

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



SPACE TECHNOLOGY APPLICATIONS



in Sudan

By

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Abstract



The paper reflects the status of space technology in Sudan. .
Examples of national programs that utilized space technology,
Institutions that involve in space technology with a focus on
Remote Sensing Authority and its role.

**The paper presents some of the national projects that
utilized RS and GIS for planning. It also illustrates
examples of research programs that integrate remote
sensing, geographic information system in the process of
natural resources assessment, management and
monitoring , land use planning and environmental
degradation assessment.**

It also highlights the human capacity development
programs as a real challenge to the effective utilization of
space technology specifically earth observation systems..

Introduction



Sudan is the largest country in Africa with an area of 2.5 million km². This area is approximately equal to 8.3% of the area of Africa and 1.7% of the land of the world.

Sudan has a diversified climate ranging from desert in the North to equatorial in the South. Annual rainfall amounts exceed 1500 mm in the South and below 100 mm in the extreme North. Water resources availability and distribution governed population existence and shaped Sudan socio – economic activities.

Introduction

- The introduction of Geo information (RS and GIS) in Sudan is backdated to late 1970s and early 1980s when the government of Sudan started a number of national programs through a foreign support. With gratitude and acknowledgement some of the supporting agencies are mentioned such as **United States Agency for International Development 1980, UNDP in 1990. Netherlands Government in 1992, FAO (Africover Project) support in 1993 and 1996.**

Introduction

late 1970's a National Remote Sensing Center was established in 1977 renamed to Remote Sensing Authority (RSA) in 1996. RSA is mandated to set space technology policies, assist government agencies, universities, and research institutes in the fields of space technology applications, research, studies, and capacity building. It involves in programs and activities that include project studies, human capacity development and awareness programs for professional as well as public awareness.

The status of Space Technology Applications

- In such a vast country it is advantageous to use space technology for sustainable development of natural resources, monitoring of environmental changes and management of disasters.
- In this respect Sudan focuses on human and institutional capacity in the field of remote sensing (RS) and the geographic information system (GIS) and global positioning system (GPS).

Availability of Geoinformation

Geoinformation that is available and, to some extent, accessible for users include:

- Landsat data 1970s, 1980s, 1990s, and 2000 covering whole country.
- Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) 90 meter .
- Rainfall estimates derived from Meteosat and ground measurement.
- Sudan Land cover database at 1:200000 (based on Landsat 1997 adopting the land cover classification system “LCCS”).
- Vegetation condition derived from NDVI (vegetation Index)
- Drainage network, mainly the Nile and its tributaries, wadies and other minor drainage.

Availability of Geoinformation

- **Groundwater basin, water points, Hafirs, hand pumps and seasonal Wadis**
- **Topographic maps at scale of 1:250,000; Some parts of Sudan at scale 1:100,000 and specific areas at scale larger than 1:20,000.**
- **Some infrastructure data e.g settlements, roads, rivers, etc produced by humanitarian sector working in Sudan**
- **Currently more than 45 institutions from government and private sector are working in the field of geoinformation with different capabilities. Number of UN agencies and NGOs are utilizing and producing geoinformation.**

Geo information and Development:

Remote Sensing, GIS and GPS, as advanced technologies, were used to enhance the availability of environmental data (acquisition, analysis and output). Some of national projects were implemented recently (2003+) utilizing RS and GIS including:

- **Development projects at national level:** Merewei Dam construction.
- **Projects for peace consolidation:** Rehabilitation of the war affected areas in the south and Darfur state.
- **Projects for sustainable development:** Water harvesting in west Sudan, Khartoum state, and Gadaref state
- **Projects for management:** such as sugar cane schemes.
- **Projects for environmental protection:** desertification in the affected states, sand encroachment in the River Nile, flood of Nile and Gash Rivers, and landfire.
- **Projects for human health:** Malaria control and eradication.

Institutional Capacity in RS and GIS

- As stated above the introduction of RS was dated to 1970's with the establishment of the "National Remote Sensing Center (NRSC)" RSA
- Later during 1980s GIS was introduced through foreign Support to the following institutions:
 - Ministry of Agriculture and Forestry
 - Ministry of Irrigation and Water Resources
 - Ministry of Science and Technology

RSA, the Role



1. Natural Resource Management Program

Remote Sensing, GIS and GPS as an advanced technologies were used to enhance the availability of environmental data (acquisition, analysis and output).

