

Regional Centre for Mapping  
of  
Resources for Development,

# DRR Dynamics & EO African Scenarios



# Questions??



Farmers praying for rain in Allahabad on Thursday. A delay in the arrival of the monsoon in the north has raised fears of a drought. — Reuters (Reports on Page 13)





**Questions??**



# What are the Issues?

Proper Planning

sound policy formulation with implementation

Timely service delivery to people

Allocation of Resources

**POLITICS  
BUSINESS  
COMPETING INTERESTS**



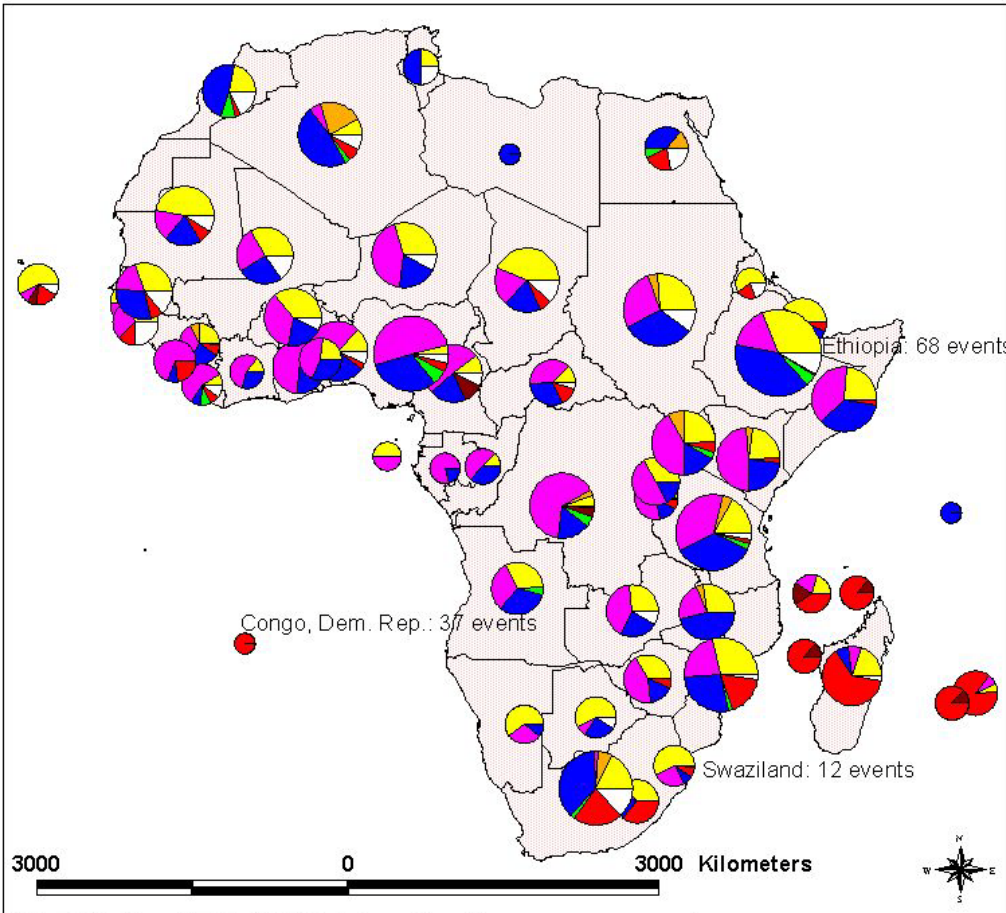
# DISASTERS







Distribution of natural disasters, by country and type of phenomena, in Africa (1975-2001)



# Disasters

- Droughts
- Land degradation
- Floods
- Landslides/Earthquakes
- Locust invasion
- Epidemics/Pandemics
- Other Man-made

