

# Space Technology Applications to Climate Change Mitigation and Adaptation in Africa

Role of RCMRD – SERVIR Africa  
Presentation By  
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Climate Change and Ecosystem Specialist

*United Nations/Indonesia International Conference on Integrated Space Technology Applications to Climate Change*

**SERVIR** 

September 2013 Jakarta Indonesia



**ICIMOD**



# OUTLINE

- About RCMRD and SERVIR
- Flood Routing Assessments and Prediction
- Frost Mapping and Prediction
- Index Based Insurance Products
- GHG Inventory Development East and Southern Africa





# REGIONAL CENTRE FOR MAPPING OF RESOURCES FOR DEVELOPMENT



Current member states are 19 with latest inclusion of South Sudan.

**VISION** | To be a premier Centre of Excellence in provision of Geo-information services

**MISSION** | To promote sustainable development through generation, application and dissemination of Geo-information and allied ICT services and products in the Member States and beyond

**SERVICES** | Geographic Information Systems | Surveying & Mapping | Capacity Building: IT, GIS, RS, GPS etc. Remote Sensing | Repair of Surveying Equipment

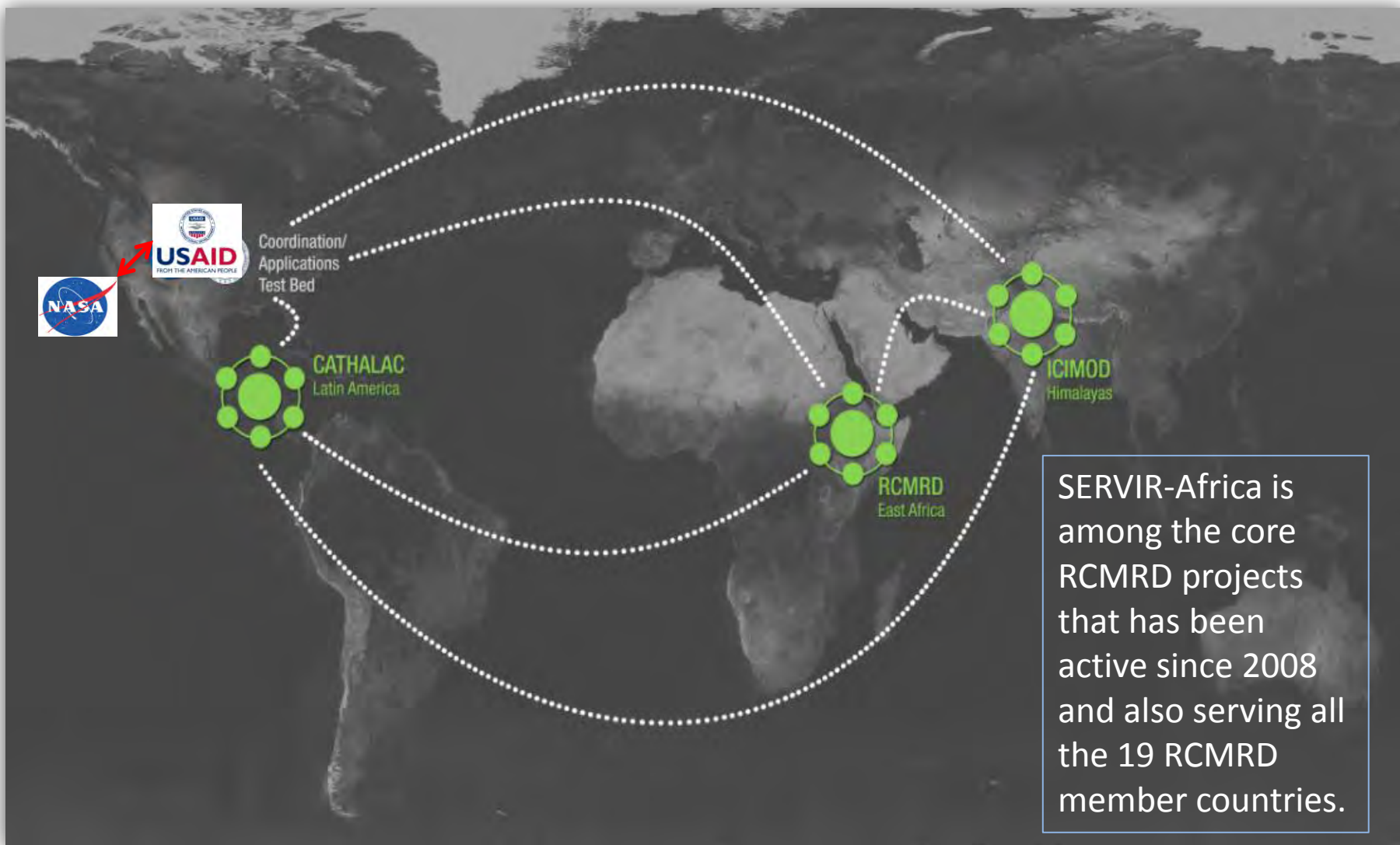
**APPLICATION** | Disaster Management | Health | Energy | Climate Geology | Agriculture Ecosystems | Biodiversity Water



Contracting Member States  
Non-Contracting Member States



# SERVIR GLOBAL HUBS AND REGIONS OF INTEREST



# SERVIR GLOBAL

The Regional Visualization and Monitoring System



USAID  
FROM THE AMERICAN PEOPLE



SEARCH

GLOBAL

MESOAMERICA

AFRICA

HIMALAYA

Middle East

[Home](#)

[Our Work](#)

[Maps & Data](#)

[About](#)

## SERVIR-Africa

Hosted at RCMRD in Nairobi, Kenya, the SERVIR-Africa hub serves 18 member states.



Botswana	Lesotho	Seychelles	Tanzania
Burundi	Malawi	Somalia	Uganda
Comoros	Mauritius	South Africa	Zambia
Ethiopia	Namibia	Sudan	
Kenya	Rwanda	Swaziland	

[View Region Home](#)

[View Regional Maps & Data](#)

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## THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



INFORMATION  
FOR THE BENEFIT  
OF SOCIETY



Disasters



Health



Energy



Climate



Agriculture



Ecosystems



Weather



Water

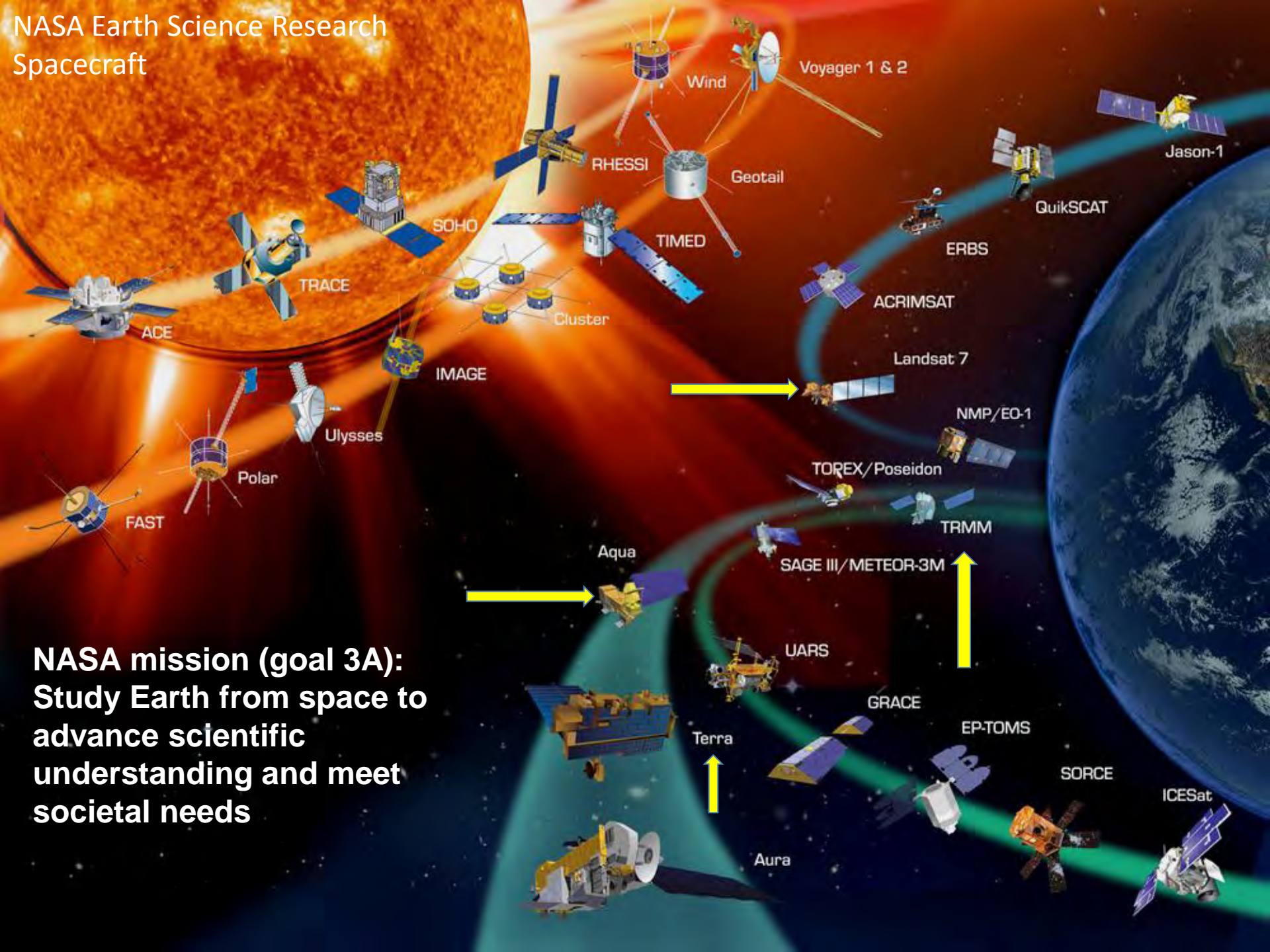


Biodiversity

# 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 Earth Science Research Spacecraft



**NASA mission (goal 3A):  
Study Earth from space to  
advance scientific  
understanding and meet  
societal needs**



# Specific Projects & Products

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# CREST, Flood and Frost Tools

