

The SERVIR Regional Visualization and Monitoring System: Africa applications and hands-on exercise utilizing SERVIR Global

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¹NASA HQ Earth Sciences Division Applied Sciences Program

²NASA MSFC SERVIR Program



NASA Applied Remote Sensing Training Program (ARSET): Using Satellites for Improved Flood Monitoring and Prediction. World Bank, March 7, 2013



About SERVIR

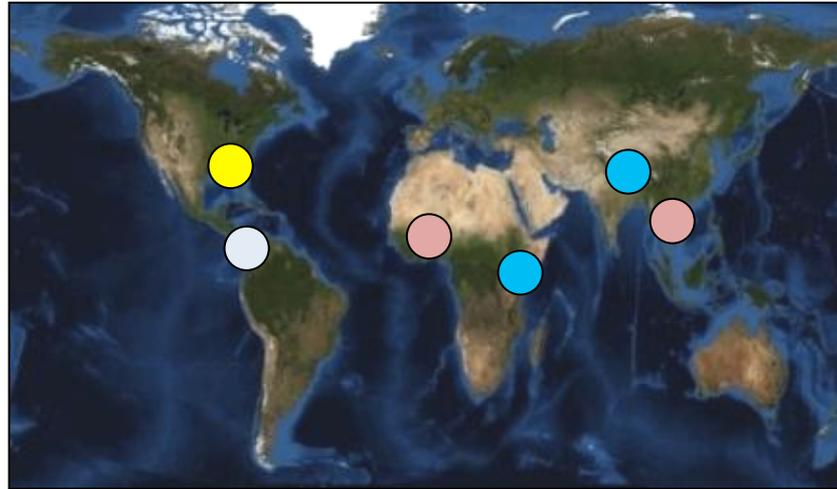
SERVIR 

A NASA-USAID partnership to **improve environmental management and resilience to climate change** by strengthening the capacity of governments and other key stakeholders to integrate earth observation information and geospatial technologies into development decision-making



SERVIR Network

SERVIR 



-  Current Hub
-  Graduated Hub
-  Program Office (NASA/MSFC)
-  Potential Future Hubs

