

SERVIR

Connecting Space to Village



Ashutosh Limaye
SERVIR Project Scientist, NASA



Outline



- What is SERVIR?
- SERVIR in Action
 - Africa
 - Asia
 - Latin America and Caribbean
- SERVIR Science and technologies
- Capacity Building
- SERVIR Expansion

What is SERVIR



SERVIR

SERVIR

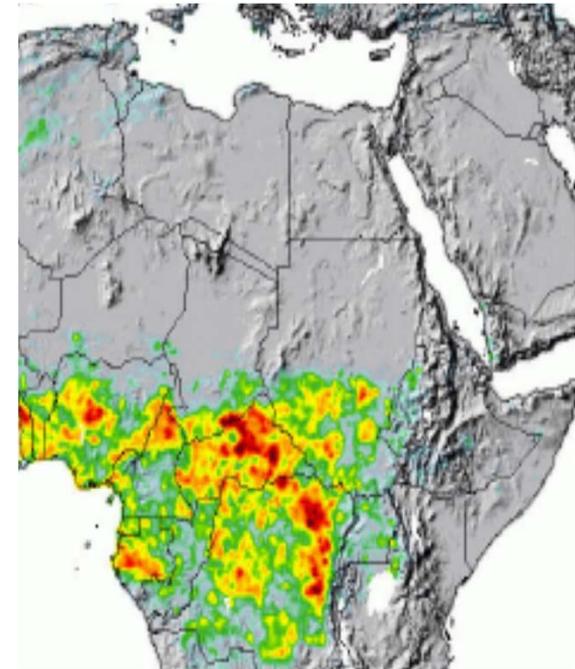
A flagship NASA-USAID project to improve environmental management and resilience to climate change by strengthening the capacity of governments and other key stakeholders to integrate earth observation information and geospatial technologies into development decision-making



What SERVIR Does

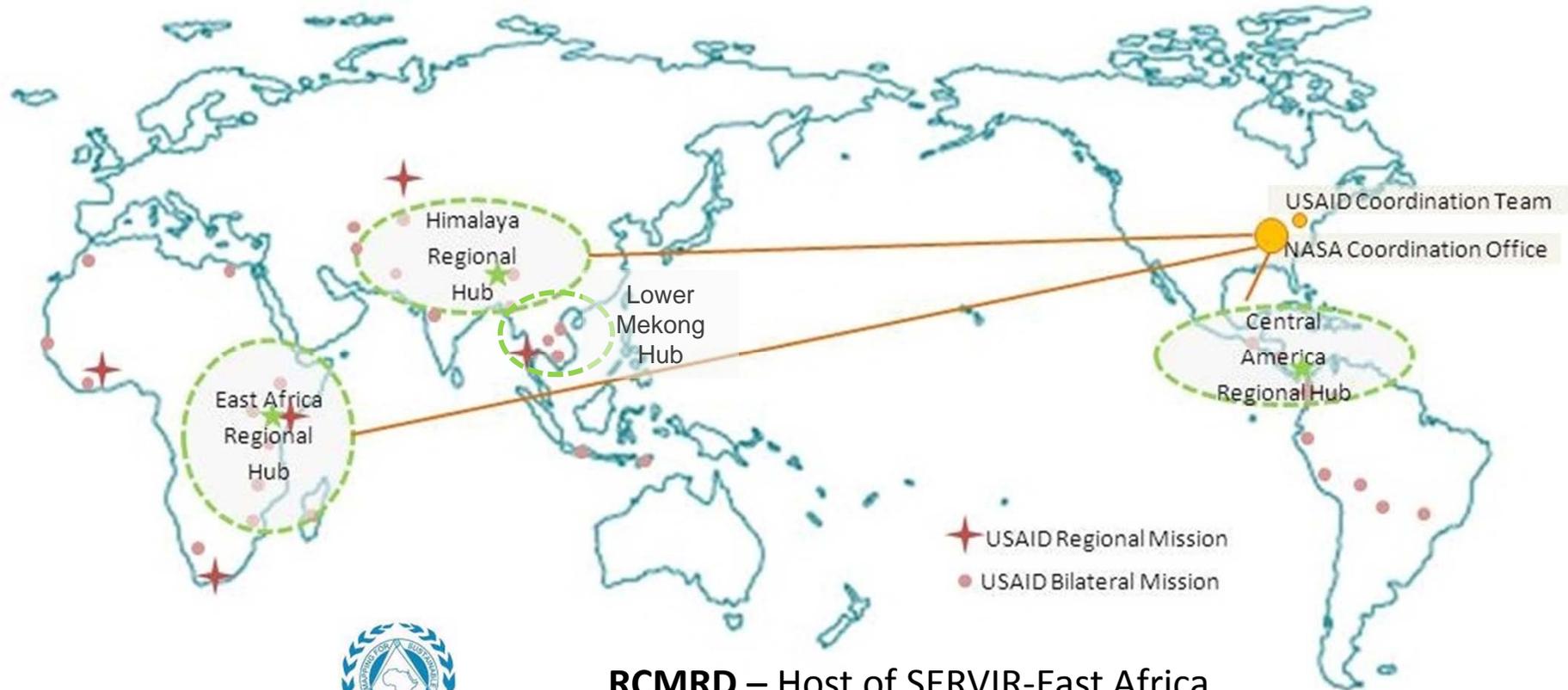


- Identify needs in SERVIR regions
- Link science products from US institutions to meet those needs through improved access to data, models, online maps, and visualizations
- Build capacity of regional institutions, stakeholders, and young professionals
- Strengthen partnerships and foster collaboration across SERVIR network



The SERVIR Network

SERVIR



RCMRD – Host of SERVIR-East Africa

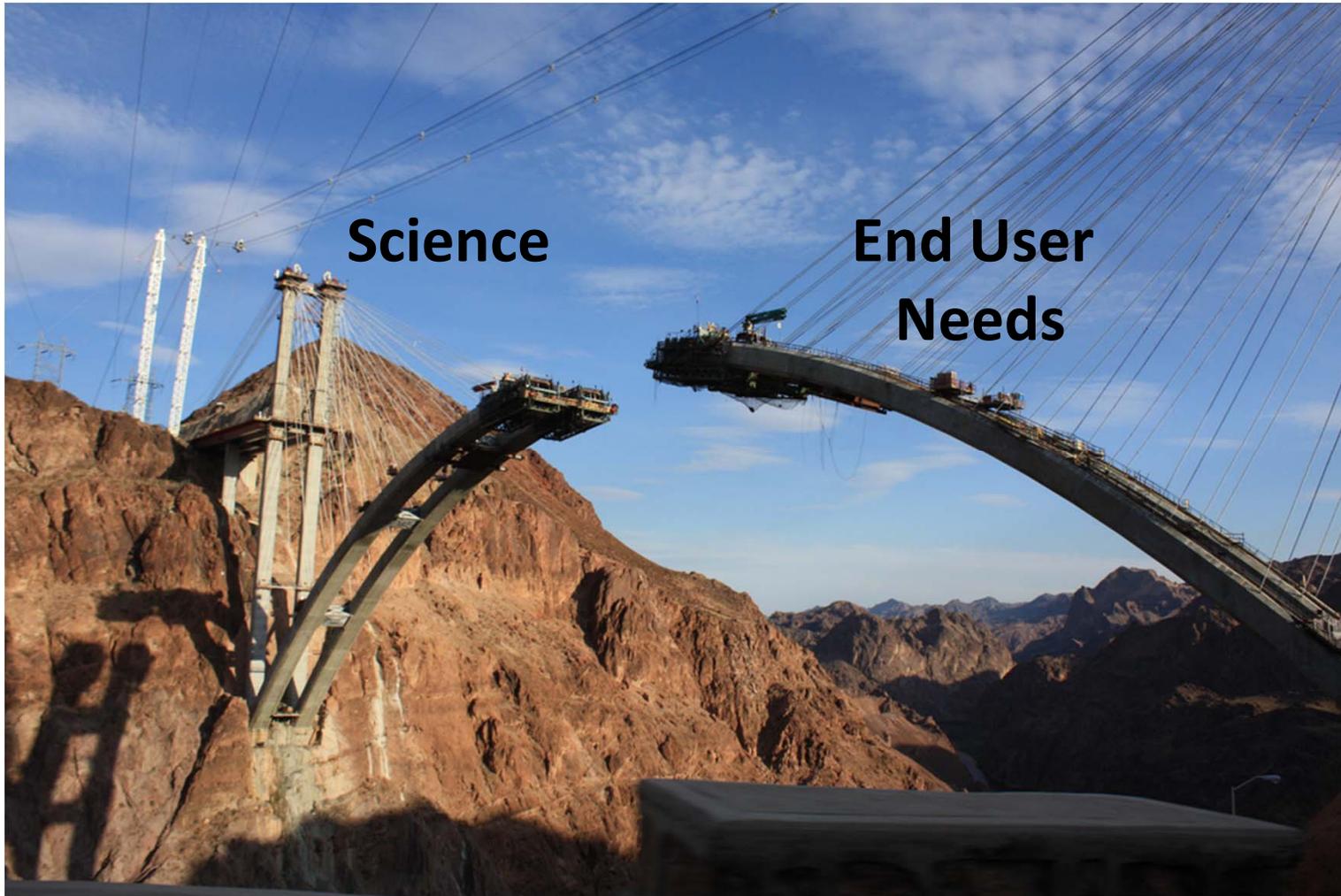
ICIMOD

ICIMOD – Host of SERVIR-Himalaya



CATHALAC – Host of SERVIR-Mesoamerica (Phase 2)

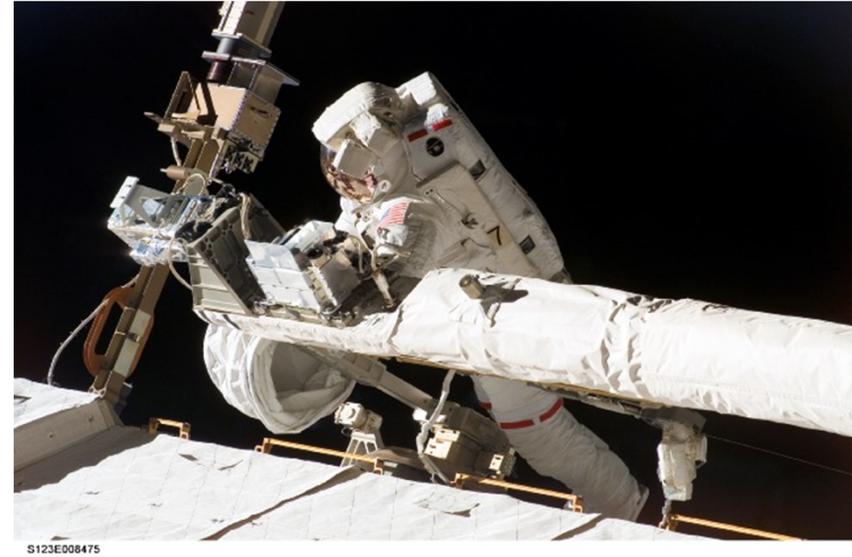
Bridging Science with End User Needs Through Applied Sciences



Courtesy: alifayre

Why NASA?

SERVIR



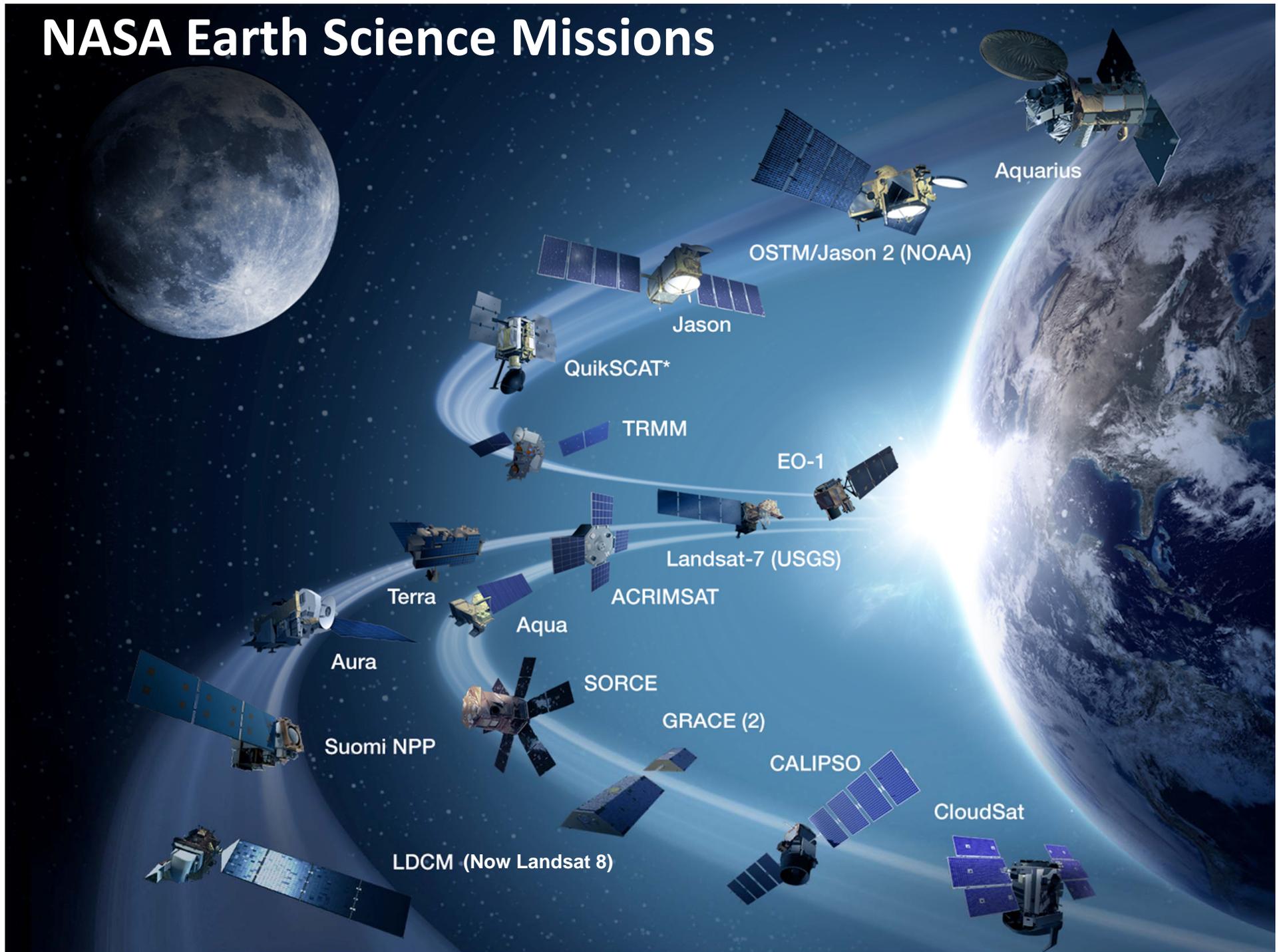
Why NASA?

The logo for SERVIR (Science, Environment, Resilience, and Vulnerability Integrated Research) is positioned in the top right corner. It features the word "SERVIR" in a bold, white, sans-serif font. To the right of the text is a stylized globe with a grid of latitude and longitude lines, rendered in shades of green and blue. The globe is partially overlaid by the dark blue background of the header banner, which also shows a portion of the Earth's horizon and some stars in space.

SERVIR

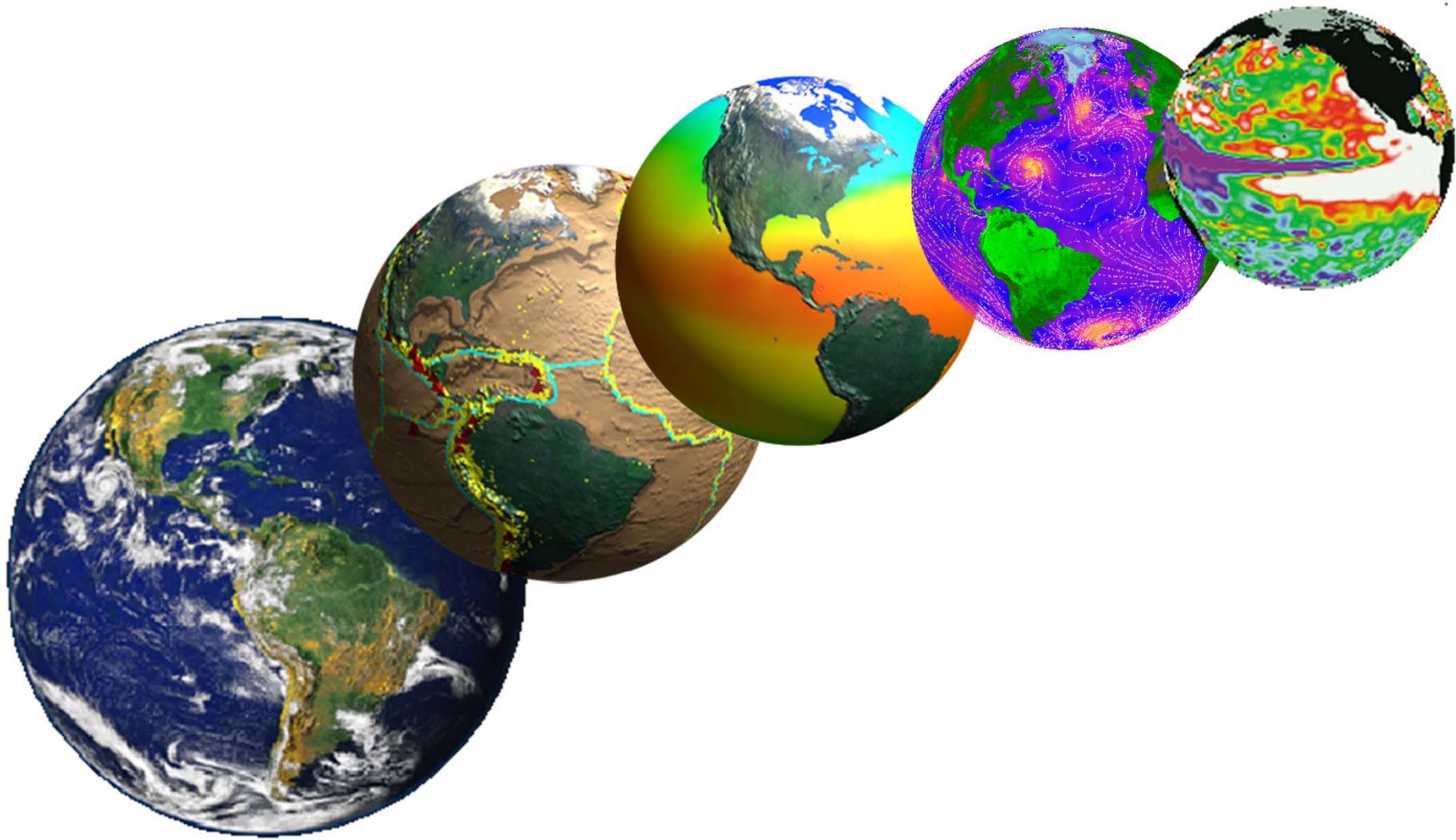
**Goal 3A: Study Earth from space to
advance scientific understanding and
meet societal needs**

