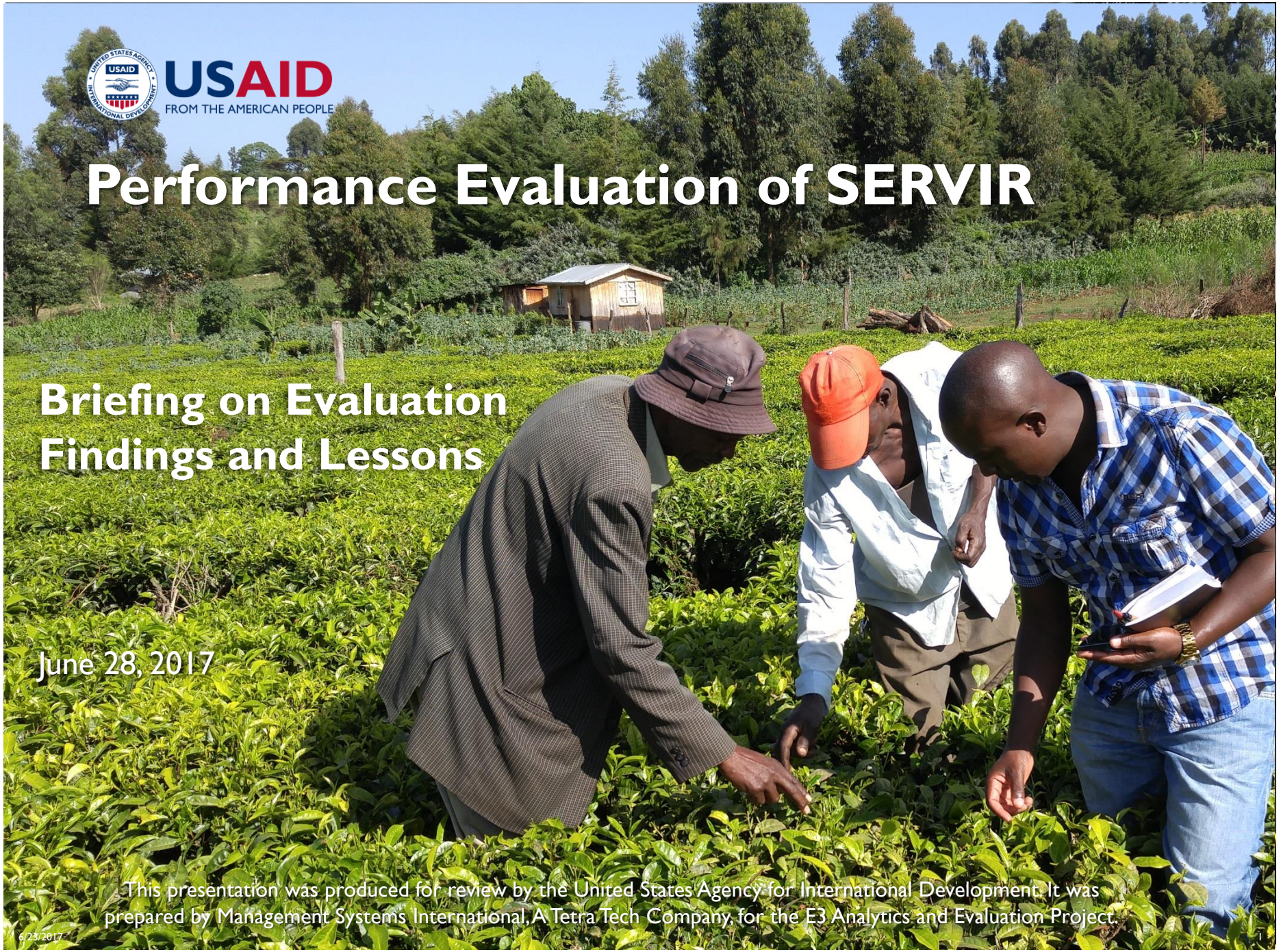

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Performance Evaluation of SERVIR

Briefing on Evaluation Findings and Lessons

June 28, 2017

This presentation was produced for review by the United States Agency for International Development. It was prepared by Management Systems International, A Tetra Tech Company, for the E3 Analytics and Evaluation Project.

Evaluation Questions

1. How are SERVIR science application tools being used and what are the results/impact of those uses?

   Nine product-specific case studies

2. Are the SERVIR hubs becoming stronger regional service providers?

   Three regional client surveys

3. What is the value of SERVIR as demonstrated through measurable effects and their monetary value?

   Two value of information studies

How are SERVIR's science application tools being used and what are the results/impact of those uses?