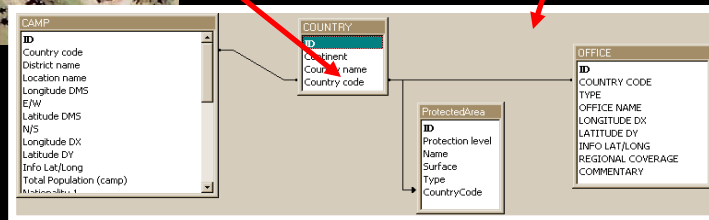
## Consequences;

- Famine
- Starvation
- Escalating poverty
- Reduced water availability
- Malnutrition
- Mass migration
- Deaths
- Conflicts
- Diseases

EM-DAT: The OFDA/CRED International Disaster Database  
(<http://www.cred.be> ; email: [cred@epid.ucl.ac.be](mailto:cred@epid.ucl.ac.be))

LEGEND	
	Volcano
	Earthquake
	Drought/Famine
	Epidemic
	Avalanche/Landslide
	Flood
	Wind Storm
	Other

# Technology Vs DSS





# GIS APPLICATIONS

## Multi-concepts



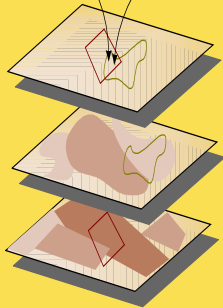
**Citizens  
GOVERNMENT**

Assessor Value = \$23,000.00  
Zoning = Light Industrial  
LR 2000 = MTM43258

Tax Assessor	
Zoning	

Riparian = Habitat Type  
Tree = Cover Type  
Erosive = Soil Type

Habitat Type	
Cover Type	



**Decision  
Support**

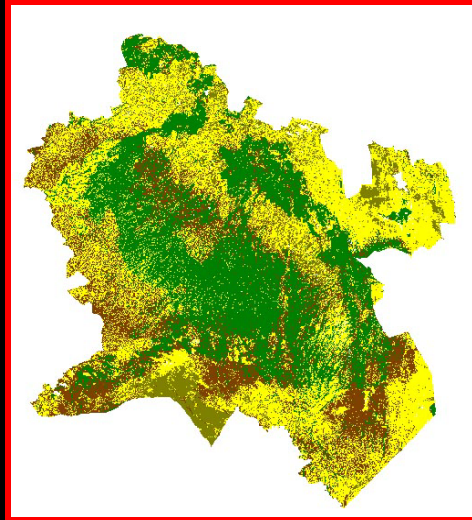


**Geographic knowledge / data**

**Real World**



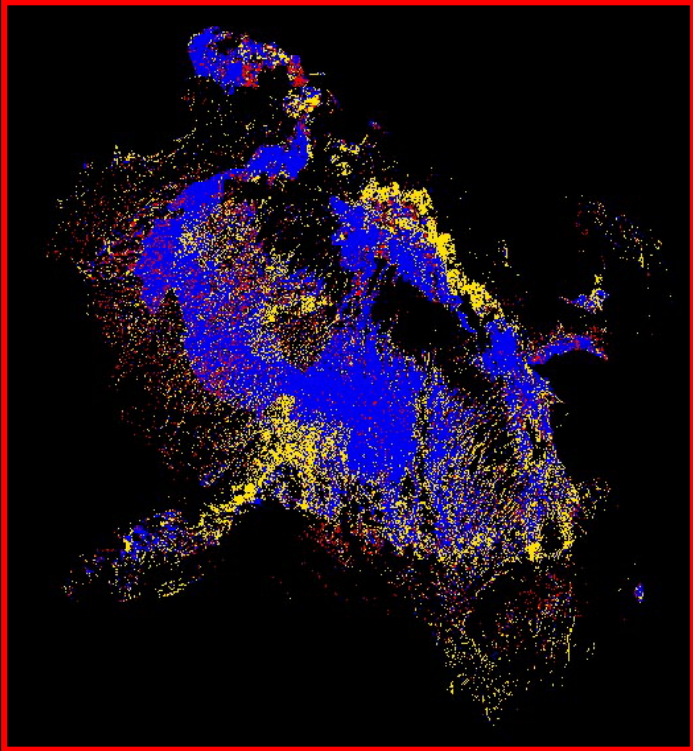
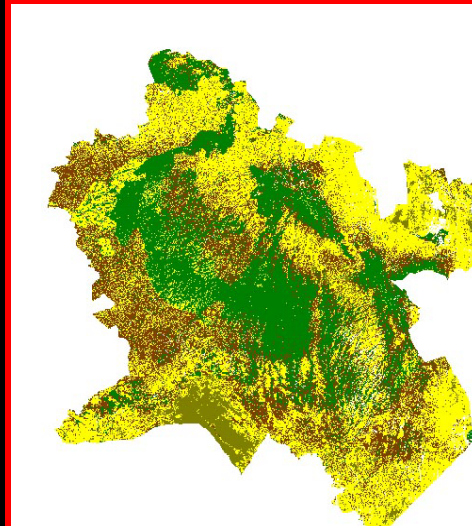
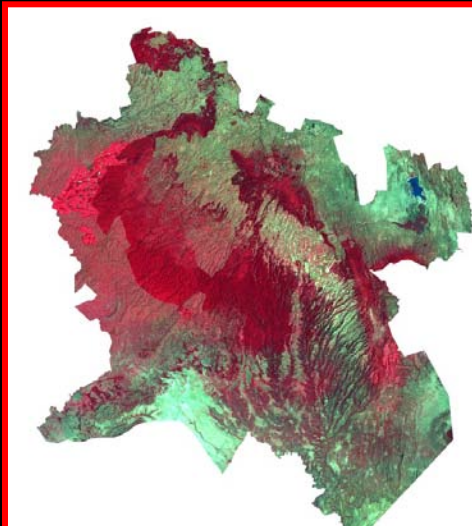
# POLITICS & FORESTRY