NASA Earth Science Missions

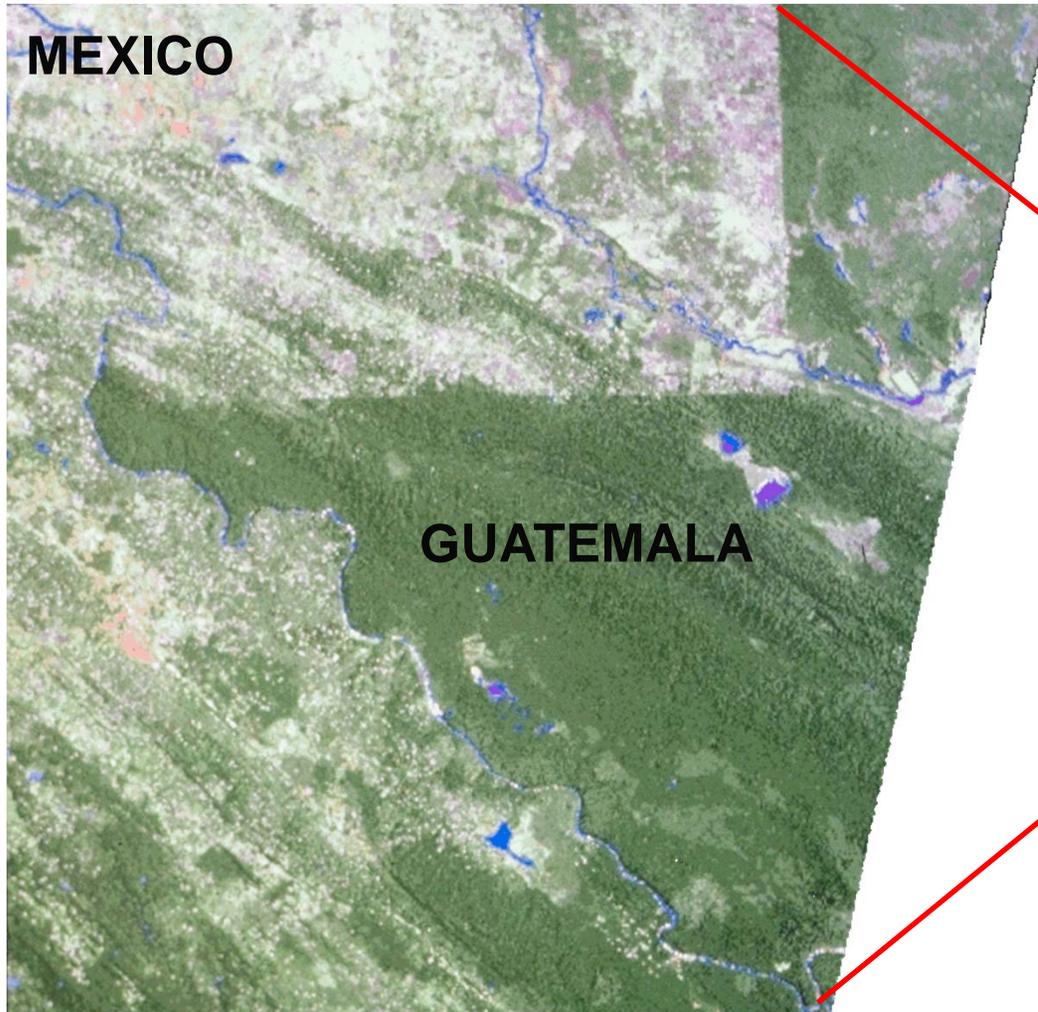


NASA Earth Science Missions





International Boundary from Space: Landsat



SERVIR In Action



The People...



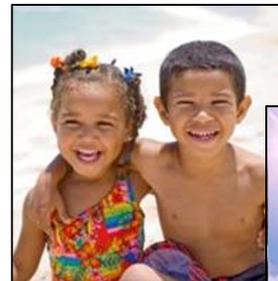
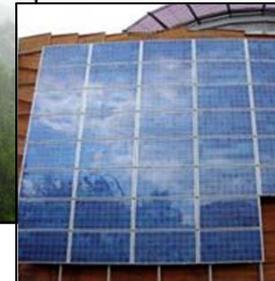
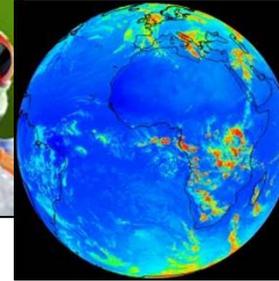
SERVIR Summit 2012



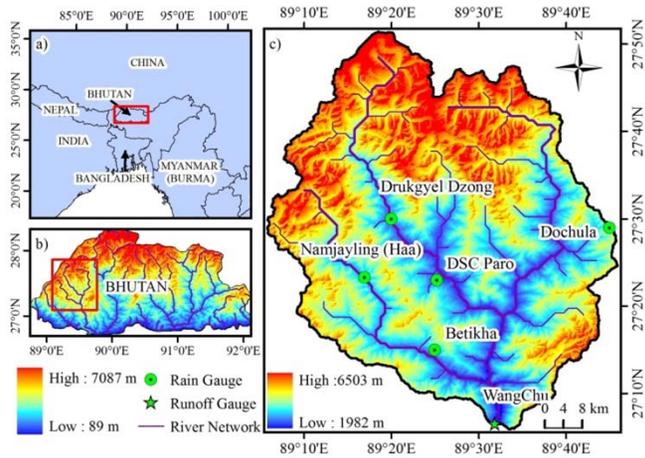
Aligning With GEO: SERVIR Thematic Areas



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



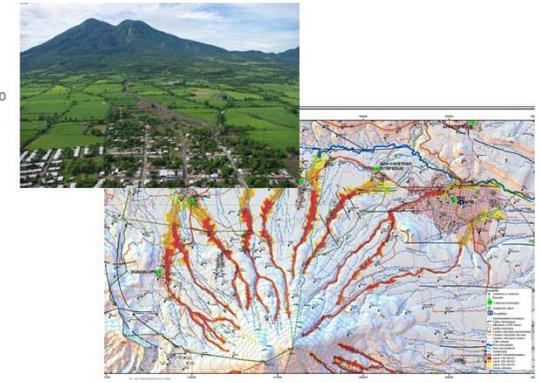
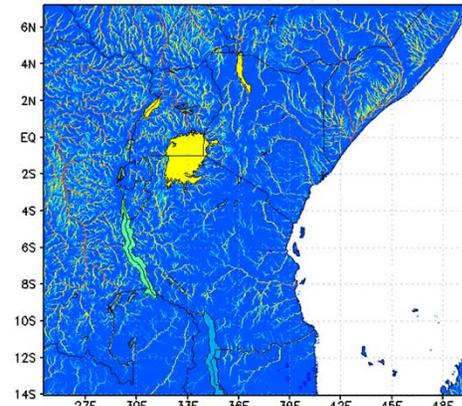
SERVIR Science Applications for Decision Making



Bhutan Water Resource Assessment

Real Time Streamflow in East Africa

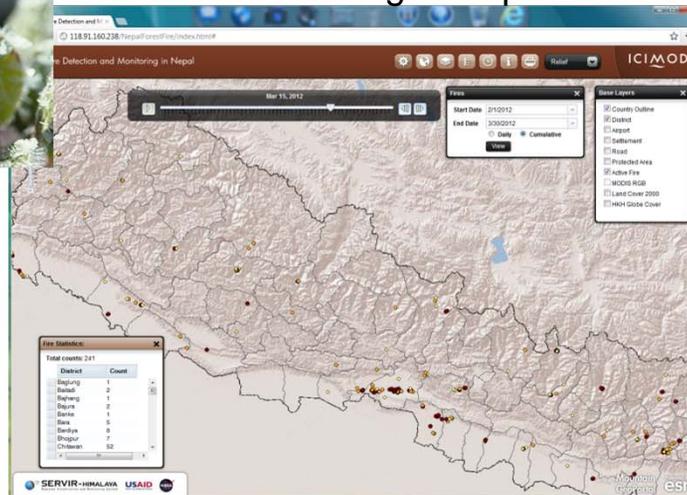
Latest 24h/3h Stream Flow (m^3/s) 2012-11-07 12h



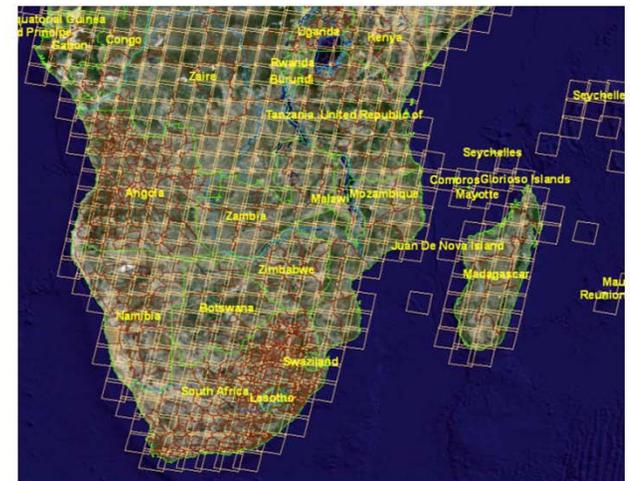
Landslide Prediction System in Mesoamerica



Near Real-time Forest Fire Monitoring in Nepal



Frost Mapping in Africa



Greenhouse Gas Emissions Inventory in Africa

Africa

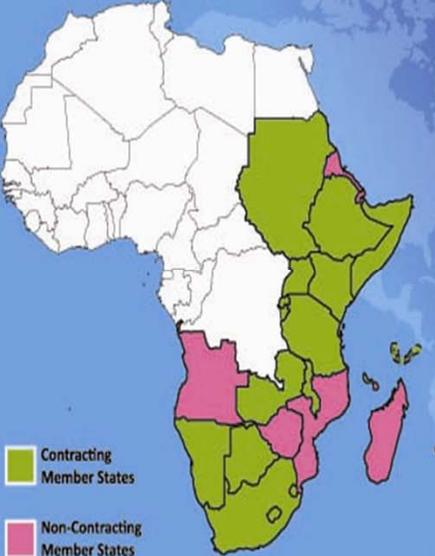
SERVIR-Africa @RCMRD



REGIONAL CENTRE FOR MAPPING OF RESOURCES FOR DEVELOPMENT

Our Vision
To be a premier Centre of Excellence in provision
of Geo-information services.

Our 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.



Contracting Member States

Non-Contracting Member States

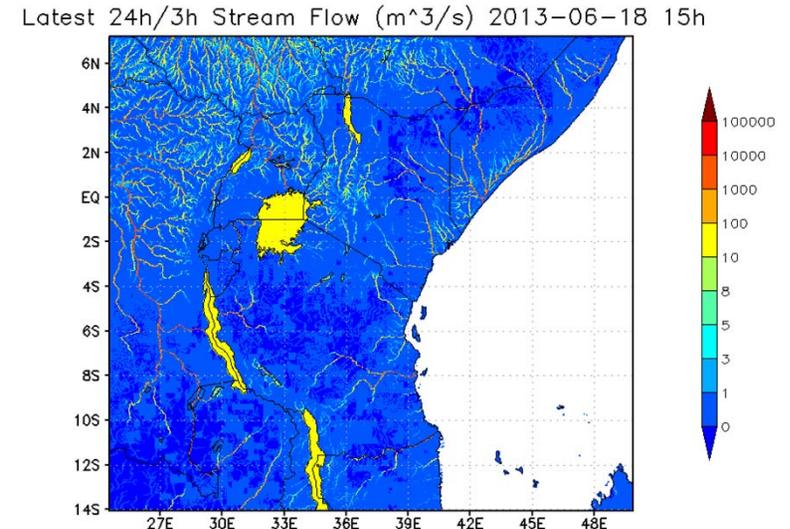


Botswana Burundi Comoros Ethiopia Kenya Lesotho Malawi Mauritius Namibia Rwanda Seychelles Somalia South Africa Sudan Swaziland Tanzania Uganda Zambia

CREST Hydrologic Model



- SERVIR implemented NASA's CREST hydrologic model, satellite data, and local information to provide streamflow and flood conditions throughout East Africa.
- As a result, Kenyan Government requested CREST monitoring of 850 high-risk locations in the country.
- Other countries in the region are now soliciting CREST training from NASA.



CREST real time stream conditions in East Africa



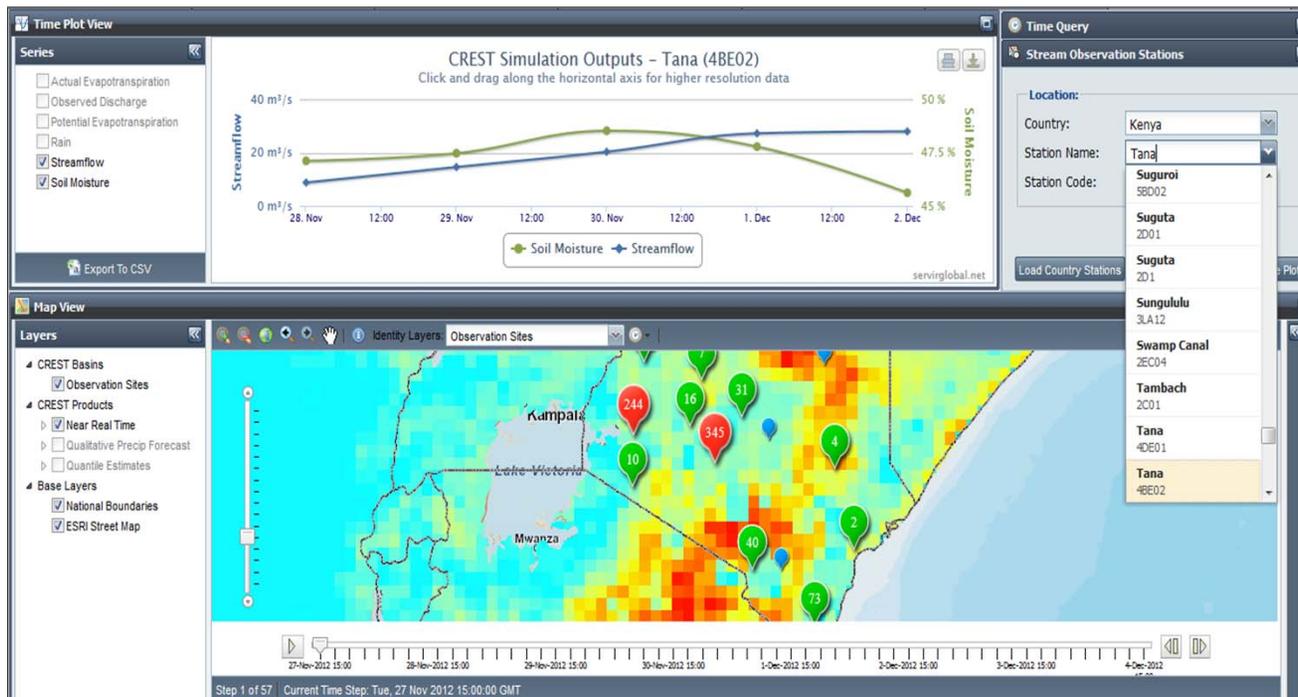
“The biggest problem we have is lack of data. When someone, like SERVIR-Africa comes along to help us out it is very good because we have been missing floods.”

Simintei Kooke
Deputy Director of Water Resources,
Kenya Ministry of Water and Irrigation

CREST Viewer



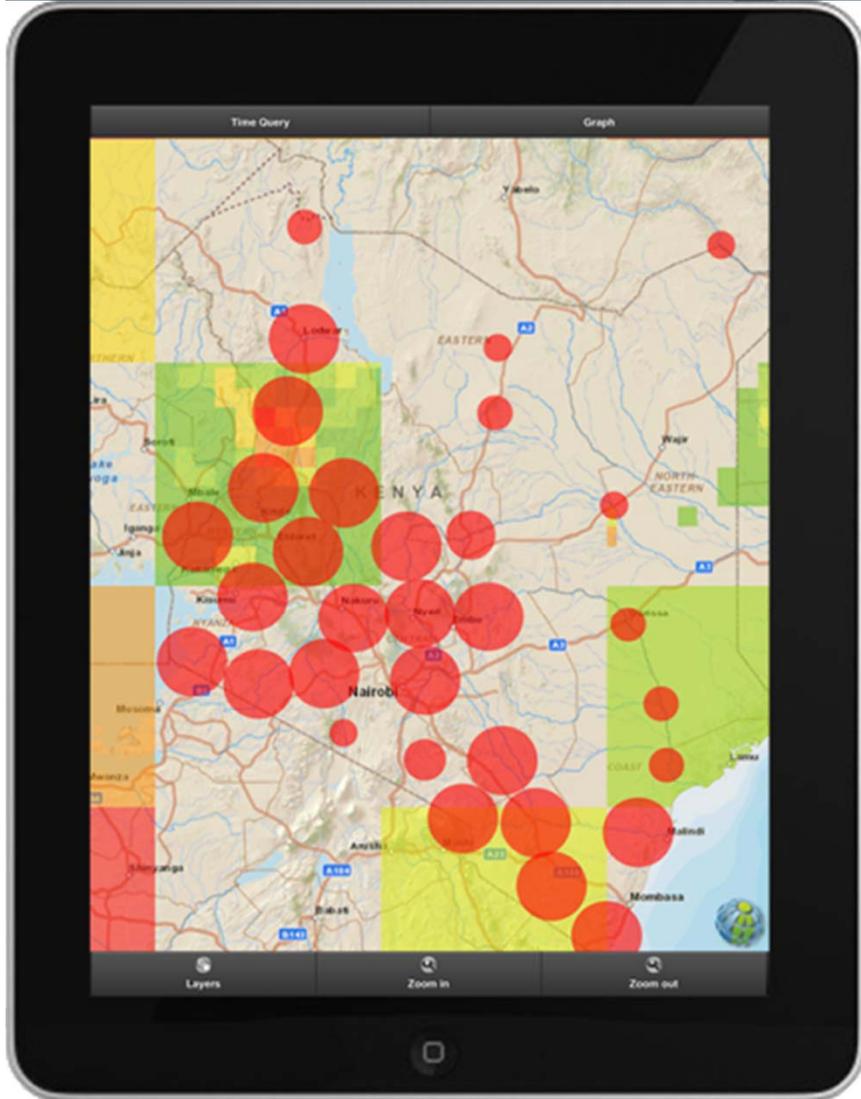
- SERVIR-Africa has generated historic hydrologic model runs, is running the model in near real time and is working on getting the seasonal forecasts in a few months.
- The CREST Viewer enables the district water resources managers a quick view of the streamflow at their point of interest, and enables them to view it in historic context.