It facilitates data and information accessibility and sharing.

It support decision making.

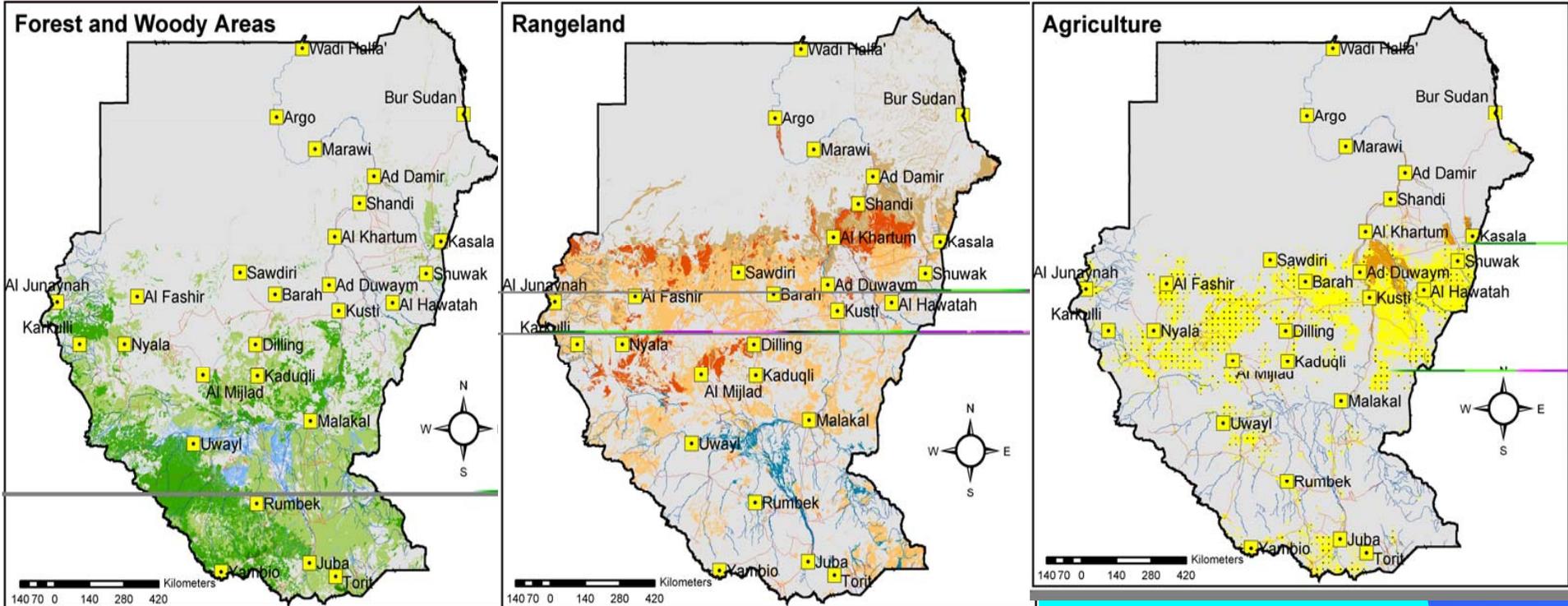


1. Natural resource Management

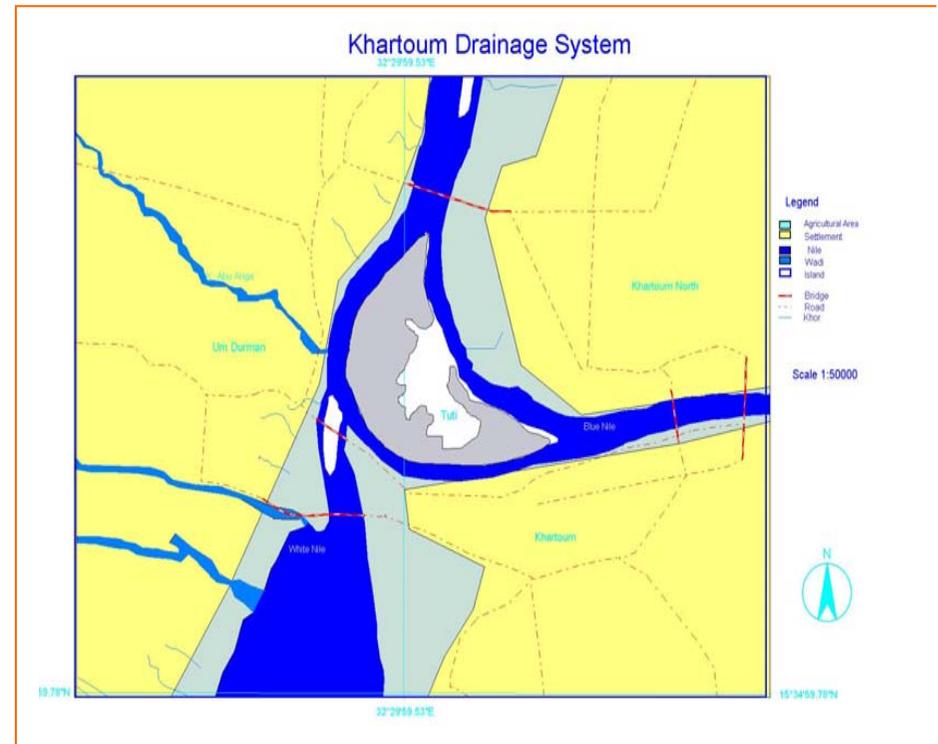
