

SERVIR: Changing Responses to a Changing Climate

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Since 2005, the United States Agency for International Development (USAID) and the National Aeronautics and Space Administration (NASA) have been providing a collaborative, Internet-based platform for developing nations to access satellite data to respond to environmental challenges. This capacity-building programme now reaches three parts of the world: Mesoamerica, East Africa, and the Hindu Kush-Himalayan (HKH) region. The programme helps countries monitor and respond to the pressing environmental challenges of their region. Regional centres or 'hubs' in Mesoamerica, East Africa, and the HKH are staffed by the host countries, where they integrate and act on real-time or near-real-time information provided by SERVIR.

USAID/NASA cooperation

USAID and NASA recently agreed to expand their joint efforts to overcome international development challenges like climate change. On 25 April 2011, NASA Administrator Charles Bolden and USAID Administrator Rajiv Shah signed a five-year memorandum of understanding at NASA Headquarters. The agreement formalises ongoing agency collaborations that use Earth science data to address developmental challenges and for assistance in disaster mitigation and humanitarian responses. The agreement also encourages NASA and USAID to apply geospatial technologies to solve development challenges affecting the United States and developing countries.

USAID is the lead federal development agency implementing United States development efforts through field-based programmes and projects around the world. NASA has broad experience with Earth science research and the development of Earth science information products and technology applications.

"Through our partnership with NASA, we can apply the latest, cutting-edge technology to deliver meaningful results for people in developing countries in areas like health, food security and water", Shah said. "It is a prime example of our efforts to use the power of science and technology to tackle today's pressing development challenges."

Since 2003, USAID and NASA have worked together to build and expand the SERVIR programme. The programme allows people in developing regions to use Earth observations to address challenges in agriculture, biodiversity conservation, climate change, disaster response, weather forecasting, energy, and health.

SERVIR and climate change monitoring

While providing useful information to respond to immediate needs like hurricanes and landslides, SERVIR also helps host nations respond to long-term problems like climate change. There are already many global climate model outputs; however, the SERVIR platform focuses on regional issues, thereby providing a useful environment for translating such climate projections into potential impacts in sectors such as biodiversity, ecosystems, and water.

USAID-NASA cooperation agreement



Mesoamerica

Much of Mesoamerica consists of tropical or subtropical rainforest with a high level of biodiversity; in an area comprising less than 1 per cent of the Earth’s landmass, nearly 8 per cent of the world’s terrestrial species can be found. However, this rich biodiversity is very sensitive to climate change.

In 2005, through SERVIR, NASA and the Oak Ridge National Laboratory (under USAID funding) produced the first downscaled climate change data for Central America, providing a much more detailed look at potential local anomalies. In 2008, as part of a USAID Global Development Alliance project, SERVIR’s partner in the region, the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC) obtained species distribution maps from NatureServe (www.natureserve.org/infonatura) and high-resolution climate data from WorldClim (www.worldclim.org) to identify species-rich areas projected to experience severe climate change. The overall objective is to assess the potential impacts of climate change on the biodiversity of Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama, specifically highlighting critical areas for conservation.

East Africa

East Africa faces several challenges that could be exacerbated by climate change, especially rainfall and flooding. In the Nzoia watershed in the Lake Victoria Basin (Figure 1), SERVIR-East Africa is working with researchers at NASA’s Marshall and Goddard Space Flight Centers and the University of Oklahoma to implement and evaluate a higher resolution (approximately 1 km) distributed hydrologic model, the Coupled Routing and Excess STorage (CREST) water balance model. In Lake Victoria Basin, the CREST model uses real-time rainfall data from the Tropical Rainfall Measuring Mission (TRMM) as a boundary condition to map stream flow, evapotranspiration, and soil moisture. For flood forecasting, SERVIR-East Africa is incorporating atmospheric model-based rain forecasts into the CREST model in place of observed TRMM rainfall. Thanks to inputs provided by the Kenyan Meteorological Department (KMD), since late 2010 the CREST model has expanded from a single river basin near Lake Victoria to watersheds in five countries around the lake: Burundi, Kenya, Rwanda, Tanzania, and Uganda. The forecast models provided by KMD, based on the historical experience of local weather forecasters, are more detailed than larger-scale models developed via satellite. These rain forecasts will give decision makers,