- SERVIR product adoption and use
- Understanding product effects and impacts
- Integration of SERVIR product data with other information
- Evidence of SERVIR products enabling further innovation leading to additional impacts

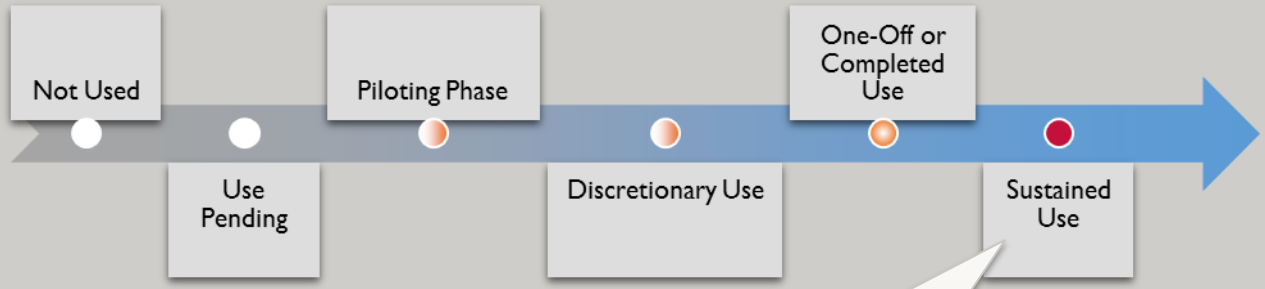
How are SERVIR's science application tools being used and what are the results/impact of those uses?

Case studies targeting nine of SERVIR's longer-running products to ensure time for adoption and use:

1. CREST Flood Mapping (*Kenya*)
2. Land-Cover Mapping for GHG Emissions Inventory (*Rwanda*)
3. Land-Cover Mapping for GHG Emissions Inventory (*Zambia*)
4. Rapid Response Mapping for Disasters (*Nepal*)
5. Agricultural Monitoring to Support Food Security (*Nepal*)
6. Water Quality Monitoring for Lake Atitlan (*Guatemala*)
7. SIGMA 1 Forest Fire Monitoring (*Guatemala*)
8. Ocean Algal Bloom Monitoring for Mesoamerica (*El Salvador*)
9. Implementation of Jason-2 for Flood Forecasting System (*Bangladesh*)

How are SERVIR's science application tools being used and what are the results/impact of those uses?

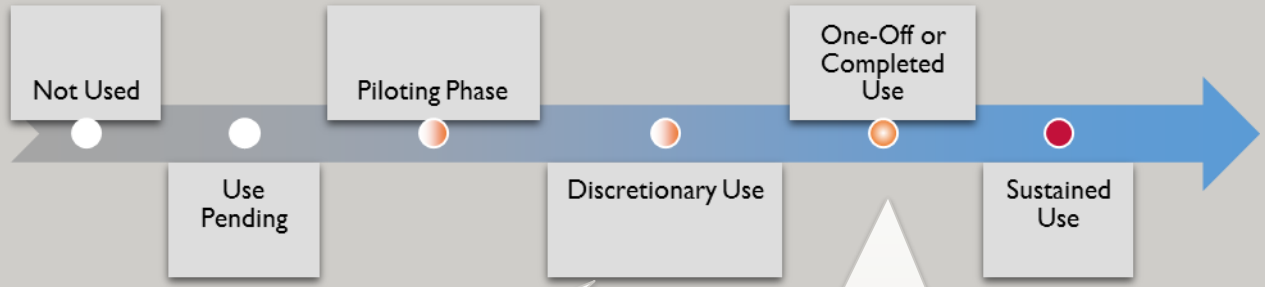
- Oceanic Red Tide Monitoring (El Salvador)



El Salvador's Red Tide Monitoring Commission reviews daily SERVIR maps for signs of algae blooms as part of its larger red tide alert system

How are SERVIR's science application tools being used and what are the results/impact of those uses?

