encroachment threatens the agricultural land and settlements in Kannar area, the course of the Nile River and endanger the livelihood of inhabitants in the area..
- The study concluded that, the integration of remote sensing and GIS prove to be reliable tools and helpful techniques in studying, assessing and mapping sand encroachment.

Contact address: elmuizejack@yahoo.com