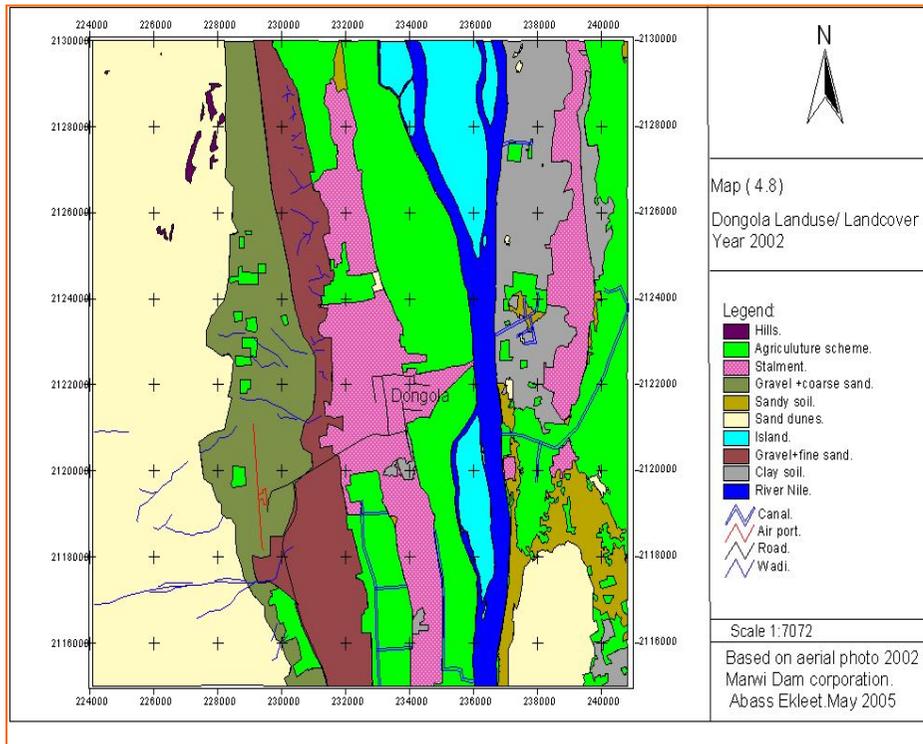
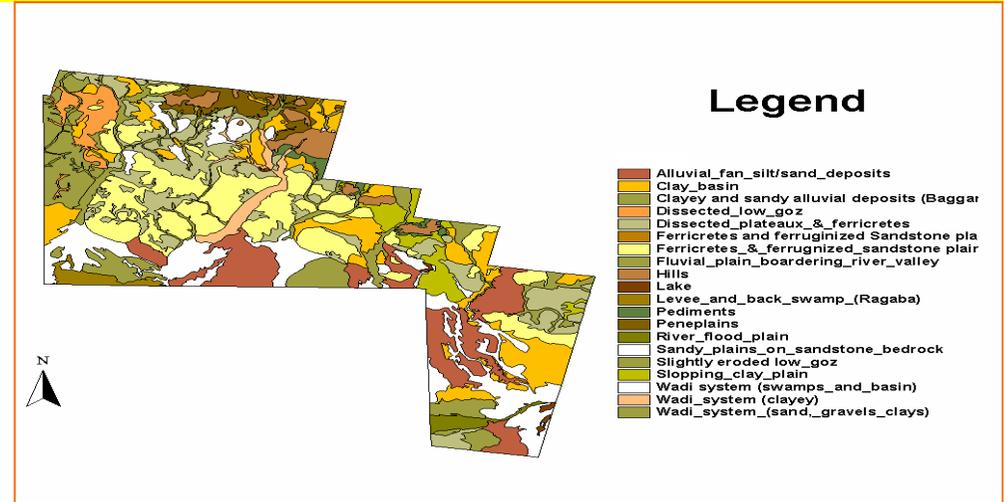
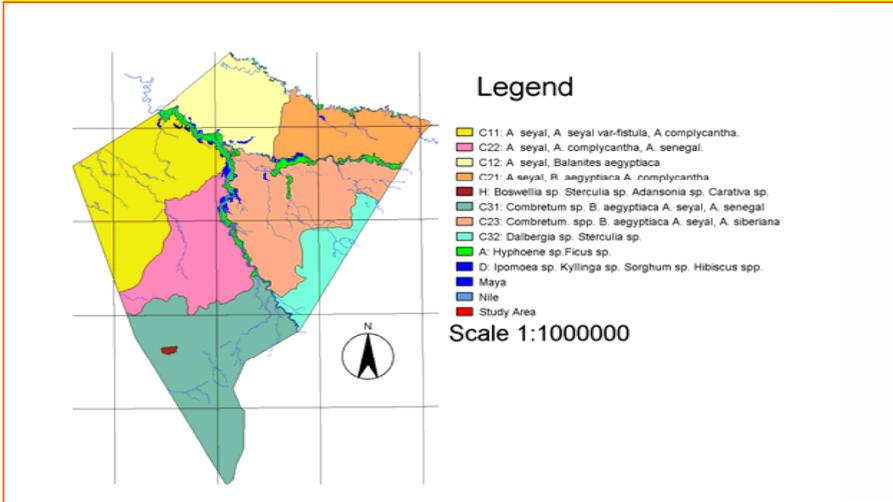
- Natural resource mapping
- Soils and geomorphology
- land use and land cover mapping
- Land use planning