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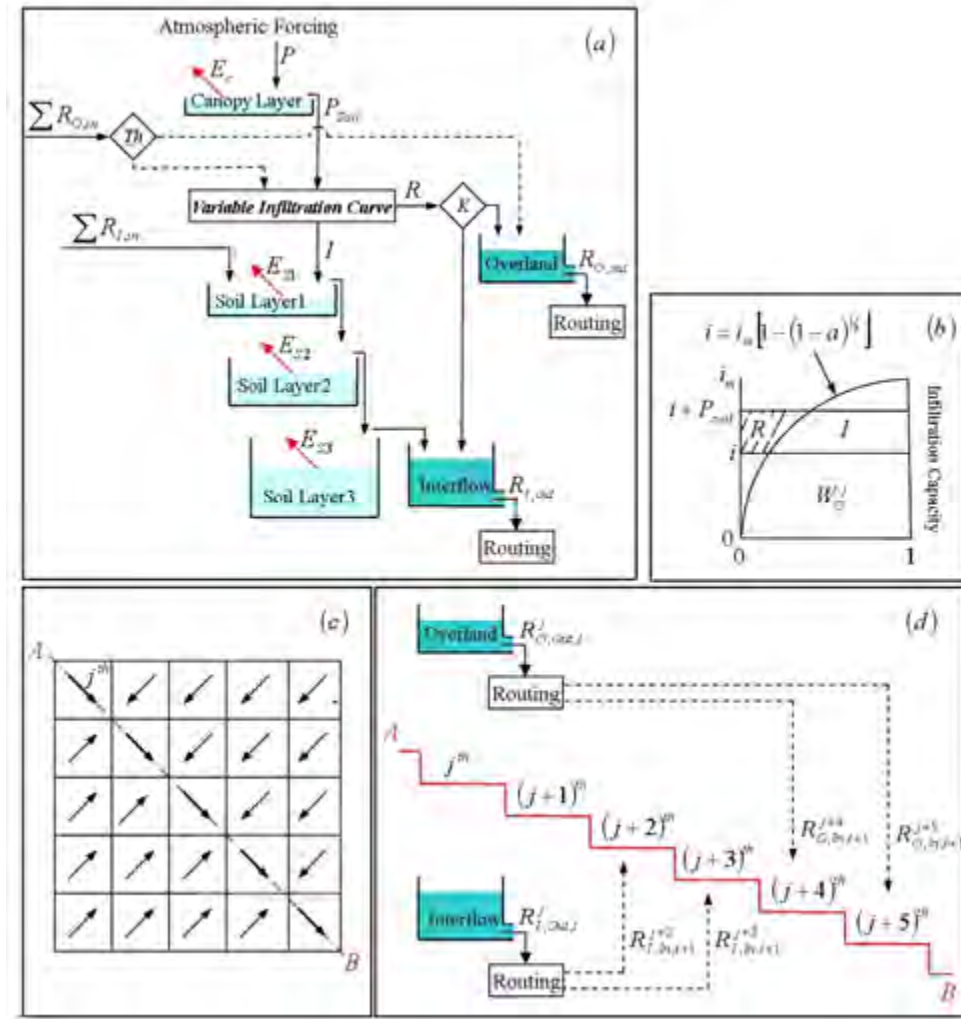


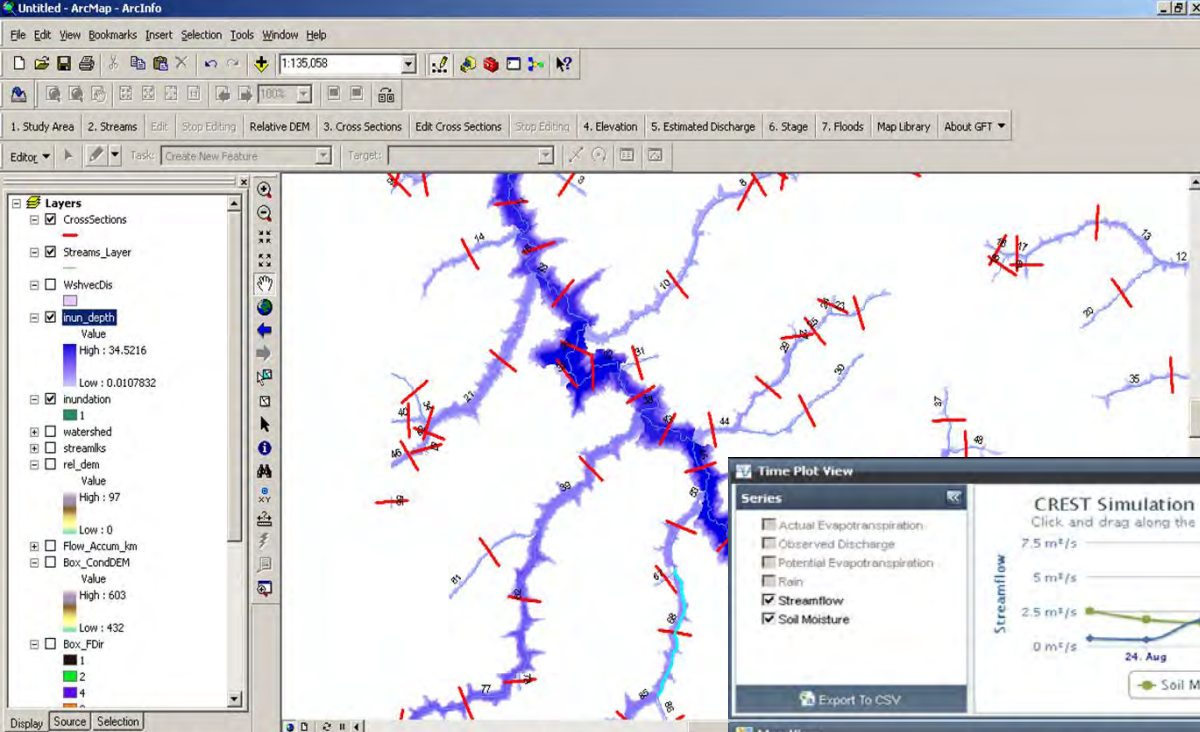
# Coupled Routing and Excess Storage (CREST)

NASA-OU Coupled Routing and Excess Storage (CREST) model

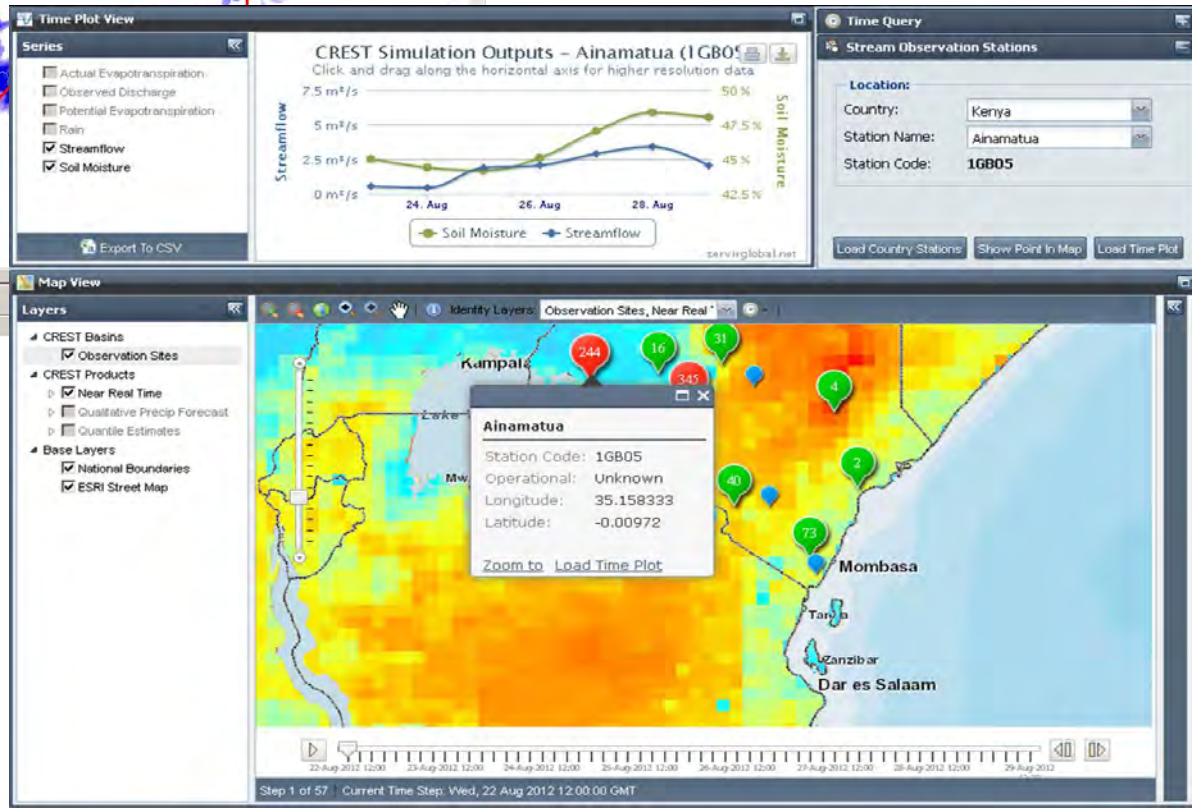


- Distributed, fully coupled runoff generation and routing model
- Simulates water and energy fluxes and storage on a regular grid
- Grid cell resolution user defined