CREST Mobile



SERVIR has adapted CREST model products to fit the mobile needs.



CREST Models can run On all iOS and Android devices.



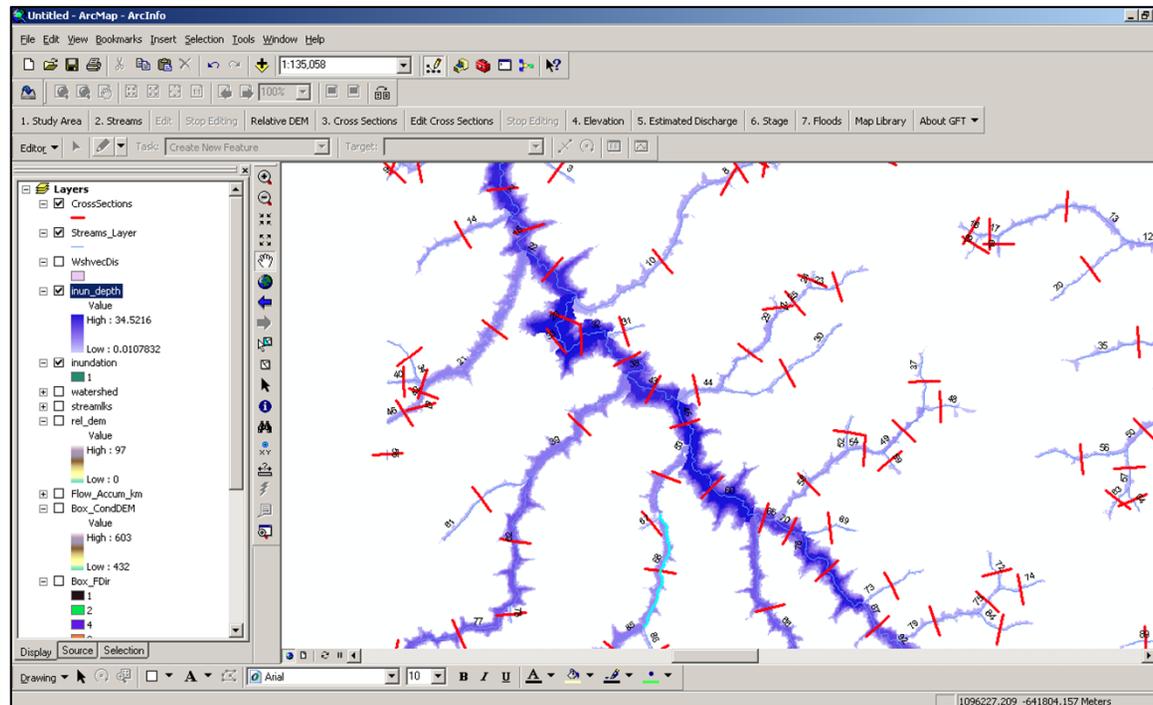
USAID
FROM THE AMERICAN PEOPLE



CREST Flood Mapping Tool



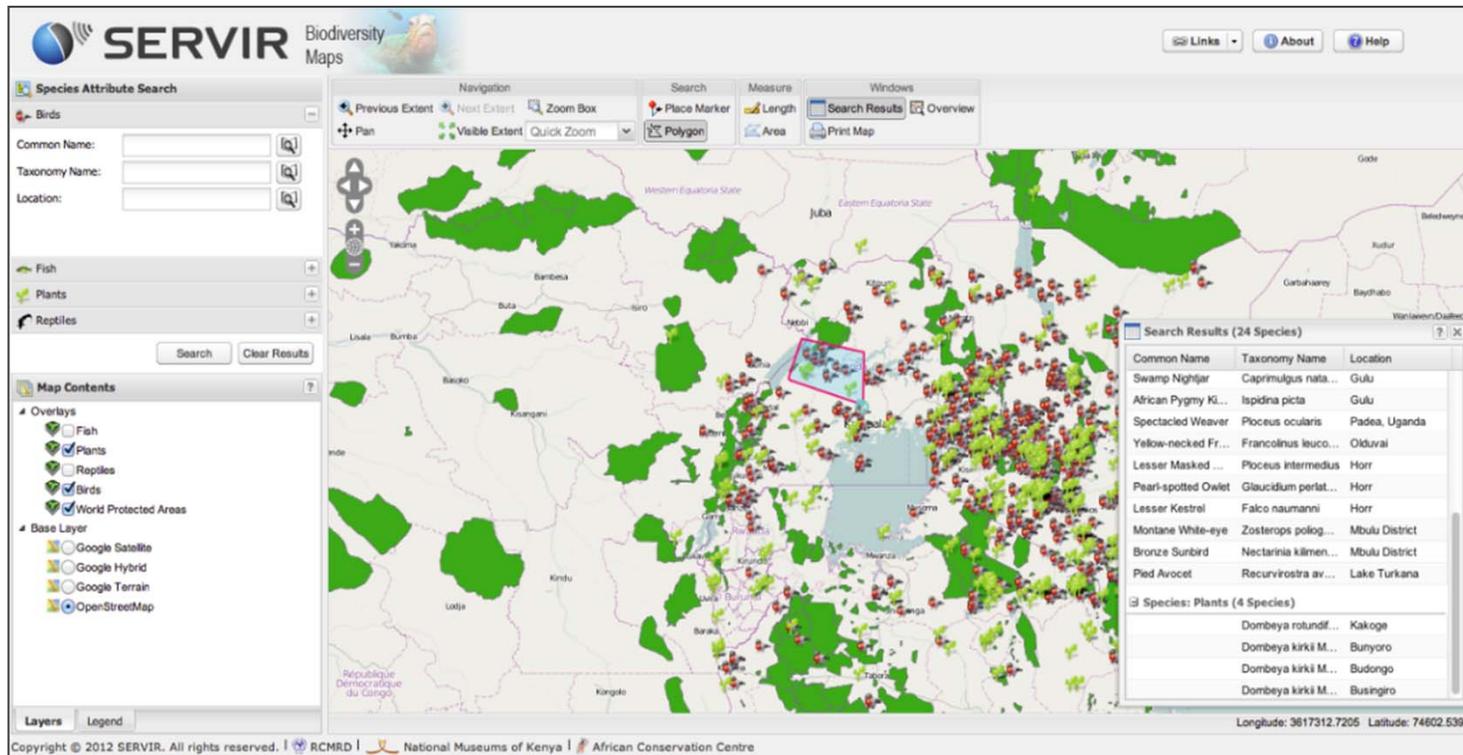
- Flood mapping tool is an offshoot of collaborative work with FEWS NET. RCMRD developed an ArcGIS plugin extension from a variety of FEWS NET scripts.
- RCMRD then developed it into a stand alone tool, which translates the hydrologic model product (streamflow) into a better visualization and decision making tool.
- The request for such a stand alone tool came from the Kenya Department of Water Resources. Under flooding conditions, the streamflow from the model can be visualized in the form of spatial flooding extent using this tool.



Biodiversity Tools

SERVIR

Mapping of spatial distribution of selected species in Kenya and neighboring countries based on the National Museums Kenya occurrence data

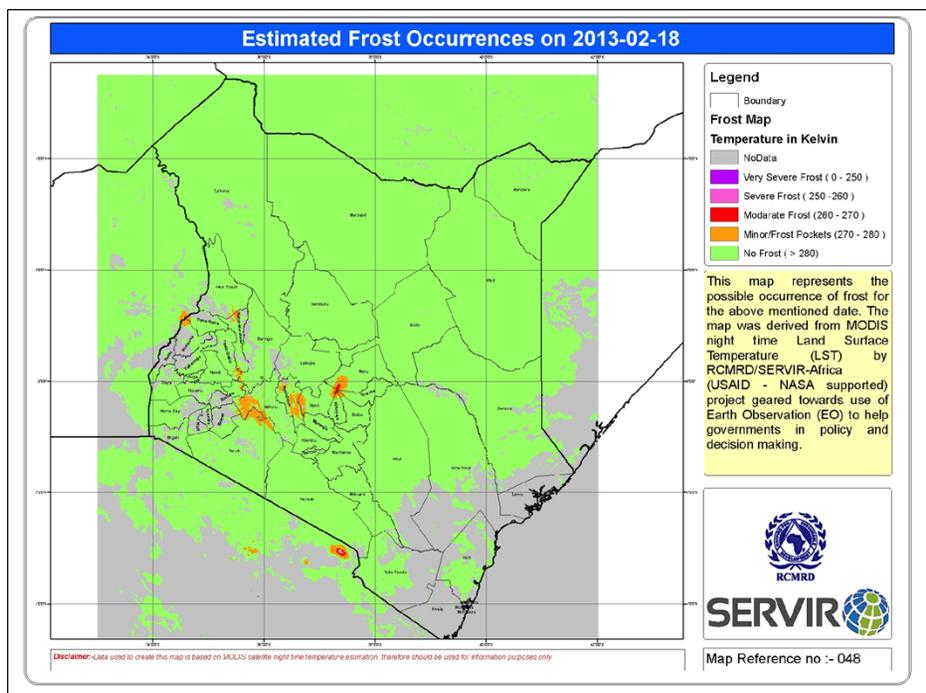


“We cannot direct the future until we discover what we have at present. The tools produced in this project have given us a better understanding of where things are (flora and fauna) and where they might be in future.”

--Lucy Waruingi, African Conservation Centre (ACC) Executive Director

Frost Monitoring and Early Warning

SERVIR 



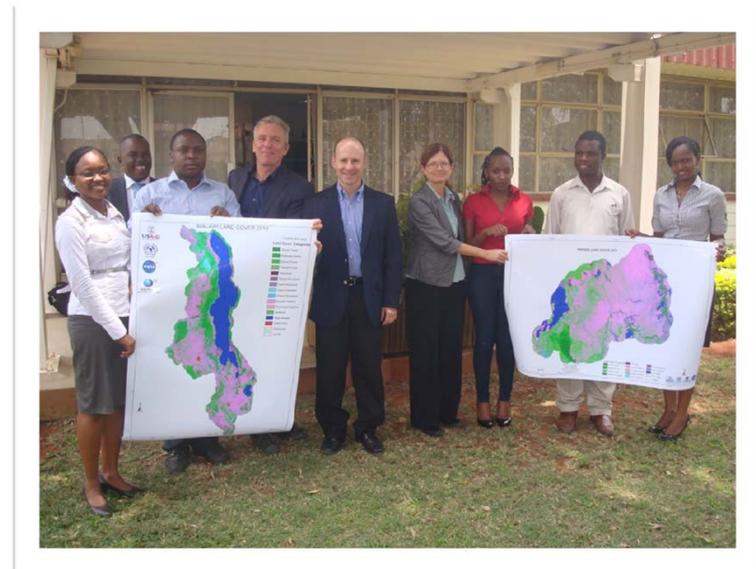
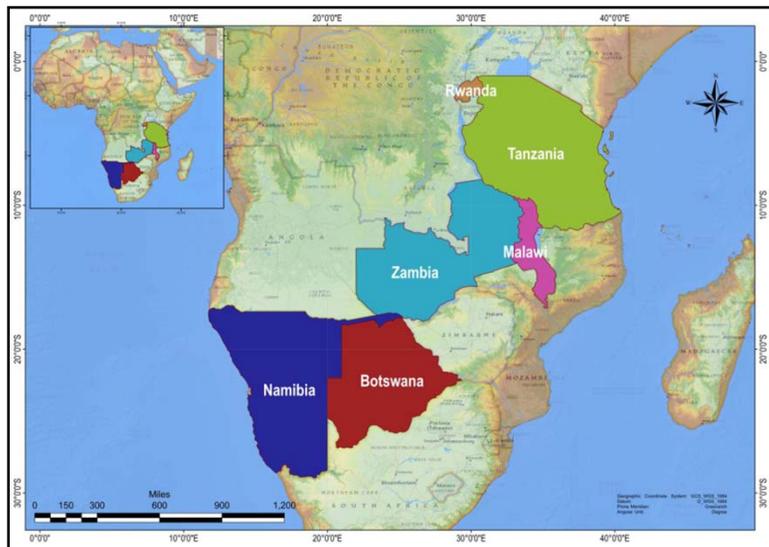
- In Kenya, as with many other countries in Africa, frost damages are a significant threat to agriculture.
- Using satellite datasets, SERVIR has put together a system for early detection of frost and for damaged area assessment. Next phases will include near real time temperature observations and forecasts of frost areas.
- This information is in high demand from agricultural insurance companies and farmers



Land Use and Land Use Change for Greenhouse Gas Emissions Inventory



- SERVIR is working in collaboration with another USAID funded activity, the US EPA effort on greenhouse emissions inventory effort with UNFCCC. The GHG emissions inventory depends on high quality land use land use change maps.
- SERVIR is working on providing consistent, reliable, relevant land use land use change information by harmonizing data compilation at national and regional levels.
- Participating Countries: Botswana, Malawi, Namibia, Rwanda, Tanzania, and Zambia
- We are using 30m satellite data for assessing the land cover change maps in 2000 and 2010. The land cover change statistics will enable us to quantify the changes in greenhouse gas inventory.



Hindu Kush Himalaya

SERVIR-Himalaya @ ICIMOD

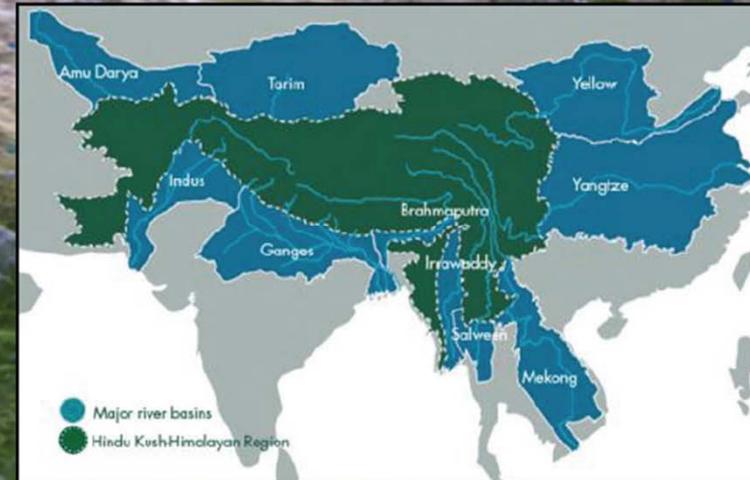
The International Centre for Integrated
Mountain Development (ICIMOD)

SERVIR GLOBAL

- A regional mountain knowledge, learning and enabling centre devoted to sustainable mountain development
- Information and Knowledge are prime Commodities of the Centre
- Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan

■ www.icimod.org
■ <http://geoportal.icimod.org>

The Hindu Kush-Himalayan Region



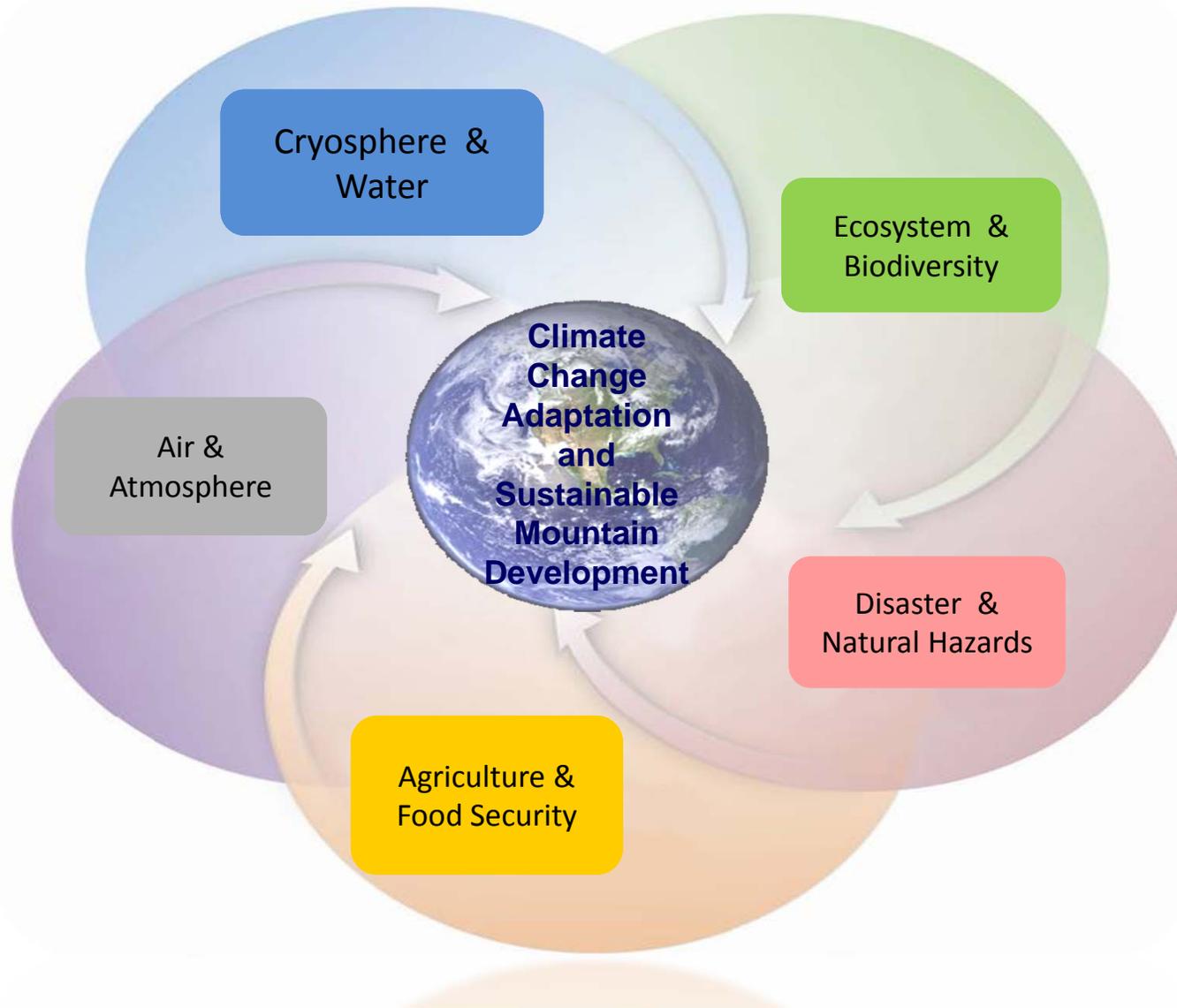
Extends over 3500 km from Afghanistan to
Myanmar and Home to 200 million People

