

4th United Nations / Pakistan International Conference on the Use of Space Technology for Water Management

Review of current status of space applications for water management in developing countries and the potential development in Sudan

HANADI ABDALLA

SPACE RESEARCH CENTRE, UNIVERSITY OF KHARTOUM



University of Khartoum Space Research Centre

Outlines

- ▶ Introduction
- ▶ Example of applications in developing countries
(Africa)
- ▶ Conclusion and recommendation.

Introduction

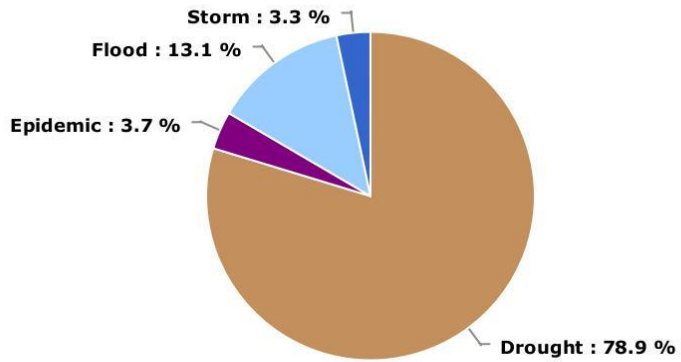
- ▶ Only 3% of the water on earth is fresh and two-third of the freshwater is in inaccessible areas such as icecaps and glaciers.
- ▶ In Africa, about 2/3 (273 Million) of the Sub-Saharan African countries(SSA) and more than 25% (45 million) of the urban population do not have safe drinking water.

Fields of applications:

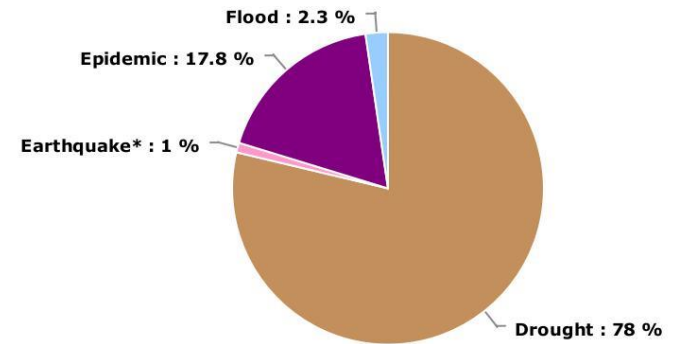
- ▶ Droughts
- ▶ Agriculture
- ▶ Grazing
- ▶ Deforestation
- ▶ Health
- ▶ Life under water
- ▶ Water constructions

Droughts:

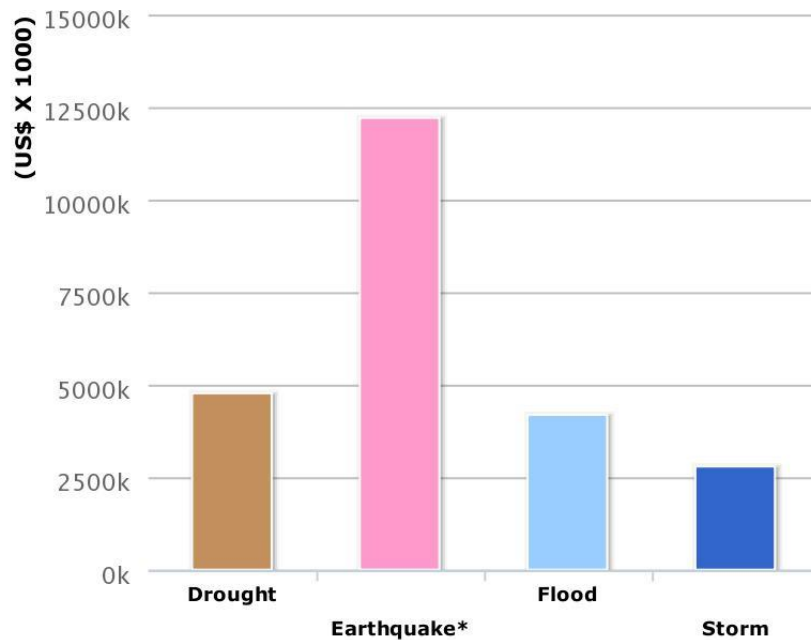
- ▶ Africa has been affected by droughts several times during the 21st century.
- ▶ The losses caused by this disaster is very high in term of human lives, animals and economical damage.



