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# SERVIR: Bringing Space to Village

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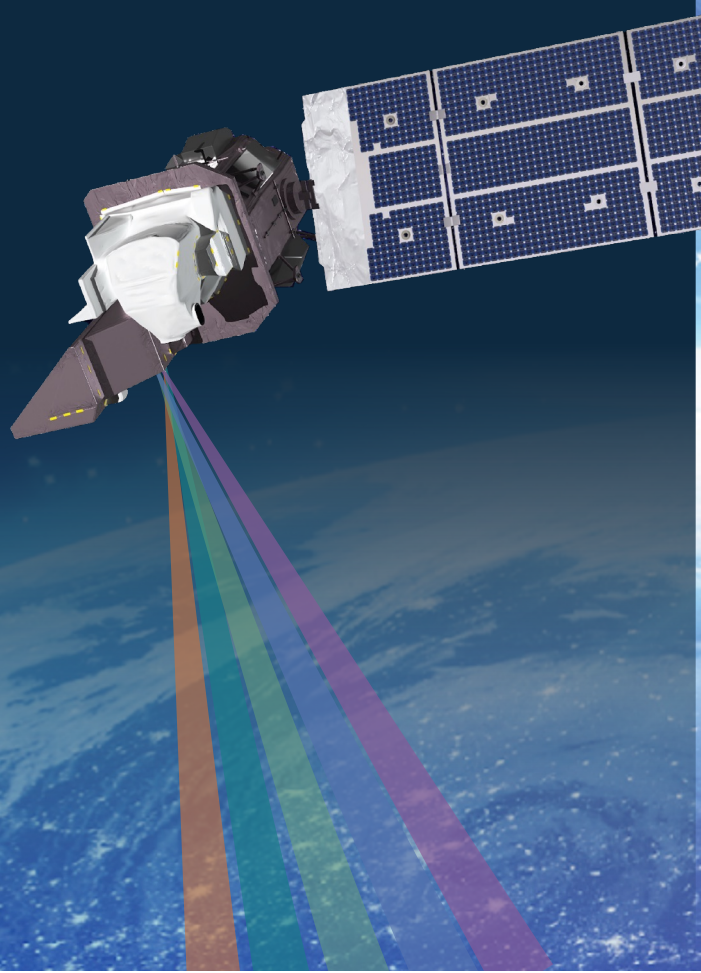
# Background & Overview

# CONNECTING
# **SPACE** TO **VILLAGE**



**SERVIR** is a joint initiative of NASA, USAID, and leading geospatial organizations in Asia, Africa, and Latin America that partners with countries and organizations to address challenges in climate change, food security, water and related disasters, land use, and air quality.

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# CONNECTING
# **SPACE** TO **VILLAGE**