**Mau Forest: 1986**

- Forest
- Degraded forest
- Bare soil
- Other cover types

**Mau Forest: 2010**



- Forest - 292,192.4 Ha (2,921.92 Km<sup>2</sup>)
- Deforested - 142,879.4 Ha (1,428.794 Km<sup>2</sup>)
- Reforested - 60,411.0 Ha (604.11 Km<sup>2</sup>)



# Land Movement

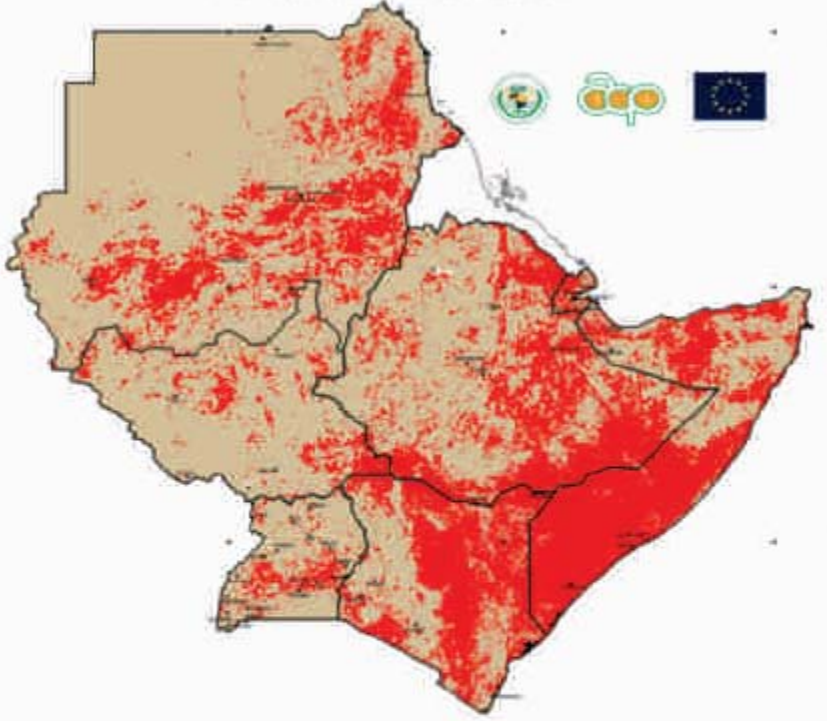




# Regional Multi-Hazard Atlas & Disaster Mapping Project



IGAD 2011 DROUGHT CONDITIONS



Scale: 0 100 200 300 400 km



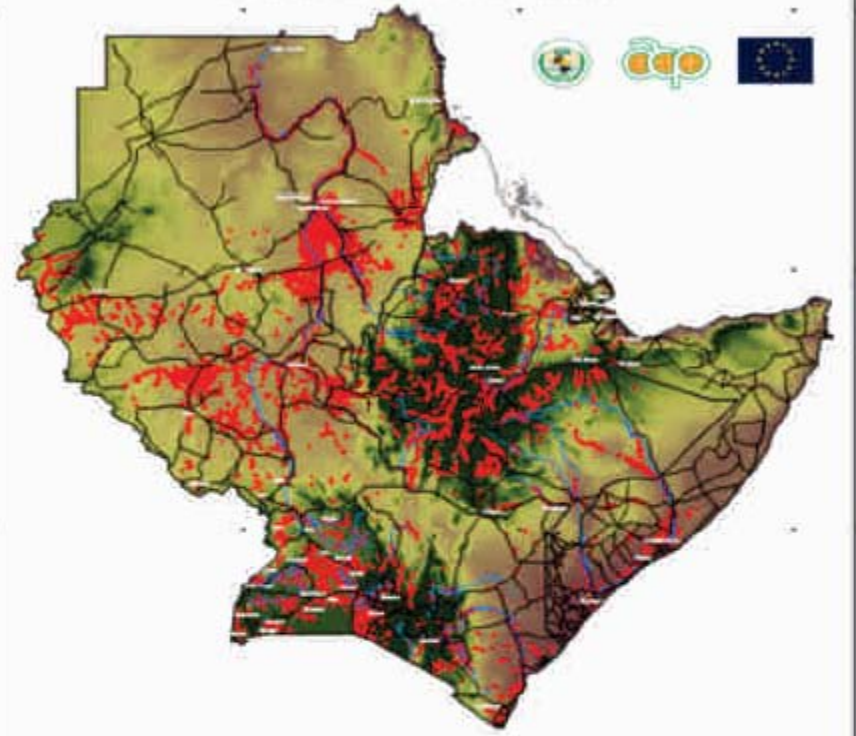
**Legend:**

- Town
- ▲ District
- State
- River
- International Boundary
- Drought-affected
- Normal conditions

**Metadata:**

Document: Report on Drought  
 Project: IGAD  
 Date: 2012  
 Data Source: IGAD  
 Scale: 1:100,000  
 Author: IGAD  
 Contact: IGAD

FLOOD PRONE AREAS - IGAD REGION



Scale: 0 100 200 300 400 km



**Legend:**

- Town
- ▲ District
- State
- River
- International Boundary
- Flood-prone

**Metadata:**

Document: Report on Drought  
 Project: IGAD  
 Date: 2012  
 Data Source: IGAD  
 Scale: 1:100,000  
 Author: IGAD  
 Contact: IGAD



# SERVIR-AFRICA

Regional Visualization and Monitoring System





# SERVIR Applications



**SERVIR Applications have several dependencies:**

- **NASA Applied Science Program**  
Agriculture, air quality, climate, disasters, biodiversity, public health, water resources
- **GEO**  
Agriculture, biodiversity, climate, disaster, ecosystems, and human health
- **USAID**  
Climate change adaptation, carbon tracking and GEO focus areas
- **Regional Needs Assessment**



# Wireless Sensor Network (WSN)



- The network is comprised of individual nodes that are part of a peer-to-peer mesh
- Capable of operating for extended periods (weeks, months) with little to no maintenance
- Network can be put to 'sleep' 'Typical' configuration – soil moisture sensors, rain gauge, temperature sensor, accelerometer, river gauge sensor etc.
- Can be interfaced to any type of sensor to monitor the environment