ICIMOD



SERVIR 

SERVIR-Himalaya – Theme Areas and Applications



- Enhancing regional capacity and fostering regional cooperation
- Putting information and knowledge in public domain
- Supporting development decision-making and advancing our understanding of mountain system

SERVIR Products, Tools and Services: Cryosphere & Water

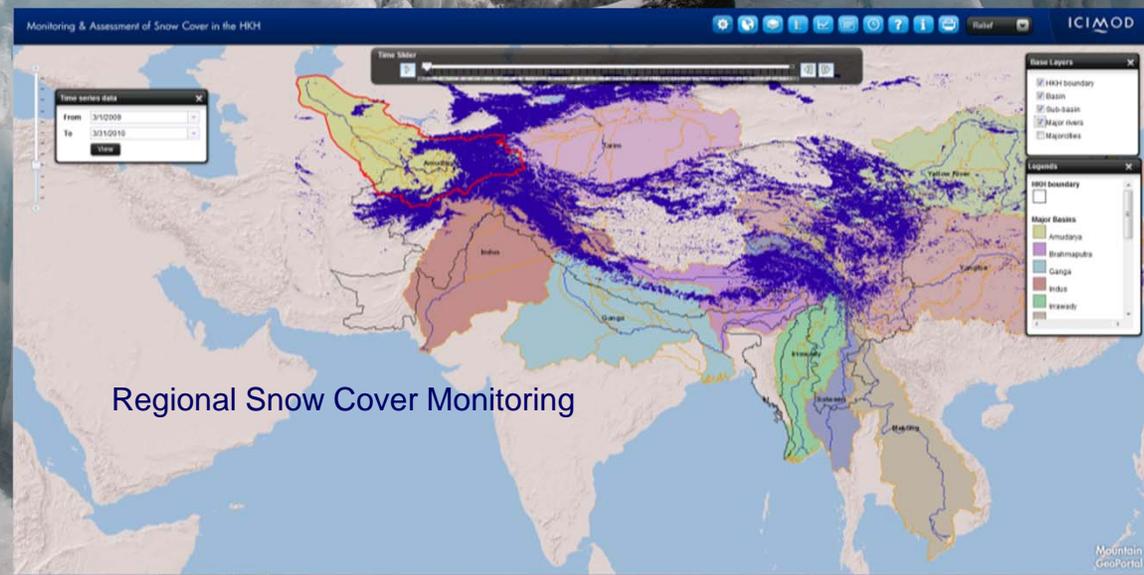


Monitoring
Modeling and
Assessment

Snow cover and
glacier dynamics;
Basin and watershed
Water resources
management



Regional Glacier Mapping



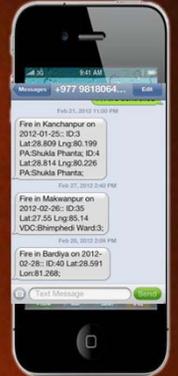
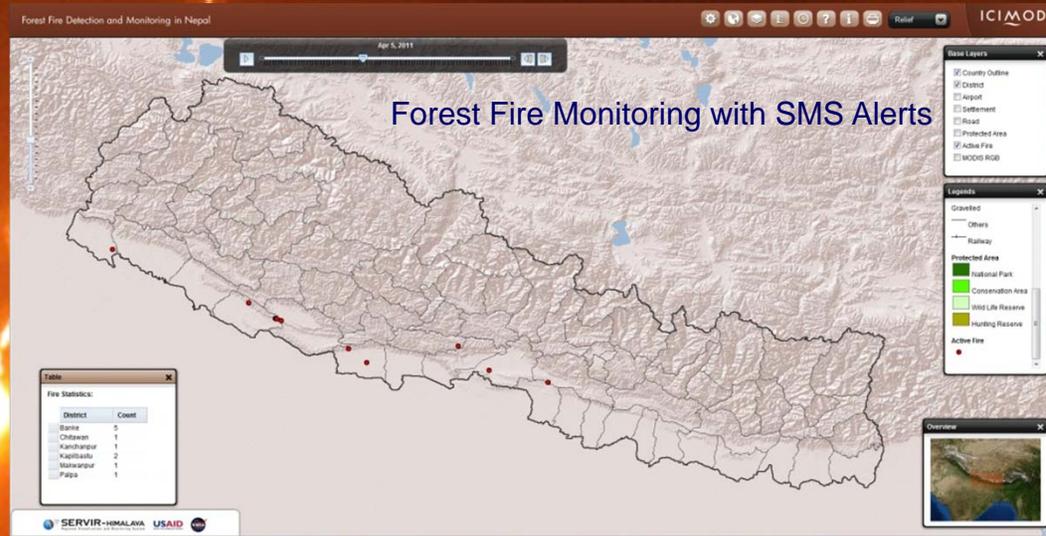
Regional Snow Cover Monitoring

SERVIR Products, Tools and Services: Disaster & Natural Hazards



Disaster Risk
Reduction and
Rapid Response
System

National disaster
response support
systems;
Community level
DRR

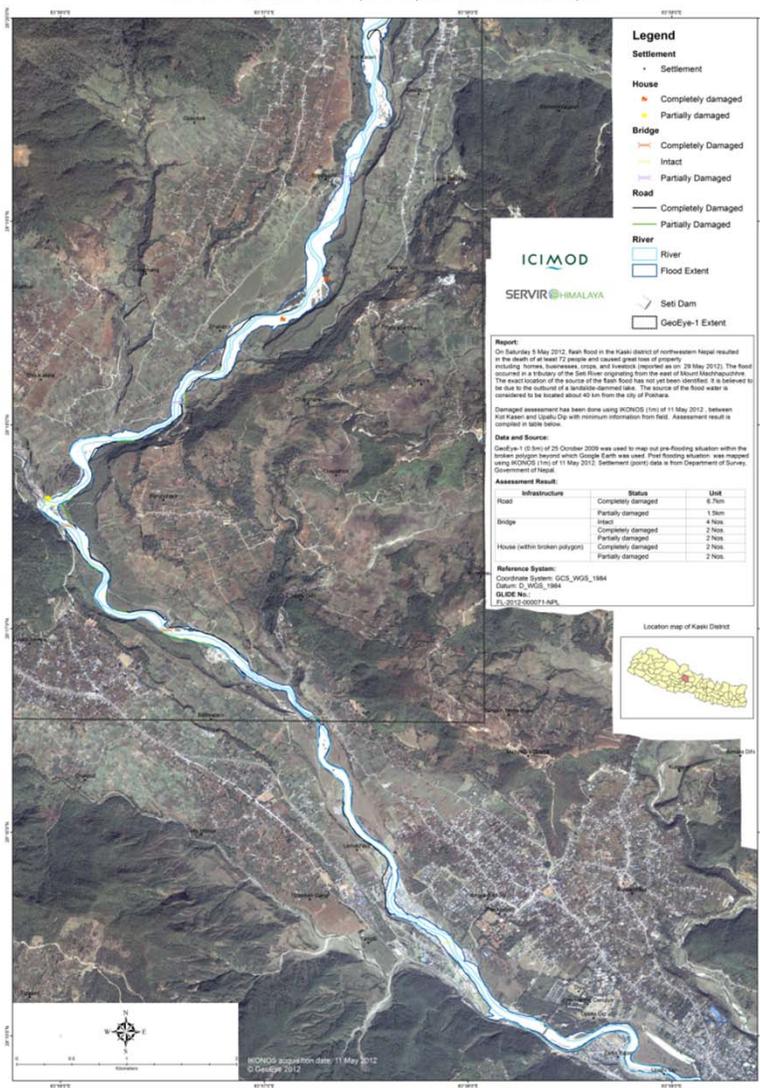


WSN based Flash Flood early Warning System in Bangladesh

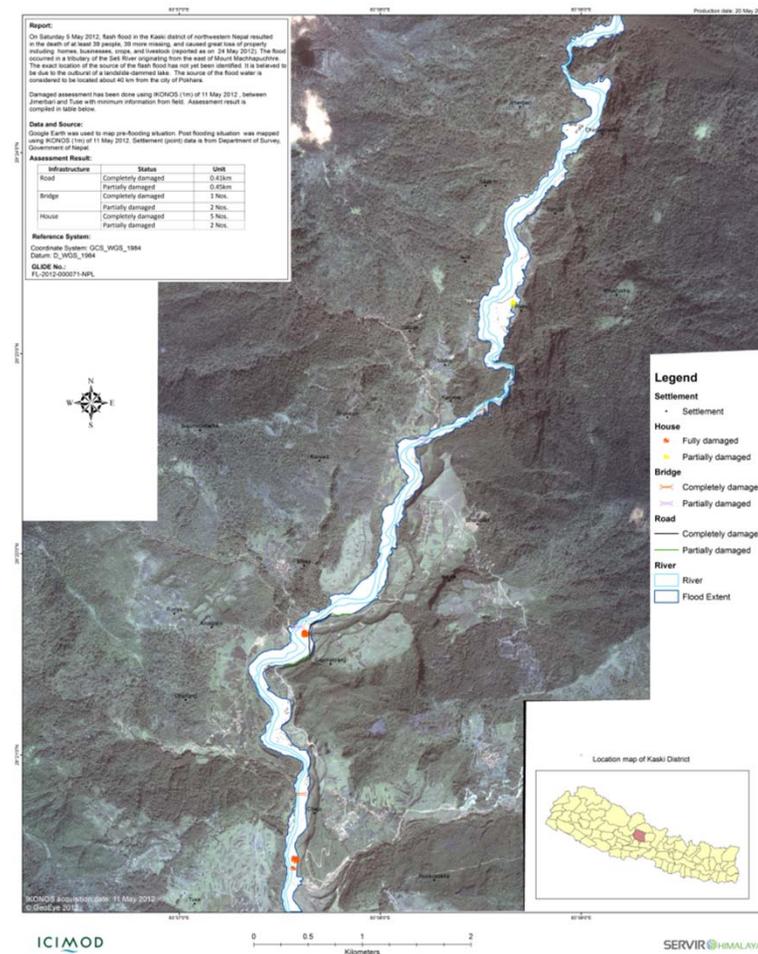
Rapid Response Mapping



Damage Assessment of Seti River Flash Flood of 5 May 2012
Between Kot Kaseri and Upallu Dip of Kaski District, Nepal



Damage Assessment of Seti River Flash Flood of 5 May 2012
Between Jimerbari and Tuse of Kaski District, Nepal

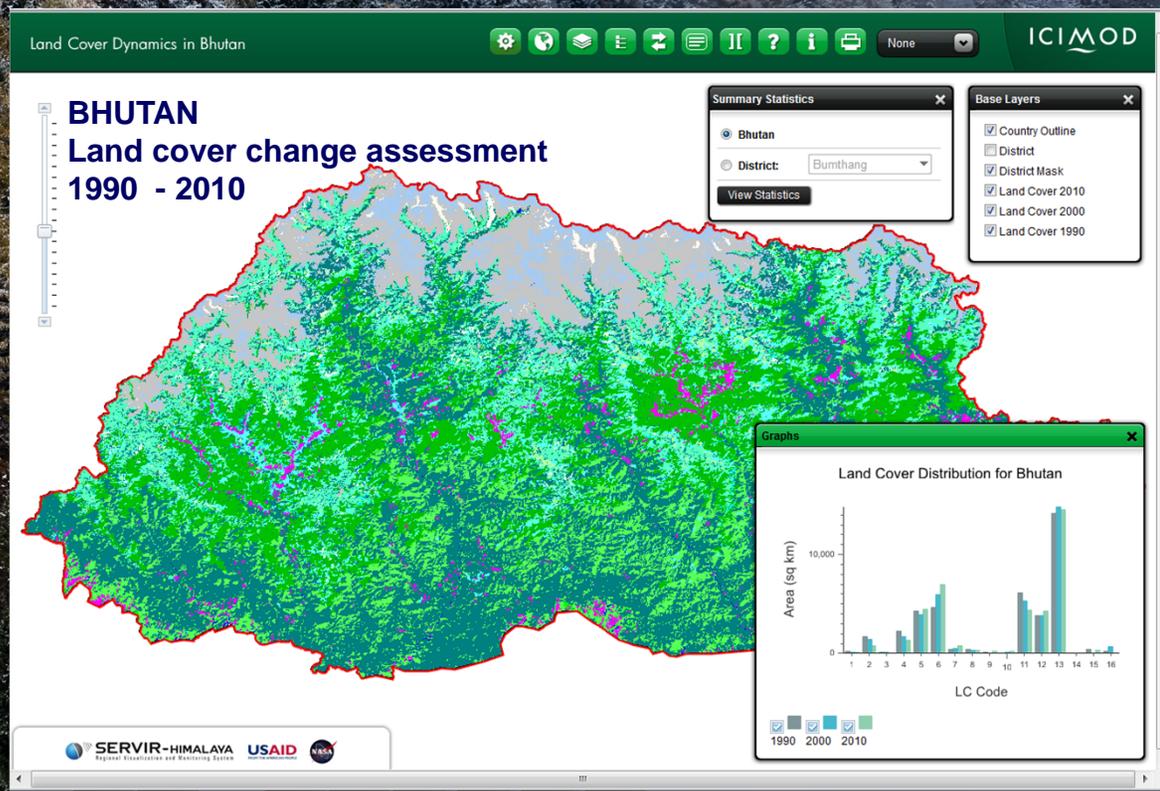


SERVIR Products, Tools and Services: Ecosystem & Biodiversity



Ecosystems Assessment,
Monitoring, & Modeling

Land cover change
assessment;
Support to national reporting
systems – GHG, Forest
carbon flux;
Carbon estimation for
community forestry – REED+;

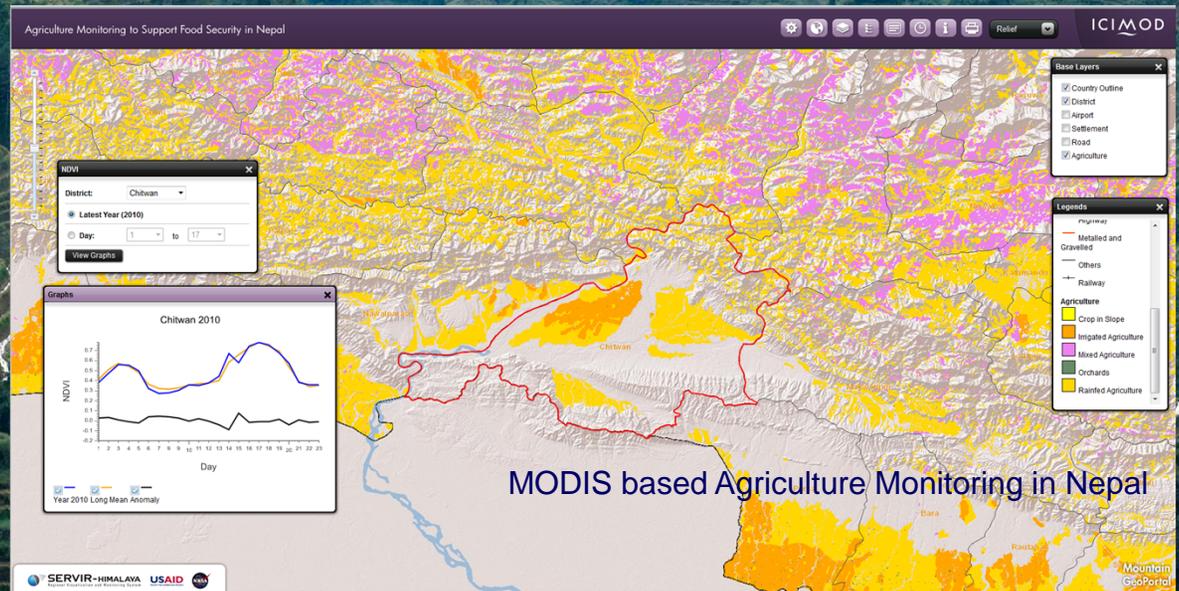


SERVIR Products, Tools and Services: Agriculture & Food Security



Agriculture
monitoring and
food production

National/sub national
crop planning and
management support
systems;
Food security scenario
planning;