Agriculture & Food Security

Water Security

Ecosystem & Carbon Management

Weather & Climate Resilience

Air Quality & Health

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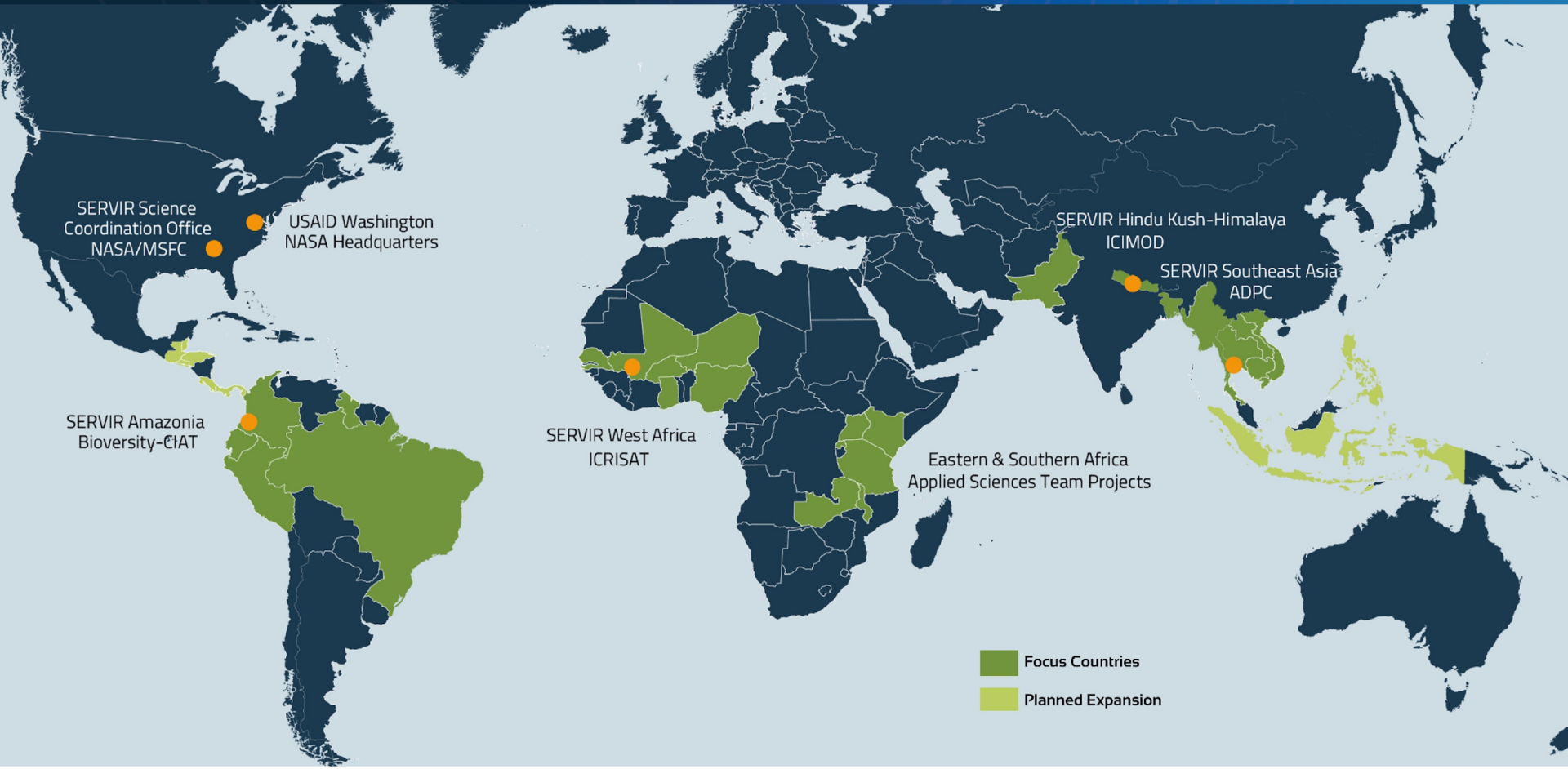
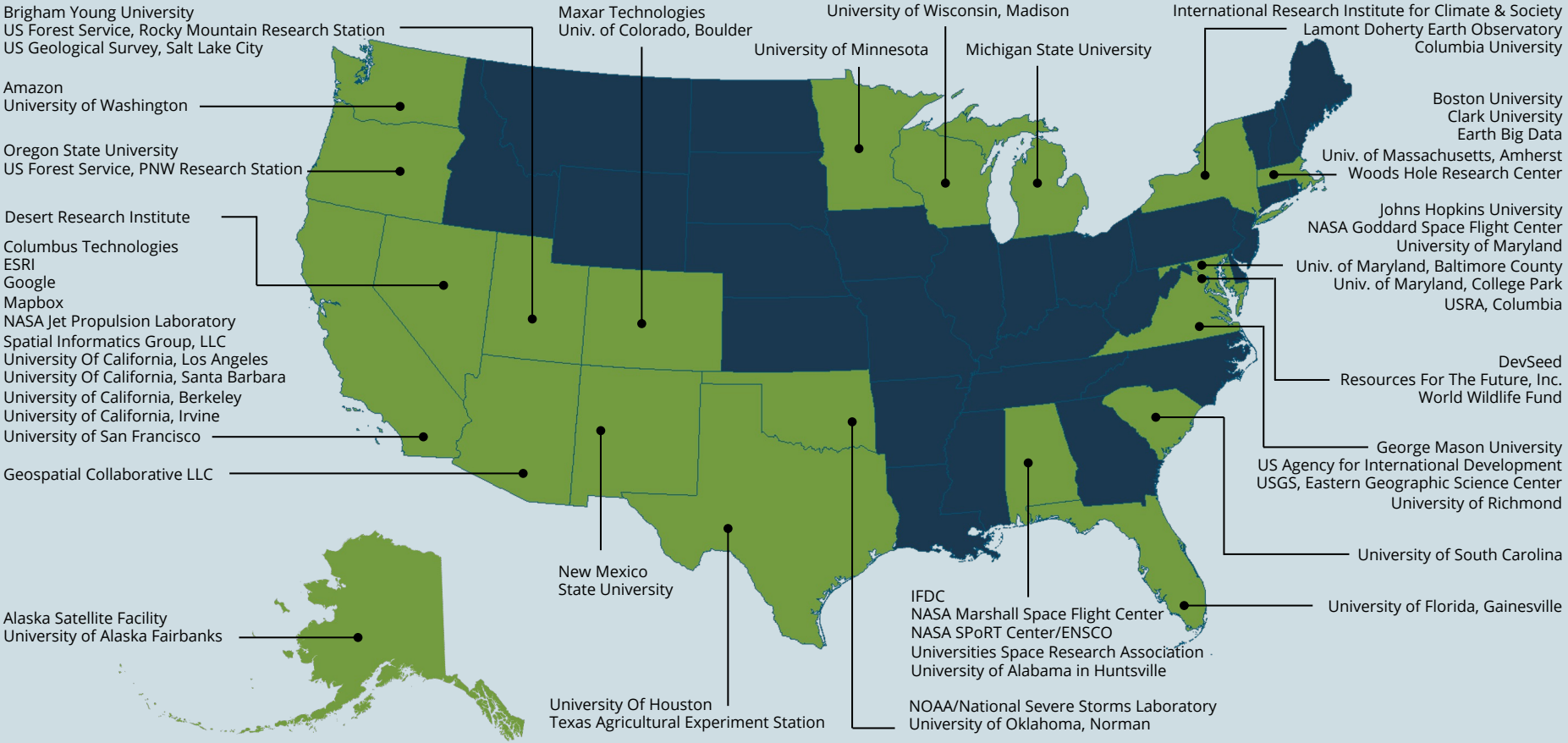
# SERVIR Focuses on Countries in Asia, Africa, & the Americas