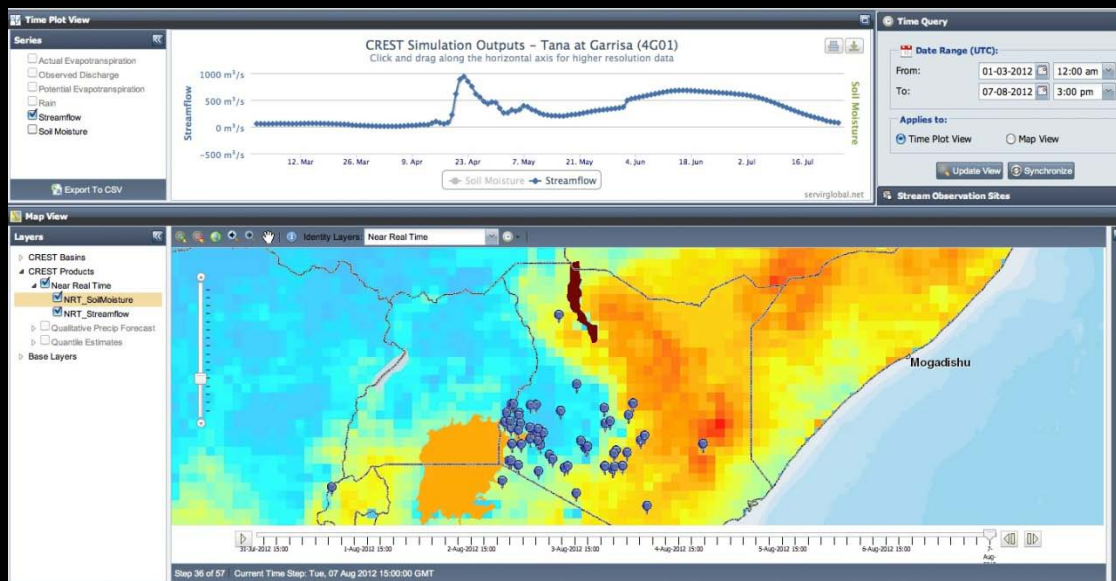
# Application of WSN

- Network installed at RCMRD and Kericho
  - 3 nodes (RCMRD) and 5 nodes (Kericho Kenya) with temperature, humidity, wind and rainfall Data available at:
- RCMRD Network:
  - <http://41.206.34.124/wsnrcmrd/SensorGraph.aspx>
  - Kericho Network:
    - <http://41.206.34.124/wsn/SensorGraph.aspx>