SERVIR Network



RCMRD – Host of SERVIR-East Africa



ICIMOD – Host of SERVIR-Himalaya



CATHALAC– Graduated Hub/Network Affiliate

SERVIR-Mesoamerica @ CATHALAC

City of Knowledge, Panama



Dedicated 2005
Graduated 2011



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SERVIR-Africa @ RCMRD

Nairobi, Kenya



Dedicated on
November 21, 2008



SERVIR-Himalaya @ ICIMOD Kathmandu, Nepal



Dedicated on October 5, 2010



ICIMOD



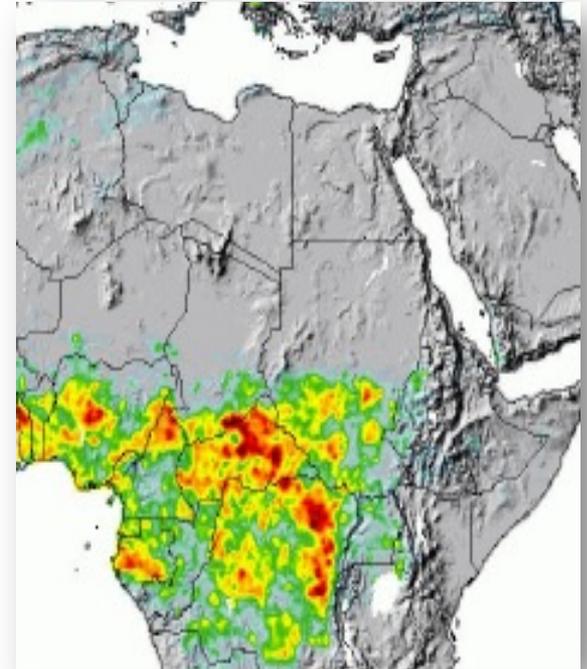


Centers are exchanging ideas and sharing experiences



What We Do

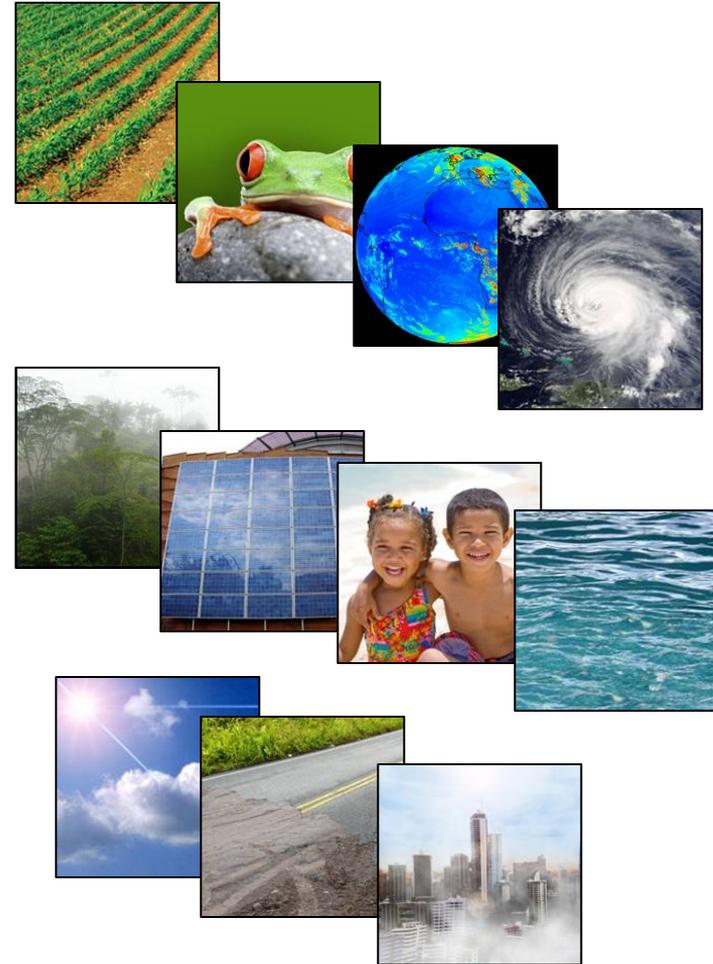
- Capacity Building of Regional Institutions, Stakeholders, and Young Professionals
- Improved Access to Data, Models, Online Maps, Visualizations
- Development of Decision Support Tools and Services
- Strengthening Partnerships and Fostering Collaboration Across SERVIR Network



SERVIR Thematic Areas

SERVIR 

- Agriculture
- Biodiversity
- Climate
- Disasters
- Ecosystems
- Energy
- Health
- **Water**
- Weather



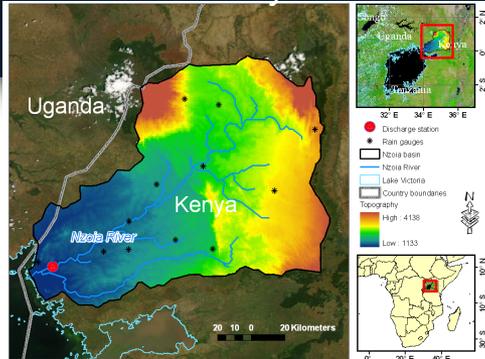
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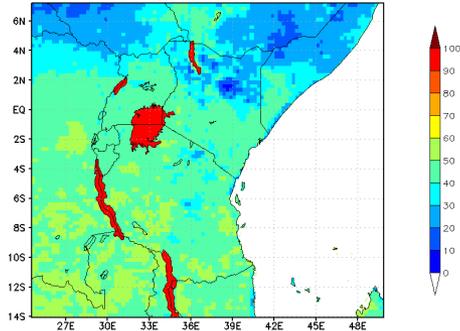
SERVIR Water Resources Assessment and the CREST Model As A Response to a Need in Africa

