Space Technology Applications to Climate Change Mitigation and Adaptation in Africa

Role of RCMRD – SERVIR Africa
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United Nations/Indonesia International Conference on Integrated Space Technology Applications to Climate Change

SERVIR

September 2013    Jakarta Indonesia
• About RCMRD and SERVIR
• Flood Routing Assessments and Prediction
• Frost Mapping and Prediction
• Index Based Insurance Products
• GHG Inventory Development East and Southern Africa
Current member states are 19 with latest inclusion of South Sudan.
SERVIR-Africa is among the core RCMRD projects that has been active since 2008 and also serving all the 19 RCMRD member countries.
GEOSS THEMES: SERVIR Thematic areas

THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS

INFORMATION FOR THE BENEFIT OF SOCIETY

- Disasters
- Health
- Energy
- Climate
- Agriculture
- Ecosystems
- Weather
- Water
- Biodiversity
Remote Sensing Data

• More than 3000 satellites are orbiting the earth; Some are owned by commercial/private agencies & others by government agencies such as NASA
• Example of agencies providing satellite data include:
  • National Aeronautics & Space Agencies (NASA)
  • US Geological Survey (USGS)
  • European Space Agency (ESA)
  • Japan Aerospace Exploration Agency (JAXA)
NASA mission (goal 3A): Study Earth from space to advance scientific understanding and meet societal needs
Specific Projects & Products
CREST, Flood and Frost Tools
Coupled Routing and Excess STorage (CREST)

- Distributed, fully coupled runoff generation and routing model
- Simulates water and energy fluxes and storage on a regular grid
- Grid cell resolution user defined
• Used as CREST Service for generation of a estimated flood extent maps for use in generation of flood alert maps.

• Used to produce flood inundation hazard pattern/Extent Map by specifying a discharge value at a location of interest.
SERVIR FROST TOOLS

- Historical plus Near real time mapping of frost occurrences in Eastern Africa
- Automatically generated and customized frost product: Readily available for download & consumption

This map represents the possible occurrence of frost for the above mentioned date. The map was derived from MODIS night time Land Surface Temperature (LST) by RCMRD/SERVIR-Africa (USAID - NASA supported) project geared towards use of Earth Observation (EO) to help governments in policy and decision making.
GHG Inventory Development
ESA Region
Overall objective of the Project is to strengthen the capacity of participating countries to improve the quality of their national GHG inventories, with a focus on Agriculture and LULUCF, and establish sustainable inventory management systems.

Specifically, the Project aims to:

1) Strengthen the institutional arrangements and inventory management systems, its functions, and ability to sustainably oversee the compilation of regular national GHG inventories for submission to the UNFCCC;

2) Enhance the technical capacity of designated personnel to produce at minimum a complete Tier I level, or where achievable move to Tier 2 level, well documented/transparent GHG inventory for the Agriculture and LULUCF sectors.

3) Improve national methodologies, activity data and emission factors through a combination of hands-on training designed to meet the individual needs of the countries, use of GHG inventory management tools specifically designed for the Agriculture and LULUCF sectors, assistance from experts with specific knowledge on these source/sink categories, guidance on developing land use maps and regional networking.
• UNFCCC oversees the development of GHG Inventories as provided for in Article 8 of the Convention.

• Six countries: Botswana, Malawi, Namibia, Rwanda, Tanzania and Zambia; requested for UNFCCC’s support in GHG Inventory development

• UNFCCC is working with RCMRD, SERVIR, USAID, NASA, USEPA and ICFI to build capacity of the countries to sustainably develop GHG Inventories.
**Countries participating in the project**

1. Malawi
2. Rwanda
3. Tanzania
4. Zambia
5. Namibia
6. Botswana
Capacity Building

Hands-On Training: Zambia

Classification Scheme Development Workshops: Zambia

Classification Scheme Development Workshops: Malawi

Classification Scheme Development Workshops: Rwanda
Malawi Land Cover Maps - Three Time Slices

Land Cover Categories:
- Dense Forest
- Moderate Forest
- Sparse Forest
- Closed Shrubland
- Open Shrubland
- Open Grassland
- Closed Grassland
- Annual Cropland
- Perennial Cropland
- Wetlands
- Water Bodies
- Settlements
- Otherlands
- Clouds

Landsat Derived Maps: Malawi Schema II

Land cover maps derived from Landsat imagery collected in 1990, 2000, and 2010. The maps show changes in land cover over time, highlighting areas of dense forest, moderate forest, sparse forest, closed shrubland, open shrubland, open grassland, closed grassland, annual cropland, perennial cropland, wetlands, water bodies, settlements, otherlands, and clouds. The maps indicate the impact of human activities and natural processes on the land cover of Malawi.