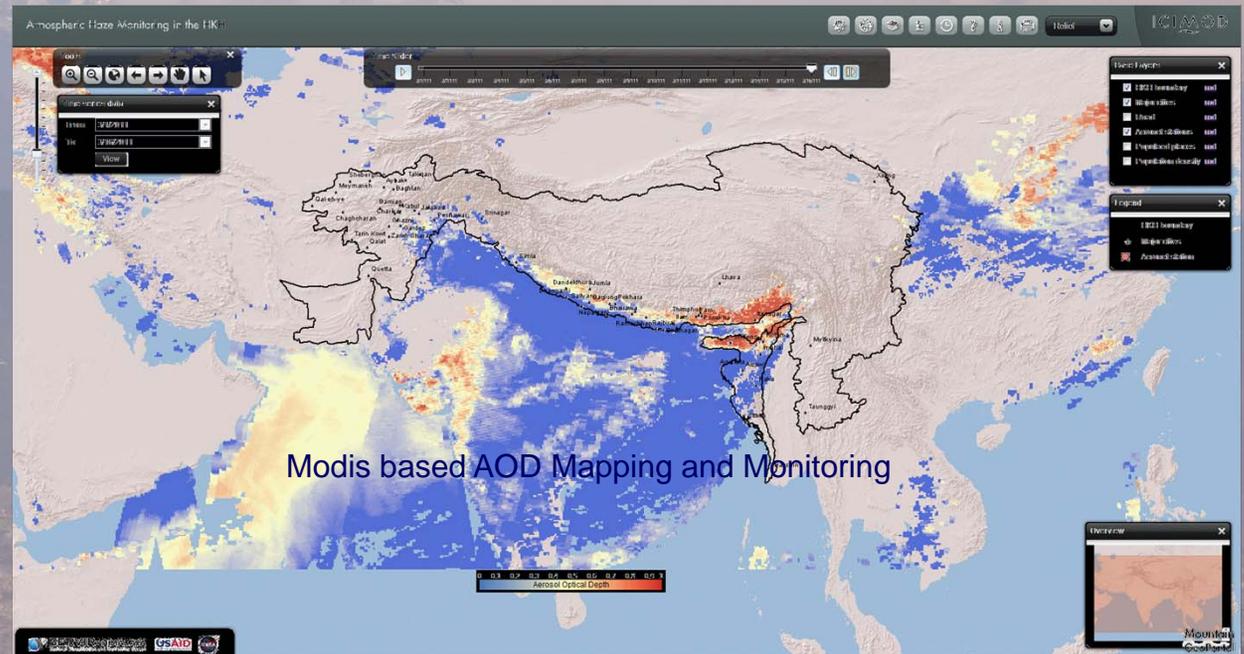
MODIS based Agriculture Monitoring in Nepal

SERVIR Products, Tools and Services: Air & Atmosphere



Air Quality
Assessment
Monitoring,
Modeling and
Simulation

RS based air quality
monitoring;
Transboundary
linkages and effects
of Black Carbon on
climate change



SERVIR-Himalaya Outreach



International Symposium

Connecting from Space to Village

Enabling Climate Policy and Actions in the Himalayas

SERVIR Side event during the Bhutan Climate Summit:
Prime Minister, Minister and other high level policy makers and delegations



Meso- America

SERVIR-Mesoamerica @ CATHALAC

CATHALAC

Science, Education, and Policy for the People



Water Center for the Humid Tropics of Latin America and the Caribbean Centro del Agua del Trópico Húmedo para América Latina y el Caribe

M ISSION

Promote sustainable development in Latin America and the Caribbean through applied research, education, and technology transfer

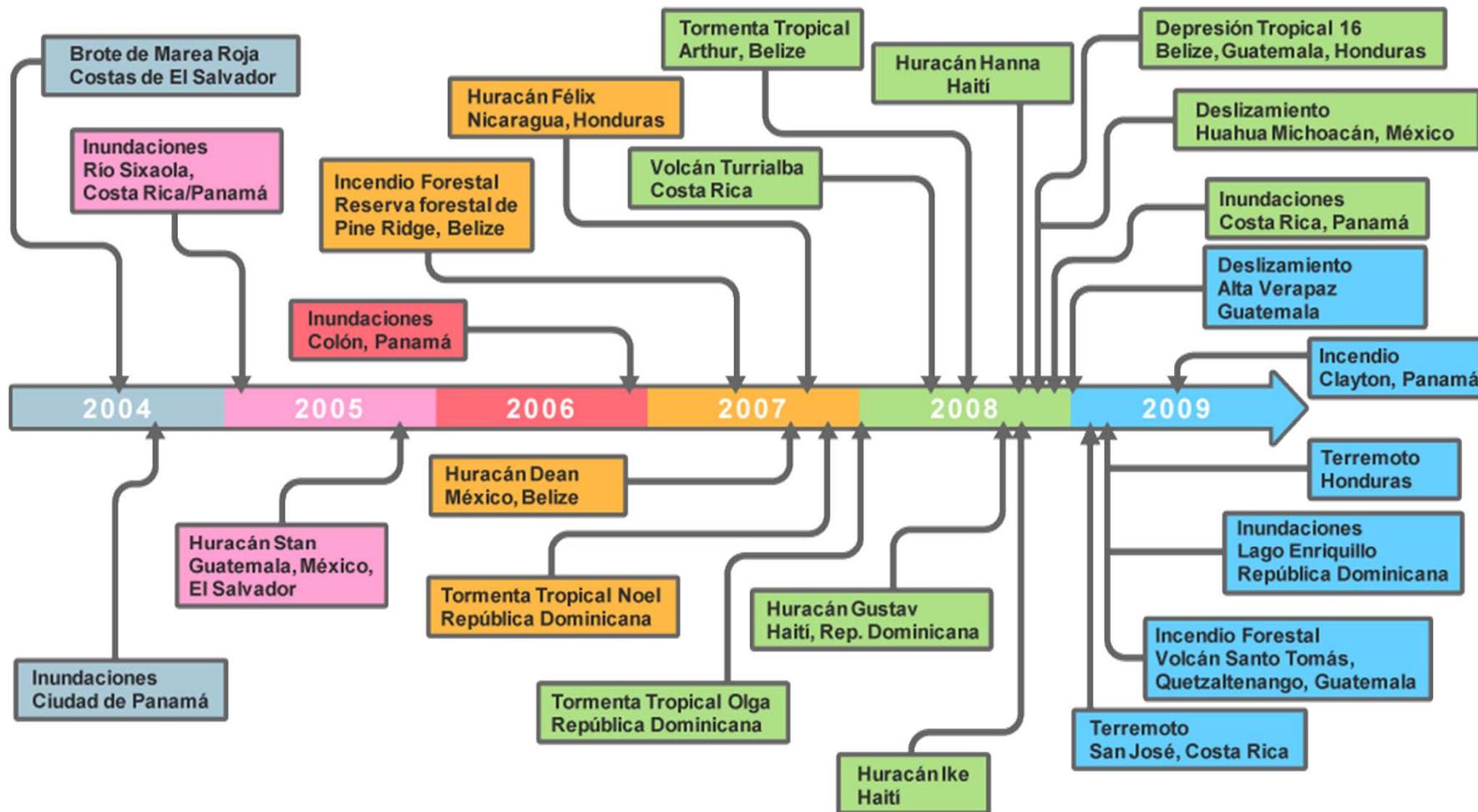


V ISION

A prosperous and sustainable environment in Latin America and the Caribbean

SERVIR 

Post Disaster Assessments

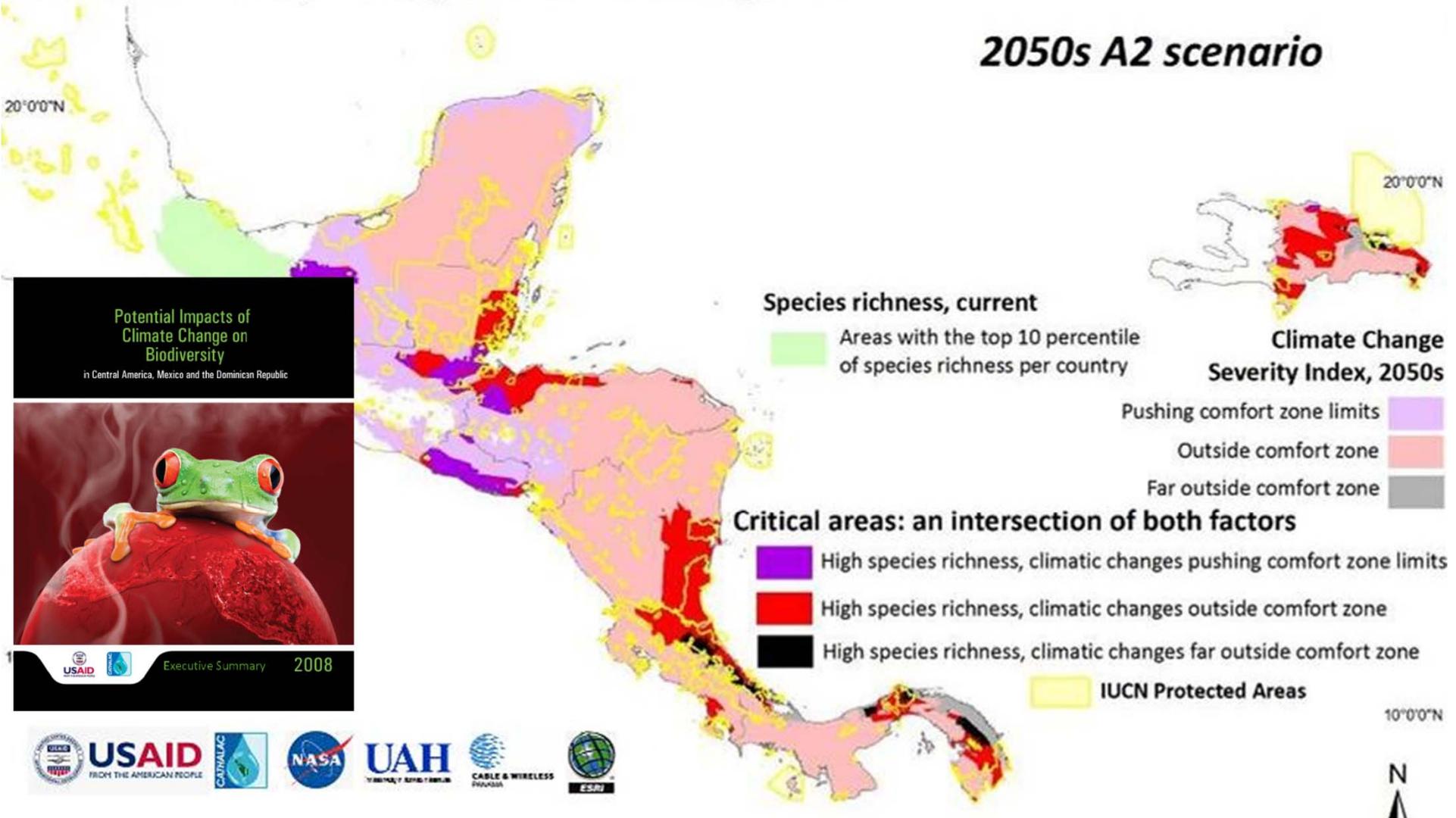


Climate Change and Biodiversity



Critical areas: high species richness and climate change severity in Central America, Mexico, and Dominican Republic

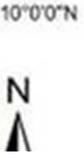
2050s A2 scenario



Potential Impacts of Climate Change on Biodiversity in Central America, Mexico and the Dominican Republic

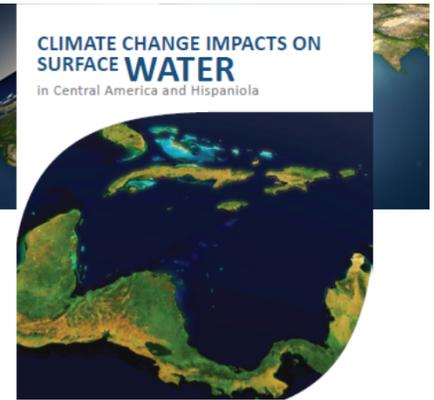


USAID Executive Summary 2008



SERVIR Mesoamerica: What We Do / Monitor

- **Atmosphere:** Monitoring and modeling air quality, the weather, modeling climate change scenarios
- **Land:** Monitoring (and scenarios) of land use change, fires, ecosystem productivity, extreme events, slow-onset changes
- **Ocean:** Monitoring ocean surface temperature, ocean water quality; modeling processes contributing to ocean water quality



FIRES IN CENTRAL AMERICA AND THE DOMINICAN REPUBLIC (2001-2010)
DATA FROM SATELLITE-BASED MONITORING



SERVIR
Sustainable Ecosystems & Resilient Economies



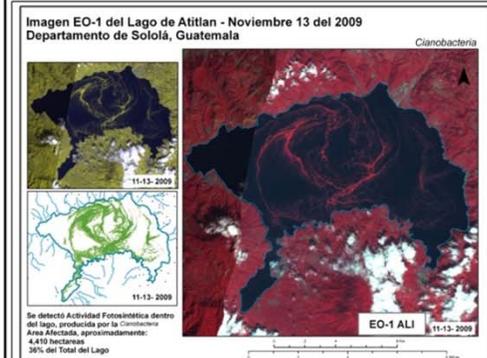
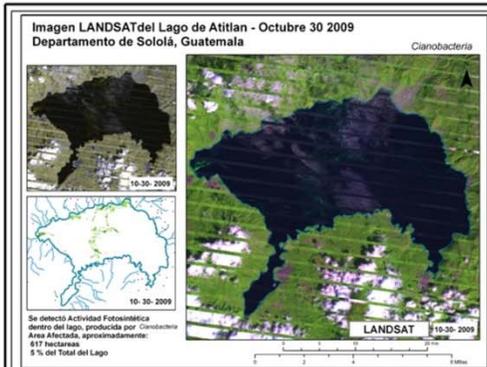
SEA SURFACE TEMPERATURE TRENDS IN THE CARIBBEAN SEA & THE EASTERN PACIFIC OCEAN



SERVIR
Sustainable Ecosystems & Resilient Economies



Monitoring Cyanobacteria Outbreaks in Guatemala



Lago de Atitlán, Departamento de Sololá, Guatemala Área Afectada por *Cianobacteria*



PRENSA LIBRE
UN PERIODISMO INDEPENDIENTE, HONRADO Y DIGNO

Guatemala, Viernes 20 de Noviembre de 2009

Gobierno titubea en reforma fiscal

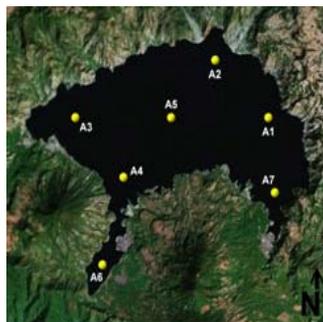
No existen condiciones políticas, habría afirmado el presidente Colom en reunión con diputados Pág. 3

APROBACIÓN DE PRESUPUESTO EMPEZÓ AYER
Plan de gastos 2010 pasó anoche en primera lectura, tras alcanzarse consenso Pág. 4

DIPUTADOS RECHAZAN PREBENDAS
Mayoría de congresistas está en desacuerdo con reparto millonario para obras Pág. 5

Autobuseros piden acción de la Policía
Ataques a pilotos y conductores han dejado 18 víctimas, y temen más violencia Pág. 12

CUBRIÓ EL LAGO EN DOS SEMANAS
Una imagen de satélite de la NASA permitió determinar que la cianobacteria cubrió más de cuatro mil hectáreas de la superficie en los primeros días de noviembre Pág. 2



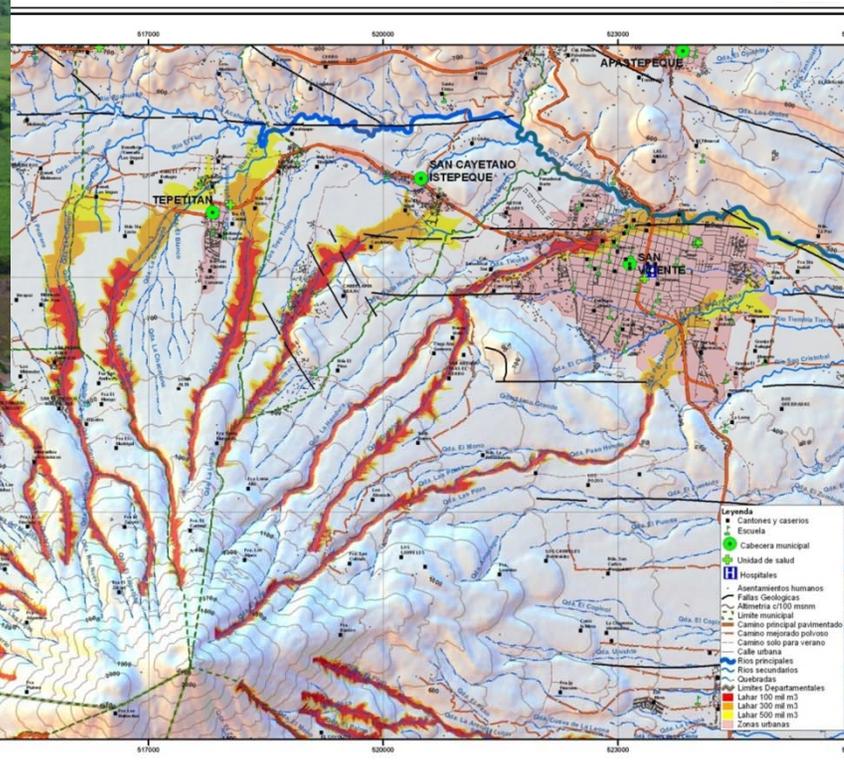
In situ Monitoring



Water Treatment



El Salvador Flooding and Debris Flow



E0-1
ASTER
IKONOS
FORMOSAT

November 2009

El Salvador Flooding and Debris Flow

SERVIR

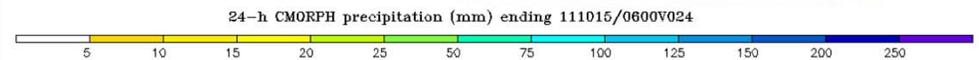
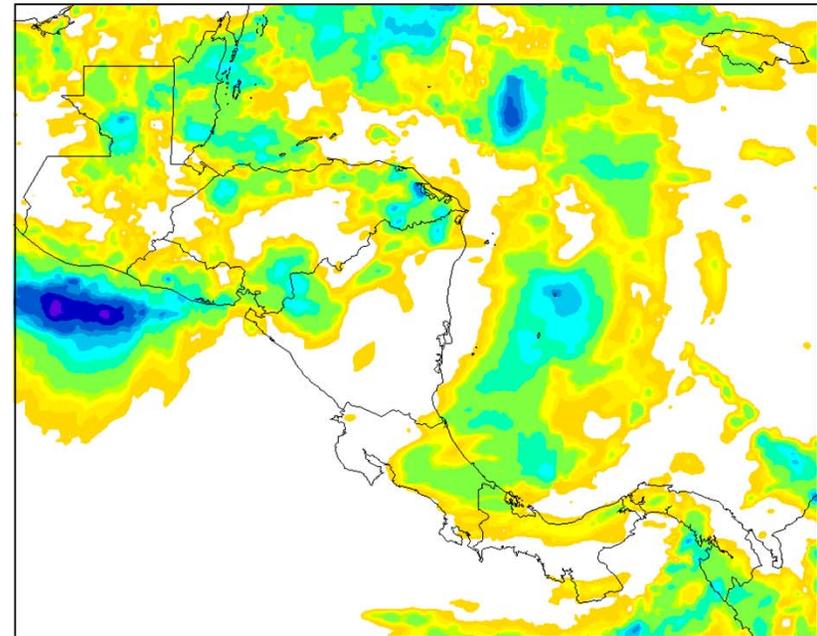
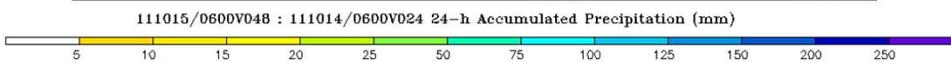
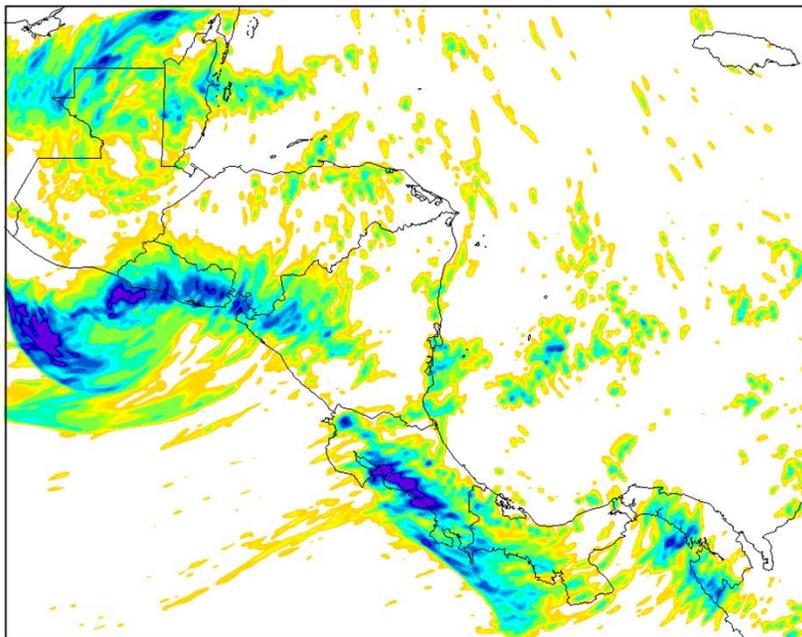