Hydrologic Model CREST Developed for Single Watershed in Kenya



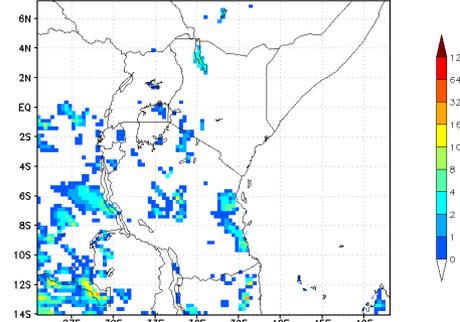
Soil Moisture

Latest 24h/3h Soil Moisture (%) 2013-01-03 15h



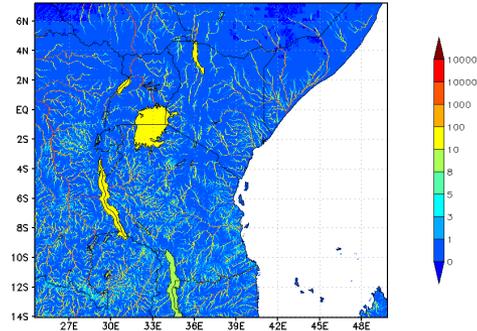
Near Real Time NASA Satellite Rainfall Data

Latest 24h/3h Precipitation (mm/h) 2013-01-03 15h



Hydrologic Modeling in East Africa with Active Engagement with End Users

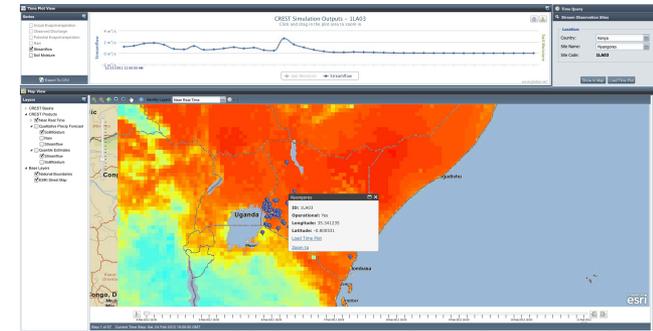
Latest 24h/3h Stream Flow (m³/s) 2013-01-03 15h