- Used to produce flood inundation hazard pattern/Extent Map by specifying a discharge value at a location of interest



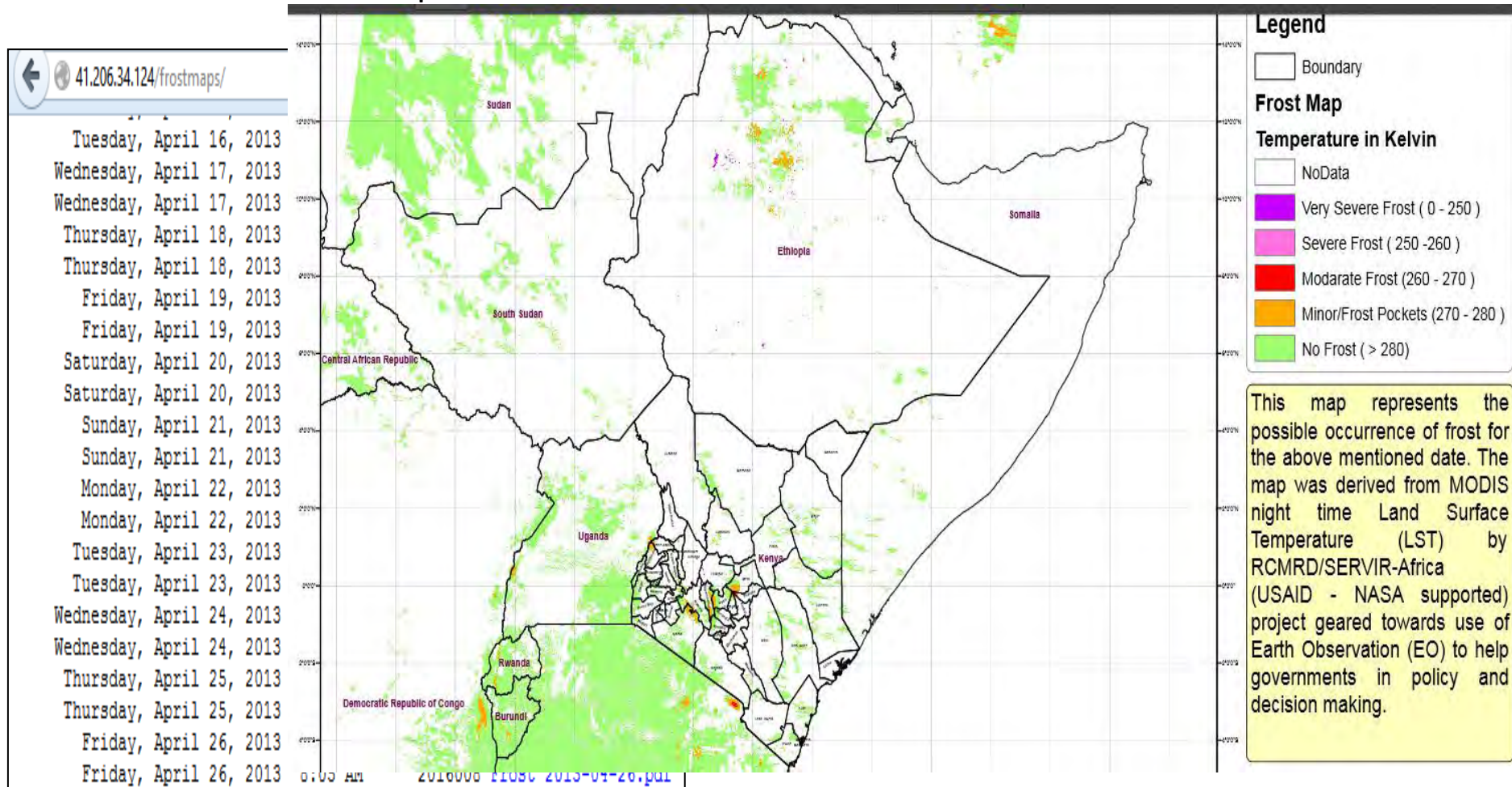
- Used as CREST Service for generation of a estimated flood extent maps for use in generation of flood alert maps.



# 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



# GHG Inventory Development ESA Region

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# GHG Inventory Development



- **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.

# Land Cover Mapping Capacity

## Building Role: RCMRD-SERVIR Africa



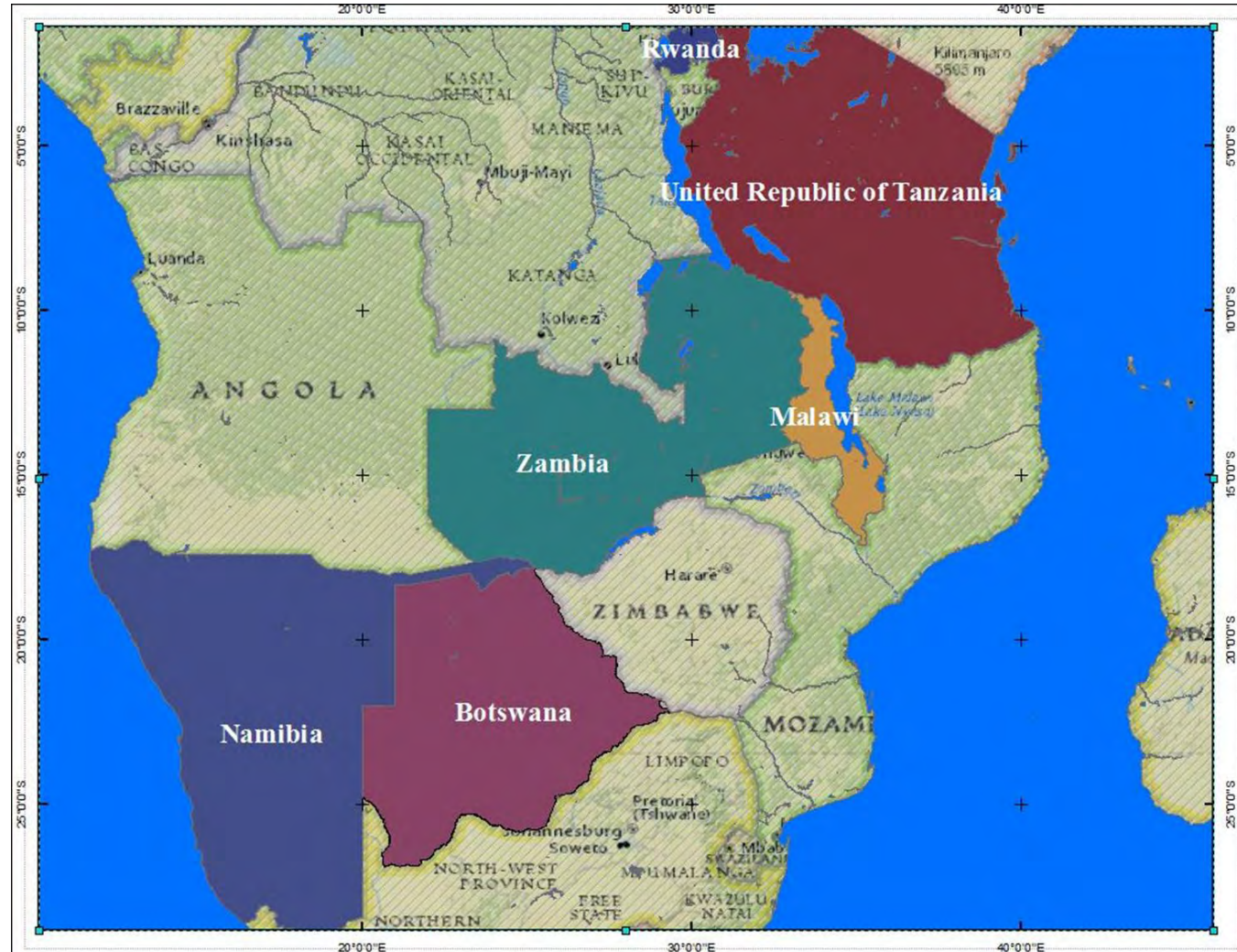
- UNFCCC oversees the development of GHG Inventories as provided for in Article 8 of the Convention.
- Six countries: Botswana, Malawi, Namibia, Rwanda, Tanzania and Zambia; requested for UNFCCC' s support in GHG Inventory development
- UNFCCC is working with RCMRD, SERVIR, USAID, NASA, USEPA and ICFI to build capacity of the countries to sustainably develop GHG Inventories.