Improved Weather Forecasting for Extreme Events



**Heavy Rainfall: 13 Oct 2011 WRF run
24-h accumulated precipitation ending
0600 UTC 15 Oct**

24-48 hour forecast (below)

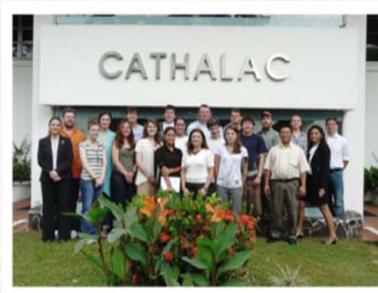


CMORPH satellite precipitation (above)

SERVIR Spin Off – Study Abroad Program



Study Abroad Program on CC and Sustainable Development in LAC



Program Components:

- ESS490 Seminar on Climate Change and Sustainable Development in Latin America
- ESS 499: UAHuntsville Undergraduate Research Capstone Supervised Research Projects relevant to regional/national climate change problems
- Field experience
- Spanish Workshop
- Excursions and field trips
- Six undergraduate credits

SERVIR Applied Sciences Team



Amy Huff



Allen Blackman



Pete Robertson



SERVIR Summit, October 2012



Faisal Hossain



James Verdin



Stephanie Granger



Pietro Ceccato



Dalia Kirschbaum



Jeffrey Kargel



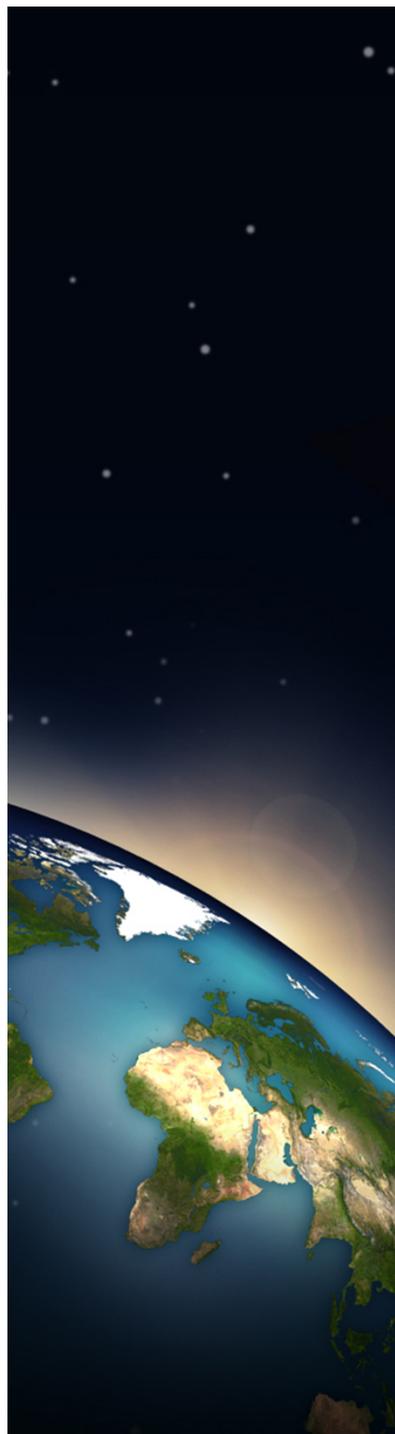
Aleix Serrat Capdevila



Juan Valdes



Nadine Laporte



SERVIR Applied Sciences Project Topics Spanning the Areas of Capacity Building



Air Quality Monitoring

WATER RESOURCES MAPPING

Health & Climate Forecasting

Carbon Emissions Reduction (REDD+)

Glacier & Alpine Hazards

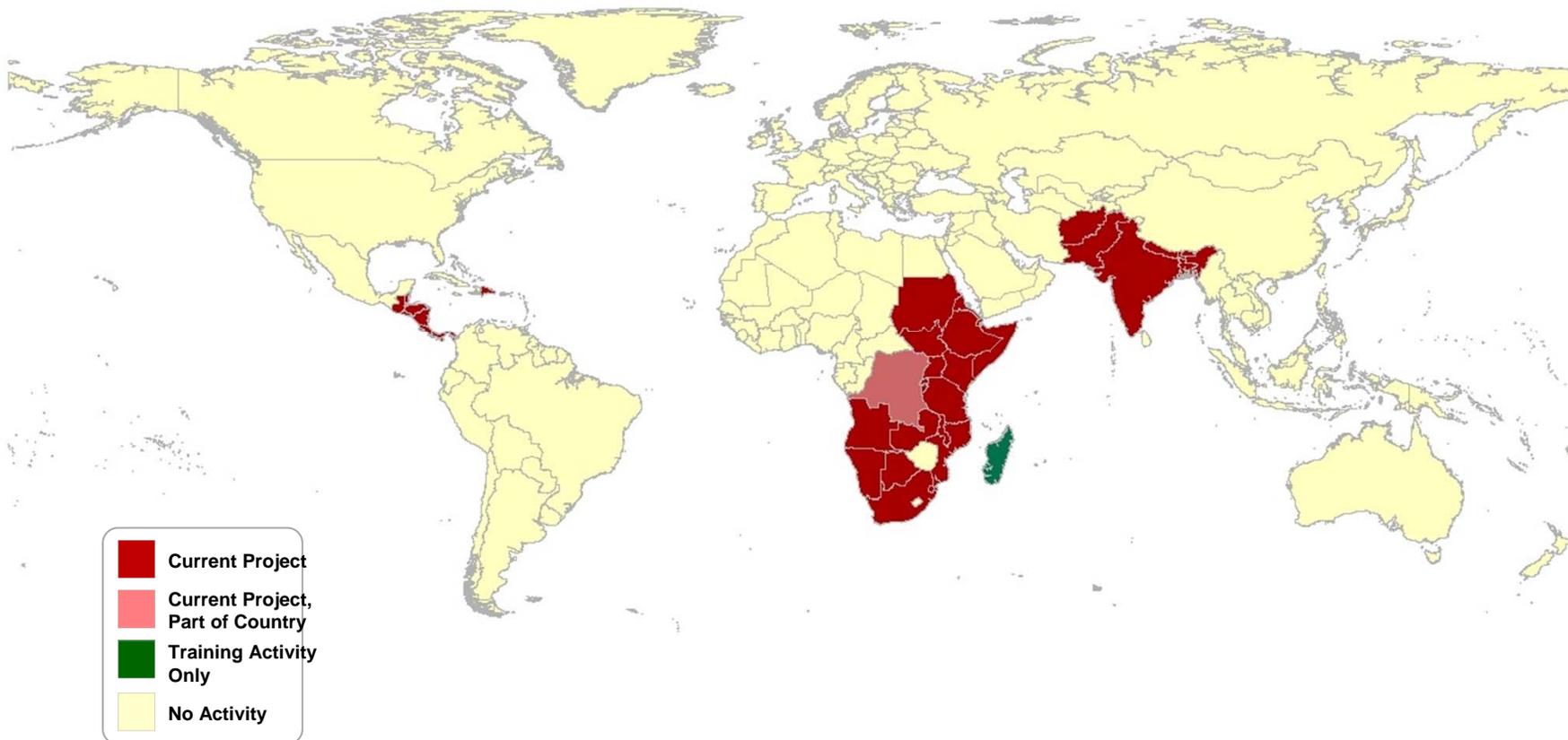
Landslide Forecasting

Drought Prediction

Agricultural Productivity

SERVIR Country Impact

SERVIR Applied Sciences Team



-  Current Project
-  Current Project, Part of Country
-  Training Activity Only
-  No Activity

Example Project - SERVIR Applied Sciences Team: Landslide Hazard Assessment and Forecasting System



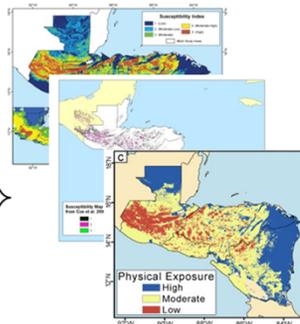
PI – Dalia Kirschbaum (NASA Goddard Space Flight Center)

- **Objective:** Develop a Mesoamerica landslide hazard forecasting system using satellite data to assess regional landslide hazards
 - Landslide hazard ‘alerts’ can be probabilistically generated using near real-time and forecasted quantitative precipitation estimates (QPEs)
 - Develop a flexible framework so that the landslide hazard forecasting system is transferable to other regions and can be run at varying spatial resolutions

Phase 1

Susceptibility and exposure mapping

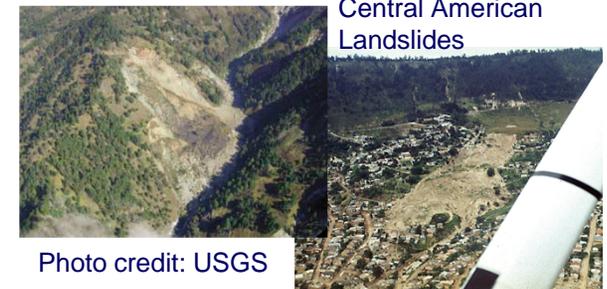
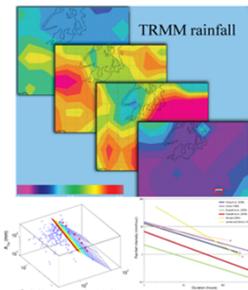
- Topography
- Land cover
- Soil type
- Lithology
- Landslide Inventories
- Socio-economic data
 - population
 - road networks



Phase 2

Calculation of Rainfall thresholds

- Satellite data
- Rainfall Gauge
- Antecedent Rainfall
- Modeled Soil moisture (LIS)
- Estimated soil moisture proxies



Central American Landslides

Photo credit: USGS

Use landslide inventories compiled at the global scale to validate model and improve performance

Phase 3

Product Development

- Near real-time system to identify landslide-prone regions
- Both static and dynamic products from Phases 1 & 2

Phase 4

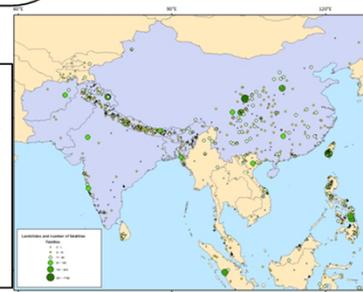
Regional Weather Forecasting analysis and uncertainty testing

- Retrospective Evaluation of LIS-WRF
- Probability analysis of near real-time system

Phase 5

Feasibility test for Himalaya node

- Data assimilation
- establish point of contacts (ICIMOD)



SERVIR Science Team: A Satellite-based Early Warning & Mapping Water Resources Visualization System for Low-lying Deltas

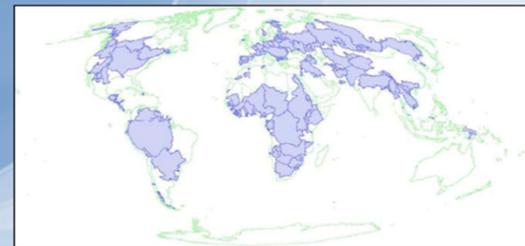


F. Hossain, Tenn Tech: Development of a hydrologic modeling system that can routinely predict, map and warn of water-related vulnerability issues, quantify hydrologic implications of climate change as well as provide rapid post-disaster assessment when needed.

TRANSBOUNDARY FLOOD MANAGEMENT

“Transboundary Flooding most catastrophic” (Bakker, 2010)

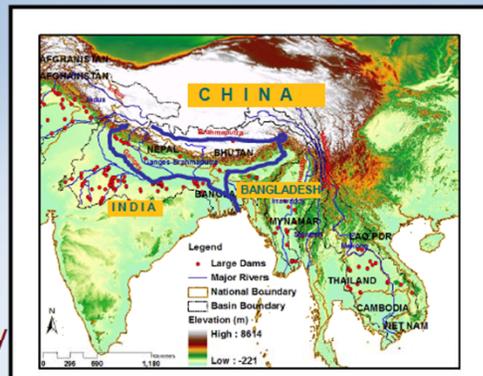
International River Basins (IRBs)



Source: Transboundary Freshwater Dispute Database, Oregon State (Credits: Aaron Wolf)

GANGES-BRAHMAPUTRA-MEGHNA BASINS

- 600 million inhabitants
- Downstream 200 million inhabitants
- Bangladesh comprises **only 7%** of total basin area.
- Lack of upstream rainfall/discharge *in real-time* limits range to **<3day**
- Complex dendritic rivers



Forecasting range using GPM/SWOT > 3

days can potentially improve:

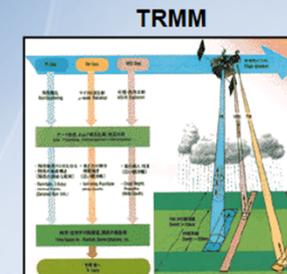
- 1) Disaster preparedness
- 2) Short-term agricultural planning.
- 3) Prevent loss of life/health epidemics

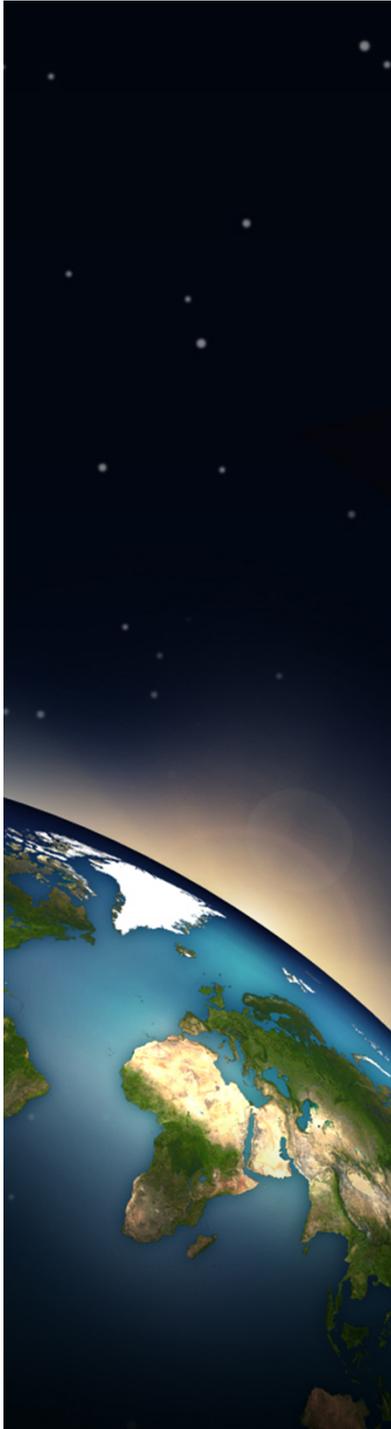
21 day forecast is IDEAL according to Asian Disaster Preparedness Center

WATER CYCLE REMOTE SENSING MISSIONS: CAN THEY BE THE ANSWER?