Real Time, Historic and
Seasonal Streamflow

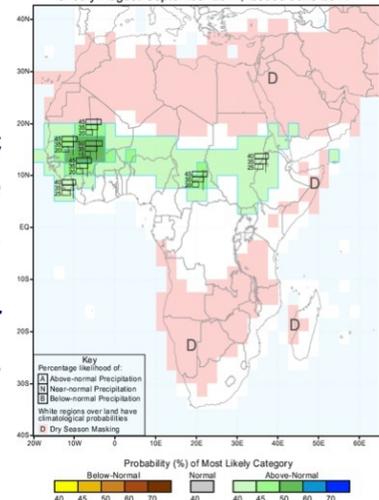
SERVIR GLOBAL

Engaged Kenya Department of
Water Resources to help monitor
floods



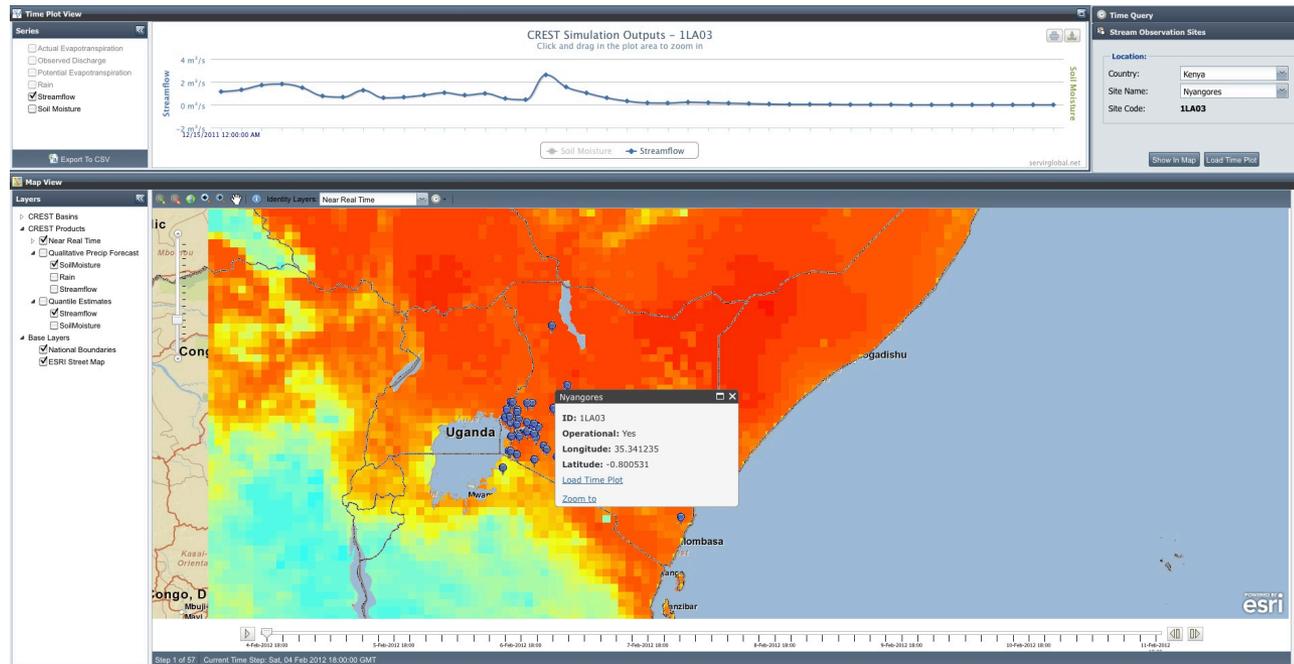
Working on
seasonal
hydrologic
forecasts at the
request of Kenya
and Tanzanian
ministries of Water
Resources

IRI Multi-Model Probability Forecast for Precipitation
for July-August-September 2011, Issued June 2011

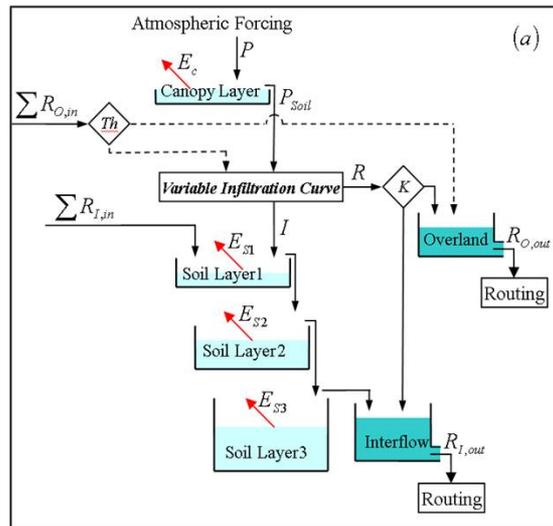


Training and Capacity Building

- NASA GSFC – University of Oklahoma developed CREST model as part of ROSES 2008 Decisions project. CREST stands for the Coupled Routing and Excess Storage model.
- SERVIR Africa has been running the model for a large domain in East Africa using TRMM RT rainfall datasets
- The purpose of the modeling effort is to empower the decision makers with timely information about the streamflow conditions. SERVIR Africa began engaging the Ministry of Water Resources in Kenya in 2011. Rwanda is beginning to use CREST for their near real time modeling.
- SERVIR Africa has generated historic hydrologic model runs using TRMM archives, is running the model in near real time, and is working on getting the seasonal forecasts in a few months.