# SERVIR Connects US Science to Global Challenges



# Who Is SERVIR?

SERVIR

USAID
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Poverty reduction & resilience
Data-dependent issues in data-scarce places
International field presence

NASA

30+ Earth observing satellite missions, free & open data
Major research portfolio
Societal benefit from space

**Private sector collaborators:**

Google · mapbox · development SEED · planet. · esri · aws · MAXAR TECHNOLOGIES

**USG collaborators:** NOAA · USGS science for a changing world · USFS · U.S. Department of State

**Intergovernmental, NGO collaborators:**

Food and Agriculture Organization of the United Nations · WFP World Food Programme · MERCY CORPS

**Research collaborators**: 20+ US universities & research centers through the SERVIR Applied Sciences Team; ITC, in-region university networks

**Regional Hub Host Institutions:**

ALLIANCE — Bioversity International · CIAT · ICRISAT Transforming Dryland Agriculture · ICIMOD · adpc

**Hub Consortium Members:**

Deltares · SEI Stockholm Environment Institute · Spatial Informatics Group · Conservación Amazónica ACCA · imaflora · eco ciencia · CILSS · AFRIGIST · CERSGIS · CSE Centre de Suivi Ecologique · AIMS · ISESTEL · Columbia University · University of Florida 1853

# Open Approach & Open-Source Science

## SERVIR Service Planning Toolkit

- Consultation & Needs Assessment
- Stakeholder Mapping
- Service Design
- Monitoring, Evaluation & Learning

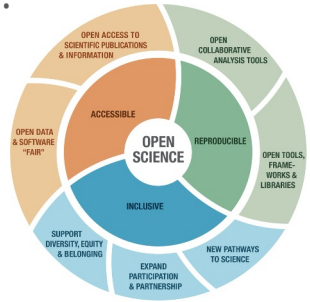
## Open-Source Science

SERVIR embraces open science, with a strong GitHub presence and focus on sharing data with users

The SERVIR Applied Sciences Team ROSES21 solicitation lays out a roadmap to accomplish open & accessible science

SERVIR continually explores new avenues of sharing data, methodologies, & results:

- *Earth Information System*
- *Earth Data Collaborative*
- *Earth on AWS*
- *Google Earth Engine*