Percentage of people affected per disaster



Percentage of people killed per disaster



Percentage of economical damage per disaster

Droughts Cont.

- ▶ East Africa region (2007).
 - ▶ Severe droughts: north eastern Ethiopia, south eastern Eritrea and north Somalia.
 - ▶ Better possible vegetation conditions: Sudan, Uganda and coastal regions of Kenya.
- ▶ Kenya, Turkana region(2017):
 - ▶ Gravity Recovery and Climate Experiment (GRACE) mission
 - ▶ Reserving at least 200 billion cubic metres of water



Image source : UNESCO

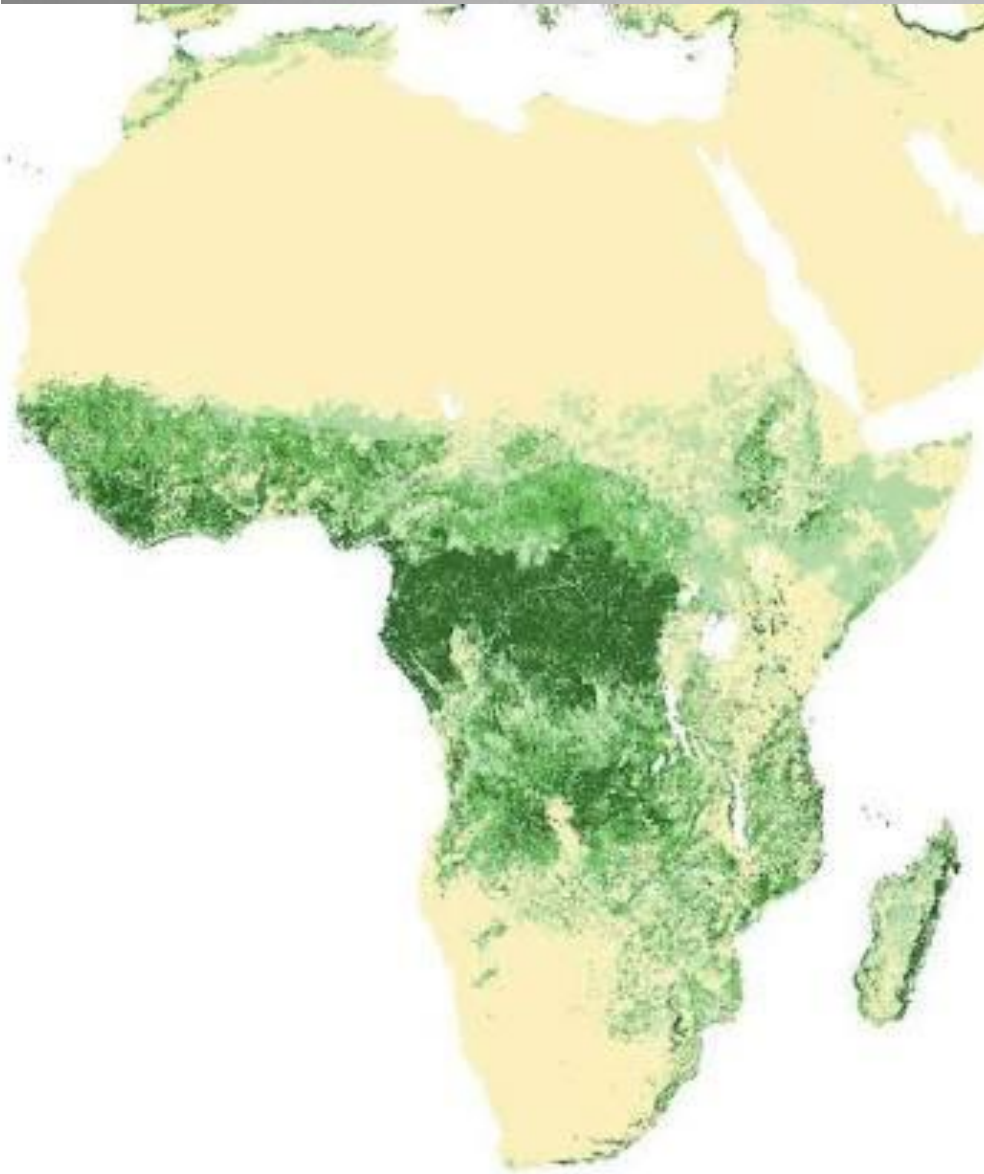
Agriculture

- ▶ 50% to 90% of the population
- ▶ 90% of national economy
- ▶ Tanzania, The Spurring Transformation for Agriculture through Remote Sensing (STARS) project:
 - ▶ UAVs for food security in small farms.
- ▶ Nigeria:
 - ▶ London based company consultancy called growmoreXGMX
 - ▶ Rice fields

Grazing

- ▶ Grass is considered gold in Africa
- ▶ Kenya has also been experimenting on how to monitor the process of grazing (2014):
 - ▶ Biomass production and the Normalized Difference Vegetation Index (NDVI)