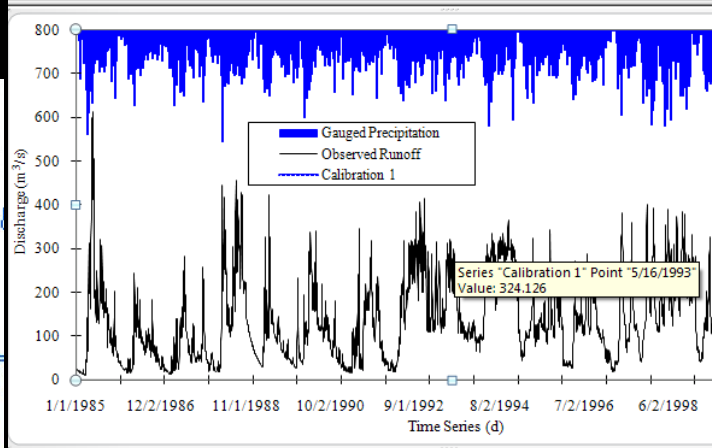
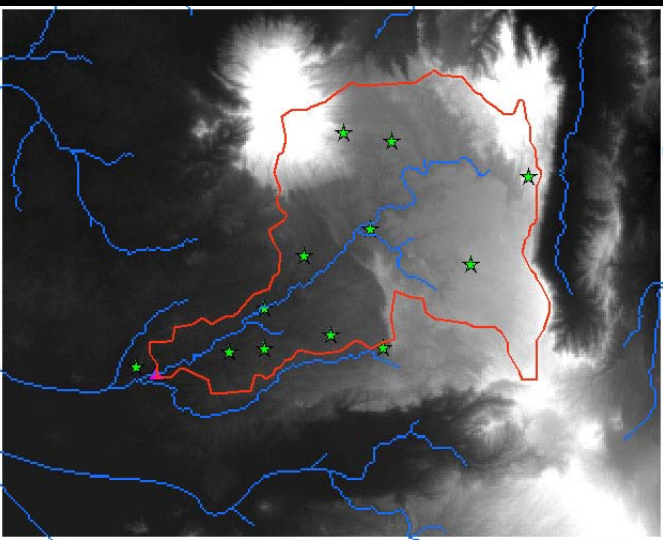
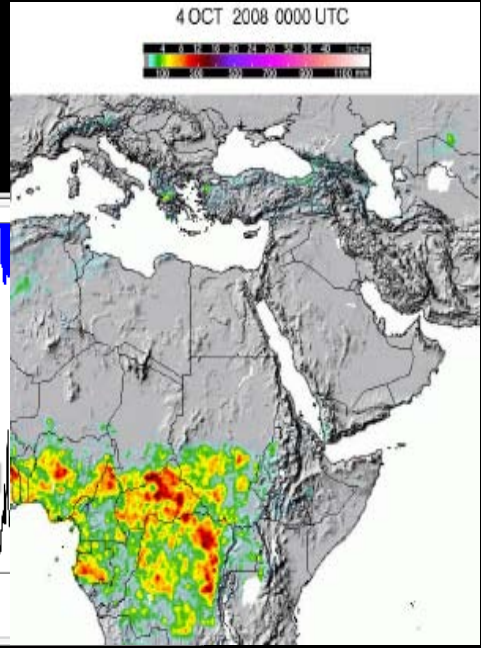
# CREST East Africa

- **SERVIR-East Africa has been running a water resource assessment tool, a distributed hydrologic model called CREST, for a large domain in East Africa using NASA remotely sensed datasets.**
- **The purpose of the modeling effort is to empower the decision makers with timely information about the water resources conditions. SERVIR-East Africa has engaged the Ministry of Water Resources in Kenya and is reaching out to other countries.**
- **SERVIR-East Africa has generated historic hydrologic model runs, is running the model in near real time and is working on getting the seasonal forecasts incorporated**

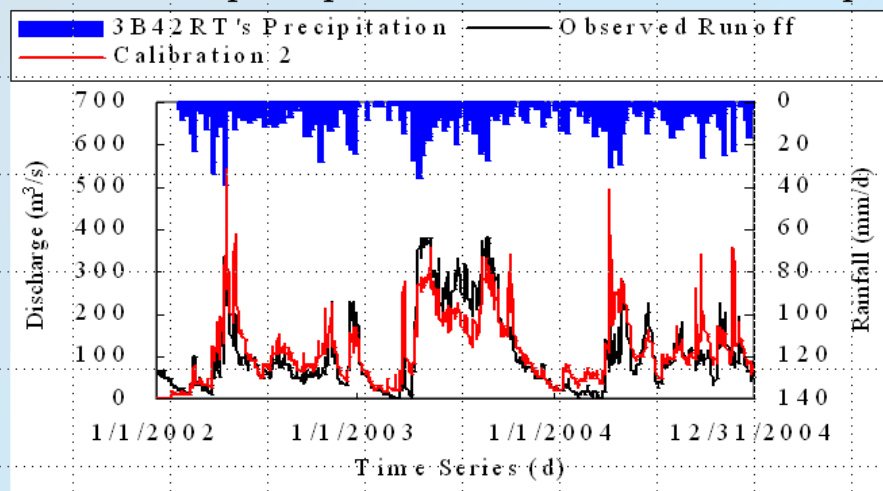




# Predicting Flooding: Nzoia River Basin



## Calibrated precipitation versus Runoff Graph



**SERVIR** - Using geospatial data to serve Africa

Home - SERVIR Africa products are science quality products and are being evaluated for operation use