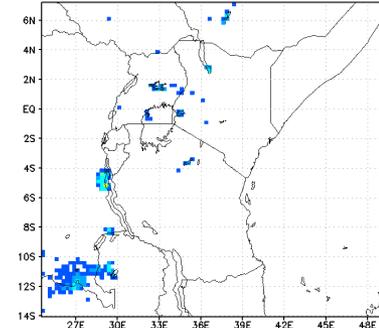


- Model being run in near real time at a spatial resolution of 1km at 3-hr frequency over East Africa domain. Output products from CREST are streamflow, soil moisture, actual evapotranspiration.
- SERVIR Africa works closely with Kenya Meteorological Department (KMD). We incorporate their near real-time WRF model products (rainfall and temperature forecasts) to generate streamflow.

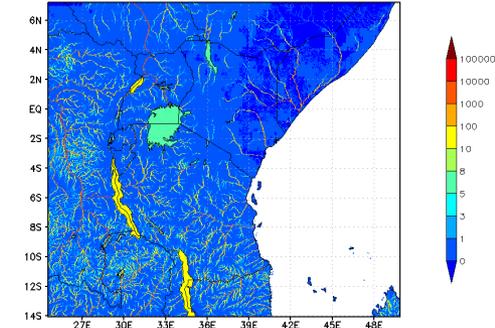


CREST model

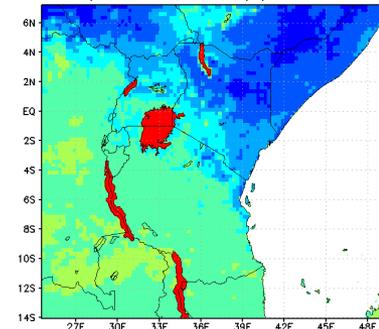
Latest 24h/3h Precipitation (mm/h) 2013-02-27 06h



Latest 24h/3h Stream Flow (m³/s) 2013-02-27 06h



Latest 24h/3h Soil Moisture (%) 2013-02-27 06h



KMD East African Domain

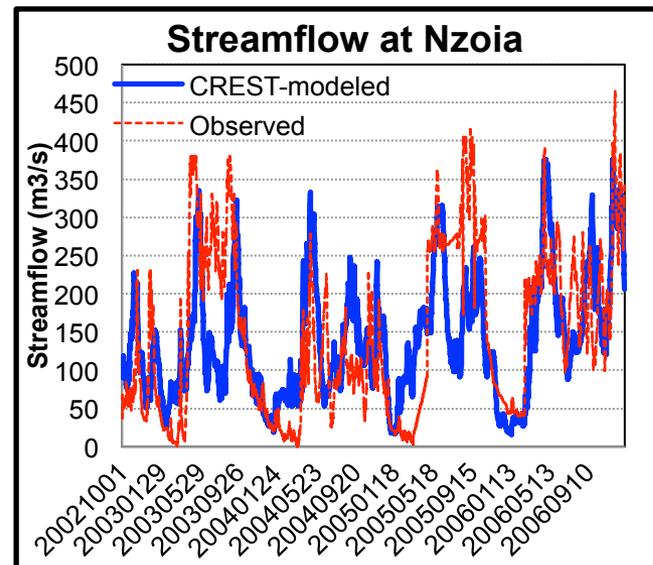


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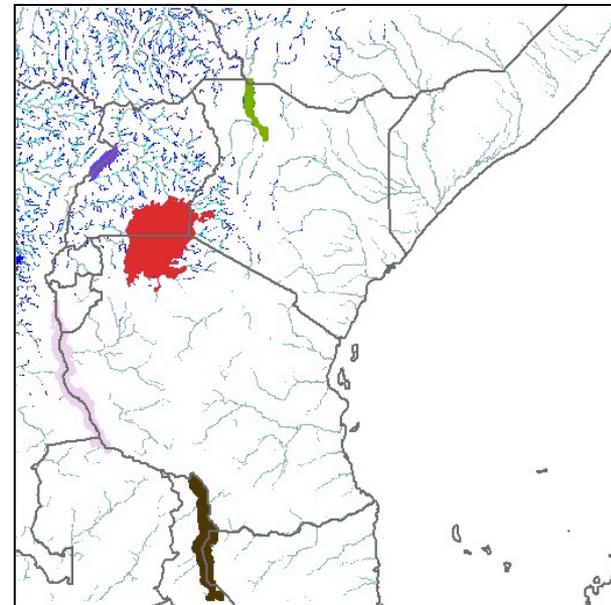