# Project Countries

*Countries participating in the project*

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



# Capacity Building

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Hands-On Training: Zambia



Classification Scheme Development Workshops : Zambia



Classification Scheme Development Workshops : Rwanda



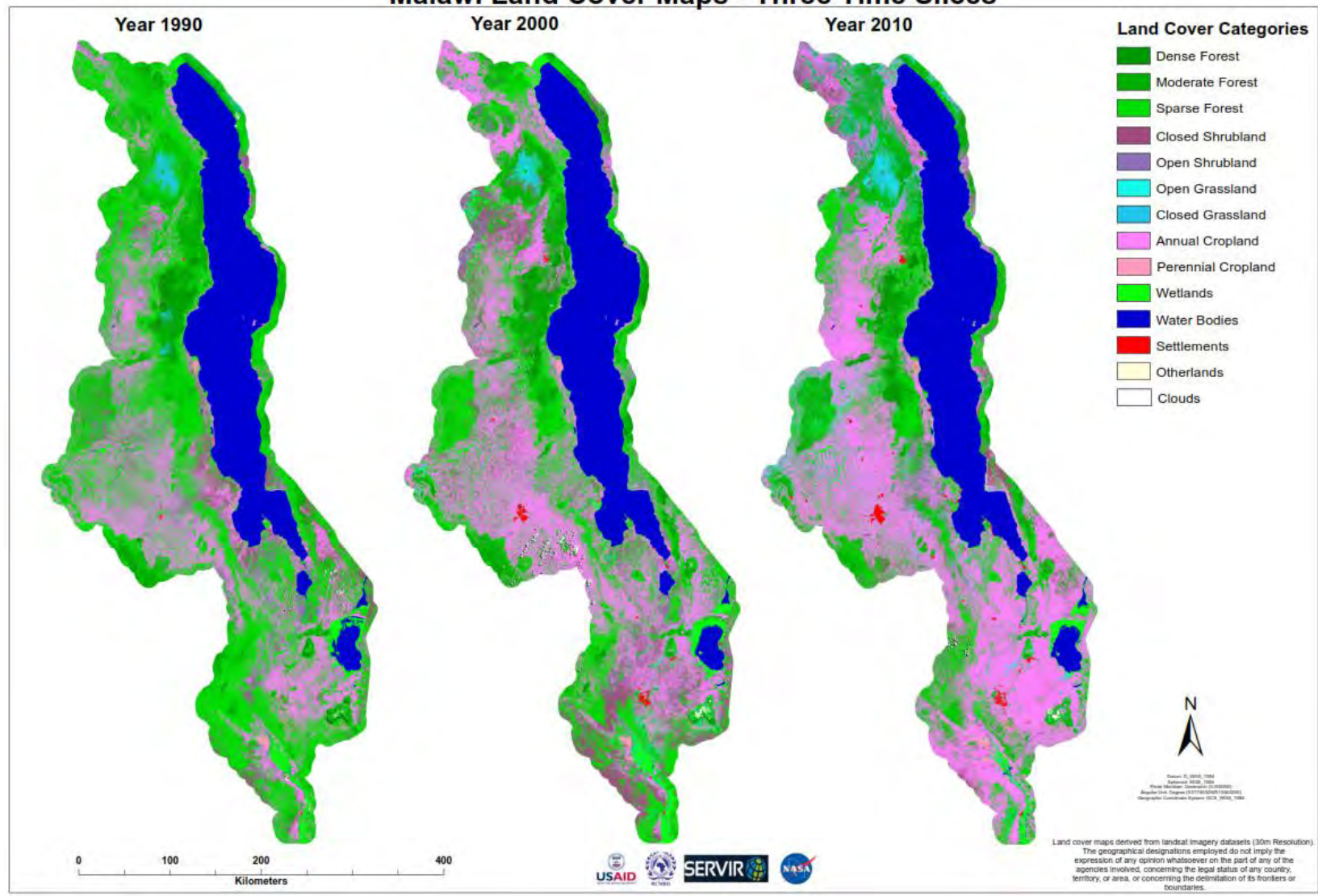
Classification Scheme Development Workshops: Malawi



# Landsat Derived Maps: Malawi Schema II



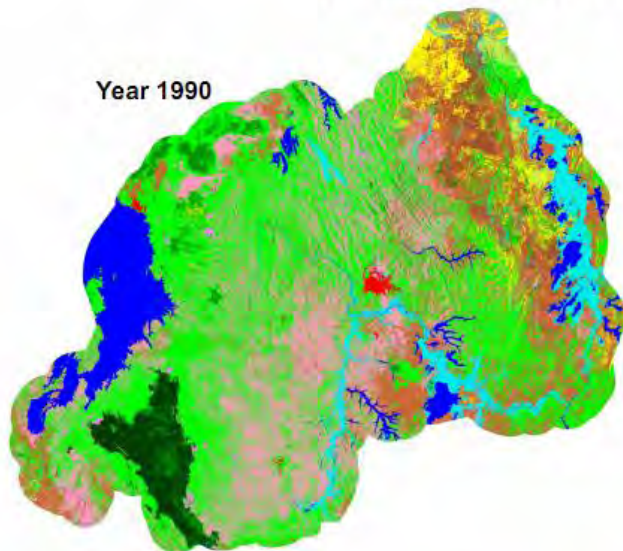
### Malawi Land Cover Maps - Three Time Slices



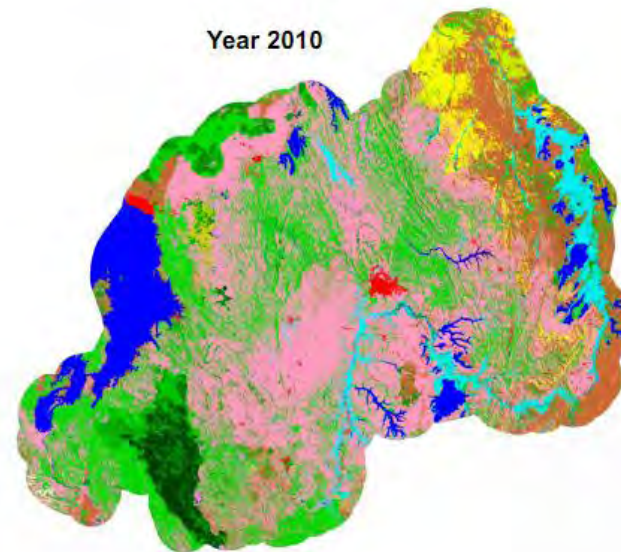
# Landsat Derived Maps: Rwanda Schema II

## Rwanda Land Cover Maps for GHG Inventory Development

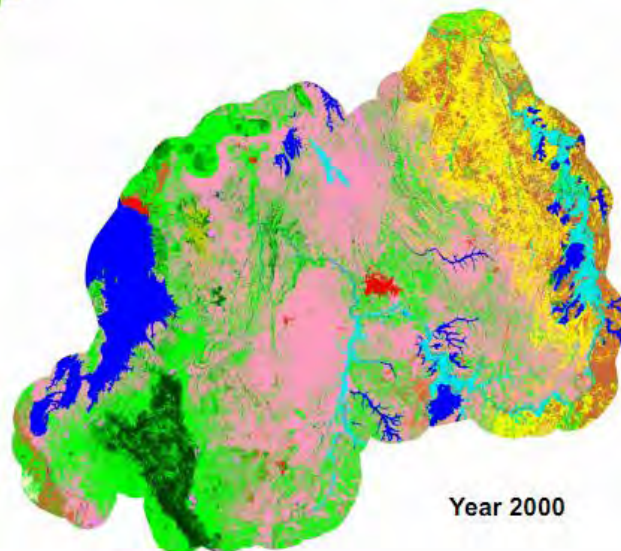
Year 1990



Year 2010



Year 2000



### Land Cover Categories

 Perennial Croplands	 Open Grasslands
 Annual Croplands	 Open Shrublands
 Dense Forest	 Closed Grasslands
 Moderate Forest	 Closed Shrublands
 Sparse Forest	 Settlement
 Wetlands	 Water Body
 Woodlands	
 Nodata	



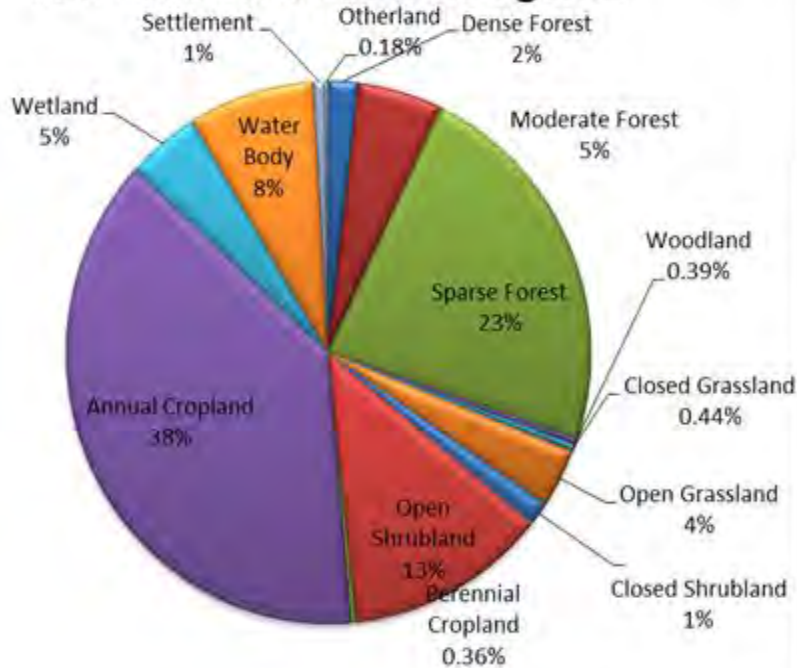
Scale: 0, 1998, 1999  
 0, 1998, 1999  
 0, 1998, 1999  
 0, 1998, 1999

Land cover maps derived from landsat imagery datasets (30m Resolution). The geographical designations employed do not imply the expression of any opinion whatsoever on the part of any of the agencies involved, concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries.