Home | SERVIR Data | Online Maps | GEOS Decision Support | 3D Visualizations

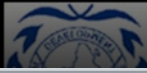
Welcome to SERVIR-Africa.net

[NASA Flood Potential Map for Africa](#)

Map | Satellite | Hybrid

LOW Level Flood Potential (75mm-125mm) | Moderate Flood Potential (125mm-250mm) | Severe Flood Potential (250mm+)

# CREST Viewer Interface



**Time Plot View**

**Series**

- Actual Evapotranspiration
- Observed Discharge
- Potential Evapotranspiration
- Rain
- Streamflow
- Soil Moisture

**CREST Simulation Outputs - Tana at Garrisa (4G01)**  
Click and drag along the horizontal axis for higher resolution data

1000 m<sup>3</sup>/s  
500 m<sup>3</sup>/s  
0 m<sup>3</sup>/s  
-500 m<sup>3</sup>/s

12. Mar 26. Mar 9. Apr 23. Apr 7. May 21. May 4. Jun 18. Jun 2. Jul 16. Jul

Soil Moisture Streamflow

Export To CSV

servirglobal.net

**Time Query**

**Date Range (UTC):**

From: 01-03-2012 12:00 am  
To: 07-08-2012 3:00 pm

**Applies to:**

Time Plot View  Map View

Update View Synchronize

**Stream Observation Sites**

**Map View**

**Layers**

- CREST Basins
- CREST Products
  - Near Real Time
    - NRT\_SoilMoisture
    - NRT\_Streamflow
  - Qualitative Precip Forecast
  - Quantile Estimates
- Base Layers

Identity Layers: Near Real Time

Mogadishu

31-Jul-2012 15:00 1-Aug-2012 15:00 2-Aug-2012 15:00 3-Aug-2012 15:00 4-Aug-2012 15:00 5-Aug-2012 15:00 6-Aug-2012 15:00 7-Aug-2012 15:00

Step 36 of 57 Current Time Step: Tue, 07 Aug 2012 15:00:00 GMT



# CREST Web Access (CREST Viewer)



- <http://41.206.34.124/crestviewer/>
- Or
- <http://ags.servirlabs.net/crestviewer/>

# CREST Web Access (Daily CREST Map Books)

- <http://41.206.34.124/crestmaps/>
- These map books are available for free download

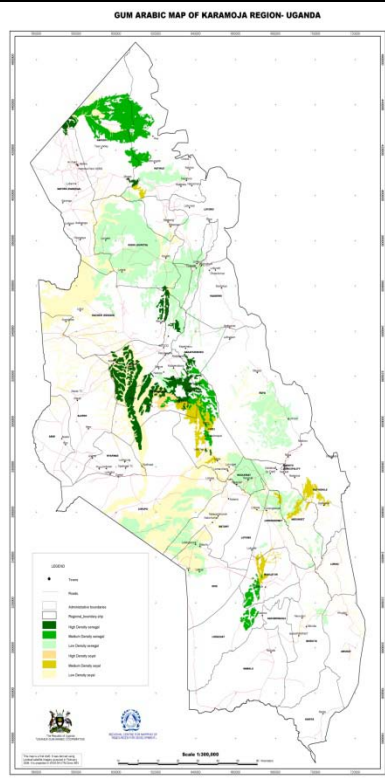
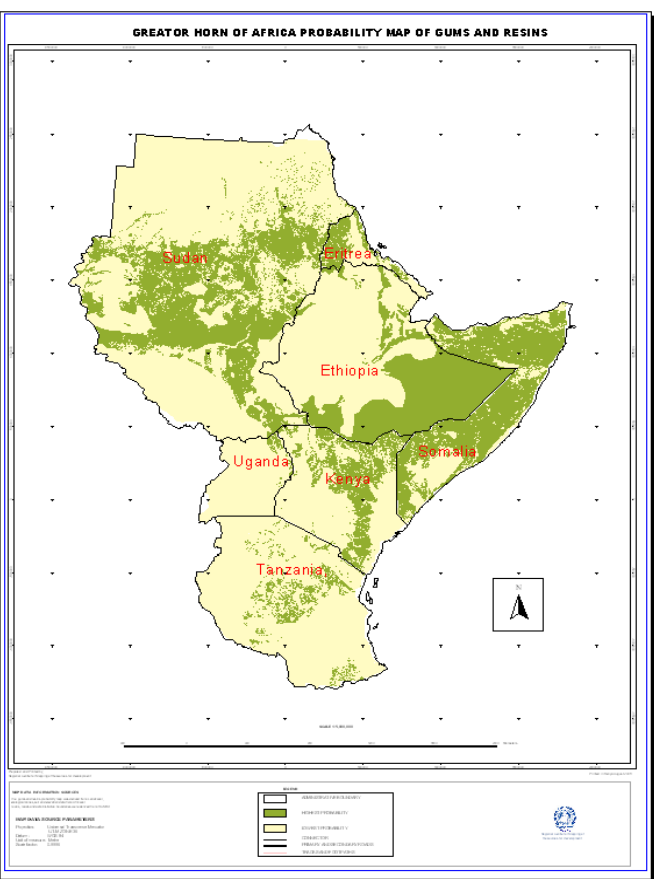
# UNOSAT/IGAD/RCMRD Initiative on DRR & Emergency Preparedness