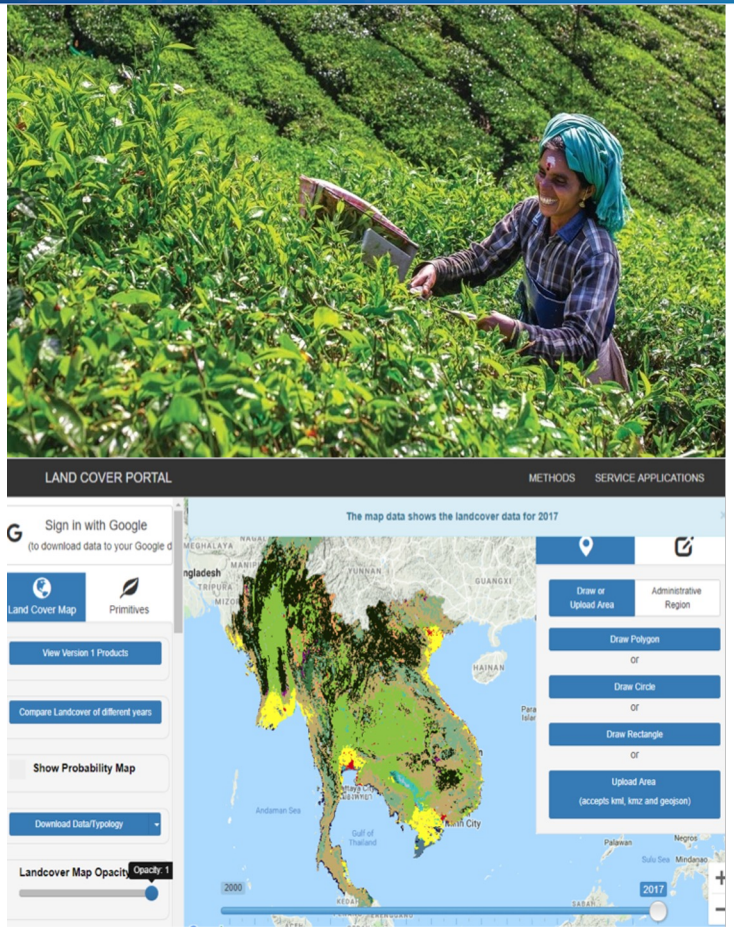


# SERVIR Enables Climate Adaptation and Mitigation

SERVIR services support climate priorities of focus countries

SERVIR's activities across network include over 45 services addressing climate adaptation and mitigation

Use cases for SERVIR services inspire other uses



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# Use Case Examples

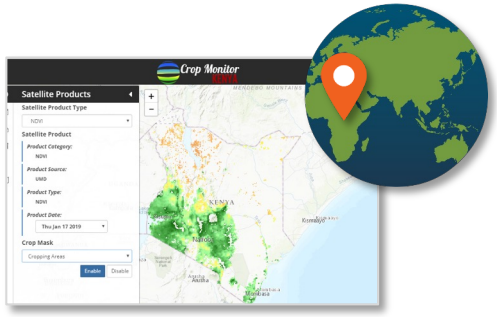
# SERVIR Crop Maps Help Protect 425,000 Kenyan Farmers

Farmers in East Africa regularly face droughts, but are seldom covered by insurance

The government of Kenya created a pilot insurance program for one county to help the farmers, but their methods required costly field data collection

Using satellite data for crop area and crop conditions, SERVIR helped the government of Kenya **reduce the cost of data collection for each county by 70%**

Because of this, the government of Kenya scaled the program nationwide, and individuals insured against crop loss have grown from 900 to 425,000+ over the past five years.




*The GEOGLAM Crop Monitor interface* (CREDIT: SERVIR ESA)

*Farmers in Makueni County, Kenya, have been some of the hardest hit by drought in all east Africa. In 2019, more than 12,000 farmers were compensated for crop losses through agriculture insurance programs.* (CREDIT: USAID)

# SERVIR Improves Air Quality, Reduces Fire Impact in Thailand

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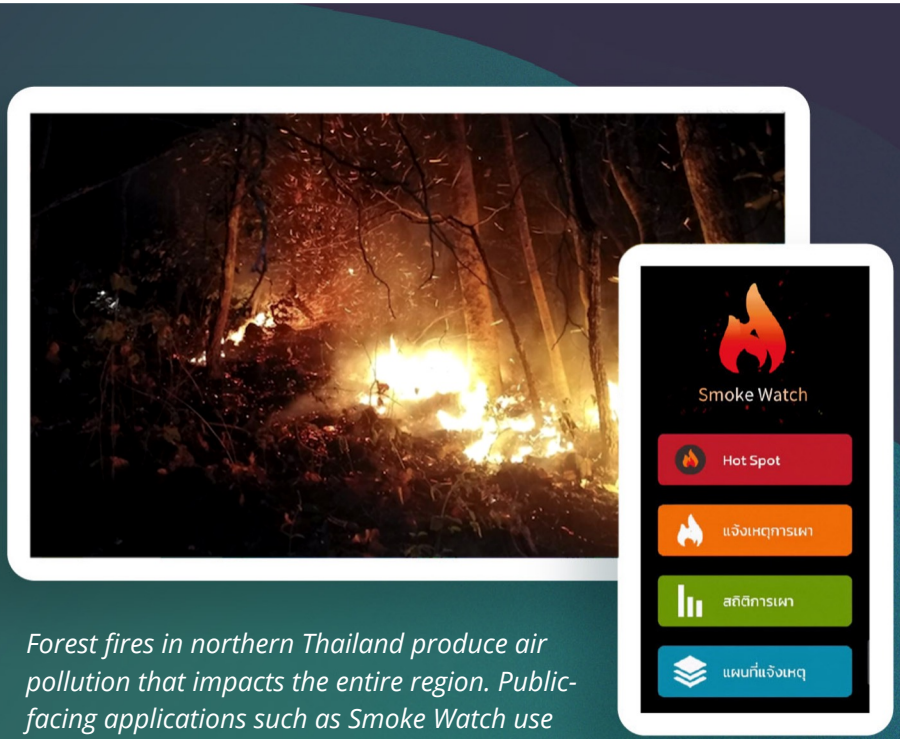
## SERVIR Southeast Asia's Air Quality Explorer (AQE) tool used for burn ban decisions in Thailand

Across south and southeast Asia, air pollution causes over 2 million deaths annually

Thailand's Pollution Control Department (PCD) seeks to reduce the impact of poor air quality (AQ).

Without satellite data, PCD depended on limited ground observations to monitor and extrapolate AQ across the country, which limited their ability to determine bans for agricultural prescribed burns during poor AQ days.