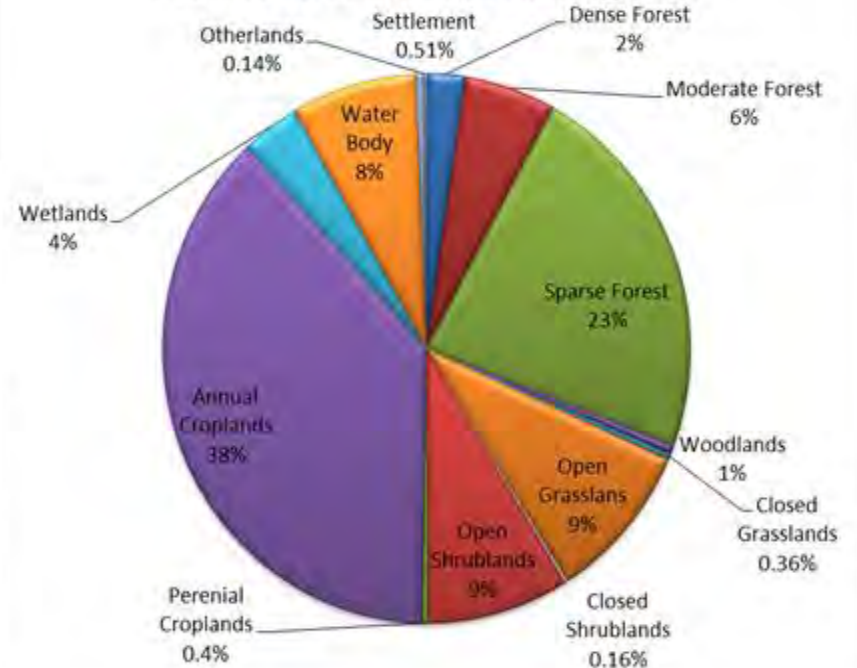
0 50 100 200  
 Kilometers

# Time Series Statistics

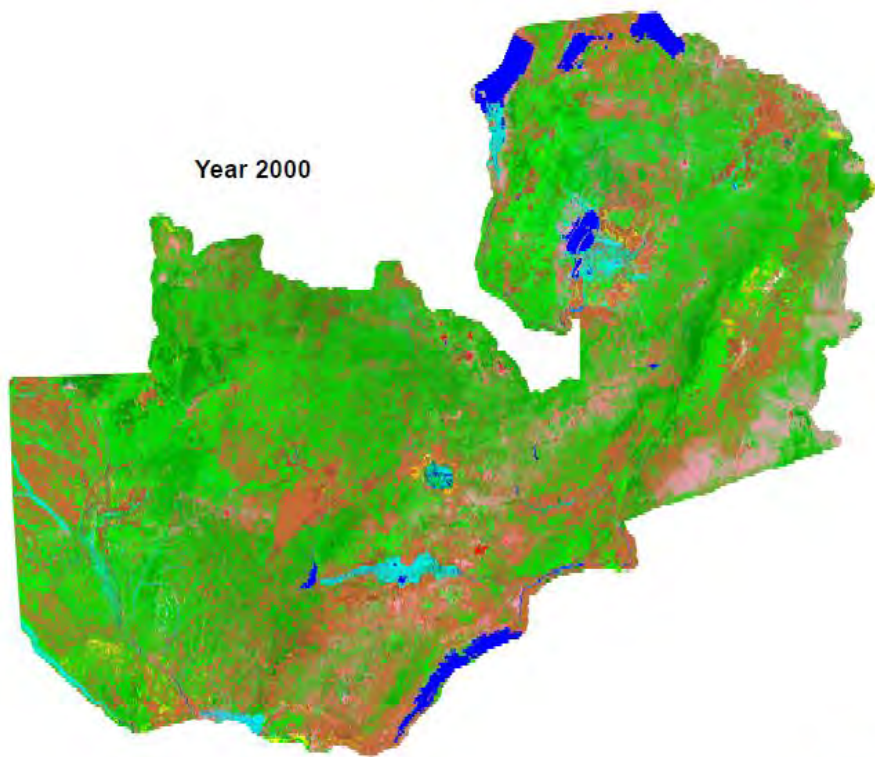
## Year 2010 Land Cover Categories



## Year 2000 Land Cover Categories

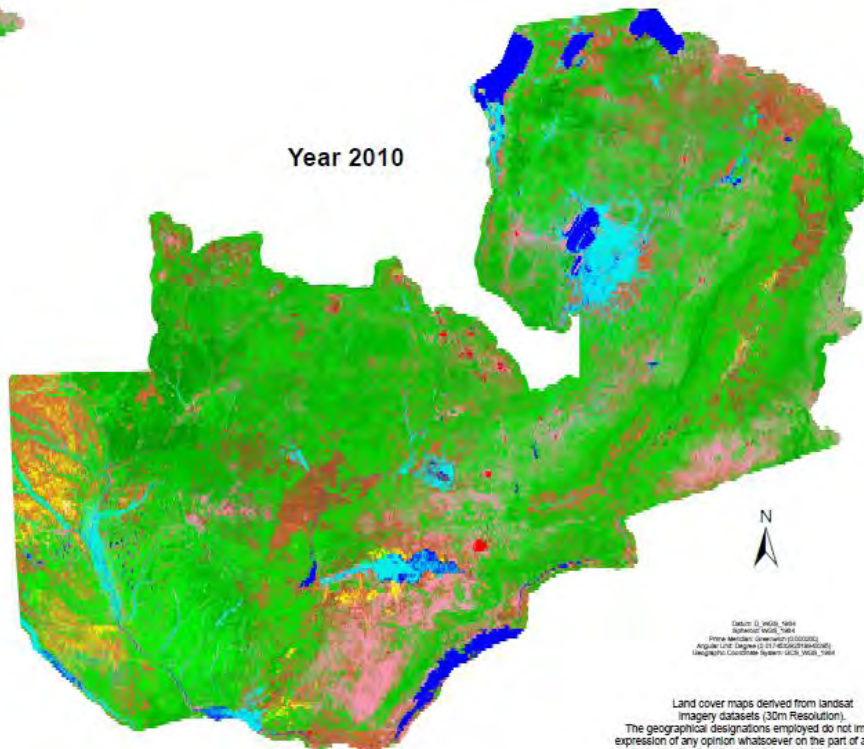


# Landsat Derived Maps: Zambia Schema II



Year 2000

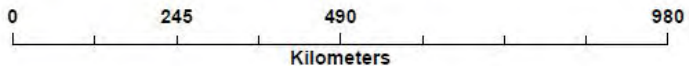
## Zambia Land Cover Maps for GHG Inventory Development



Year 2010

### Land Cover Categories

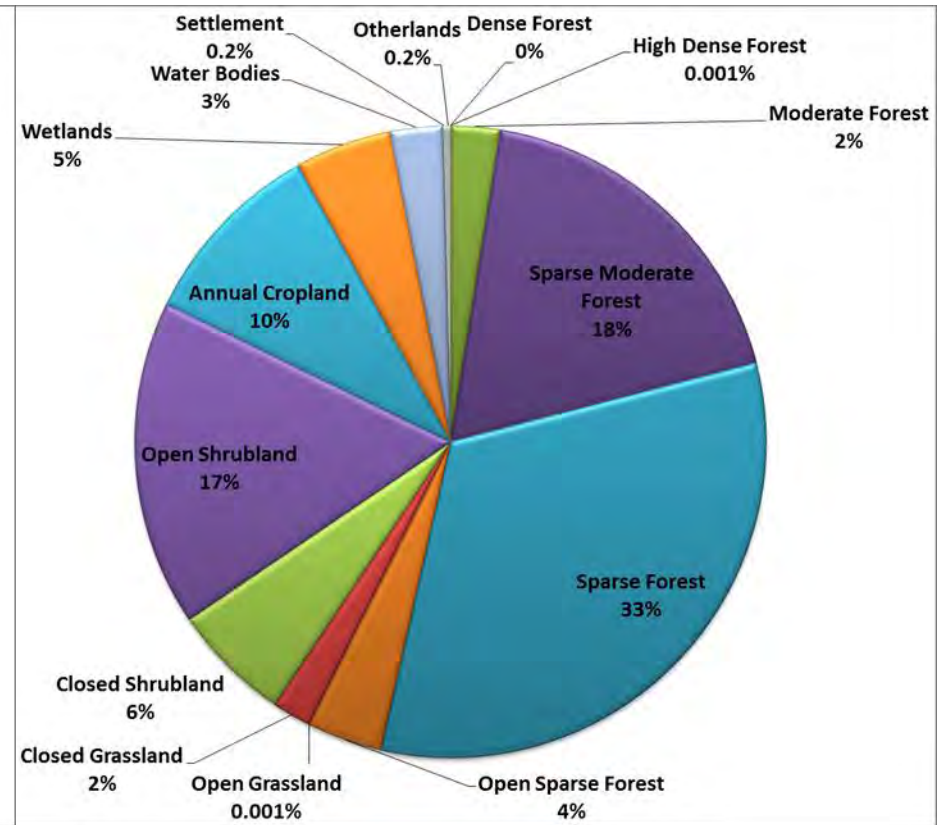
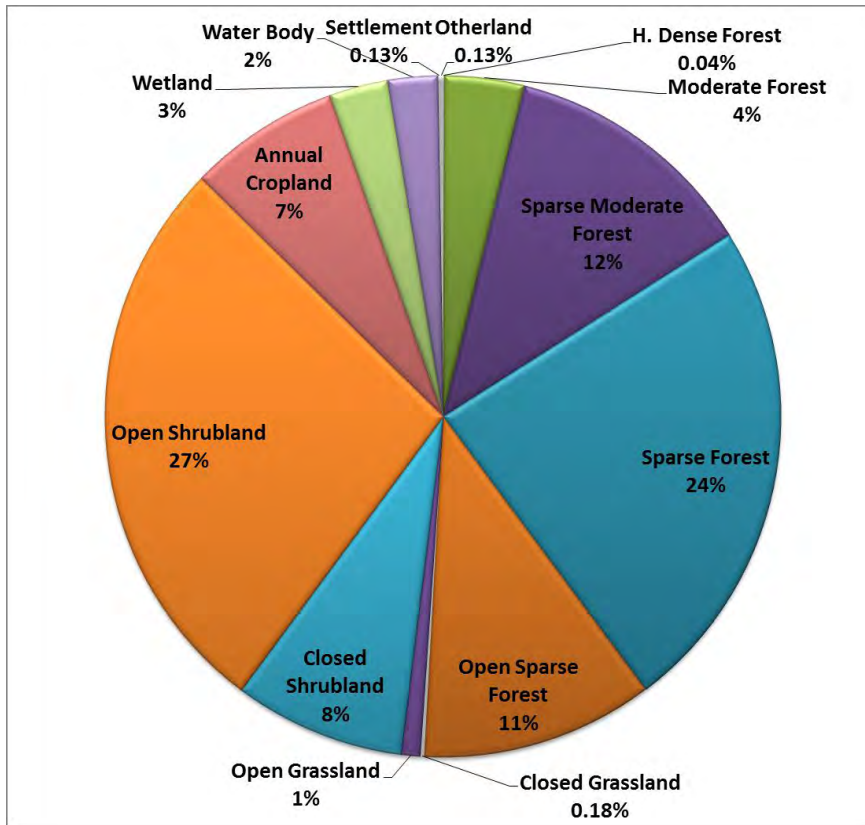
- |   |  |   |
|---|--|---|
|  Very Dense Forest      |  Closed Grasslands  |  Settlements |
|  High Dense Forest      |  Open Grasslands    |  Otherland   |
|  Moderate Forest        |  Closed Shrublands  |   |
|  Sparse Moderate Forest |  Open Shrublands    |   |
|  Sparse Forest          |  Perennial Cropland |   |
|  Open Sparse Forest     |  Annual Cropland    |   |
|  Planted Forest         |  Wetlands           |   |
|  Woodlands              |  Water Bodies       |   |