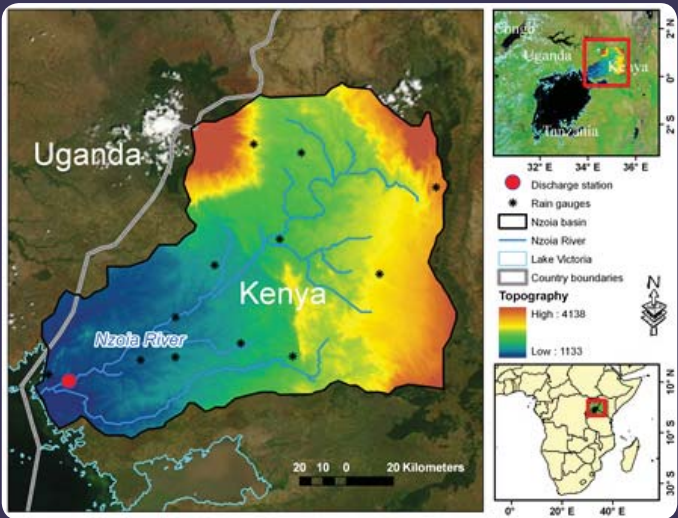
SERVIR-Himalaya regional inception workshop

including the Kenya Ministry of Water Resources, a longer lead time for flood forecasts, allowing more time for preparation and reaction.

Hindu Kush-Himalayas

Following a request from ICIMOD to consider establishing a SERVIR system in the HKH region, USAID and NASA travelled to ICIMOD’s headquarters in Kathmandu, Nepal in August 2009. Upon assessing the potential for SERVIR at ICIMOD, the three organisations determined to move forward on plans to establish SERVIR-Himalaya, the third regional SERVIR operational facility, in 2010. SERVIR-Himalaya was inaugurated at ICIMOD in October 2010 in the presence of high-level delegates from ICIMOD’s regional member countries and international participants. “Natural and human induced changes in the world have to be measured using all available knowledge resources and

Figure 1: Mapping topography with a Digital Elevation Model (based on Shuttle Radar Topography Mission data) allows SERVIR scientists to model how water and potential floods move through the Nzoia watershed in the Lake Victoria Basin in East Africa



SERVIR aims to provide satellite based information in combination with in-situ observations to enable science based decision-making”, said Charles Bolden in his keynote speech during the inauguration of SERVIR-Himalaya.

Areas of focus for SERVIR-Himalaya are on developing decision support tools for monitoring snow and glacier melt, georeferencing biodiversity information, improving search and download capability for geospatial data sets covering the Himalayan region, validating national scale land-cover products, disaster response (see Figure 2), and much more.

One specific objective of the ICIMOD/SERVIR hub is to build the capacity of stakeholders in the HKH region to use SERVIR-Himalaya data and decision-support tools for issues related to climate change, ecosystems monitoring, disaster risk assessment, water management, agriculture and food security, transboundary air pollution, and other relevant environmental issues.

One important issue related to climate change is snow melt and glacier retreat: as the climate gets warmer, snow and glaciers atop the Himalayas melt and shrink, reducing the amount of water flowing into the major watersheds of the HKH region, which includes the regions ten major river basins which sustain more than a billion

people downstream. The more data are gathered about the state of Himalayan snow and glaciers on a continuous basis, the better nations fed by these important rivers can manage their water resources. SERVIR and ICIMOD are important partners in long-term environmental policies because they can share the data necessary for ICIMOD’s regional member countries to determine the correctness and effectiveness of their policies.

Future of SERVIR

USAID and NASA plan to expand the SERVIR network in the coming years, eventually extending to eight to ten different hubs around the world. Additionally, in the near future, SERVIR will employ an imaging system on the International Space Station, as well as ground-based sensors to capture near real or real-time image data of environmental problems. This broader array of sensors will provide more data in more places for better responses to environmental challenges.

An important side benefit of expanding the SERVIR network is the increased opportunity for international cooperation on issues that benefit society, from environmental management to responding to climate change. This is perhaps the most important effect of bringing space technologies ‘down to Earth’.

Figure 2: Rapid response mapping during Pakistan floods, 2010