Data availability, analytical approaches and human capacity development are the main components of these programs.

Natural Resource Management



Natural Resource Management





2. Environmental Monitoring

- **Desertification monitoring program,**
- **Flood assessment,**
- **Urban sprawl**
- **Environmental degradation assessment.**

Data availability, analytical approaches and human capacity development are the main components of these programs.

Environmental Monitoring



Sand Dunes threaten The River Nile

Dongola 2004



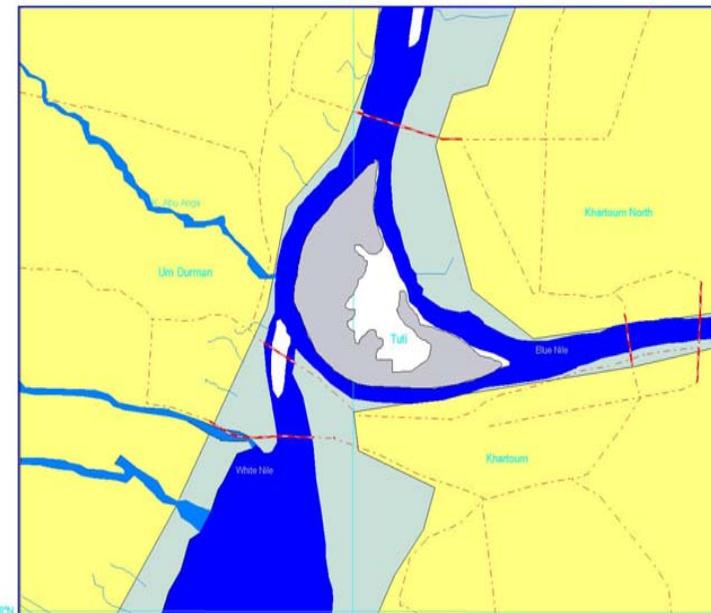
Urban Change: Gadaref Town



Simple Risk Map



Khartoum Drainage System



- Legend
- Agricultural Area
 - Settlement
 - Nile
 - Wadi
 - Island
 - Bridge
 - Road
 - Khor