Scale: 0, 245, 490  
Approx: 1:100,000  
File Name: Zamb\_2000\_30m  
Angular Unit: Degree (S) (1145000000000000)  
Geographic Coordinate System: WGS\_1984\_ZAMB

Land cover maps derived from Landsat imagery datasets (30m Resolution).  
The geographical designations employed do not imply the expression of any opinion whatsoever on the part of any of the agencies involved, concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries.

# Time Series Statistics



# Disaster/Hazard and Risk Insurance

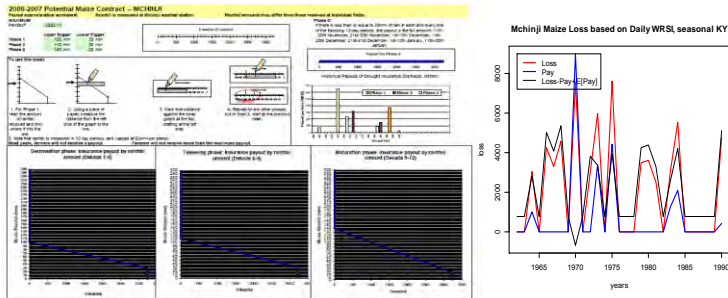
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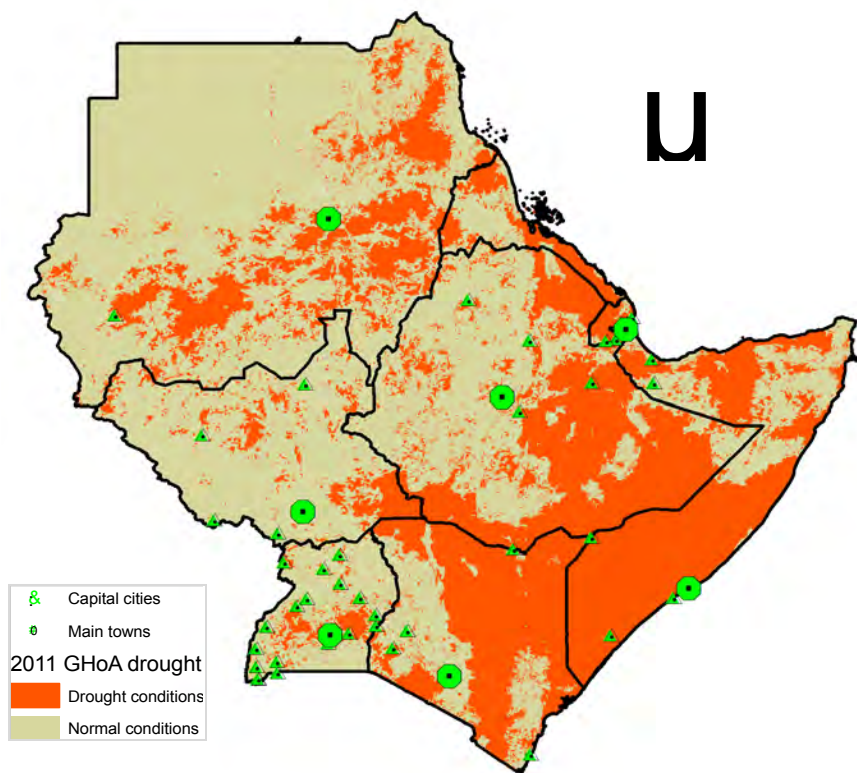
# Index Insurance and Climate Risk Management

- **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**



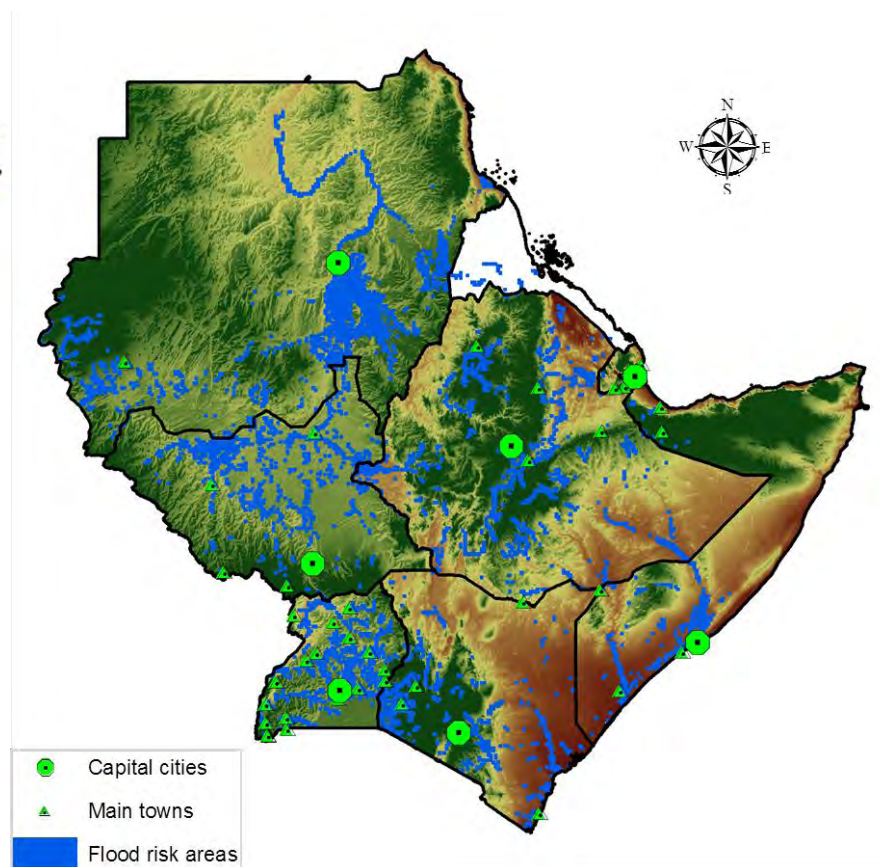
- **Index insurance risk management package**
  - We have designed the contracts for a drought insurance system that provides the backbone for a package of loans, groundnut, and maize inputs for smallholder farmers
  - Drought insurance solves traditional crop insurance pitfalls
  - Partners include 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**

# DISASTER/HAZARD MAPS & ATLAS: Understanding the risks: The model



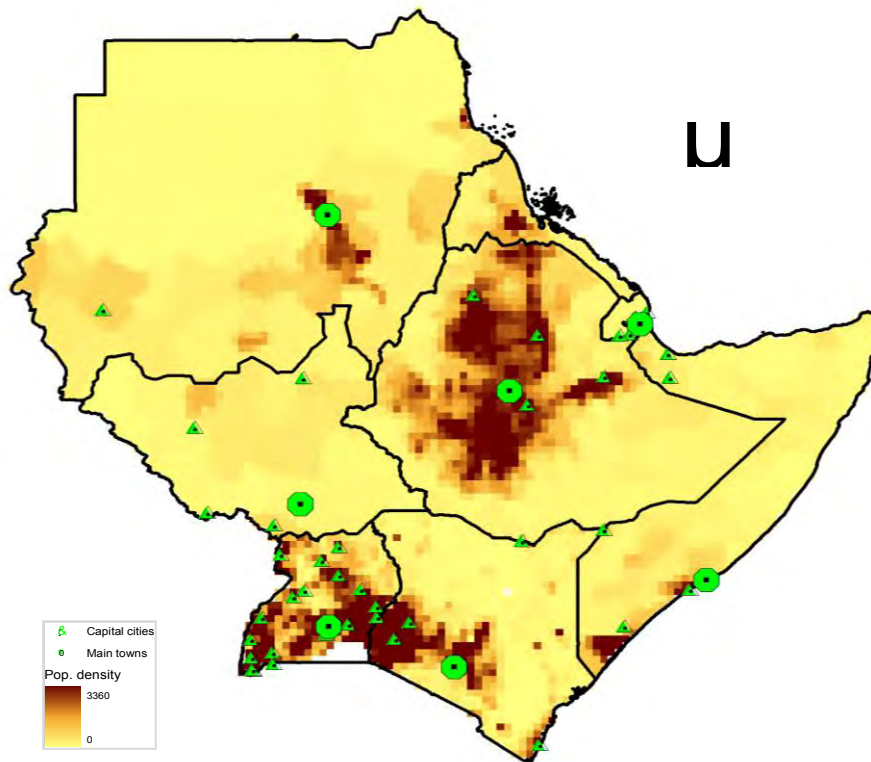
What are the risk?

