Use of Earth Observation Data for Water Resources Management by the Nile Basin Initiative. - Tigernet Project

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NBI: Overview

- The Nile Basin Initiative (NBI) is
  - Intergovernmental
  - Regional
  - Partnership
  - Among 10 riparian states of the Nile River (Burundi, D R Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania, and Uganda.
  - Eritrea is an observer
  - For cooperative management and development of the shared Nile Waters resources.
NBI shared vision objective

- To achieve sustainable social economic development through the equitable utilization of, and benefit from the common Nile Basin water resources.
Basin Monitoring

- Is one of our key activities

- Based on:
  - Observed measurements and
  - Satellite data
Some of the processes we monitor are:
- Rainfall
- Temperature
- Climate Change/Variability
- Actual Evapo-transpiration
- Water Levels
- Land Cover/land Use change
- Vegetation dynamics
- Floods
- Soils (soil erosion vulnerability) soil degradation
- Water quality
- Population
- etc
Sediment Load: Lake Tana
Sediment Load: Abbay at Kessie Bridge
SILT INTO LAKE VICTORIA FROM KAGERA RIVER
Land degradation
TIGERNET- NBI COLLABORATION

- The Tigernet Initiative was first contacted by NBI through WRPM project in 2011
- Main objective was to meet data requirements for the NB DSS
- Was later extended for other Basin monitoring purposes.
- The Nile Basin Decision Support System (NB DSS) is software framework for communication, information management and analysis of water resources.
- The NB DSS is a tool that is used to analyze different management scenarios for informed water resources management.
Why EO data

- The NB DSS requires basin-wide data to be analysed in order to inform decision making.
- The available data is scanty and does not cover the whole Nile Basin
- Available data has gaps
- Ensuring the availability of ready to use operational Earth Observation data products needs cooperation with partners like the TIGER NET
Tigernet Interventions

- Is developing a Water Observation and Information System (WOIS) for the NBI
- WOIS is license free; affordable
- Based on open source software (Quantum GIS and others)
- WOIS uses satellite observations to support evidence-based Integrated Water Resources Management
- Has ready-to-use workflows (with inbuilt algorithms)
- Flexible to add other workflows
WOIS Work Flows

Easy to use well guided Workflows With instructions
Demonstration Cases

01 Large Lakes Water quality and Temperature

This workflow provides operational and historical EO water quality monitoring products
- Chlorophyll concentration
- Total Suspended Matter (TSM)
- Lake Surface Temperature

Data requirements
- MERIS-FR level 1b product
- Advanced Along-Track scanning Radiometer (AATSR) data
  1Km resolution
Feedback

• There is limited synthesized – updated knowledge about lake Victoria; This workflow provides a chance to monitor and analyse such issues.
• The white areas show no data areas due to the quality of input data in those areas— as a challenge.
Demonstration Cases

- **03 Medium resolution Land degradation Index**
  - This workflow performs a Vegetation Trends Analysis

- **Data Requirements**
  - Normalised Difference Vegetation Index (NDVI)
Demonstration Cases

04 Medium Resolution Full Basin Characterisation

- Land cover classification
- Land cover mapping (supervised and unsupervised classification)

05 High Resolution Basin Characterisation

- Change detection

Data Requirement

- Medium resolution data such as MERIS AND MODIS
- Multi spectral data such as SPOT, RapidEYE, Landsat
Feedback

- This workflow provides an opportunity to use both medium resolution and high resolution data;
  - is not limiting - enables one to use what is available
- The products require ground truthing
Demonstration Cases

- 06 Water Body Mapping
  - Small Water body mapping
  - Surface Water Detection

- Data Requirements
  - Medium Resolution data such as Spot, Landsat
  - Multi Spectral data such as RapidEye, MERIS, MODIS
Demonstration Cases

- 07 Flooding Mapping system
  - Flood prone areas
  - Threshold classification
  - Historical flood mapping

- Data requirements
  - ENVISAT ASAR data
Feedback

- This workflow has been integrated into ENTRO’s Eastern Nile Seasonal Flood monitoring.
- Efforts were made to compare flood maps generated from RADARSAT-2 and flood inundation maps generated from flood forecasting system during the first half of September 2013.
- Failed because of budget limitations but can still be done.
Demonstration Cases

08 Hydrological Characterisation

- Evapo-transpiration (LSA-SAF) every 30 minutes to daily
- Historic Precipitation (RFE) Daily and decadal to Monthly
- Real Time Precipitation
- Start of Season Statistics
Feedback

- This workflow is easy to use
- Allows you to connect to download most recent data
- The products- Statistics/ Zonal statistics and reports have been generated
Demonstration Cases

• 11 Long Term and Seasonal Variation of Wetlands.
• Characterisation of the Sudd
• Looking forward to improvement of this workflow using Radar data
Demonstration Cases

- 12 Medium Resolution Erosion Potential Indicators
  - Soil erosion Potential
  - Hot Spot Detection

- Data Requirements
  - NOAA RFE Rainfall data
  - FAO Soils
  - SRTM DEM
  - ESA GlobCover Landcover
  - Tigernet Land degradation index- based on NDVI
Feedback

- This workflow works well and is easy to follow.
- The input data are all global datasets which are easy to find.
- So far, the product is acceptable, however it requires field truthing.
- We have sent out this product to some experts for further validation.
Products

- Knowledge products
- Time series data for input into modeling tools
Benefits from Tiger-net

- Trainings (Capacity building)
- Data download
- Already organised workflows
- Ability to create a personalised workflows
- Has contributed towards Knowledge Management
Future Plans

- WOIS is still being developed by Tigernet
- To Contribute towards GEOSS Portal
THANK YOU