Scale 1:50000

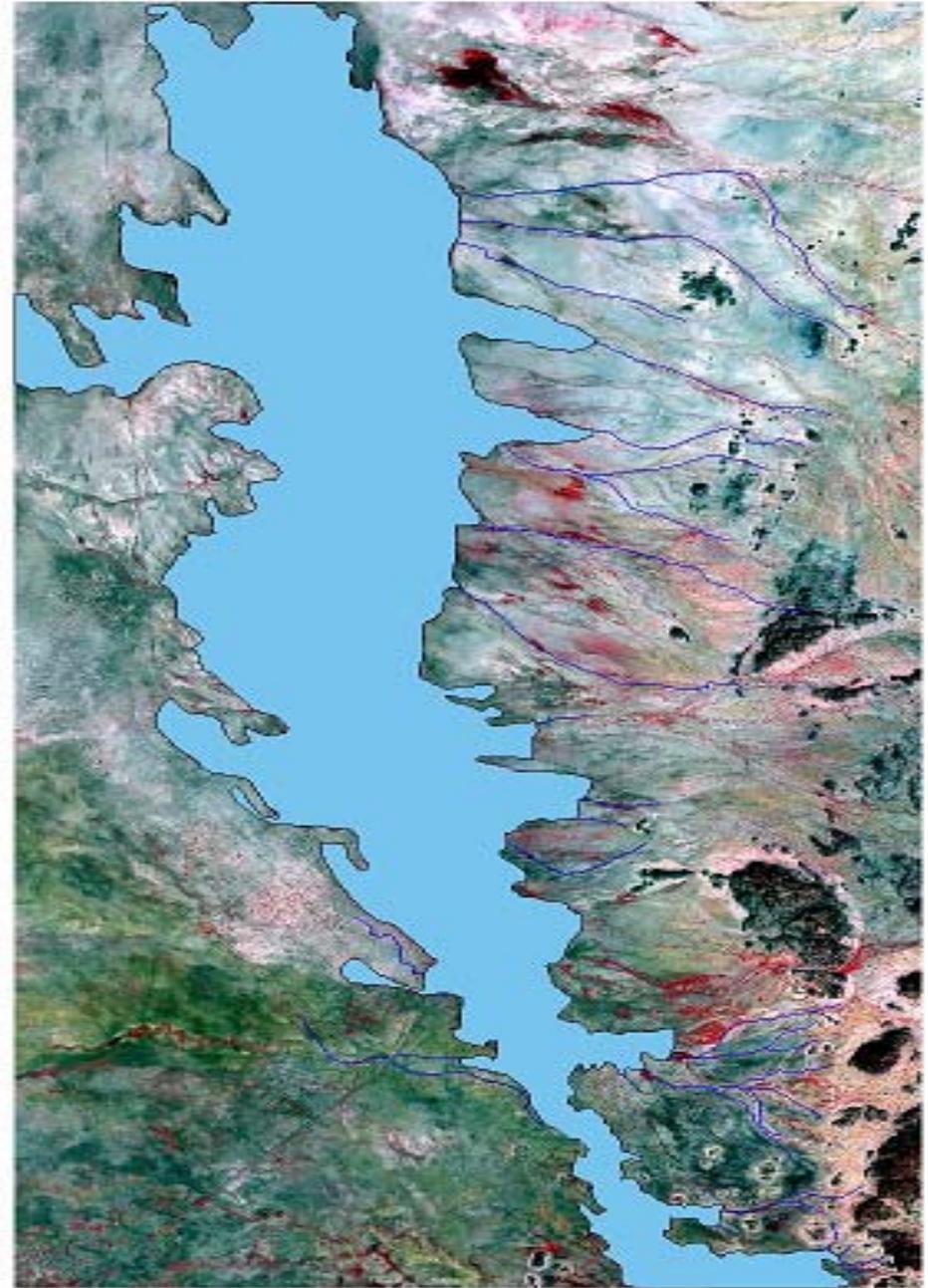


15° 10' N

32° 29' 59.53" E

15° 14' 59.78" N

Environmental Monitoring





3. Training and Education

- **Short training program targeting professionals from different fields.**
- **Training program tailored for teaching assistants within universities.**
- **Special training Modules (remote sensing/GIS training course).**
- **Long- term training program.**

Sustainable development is a major strategy for Sudan's government. In order to achieve such a goal a program for human and institutional capacity was structured to introduce RS and GIS as the best tools that can provide geo-information.

Training and Education





4. Awareness

- **Public**
- **Decision makers**
- **Education**
- **Professionals**

The awareness program includes numbers of local seminars, workshops, besides the international workshops and conferences.