Providing Historic Perspective to Near Real Time Hydrologic Model Outputs

- We have used 10-year historic TRMM data to drive the CREST model. We computed daily streamflow for every 1 km pixel in East Africa over KMD domain.
- Those historic and near real time data are shared with Kenya Department of Water Resources (KDWR) at nearly 850 stream gauge locations of their choice. We also make the data available on our web portal.
- Working with KDWR to incorporate their streamflow observations to improve the model runs.
- We have used the historic data to assess 5th, 20th, 80th and 95th percentiles for each 1 km pixel. Based on the four quantiles, we assess whether the near real time model output is extremely dry, very wet or in between.



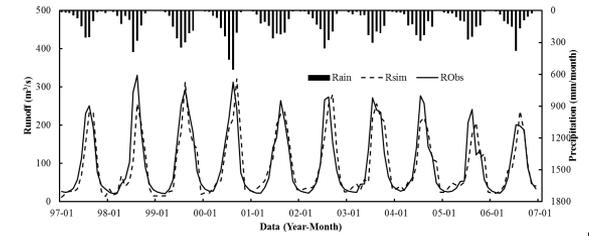
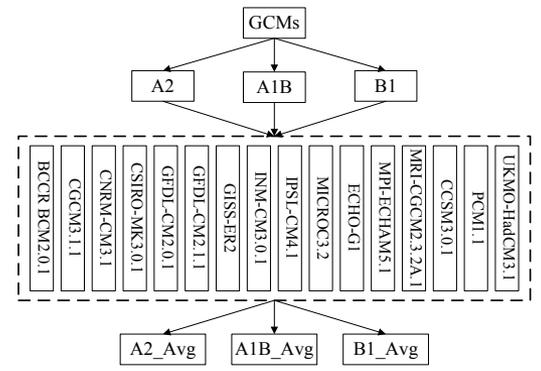
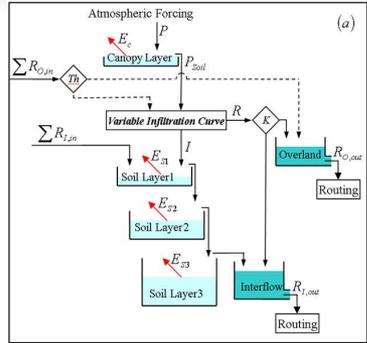
- Near Real Time Hydrologic Datasets
 - Streamflow
 - Soil moisture
 - Quantiles of Streamflow, Soil Moisture
- Short Term Forecasts using KMD QPF
 - Rainfall
 - Streamflow
 - Soil moisture