Expected launch 2014
3 hourly global rainfall products at 10X10 km scale





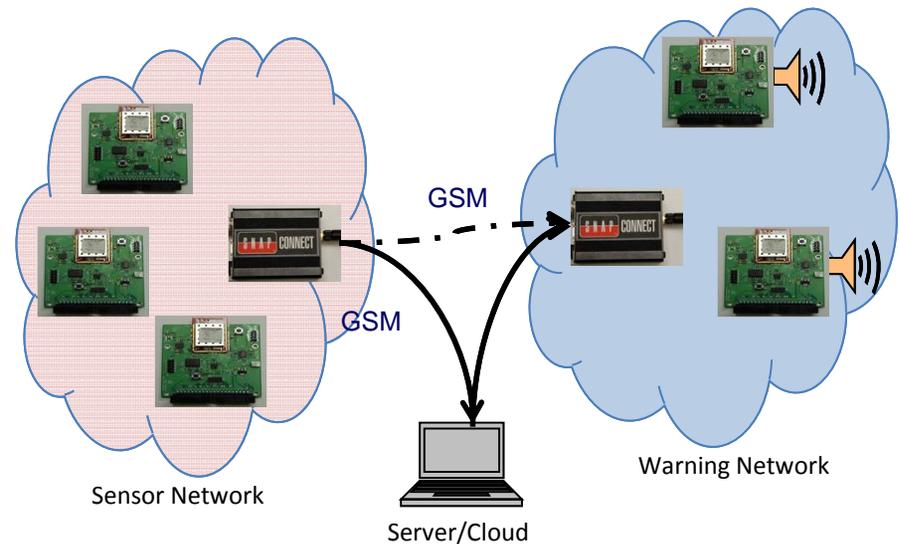
Innovative Technologies

- Wireless Sensor Networks
- International Space Station – ISERV

Wireless Sensor Networks for Environmental and Disaster Early Warning Systems

SERVIR

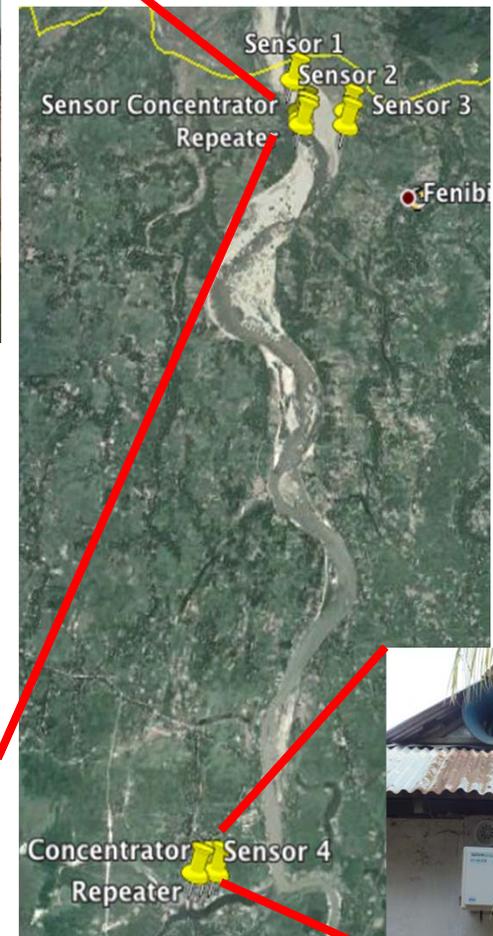
- Availability of good ground observations is vital in any disaster early warning system and for environmental variables – not always available in developing countries
- ‘Configurable’ Swiss Army knife for in-situ environmental observations – can be configured to measure *any* environmental parameter
- Designed as a **low-cost** system that can be deployed quickly, requiring minimal long-term maintenance
- Web-based interface to acquire and visualize **real-time environmental data** and **disseminate warnings** to the general public via SMS/email/sirens on the ground



Bangladesh Flash Flood Early Warning System Pilot



- Requested by the Center for Environmental and Geographical Information Systems (CEGIS), Bangladesh, and led by SERVIR-HKH, a Wireless Sensor Network (WSN) based flash flood early warning system was recently installed in Sunamganj, (north-eastern) Bangladesh
- System consists of 4 river level sensors along the length of the Jhalukhali river
- Warnings are sent out to the public via sirens that are part of the WSN system, along with SMS-based alerts sent to emergency managers
- CEGIS is working with the local community to take responsibility for and maintain the network



ISERV: The ISS / SERVIR Environmental Research and Visualization System



- Testbed SERVIR camera on the International Space Station
- Tasked by SERVIR Hubs
- 4m Spatial Resolution
- 14.5km x 10km field of view
- Visible Spectrum
- Operating since February 2013

February 18, 2013: The Rio San Pablo in Veraguas, Panama, as it empties into the Golfo de Montijo



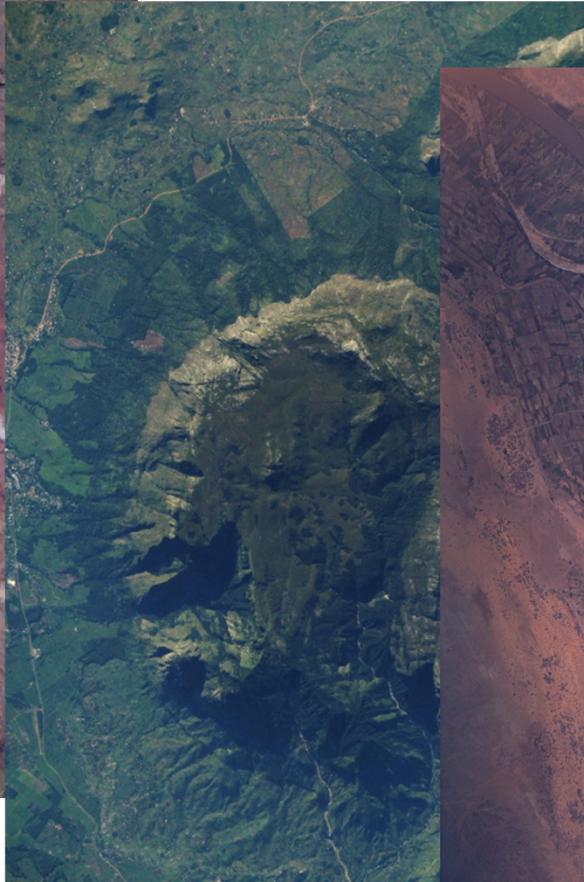
ISERV First Light

ISERV Imagery

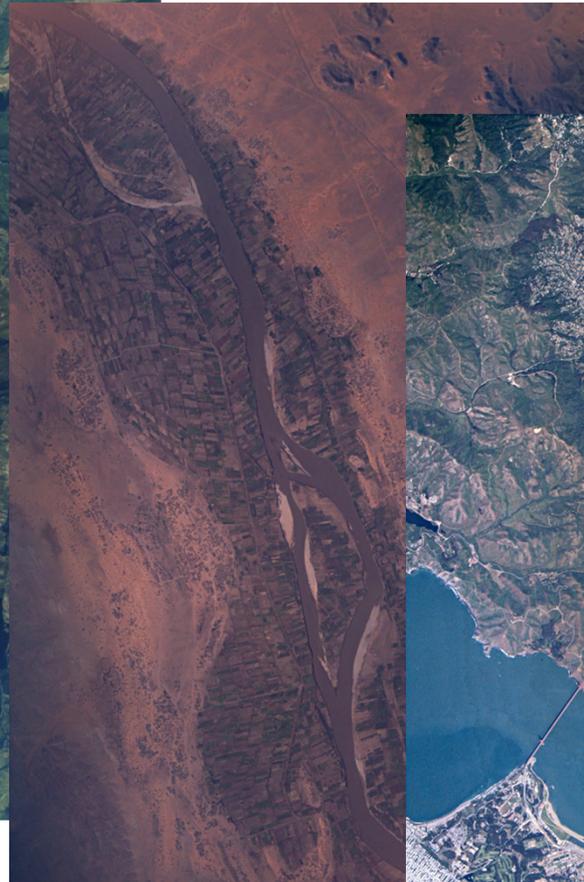
SERVIR 



Chile



Malawi



Sudan



San Francisco, USA

SERVIR Product Catalogue (DRAFT)



SERVIR Application

Agricultural Monitoring Based on Remote Sensing to Support Food Security

"Global climate changes have already stressed the Himalayan agro-ecosystem through temperatures, altered precipitation patterns and more frequent and extreme weather affected food and livelihood security in the region." (ICIMOD 2007, *Melting Himalayas: Rapid climate change on mountain ecosystems and livelihoods*, Technical Paper, 11-24)



Why did SERVIR develop this application? Concern in the Himalayas, especially because of uncertainties in weather patterns, the water change also puts additional pressure on agricultural population. Remote sensing is an effective way to determine whether current farming practices instead need to be modified. In addition, remote crop yields so that countries can take appropriate steps.

What does this application do? This SERVIR assessment tool that provides an early assessment of crop growth in Nepal.

How does it work? This application analyzes the relationships to historical remotely sensed data – specifically the 16-day (acquired every 16 days) Spectroradiometer (MODIS) Normalized Difference Vegetation Index (NDVI) data from 2001 to 2010. Comparing NDVI data from the current season to that historical data for crop growth for the current growing season.

In simple terms, the MODIS sensor monitors greenness to estimate how much photosynthesis is occurring. By comparing recent vegetation growth data to historical MODIS data of the same anomalies (departs from average). That is, current measurements are compared to historical yields for the current year in the eastern Hindu Kush-Himalaya region will be greater or less than the historical average.

The application includes a time-slider tool for viewing vegetation status for a selected time period. (Note: The methodology used in the application is based on Famine Early Warning Systems Network (FEWS NET) techniques originally developed for Africa.)

Where is this application used? Nepal, Pakistan

When will it be available? This application is available at <http://www.ecosport.icimod.org/ndvi>

Who are the developers? ICIMOD

Who uses it? Ministry of Agriculture in Nepal

What Earth observations and NASA products contributed to this application? MODIS NDVI, VIIRS (Future)

ICIMOD, SERVIR, USAID, NASA

SERVIR Application

Wireless Sensor Network Pilot Systems for Environmental Monitoring



Why did SERVIR develop this application? Wireless Sensor Networks (WSNs) are being used to increase monitoring and controlling a large number of sensors are capable of near-real-time power and low cost, making them ideal for monitoring for environmental conditions. WSNs are valuable tools for disaster preparedness and more – that observations. By using intelligently wireless interconnected networks, WSNs can acquire more efficiently and time, and at a lower cost compared to intensive field campaigns. WSN validation for satellite-based environmental monitoring.

What does this application do? This application consists of sensors (which were constructed from off-the-shelf components) that can be spread over a region of interest (square miles) to measure, depending on environmental conditions such as temperature, humidity, and soil moisture. Periodically, a central location receives data from the sensors.

How does it work? An array of sensors is deployed across a region of interest in a "mesh" topology network. This self-organizing network allows for data to be collected after deployment. Intelligent processing of data reduces the need for external power systems, enabling the network to maintain viability at the edge.

Children in the Sunanganj district of northern Bangladesh are curious about the SERVIR sensors installed as part of the pilot system.

The technology required to produce large-scale networks from these prototypes will be developed for deployment in Africa this year.

Where is this application used? SERVIR hub regions

When will it be available? Availability varies depending on specific use.

Who are the contributors/partners? SERVIR Coordination Office, SERVIR hubs

Who are the contributors/partners? CEGIS, KMD

Who uses it? CEGIS, KMD (future)

What Earth observations and NASA products contributed to this application? For future use, VIIRS land surface temperature data.

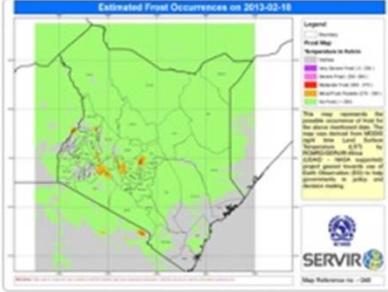
For more information contact: Karthik Srinivasan (karthik.srinivasan@nasa.gov)
<https://servirhub.net/Globe/Articles/tabid/06/ArticleID/117/servir-wireless-sensor-network.aspx>

ICIMOD, SERVIR, USAID, NASA

SERVIR Application

Frost Monitoring and Forecasting in Africa

"The frost maps are excellent tools. These will give us a much stronger basis to conduct our assessments and will boost development of frost insurance. With your aid, in forecast and/or real-time reports, we will be able to alleviate this problem and make our farmers smile." (James Rigaru, Accounts Manager and Agronomist at ACH Risk Solutions)



Why did SERVIR develop this application? Frost poses a significant threat for agricultural communities – rural farmers and commercial farmers alike. Frost hits the crop yield hard, and impacts the initial survivability of the plants. For example, in East Africa it causes millions of dollars in damage to crops such as tea and coffee. With advance warning, farmers can take preventive steps to protect their crops from frost's negative impacts.

In Kenya, the Ministry of Agriculture, through the Kenya Meteorological Department (KMD), has requested that SERVIR-Africa generate a capability within the Ministry to (1) identify frost-impacted areas by analyzing land surface temperatures from NASA satellite datasets and (2) identify areas where frost is likely to occur within Kenyan agricultural regions over the next 72 hours.

What does this application do? The Frost Monitoring and Forecasting application uses satellite datasets to provide assessment of frost-damaged areas in Africa. Next phases will include (1) integration of near real-time ground temperature observations from KMD to enable 72-hour forecast mapping of where frost is likely to occur, and (2) a Wireless Sensor Network pilot application to augment this mapping.

How does it work? Using night time land surface temperature datasets from NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) aboard the Terra (EOS AM) and Aqua (EOS PM) satellites, the Frost Monitoring and Forecasting application maps and displays areas impacted by frost. It also provides KMD with daily email updates containing the maps identifying locations of frost. The maps' color schemes make it readily apparent where problem areas exist. In an impending upgrade, KMD WRF numerical prediction model forecasts will be incorporated to help map areas of potential frost up to 3 days in advance.

Where is this application used? This application is being tested in Kenya, and there is significant interest in other African countries.

When will it be available? The application provides email updates to the end users as email links every day so they can see today's and previous datasets. It will soon be available through the Interactive Mapper in SERVIRGlobal.net.

Who are the contributors/partners? KMD

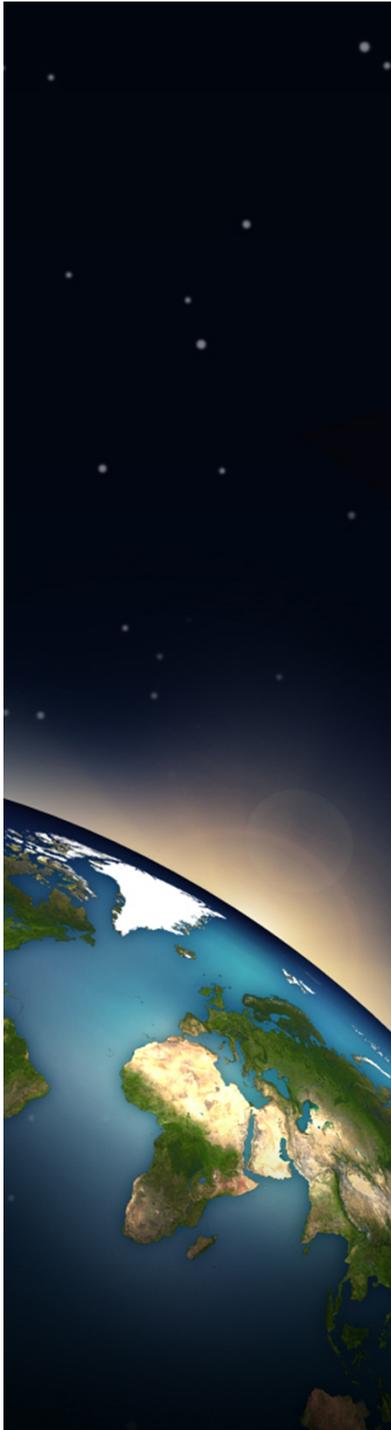
Who uses it? Kenya Ministry of Agriculture, Kenya Ministry of Water and Irrigation.

What Earth observations and NASA products contributed to this application? MODIS, VIIRS (Future)

For more information:
41.206.34.124/frostmaps/

Last updated: June 2013

ICIMOD, SERVIR, USAID, NASA



Training and Capacity Building

- SERVIR End Users
- My Community Our Earth (MyCOE)/SERVIR Initiative
- NASA DEVELOP @ ICIMOD
- International Space Apps Challenge

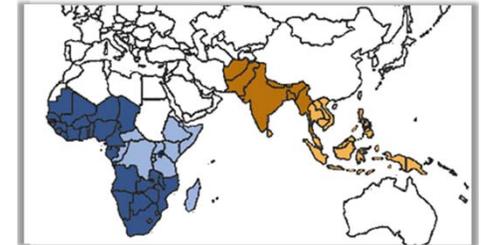
Capacity Building: SERVIR End Users



MyCOE-SERVIR Initiative

SERVIR

- Students & mentors competitively selected; both receive modest stipends to conduct 6-month long projects
- Building capacity to protect biodiversity using geospatial technologies.
- Strengthening collaboration amongst universities, government environmental authorities, and NGOs.
- Recently kicked off **five rounds** of Initiative Activity in Africa and Asia, with SERVIR Hubs to organize teams of students with mentors, totaling 150 participants worldwide



MY Community, Our Earth



NASA DEVELOP @ ICIMOD

SERVIR

Interdisciplinary Student Research Team on Protected Areas in Bangladesh
Visualize and analyze issues as forest cover degradation, urban expansion and fragmentation

- Make use of SERVIR land cover application
- Use of Landsat, VIIRS, MODIS and possibly ISERV imagery
- Team with interns from Bangladesh (2), Nepal (2) and US (1), center lead from MSFC and coordination with DEVELOP office Langley
- Effort to take DEVELOP to other countries in the region



International Space Apps Challenge “Hackathon”

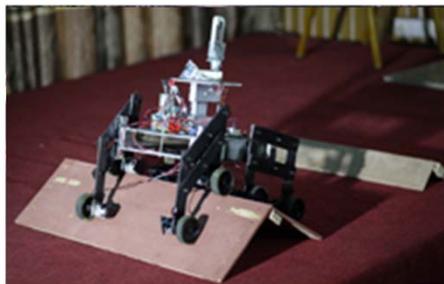


Young minds come up with solutions to address global challenges

22 Apr 2013

International Centre for Integrated Mountain Development and YoungInnovations host NASA International Space Apps Challenge: Kathmandu Hackathon

Over the weekend, 60 young, innovative software developers, engineers, designers, and technologists from Kathmandu came together at the **NASA International Space Apps Challenge: Kathmandu Hackathon** to develop solutions to pressing global problems. The winning team, Mars Odyssey, consisting of Binayak Dhakal, Roshan Bhatta, and Sakar Pudasaini, developed an easy-to-use tool to teach children programmatic thinking without the need for technical programming knowledge.



The 48-hour event – organized 20–21 April by **YoungInnovations** and the International Centre for Integrated Mountain Development (ICIMOD) within the framework of the **SERVIR-Himalaya** Initiative supported by **USAID** and **NASA** – embraced collaborative problem solving with a goal of producing open-source solutions to global challenges.