Awareness: World Space Week Celebration 2004



Awareness : Regional Workshop 2004



**Regional Workshop on the Use of Space
Technology for Natural Resources
Management, Environmental Monitoring and
Disaster Management**
Organized by : MOST/NCR, RSA, UN OOSA, ESA
Alsbatt International Hall for Conferences Sunday 4 - Thursday 8 - April, 2004

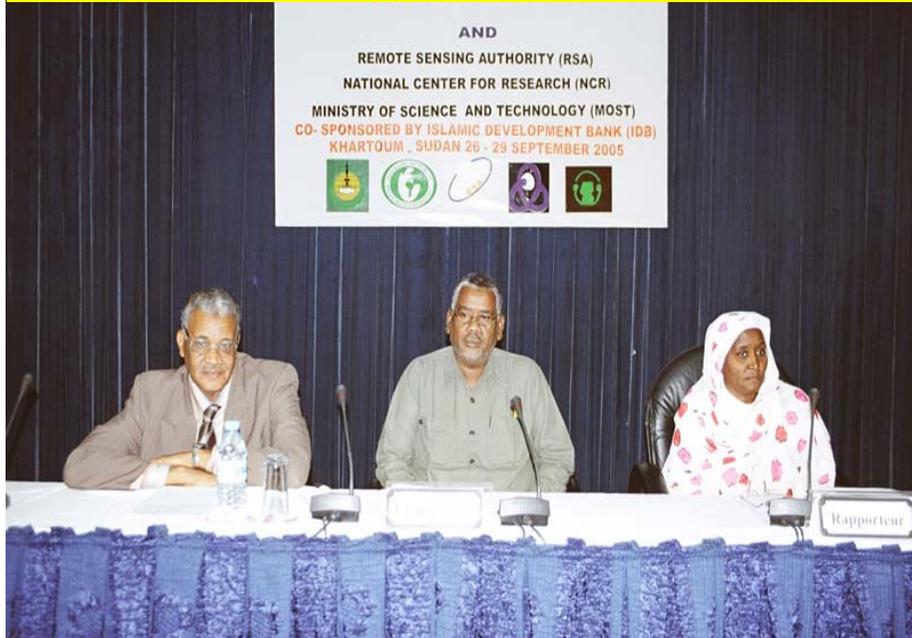


Awareness : International Workshop 2005



MINISTRY OF :
CO- SPONSORED
KHARTOUM

AND
REMOTE SENSING AUTHORITY (RSA)
NATIONAL CENTER FOR RESEARCH (NCR)
MINISTRY OF SCIENCE AND TECHNOLOGY (MOST)
CO- SPONSORED BY ISLAMIC DEVELOPMENT BANK (IDB)
KHARTOUM , SUDAN 26 - 29 SEPTEMBER 2005



Future Perspectives



- **Long-term training programs in space technology within Sudan Academy of Science.**
- **Ground receiving station**
- **Sudan Earth Observation Satellite (SEOS)**

To ensure information availability and accessibility.

Thank You