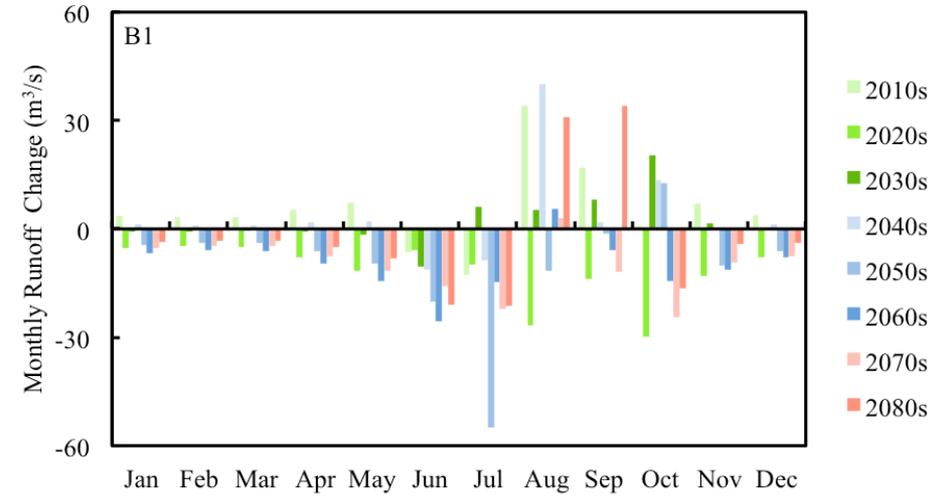
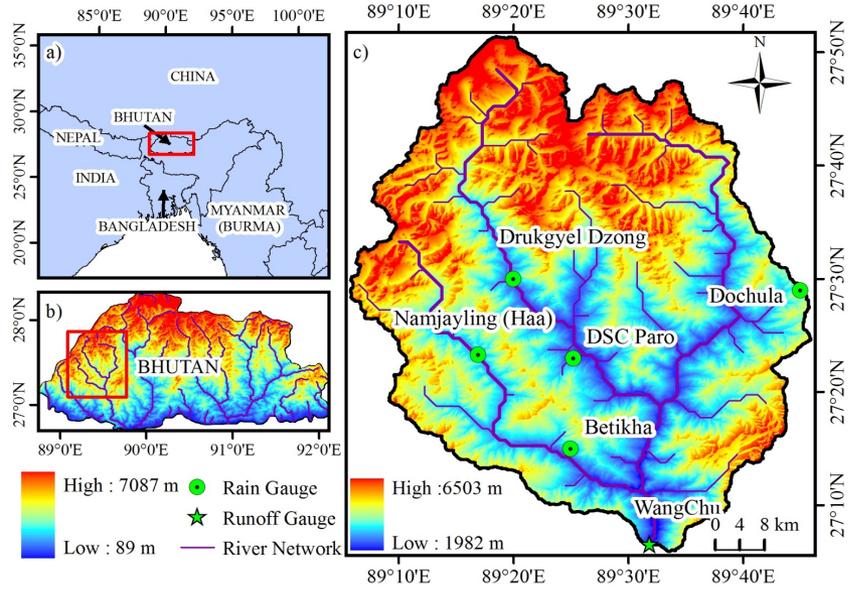
SERVIR Water Resources Future Projects

SERVIR Water Resource Assessment



CC	0.88
NSCE	0.77
Bias(%)	-4.37

Bhutan Water Resource Assessment using IPCC Climate Change Scenarios and a Distributed Hydrologic Model