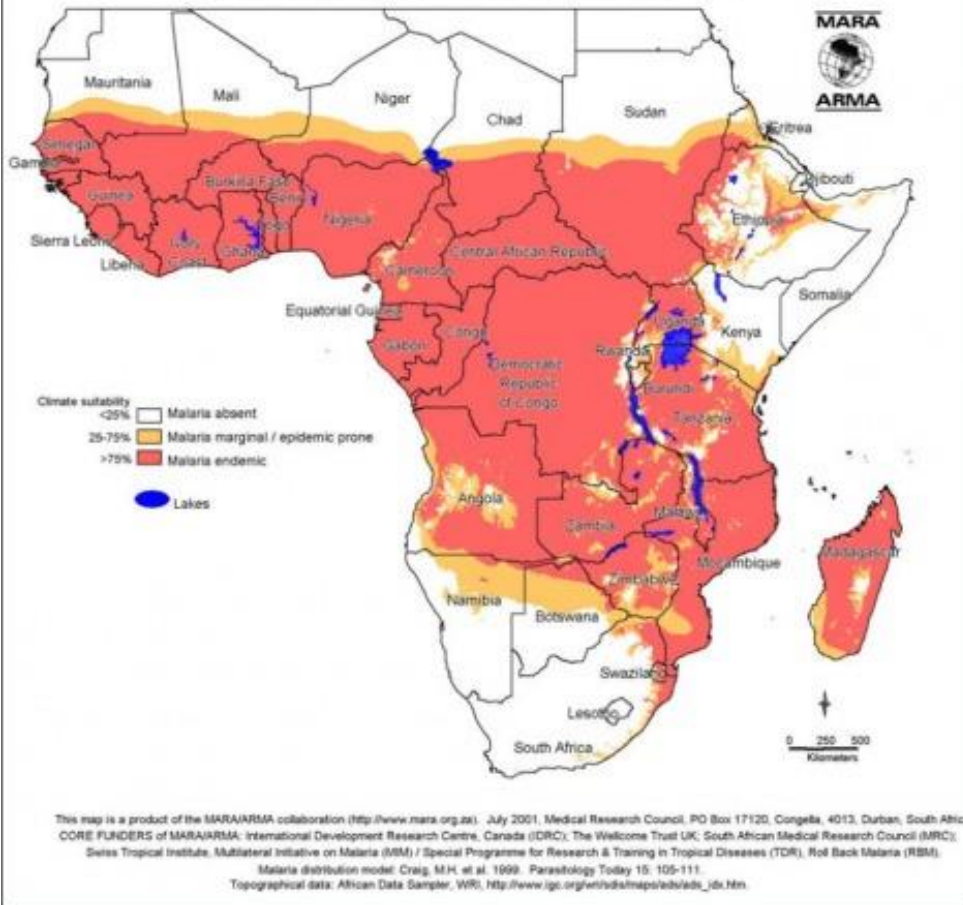
Deforestation



- 17% of the world's forests.
- Climate change and biodiversity.
- Kenya, Aderdare forest:
 - water catchment (Tana, Athi, and Ewaso Nyiro rivers,)
 - from LandSat TM: 30 % decrease 1987-2000.

Health

Distribution of Endemic Malaria



- In Southern Zambia 2007:
 - Potential anopheline larval habitats
 - Data was collected from Shuttle Rader Topography Mission (SRTM), the Advanced Spaceborne Thermal Emission and Reflection radiometer (ASTER) and the Terra spacecraft platform

Life under water



- 30% drop in global fish stock.
- Over 3 Billion people depend on coastal and marine biodiversity.
- In 2009, a descriptive study used the Landsat 7 data to create the first inventory of the main coral reefs geomorphological units in Madagascar and every Western Indian Ocean Islands.

Water constructions

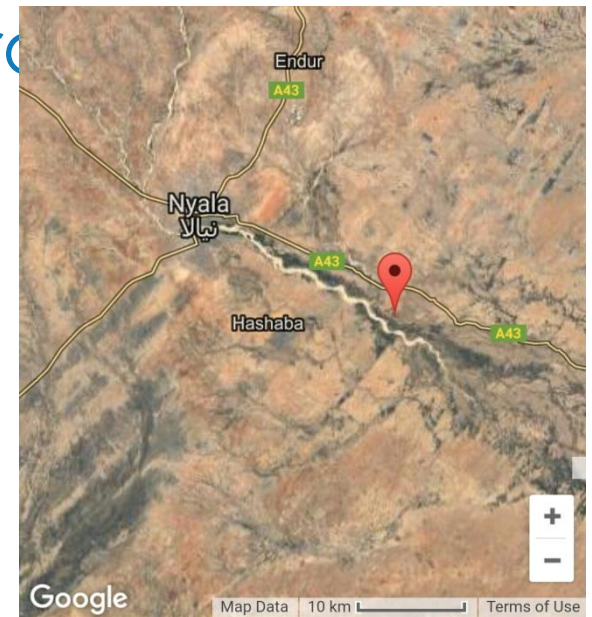
The Grand Ethiopian Renaissance Dam (GERD)



- RS was used to model and assess the scenarios in case of failure or success of such structure.
- Data obtained from STRM and ALOSPALSAR .

Sudan

- ▶ Water availability dropped from 1997 to 55% in 2014.
 - ▶ rainfall scarcity
 - ▶ cyclical droughts
 - ▶ disputes over water
- ▶ Lack of data
 - ▶ Impeded the modeling and studying of the entire seasonal stream of Wadi Nyala.



Conclusion

- ▶ Remote sensing provide a vital tool in analyzing and modeling of water issues.
- ▶ Lack of experts and required data present a hindrance in the development of African countries.
- ▶ The need of data and documentation is vital for a sustainable development of countries.

Recommendations

- ▶ Developing countries should invest more in capacity building to help form a solid infrastructure for using space technology in water management.
- ▶ National and international cooperation could boost the development and analysis of developing countries water concerns.
- ▶ Through sharing data and experiences; critical issues in water sector could be addressed.
- ▶ More research should be supported and conducted in Sudan and training workshop to help build a national network of expertise.



Thank you...