Where is the risk?

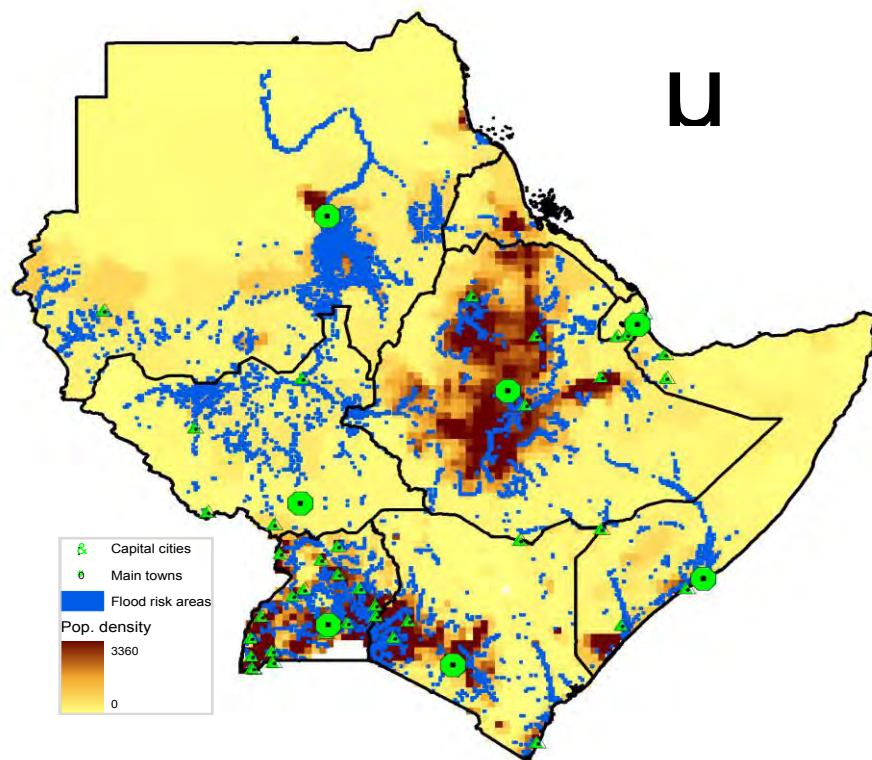


# IGAD HAZARD MAPS & ATLAS: Assessing the vulnerabilities

Where are the people living?



What's the level of exposure?



[Atlas:](#)

<file:///D:/IGAD%20Hazards%20Maps%20&%20Atlas/DVD%20Version/atlas/index.html>

# Tools & Applications (At a Glance)

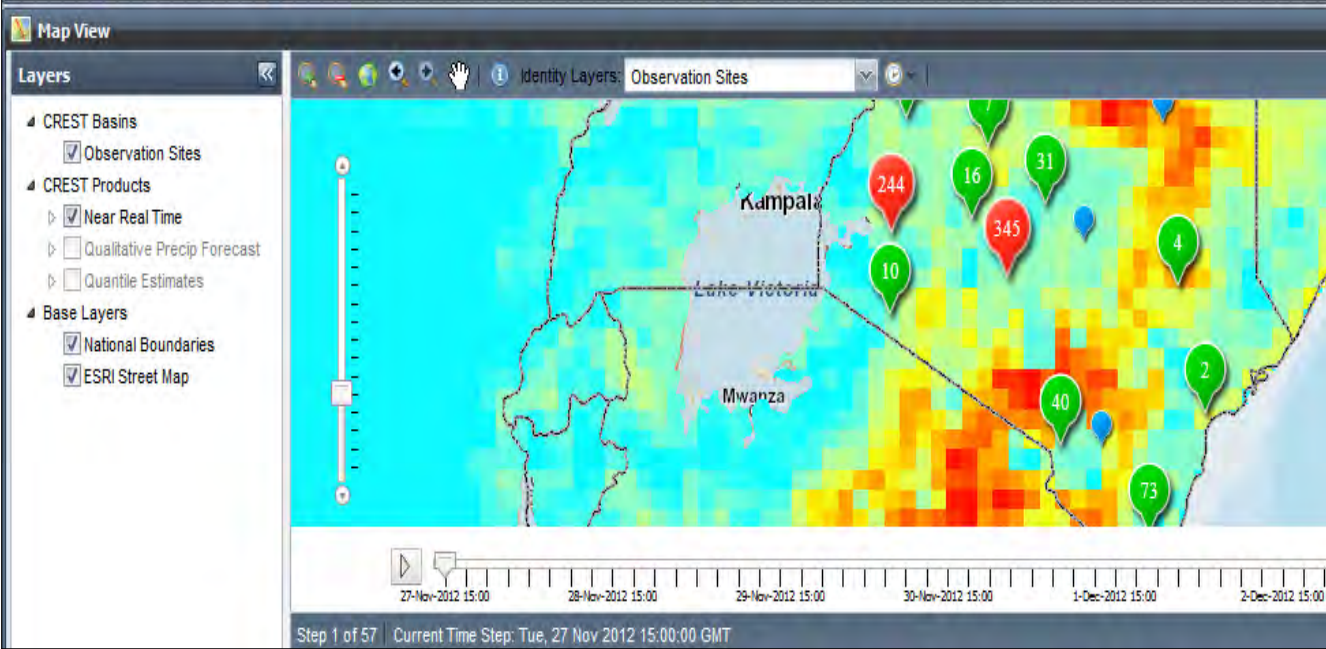
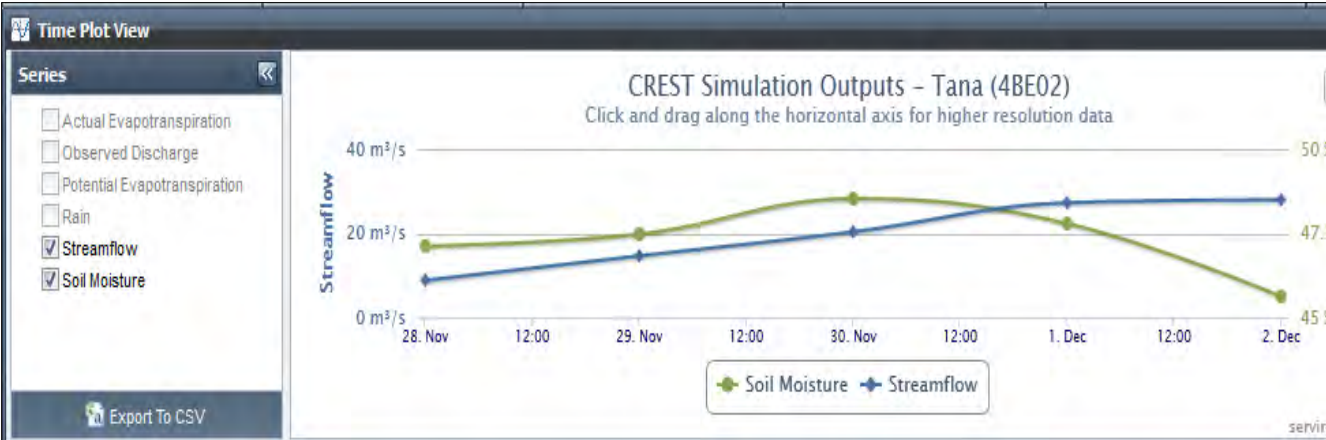
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# Flood Prediction Model: Using Satellite Imagery Data (TRMM)



## Temporal Maps and Time Series: Stream Flow and Soil Moisture



# One-stop Discovering, Visualizing and Access to Geographic Data

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## SERVIR-Africa Geodata Portal

[Login](#) [Register](#) [Help](#) [About](#) [Feedback](#)