The AQE and derivative Smoke Watch application, now **enables country-wide monitoring for Thailand and improves PCD's ability to issue effective prescribed burn bans to reduce further worsening of AQ.**




*Forest fires in northern Thailand produce air pollution that impacts the entire region. Public-facing applications such as Smoke Watch use SERVIR's AQE with MODIS and VIIRS, to help disseminate critical AQ information in near-real time.*

*(IMAGE CREDITS: SERVIR-Mekong/NASA Applied Sciences; Forest Fire Control, Protected Areas Regional Office 15 (Chiang Rai))*

# SERVIR fire forecasts aid in early detection, more responsive management

The Amazon Dashboard **classifies fire types in near real-time**, enabling early detection and more responsive management efforts:

- The open-access tool analyzes satellite imagery for **individual fire characteristics**
- It can also **detect** the **more intense fires** occurring in recently cleared areas
- The analysis tool brings additional insight into each dry season, supporting forest monitoring and management decisions

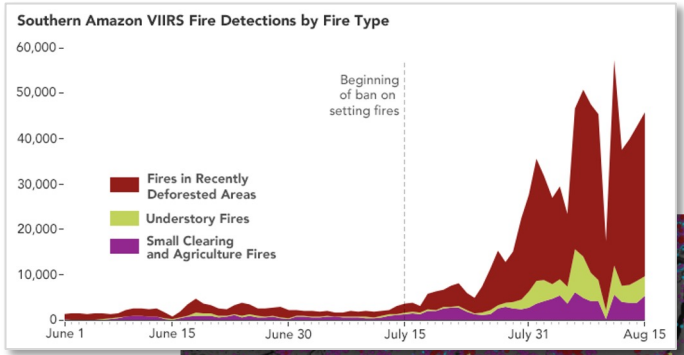
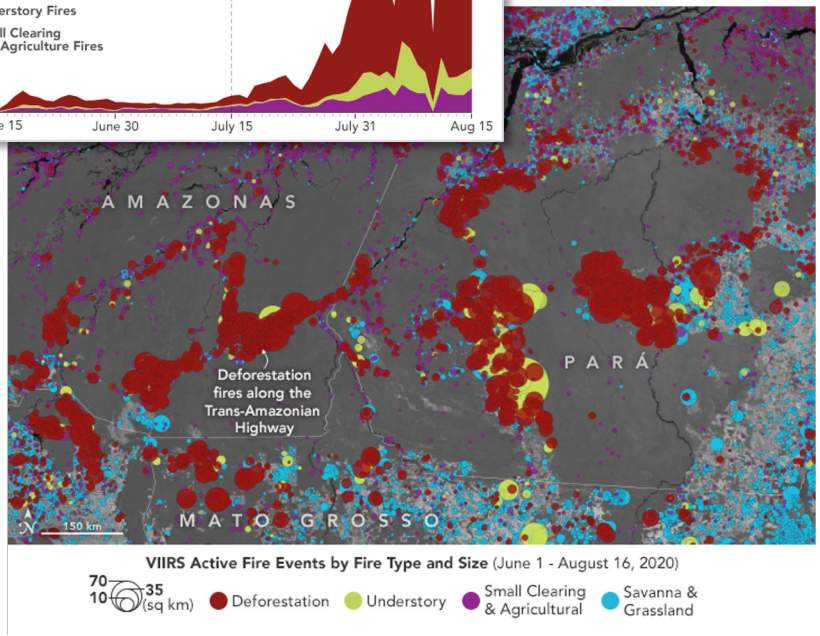


*IMAGE CREDITS: NASA Earth Observatory*



# SERVIR Forecasts Provide Higher Accuracy Severe Weather Alerts

The **High Impact Weather Assessment Tool** (HIWAT) is used by officials in Bangladesh and Nepal for high-accuracy forecasts and warnings ahead of floods, hail, lightning, and other hazards across south Asia.

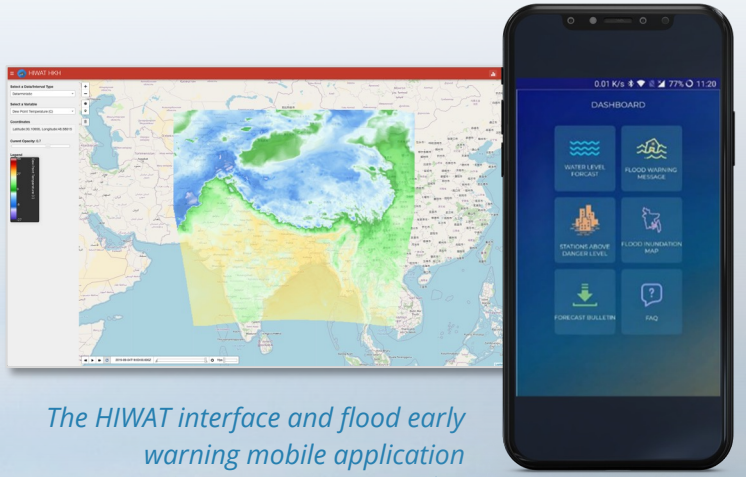
The Hindu Kush Himalaya region is a hotspot for some of the most intense—and often fatal—thunderstorms in the world