- Capacity Building in Geo-Information
- Testing of New Technologies
  - UAV
  - Livestock Tagging
- Developing Alternative Livelihoods
- Crowdsourcing & Mapping
  - Geo Tagging
- Satellite Disaster Charter Engagement



# Alternative Livelihoods



# Disaster Related Space Activities at the RCMRD





## Earliest Activities at the RCMRD

Time	Activity
1988 - 1993	Qualitative analysis of CCD for food security assessment In the IGAD countries. Funded by the Japanese Govt. through FAO in the project GCPS/RAF/231/PJN.
1996 - 1997	Qualitative analysis of CCD and NDVI in the IGAD countries and Rwanda and Burundi. Funded by the French Govt. through FAO in the project GCP/RAF/310/FRA
1995 - 2000	Qualitative end of season crop yield forecasting and environmental analysis in the IGAD countries using ET data derived from Meteosat satellite. Co-executed by RCMRD and EARS and funded by the Dutch Govt. In the REFIEWS Project.

# RCMRD Activities on DRR

- **Food Security and environmental monitoring**

(USGS/Fewsnet, ICPAC, DLCO, WFP, ILRI, LEWIS, GMFS)

- **DRASTIC Modeling, CREST Modeling, Flood Modeling and Prediction**

(USGS, NASA, EU)

- **Disease Modeling and Prediction**

- Rift Valley Fever (WRI, AU-IBAR, UoN, USGS)

- Mapping of HIV/AIDS on the Mombasa – Kampala highway (Manitoba University, UoN)

- **Land Suitability, Land degradation mapping and monitoring**

- Deforestation (Mau Forest)

- Land use / Land cover change (Kordofan Region, South Sudan)

- Uganda

- **Capacity building**

- Training in the use of modern Geo-information technologies in early warning & food security, disease mapping, land degradation, disaster risk management

- **Monitoring urban sprawl & Camp Mapping** (Informal settlements)

- **Policy Development for Space Applications**



# Conclusion



For space technology usage to become operational in resource mapping and assessment and in environmental mapping and disaster management:

- there is need for aggressive and sustained awareness creation among decision makers
- Increasing Capacity at a national level
- Development of a variety of space technology applications
- Research, Development & innovation in space technology applications
- Support of National and Regional Initiatives



# REGIONAL CENTRE FOR MAPPING OF RESOURCES FOR DEVELOPMENT



## 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







## RCMRD Roles:

- **Promote Awareness of Sat-tech & Applications**
- **Project Implementation & Building Capacity**
- **Formulation of spatial policies and data infrastructure**
- **Creation of national and regional partnerships**

# END

Regional Centre for Mapping of  
Resources for Development  
(RCMRD)

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# SCENARIO ANALYSIS

**You have 5 seconds to interpret the following scene**







**You have 3 seconds to interpret the following scene**