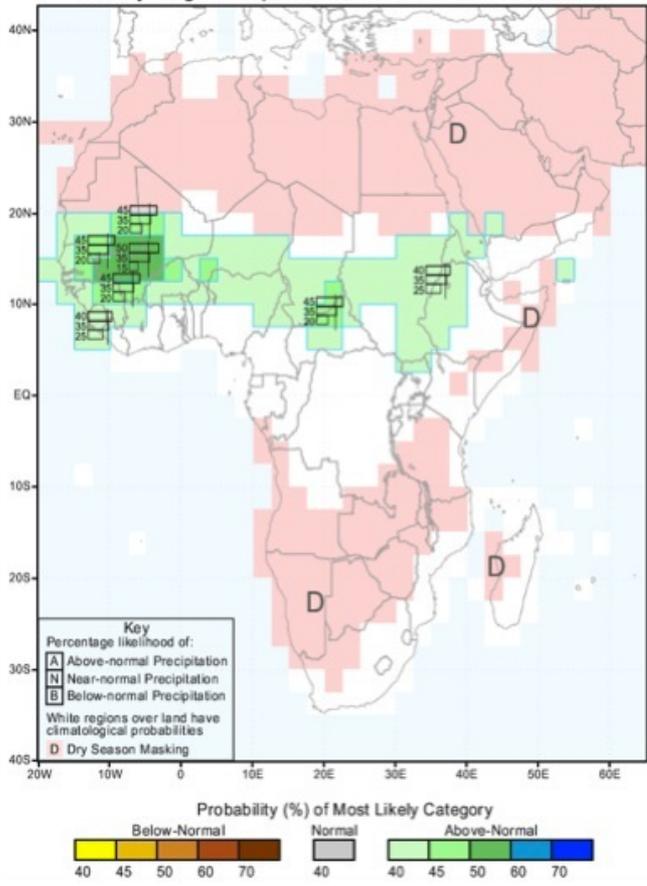


Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

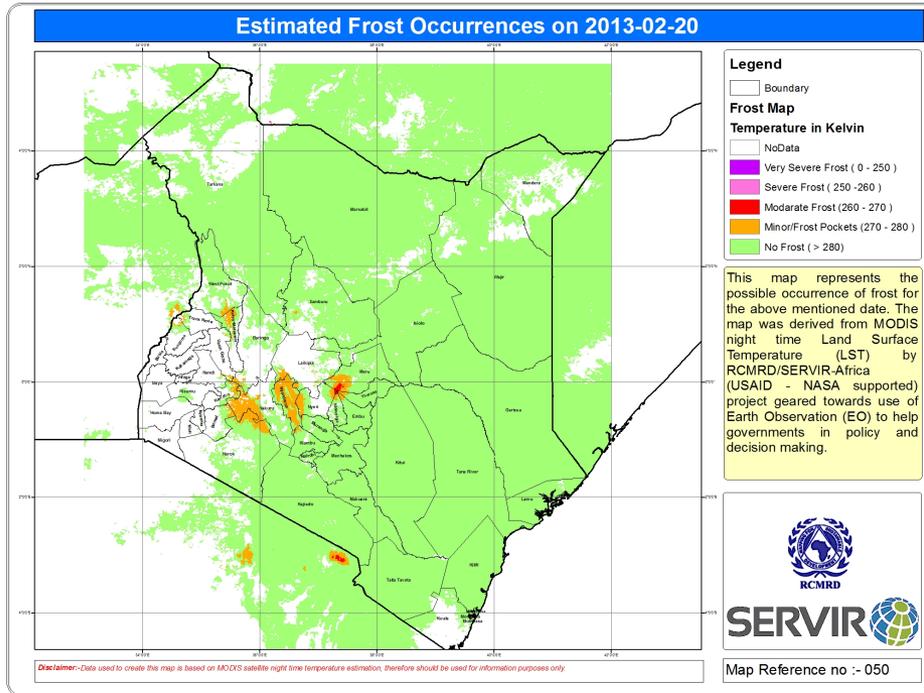
Incorporating Seasonal Outlook from ICPAC / IRI



IRI Multi-Model Probability Forecast for Precipitation for July-August-September 2011, Issued June 2011



- Seasonal forecasts of rainfall outlooks do not translate directly into the hydrologic estimates because of the non-linearities in the land surface interactions.
- SERVIR is working on generating ensembles of seasonal streamflow forecasts based on the probabilistic rainfall estimates.
- We are working on generating the ensembles of rainfall using historic reanalysis datasets sorted under the “normal”, “above” and “below” conditions.
- We expect to produce the hydrologic forecasts with the seasonal forecasts soon.



SERVIR is keen on getting satellite data and products to end users in the agricultural community to improve decision making.

In Kenya, as with many other countries in Africa, frost damages are a significant threat to agriculture.

Kenya Meteorological Department requested SERVIR to help with identifying the frost damaged areas, for public dissemination and damage assessment purposes.



- Using satellite and KMD datasets, SERVIR Africa has put together a system for early detection of frost and for damaged area assessment. Next phases will include near real time temperature observations and forecasts of frost areas.

Thank You