Varied terrain and difficult-to-access locations make storm monitoring and damage assessments challenging

Weather experts and forecasters are now using HIWAT data for regional weather models and alerts

Data from HIWAT is disseminated directly to the community via online visualized forecasts and a mobile app from the Bangladesh meteorological department

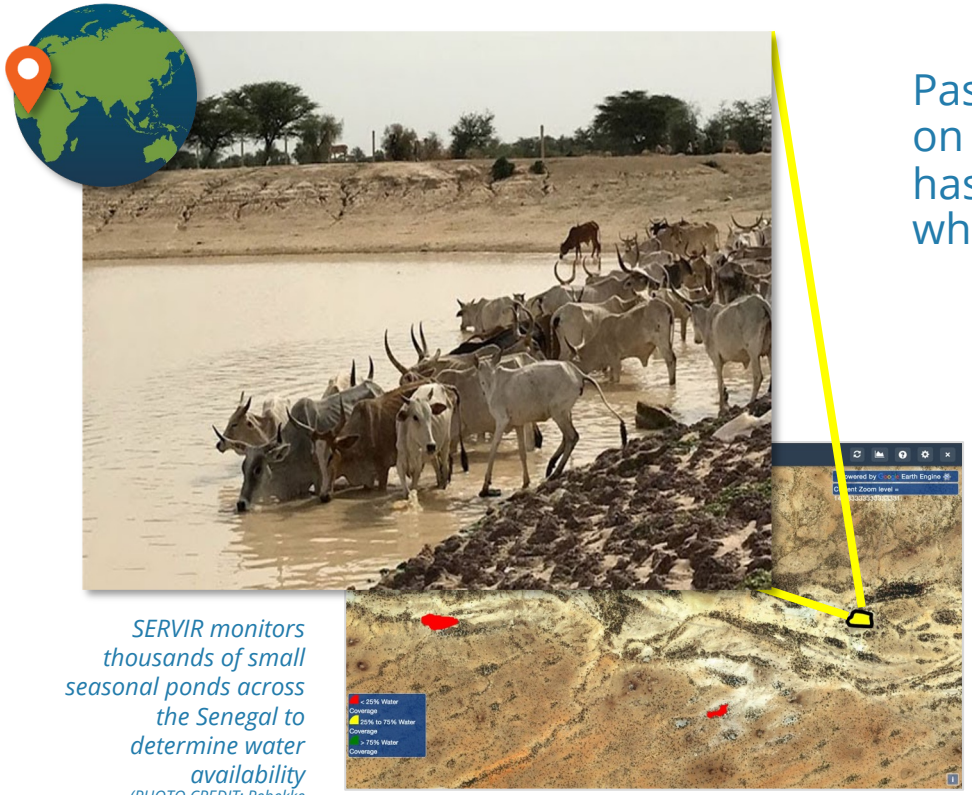
SERVIR HKH added additional capabilities supporting fire outlooks and flash flood forecasting.




*The HIWAT interface and flood early warning mobile application*

*(PHOTO CREDITS: SERVIR-Mekong)*

# SERVIR Small Water Body Detection Guides Pastoralists To Water



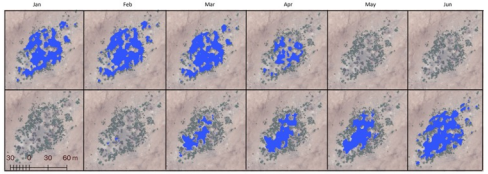

*SERVIR monitors thousands of small seasonal ponds across the Senegal to determine water availability* *(PHOTO CREDIT: Rebekke Muench/NASA SERVIR)*

Pastoralists in West African rangelands rely on small ponds for their livestock. SERVIR has developed a tool to monitor and map where water is available.

These small water bodies hold water for part of the year, providing for the region's nearly 60,000 herders

Monthly composites provide actionable information to direct herds during the dry season (Oct-June)

Information is relayed by a web-based platform and community radio broadcasts in remote areas