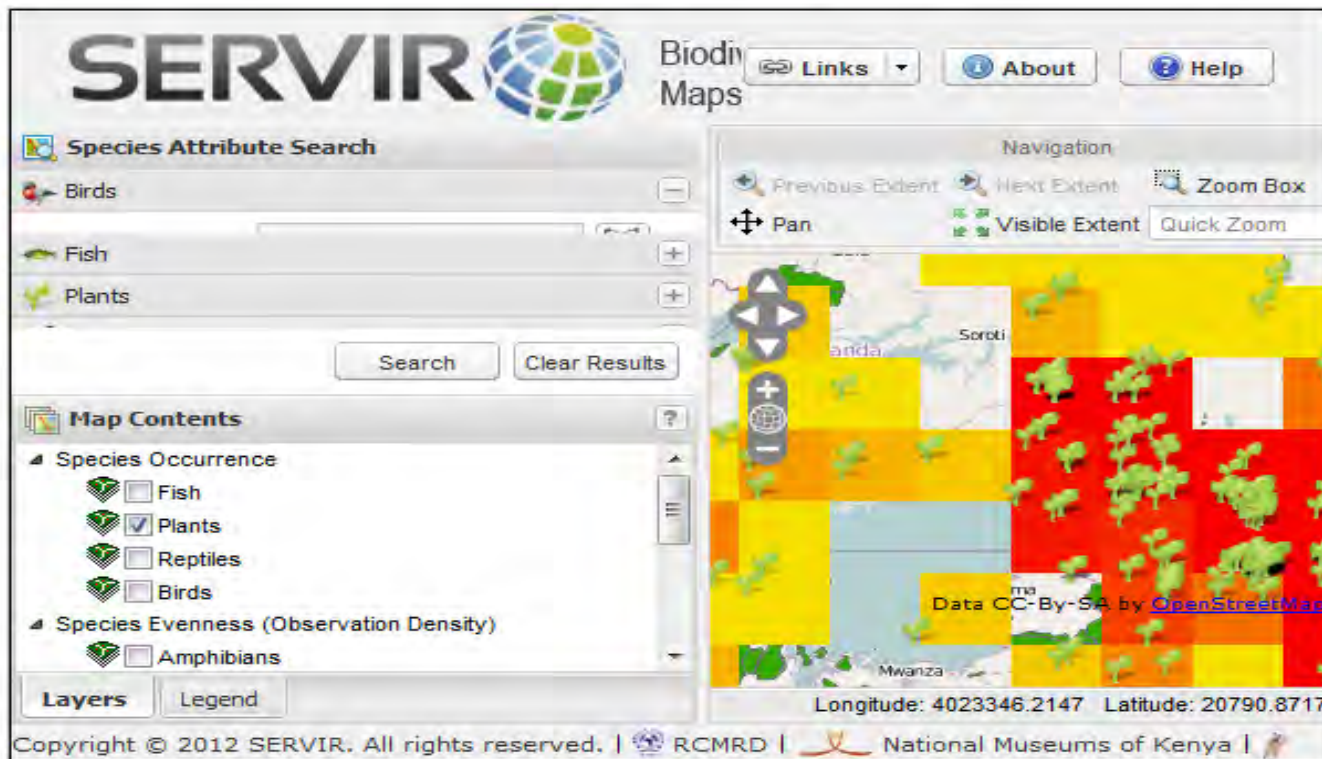
[HOME](#) [SEARCH](#) [BROWSE](#)

[Details](#) [Review](#) [Relationships](#) [Preview](#)

### Plants Observation Density Count

URL: <http://servir.rcmr.org/geoapps/biodiversity/>

Embed: `<iframe src="http://servir.rcmr.org/metacatalog/catalog/livedata/embed.jsp?url=http%3A%2F%2Fservir.rcmr.org%2Fgeoa`



**SERVIR** Biodiversity Maps

Navigation: Previous Extent, Next Extent, Zoom Box, Pan, Visible Extent, Quick Zoom

Species Attribute Search: Birds, Fish, Plants

Map Contents: Species Occurrence (Fish, Plants, Reptiles, Birds), Species Evenness (Observation Density) (Amphibians)

Longitude: 4023346.2147 Latitude: 20790.8717

Copyright © 2012 SERVIR. All rights reserved. | RCMRD | National Museums of Kenya

#### Plants Observation Density Count

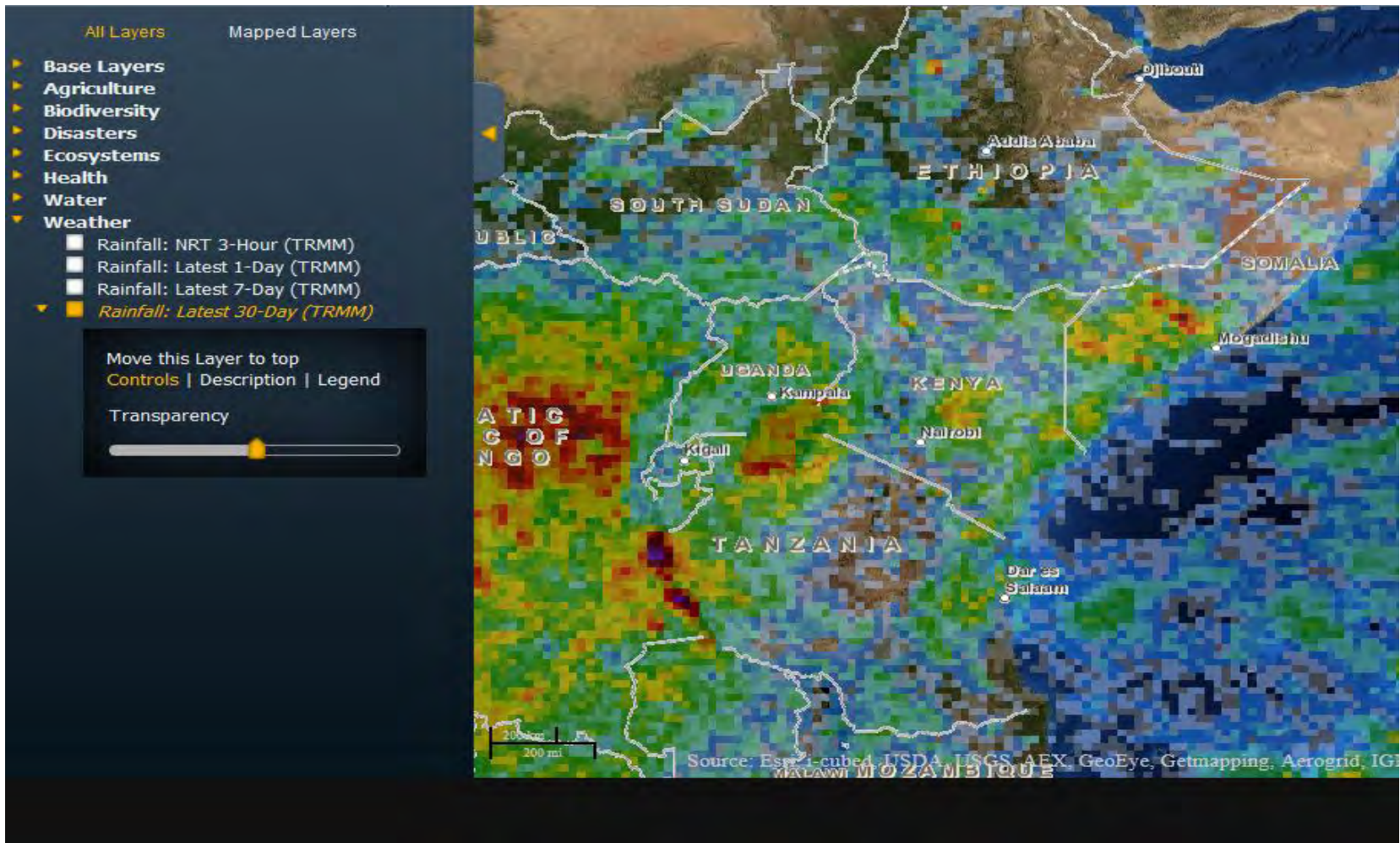
This Gridded data set represents density count of different plants species observations present in approximately 50km (0.45 decimal degrees) pixels. This data set has been derived from species occurrence records, digitized from the National Museums of Ken...

[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.



# SERVIR-Africa Ecosystem maps & products (Clip, Zip, Ship)



- 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.

### Clip, Zip & Ship

Download SERVIR datasets by following the steps below.

STEP 1: Enter your e-mail address:

STEP 2: Click the button to activate clipping mode.

**START DRAWING ON MAP**

### Map Contents

- ESRI Street Map
- USGS\_Ecosystems
  - Terrestrial Ecosystems
  - Surficial Lithology
  - Land Surface Forms
  - Topo Moisture Potential
- Agriculture
- Biodiversity
- Climate

### INSTRUCTIONS

This is a clip, ship & zip testbed.

This tool lets you download Servir datasets for a custom area that you define by drawing on the map. The datasets are zipped and set aside on the server. An e-mail is sent to you containing a link to the zip file. Data is currently only available in ESRI shapefile format.

### HOW TO USE

Start by entering your e-mail address in the textbox. Next, zoom to an area of interest on the map (use shift + mouse drag for rubber band).

Click on the button in step 2, then draw a shaded region on the map. This will be the area for which data is downloaded. Double-click to finish drawing. When finished, a background process will zip the data within the area you drew and send you an e-mail containing a link to the zipped file.

### NOTE

Only layers that are visible will be included in the download. You can toggle the visibility of individual layers using the Map Contents control. Check the box next to an item to make it visible, and uncheck it to hide the layer.



# Open Data for the Horn - GEONODE



- Comprises of data focusing on Food security, Health, Demography, Water etc.
- An Online Data Repository that allows upload, download & visualization of geospatial data

## Open Data for The Horn

MEMBERS LOGIN

Username

Password

Login

Forgot password? [Reset it!](#)

[Data](#) [Maps](#)

### Horn of Africa: Food Security Projection for Sep 2011 by FEWS (as of July 2011)

**Abstract:** Projection in food security status for September 2011 in the drought affected countries. For reference on the categories, visit <http://www.fews.net/ml/en/info/pages/scale.aspx>

**Download**

[Download all layers included in this map](#)

**Layers**

This map uses the following layers

- geonode:TM\_WORLD\_BORDERS\_0
- geonode:EA\_1107\_ML1
- geonode:TZA\_Food\_Insecurity\_Manual
- geonode:TM\_WORLD\_BORDERS\_0

**Manage**

- [View or edit this map](#)
- [Duplicate map](#)

# Important Links (follow up)

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# RCMRD SERVIR-Africa Online Tools & Applications

## 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-](http://www.mwri-goss.org/index.php?option=com_content&view=category&layout=blog&id=68&Itemid=49)

[goss.org/index.php?option=com\\_content&view=category&layout=blog&id=68&Itemid=49](http://www.mwri-goss.org/index.php?option=com_content&view=category&layout=blog&id=68&Itemid=49)

<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](http://www.servirglobal.net)

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[fredonsk@gmail.com](mailto:fredonsk@gmail.com)

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