Kilometers

0 100 200 300 400
Landsat Derived Maps: Rwanda Schema II

Rwanda Land Cover Maps for GHG Inventory Development

Year 1990

Year 2000

Year 2010

Land Cover Categories:
- Permanent Croplands
- Annual Croplands
- Dense Forest
- Moderate Forest
- Sparse Forest
- Wetlands
- Woodlands
- Settlement
- Open Grasslands
- Open Shrublands
- Closed Grasslands
- Closed Shrublands
- Water Body

Land cover maps derived from Landsat imagery (released 2011, NASA). The geographic designations employed do not imply the expression of any opinion whatsoever of the party or parties concerned, or concerning the delineation of its frontiers or boundaries.
Time Series Statistics

Year 2010 Land Cover Categories
- Settlement: 1%
- Dense Forest: 2%
- Water Body: 8%
- Wetland: 5%
- Annual Cropland: 38%
- Open Shrubland: 13%
- Perennial Cropland: 0.36%
- Sparse Forest: 23%
- Moderate Forest: 5%
- Closed Grassland: 4%

Year 2000 Land Cover Categories
- Settlement: 0.51%
- Dense Forest: 2%
- Moderate Forest: 6%
- Water Body: 8%
- Wetlands: 4%
- Annual Croplands: 38%
- Open Grasslands: 9%
- Open Shrublands: 9%
- Closed Grasslands: 0.36%
- Perennial Croplands: 0.4%
- Closed Shrublands: 0.16%
- Otherlands: 0.14%
Landsat Derived Maps: Zambia Schema II

Zambia Land Cover Maps for GHG Inventory Development

Land Cover Categories:
- Very Dense Forest
- High Dense Forest
- Moderate Forest
- Sparse Moderate Forest
- Sparse Forest
- Open Sparse Forest
- Planted Forest
- Woodlands
- Closed Grasslands
- Open Grasslands
- Closed Shrublands
- Open Shrublands
- Perennial Cropland
- Annual Cropland
- Wetlands
- Water Bodies

Settlements
Otherland

Year 2000

Year 2010

Kilometers
0 245 480 980

Land cover maps derived from Landsat imagery products (USG Distribution). The geographical designations employed do not imply any official or any endorsement on the part of any of the agencies involved, concerning the legal status of any territory, area, or concerning the delimitation of the frontiers or boundaries.
Disaster/Hazard and Risk Insurance
Index Insurance and Climate Risk Management

- In Malawi, smallholder farmers report they cannot obtain inputs necessary to address climate variability
  - High yielding seeds require cash the farmers do not have
  - Drought risk prevents farmers from being eligible for loans
  - Malawi farmers report they want to adjust practices to take advantage of seasonal forecasts but are unable to obtain appropriate fertilizer and seed

- Index insurance risk management package
  - We have designed the contracts for a drought insurance system that provides the backbone for a package of loans, groundnut, and maize inputs for smallholder farmers
  - Drought insurance solves traditional crop insurance pitfalls
  - Partners include Malawi farmers and financing associations (NASFAM, OIBM MRFC, Malawi Insurance Association), the World Bank CRMG, Malawi Met Service, CUCRED
  - Project is in its second year of implementation, scaling up from about 900 farmers last year to several thousand, due to overwhelming demand
  - Additional pilots underway (e.g. Kenya, Tanzania, South Africa . . .)
  - We are cooperatively developing packages that provide price incentives, risk protection, and strategic input availability so farmers can take advantage of forecasts
  - Farmers report that this program is how they adapt to climate variability and change

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Where is the risk?

What are the risk?
Where are the people living?

What’s the level of exposure?

Atlas:
Flood Prediction Model: Using Satellite Imagery Data (TRMM)

Temporal Maps and Time Series: Stream Flow and Soil Moisture

Field Observations

Flooded Part: River Nzoia
Plants Observation Density Count

This Gridded data set represents density count of different plants species observations present in approximately 50km (0.45 decimal degrees) pixels. This data set has been derived from species occurrence records, digitized from the National Museums of Kenya...

Open Preview Details Metadata
SERVIR Interactive Mapper

- An online visualization tool that allows mash up of several data layers and retrieval of same information from multiple external sources.
- Comprises of both time series data like TRMM rainfall data and other still data sets.
A simple to use interface for downloading Geospatial Data on various thematic layers. Users require to enter email address, draw their ROI and click ok to send zipped data link to their email address. Download has to performed within 48 hrs. of receiving the link.
Comprises of data focusing on Food security, Heath, Demography, Water etc.
An Online Data Repository that allows upload, download & visualization of geospatial data
Important Links
(follow up)
1. Interactive Mapper:
Core viewer that enables access and display of datasets from different sources
https://servirglobal.net/EastAfrica/MapsData/InteractiveMapper.aspx

2. Data Catalog:
Interface for discovering geospatial resources using keyword searches
https://servirglobal.net/EastAfrica/MapsData/DataCatalog.aspx

3. CREST Viewer:
Interface for displaying flood model outputs in near real time
http://41.206.34.124/CrestViewer/

4. Biodiversity Maps:
Interface for displaying and querying species distribution maps
http://servir.rcmrd.org/geoapps/biodiversity/

5. Frost maps
Daily frost maps derived from MODIS terra LST products
http://41.206.34.124/frostmaps/
6. Clip/Zip/Ship:
Interface for downloading SERVIR datasets based on a user-defined area of interest
http://servir.rcmrd.org/geoapps/ecosystems/

7. WASH Information Management System:
Designed as an integrated database that provides a systematic way of gathering information about water to assist in decision-making and policy development at different societal levels in South Sudan
http://www.mwri-goss.org/wimsapp/index.html

8. SERVIR AFRICA GEODATA PORTAL
Interface designed for discovering, visualizing and access to Geographic data.
http://servir.rcmrd.org/metacatalog/catalog/main/home.page

9. OPEN DATA FOR THE HORN: Battling Hunger in the Horn of Africa
This site lets you upload, manage, and browse geospatial data for the Horn of Africa. These data sets focus mostly on food security
http://horn.rcmrd.org/
Terima kasih
Thank You

http://www.rcmrd.org
www.servirglobal.net

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