*Monthly water content composites* *(PHOTO CREDIT: SERVIR-West Africa)*

# Tracking Illegal Gold Mining in the Amazon

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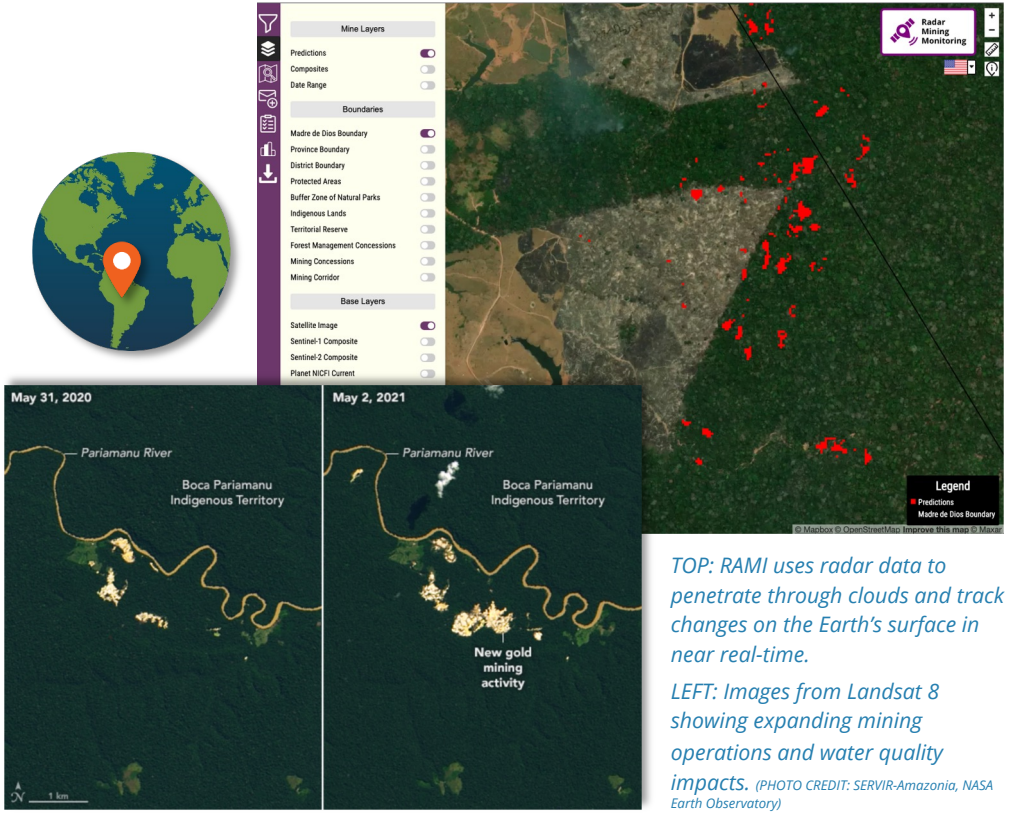
Small-scale gold mining has led to over **250,000 acres of forest loss** in the Peruvian Amazon over the past 30 years.

The Radar Mining Monitoring Tool (RAMI) tracks mining-related deforestation and **differentiates** between **illegal, informal, and formal mining**

RAMI equips land managers with actionable information, and helps scientists better **understand the effects of gold mining** on local rivers and forests

The service is the result of a cross-Atlantic collaboration with SERVIR-West Africa, where mining in Ghana's high forests poses similar challenges




*TOP: RAMI uses radar data to penetrate through clouds and track changes on the Earth's surface in near real-time.*

*LEFT: Images from Landsat 8 showing expanding mining operations and water quality impacts.* *(PHOTO CREDIT: SERVIR-Amazonia, NASA Earth Observatory)*

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# Global Services

# Collect Earth Online Enables Improved Global Land Cover Monitoring

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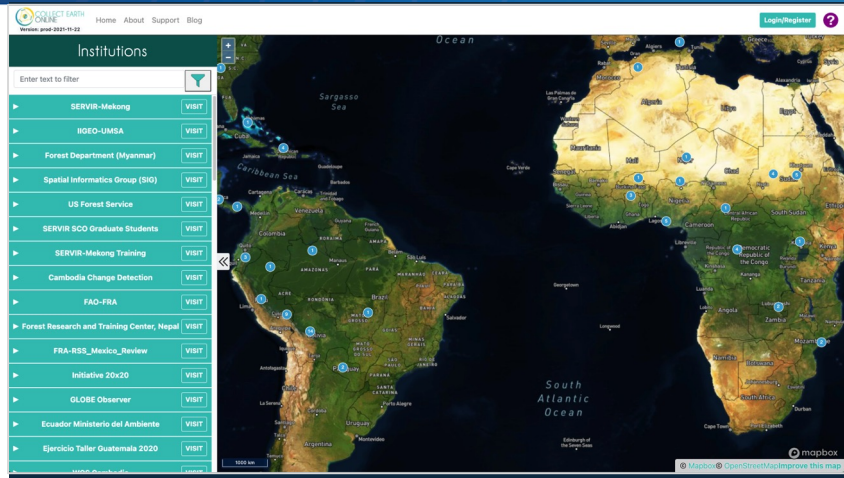
**Collect Earth Online** (CEO) promotes collaborative, consistent, and quality-controlled reference data collection:

- Collecting field data is expensive and time consuming
- CEO provides access to multiple sources of satellite imagery, enabling collaborative projects via an intuitive, web-based collection interface
- SERVIR scaled CEO from a service in Southeast Asia to the globe, enabling broader use
- FAO used CEO as the **primary data collection tool** for 2020 Global Forest Resources Assessment (FRA)
- As of 2021, CEO has **4,500+ users** and over **9 million sample points**




> "[CEO] allows the collection of up-to-date data about our environment and its changes in a more efficient and participatory manner, using the local experts that know the landscape and the underlying ecology.
>
> Mette Wilki
> *Head of Policy and Resources, UN FAO Forestry Division*

# ClimateSERV Increases Global Access to Critical Agricultural, Drought Information

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**ClimateSERV** provides actionable climate information for regional and local decision makers:

- Enables easy access to seasonal **180-day rainfall and temperature forecasts**, along with historic rainfall and vegetation conditions
- Includes **key datasets and visualizations** from CHIRPS, NMME, and MODIS without the need for extensive local monitoring
- Currently in use by Kenya Meteorological Service field offices to develop in-season **crop selection guidance** and **suggested planting times**

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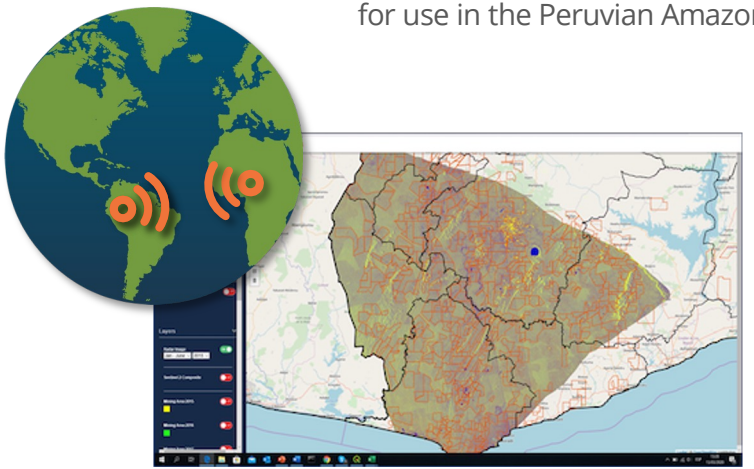
# Distinctive Aspects of SERVIR

# SERVIR's Global Network Enables Scaling, Sharing & Replicating

## SERVIR tools & services can scale from hub to hub or across regions:

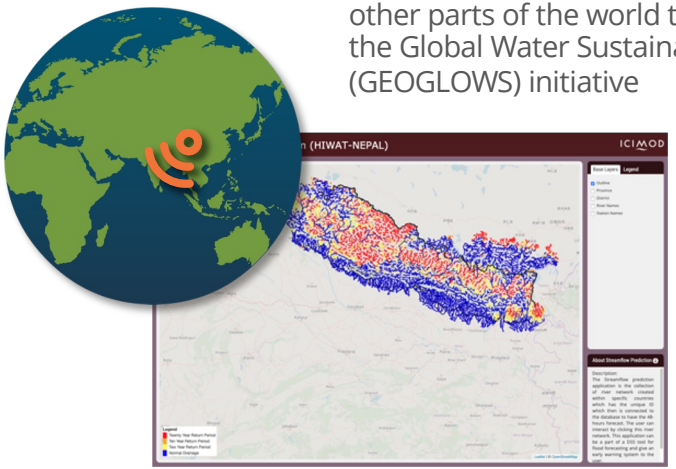
### Teaming Up to Detect Cross-Atlantic Illegal Gold Mining from West Africa to Amazonia

Originally developed for Ghana's forest zones, a similar radar-based tracking system has been adapted for use in the Peruvian Amazon



### Scaling Streamflow Prediction From Nepal to Around the Globe

The Streamflow Prediction Tool supports official flood bulletins in Nepal, and has been adapted for other parts of the world through the Global Water Sustainability (GEOGLOWS) initiative



# SERVIR Integrates and Acts on Gender Inclusion

**SERVIR** works to make geospatial technologies and professions more **gender responsive** and **inclusive** by:

1. **Supporting women leaders & gender champions** in SERVIR, creating an equal opportunity work environment
2. **Empowering women and girls to explore STEM fields** in countries and regions where we operate
3. **Integrating gender considerations in service planning** through gender analyses and participatory review
4. **Using remote sensing & GIS to address issues impacting groups** characterized by gender, ethnicity, age, and/or social status

# What Makes SERVIR Unique?

## SERVIR services are…

**Demand-driven** to ensure each community's needs and values are prioritized throughout the process

**Co-developed** with regional experts to bring together NASA science and in-depth local knowledge

**Inclusive**, emphasizing that services must be accessible and represent the needs of women and indigenous communities

**Built to last**, prioritizing trainings and resources to strengthen capacity and foster sustained capabilities

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