Sixty participants, including 16 women, divided themselves into 17 teams, with some calling upon virtual participation and input from others around the globe. Using earth observation resources and geo-ICT tools, teams worked on challenges that included mapping emergency service providers in Kathmandu through an online interface, creating a mobile application that brings information about space and the universe to your fingertips, and developing a means for common people to remotely control and conduct research on ArduSat, an open-source nanosatellite, from a personal computer.



The Future...

SERVIR

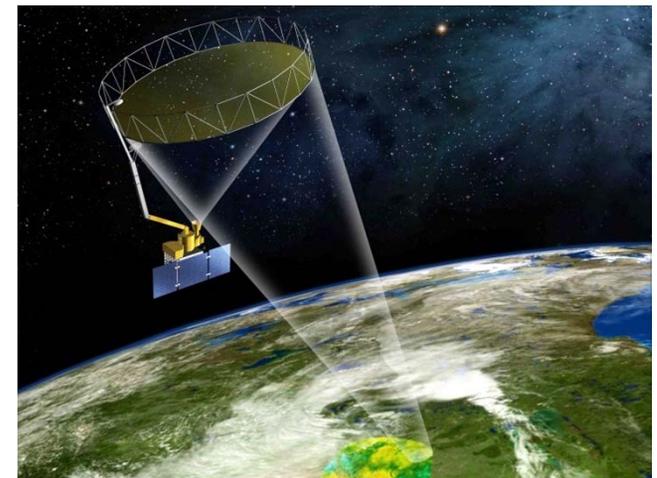


The Global Precipitation Measurement (GPM) Mission

- International satellite to provide the next-generation global observations of rain and snow
- Planned Launch for 2014

The Soil Moisture Active Passive (SMAP) Mission

- Global observations of mapped soil moisture and freeze/thaw data with unprecedented accuracy, resolution, and coverage
- Planned Launch for 2015



SERVIR Expansion





SERVIRGlobal.net

SERVIR

SERVIR GLOBAL

The Regional Visualization and Monitoring System

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Resource Inventory and Assessment of Phobjikha Wetland Ecosystem

The application provides important information and a basis for management zoning of the valley for conservation efforts. It has been

[Read More](#)



Scenario-based Climate Change Impact on Water Availability and Hydrologic Flows in the Wangchu Basin of Bhutan

Water security is a major concern related to climate change. This SERVIR application uses a distributed hydrological model called CREST

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SERVIR-East Africa Visit by US Asst. Sec. of State Dr. Kerri-Ann Jones

On Feb 20, 2012, Dr. Kerri-Ann Jones, Assistant Secretary of State, visited the SERVIR-East Africa hub at RCMRD.

[Read More](#)



SERVIR to conduct remote sensing training at Mexico's University of Veracruz in support of public health project

SERVIR research associates Africa Flores and Eric Anderson will be training public health officials as well as university students and

[Read More](#)

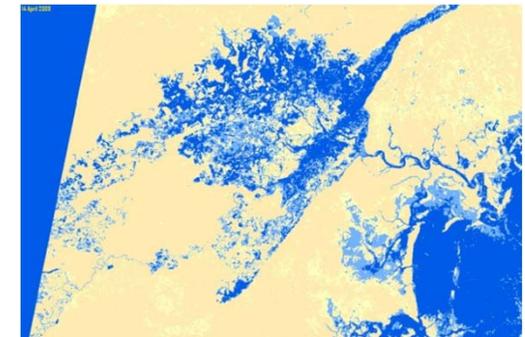
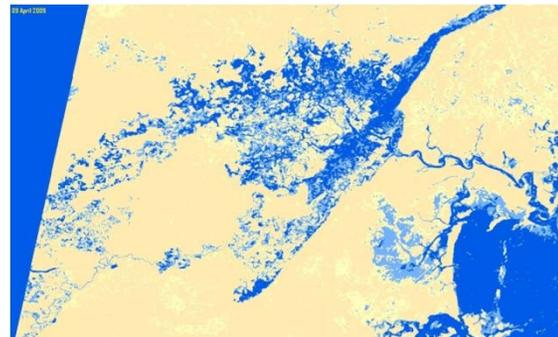
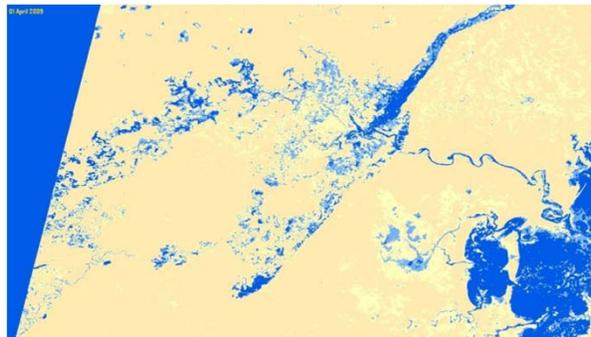
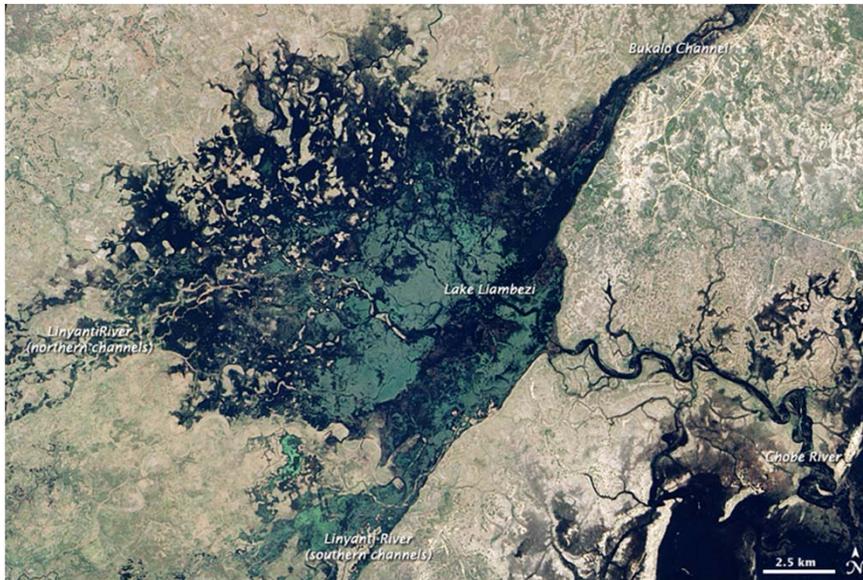
Backup



SERVIR 

Mapping Floods in Africa

Lake Liambezi Area



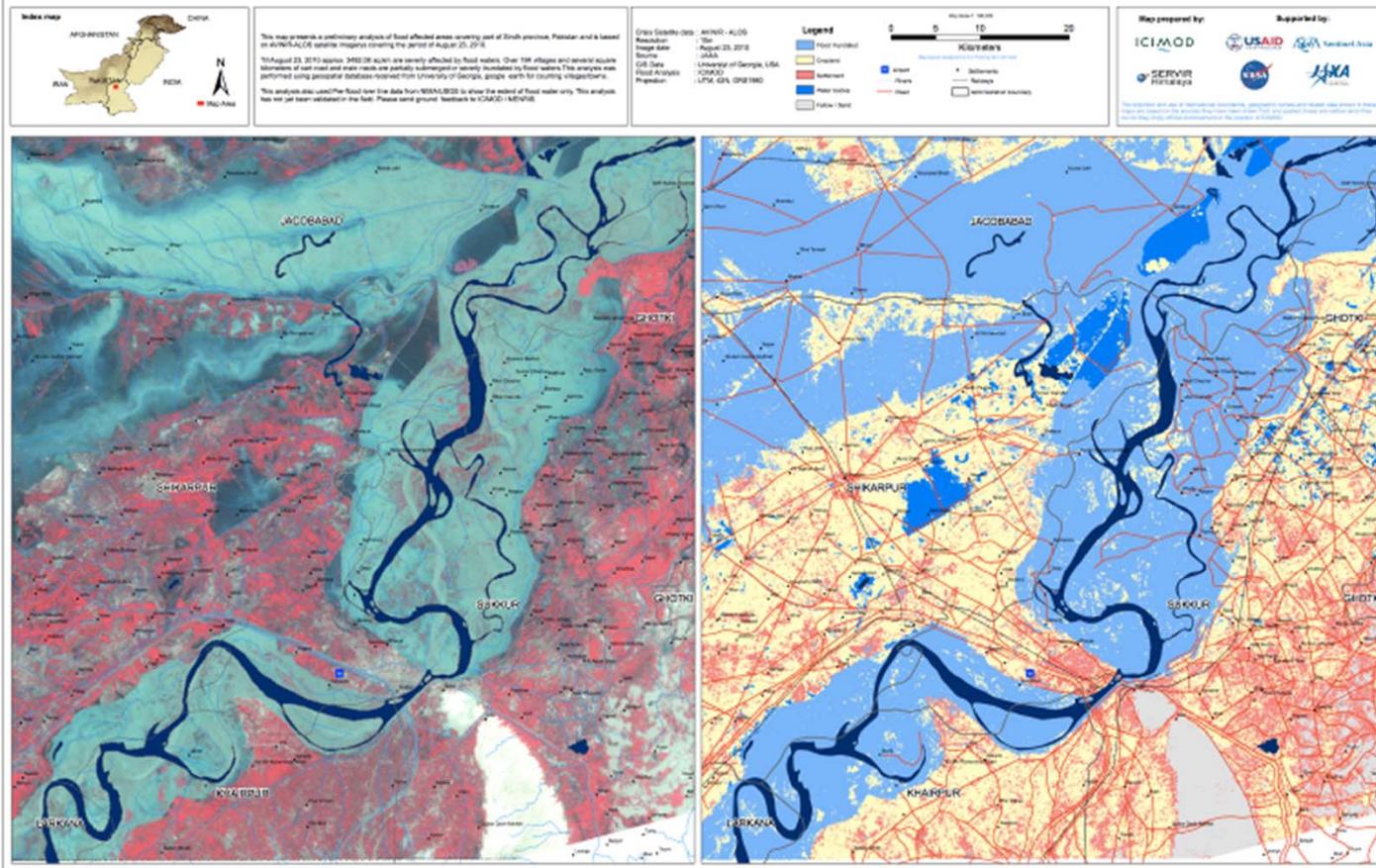
LAKE LIAMBEZI AREA – NASA EO1 BAND 6 SCENES FOR 01, 09 and 14 APRIL 2009
(false colours based on preliminary classification without ground verification)

Flooding in Pakistan



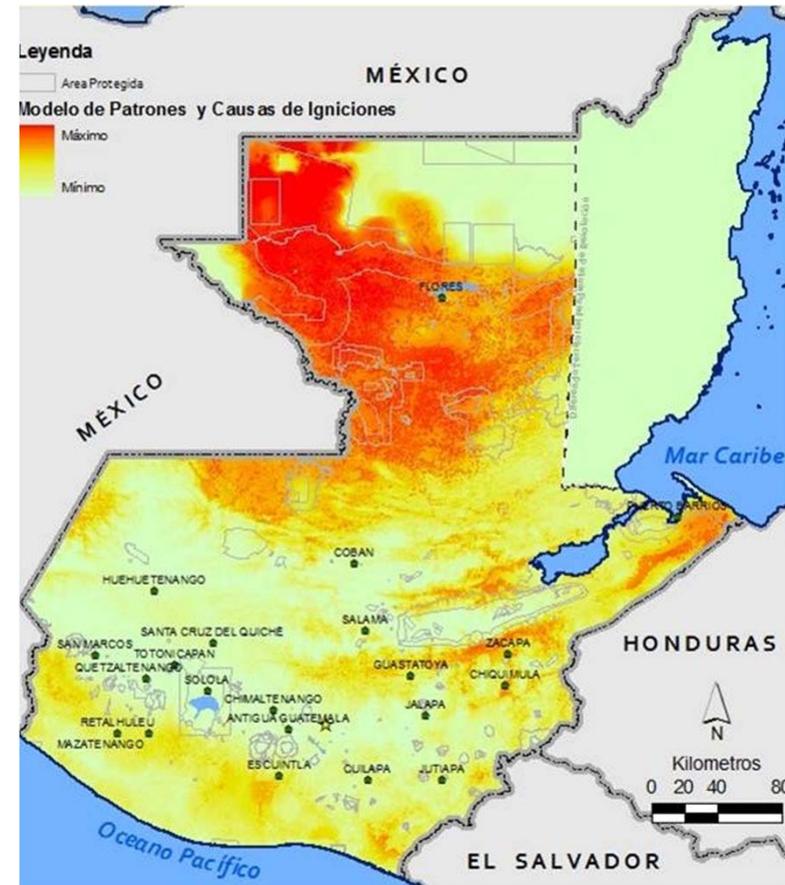
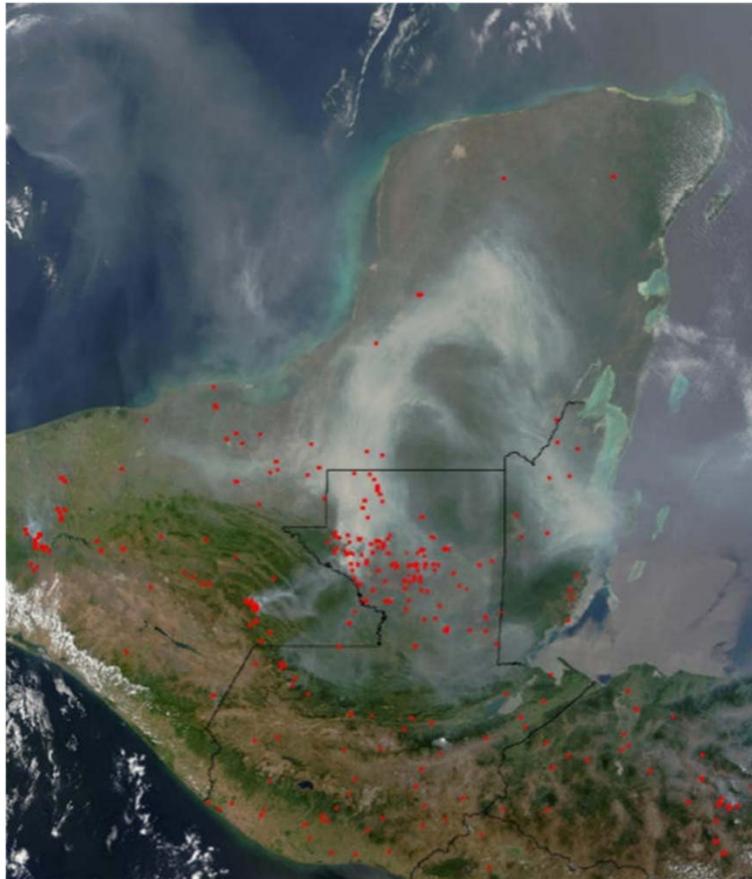
Analysis on Flood Affected Areas along the Indus River, Parts of Sindh Province, Pakistan

24 August 2018
 FLOOD-INDUS-PAK
 Version 1.0



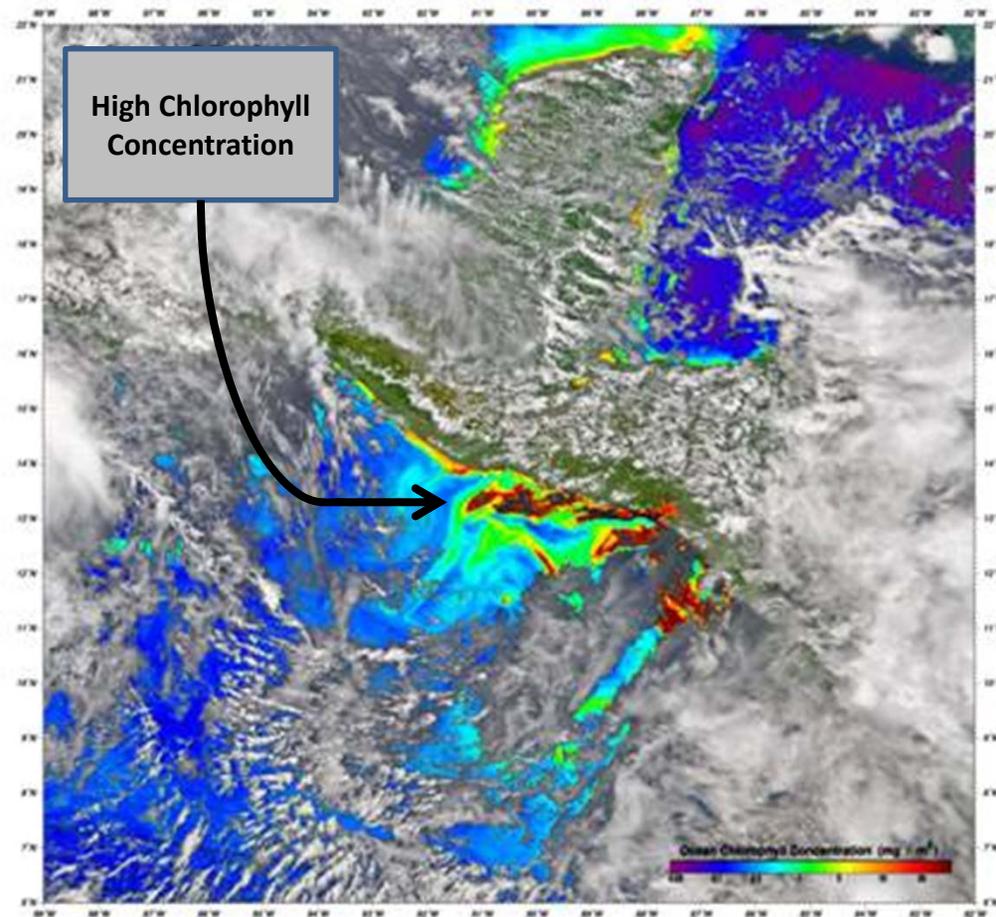
Fire Monitoring and Forecasting

SERVIR



Algal Blooms

Monitoring of Harmful Algal Blooms (HAB) using remotely sensed data products for the coast of El Salvador



Space to Village

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

USAID: renewed focus on integrating science, technology, & innovation into development to solve today's most pressing development challenges around the globe.

NASA Sub-Goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.