- Water Quality Monitoring (Guatemala)

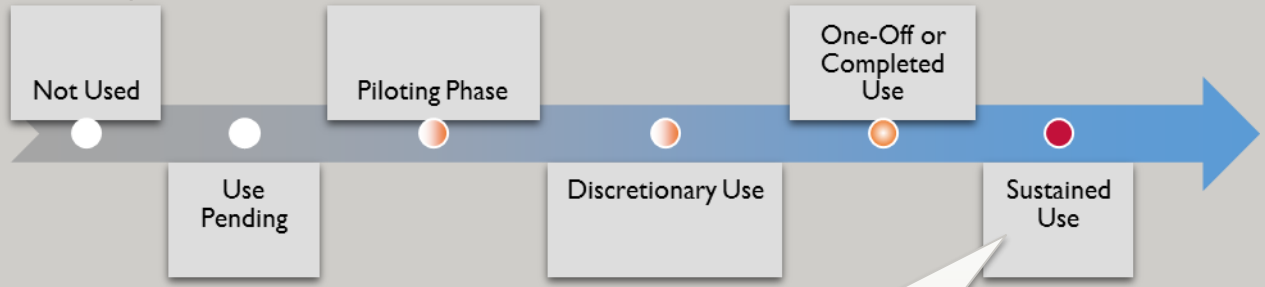


Multiple years of lake water quality data are available for use by government and NGO actors working in the environmental and natural resource sectors

A SERVIR-generated map of a severe 2009 algae bloom in Lake Atitlán was used to motivate regional and national environmental protection actions

How are SERVIR's science application tools being used and what are the results/impact of those uses?

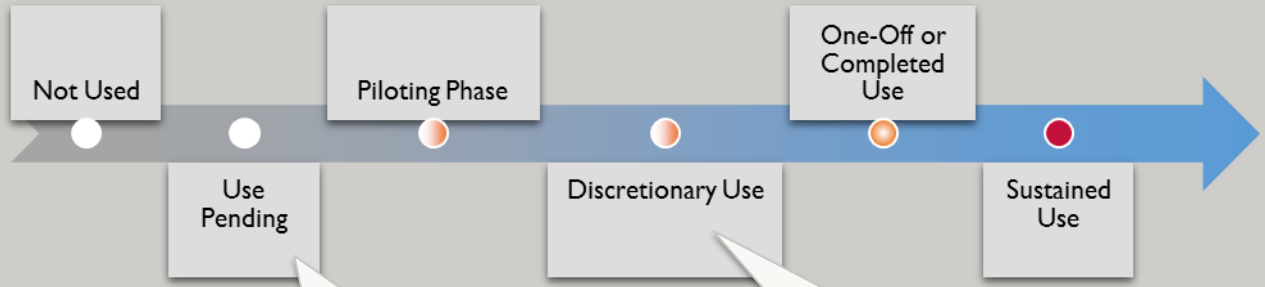
- Hot-spot Mapping and SIGMA-I Forest Fire Management Tools (Guatemala)



Guatemala's Forest Fire Commission monitors and disseminates daily hotspot maps from SERVIR SIGMA-I suite to help responders locate and control forest fires

How are SERVIR's science application tools being used and what are the results/impact of those uses?

- CREST Suite (Kenya)

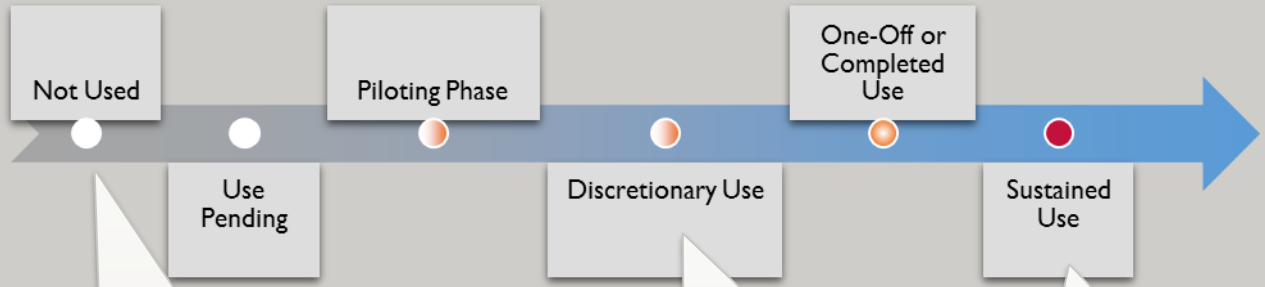


CREST forecasting will require predictive capacity and reliable data delivery by Kenya's Meteorological Service. SERVIR and RCMRD are building that capacity, at which point use by local partners is likely.

CREST modeling data informed infrastructure and construction projects, while CREST real-time streamflow data supplement gaps in other water resource monitoring practices

How are SERVIR's science application tools being used and what are the results/impact of those uses?

- Land Cover Classification (Zambia and Rwanda)



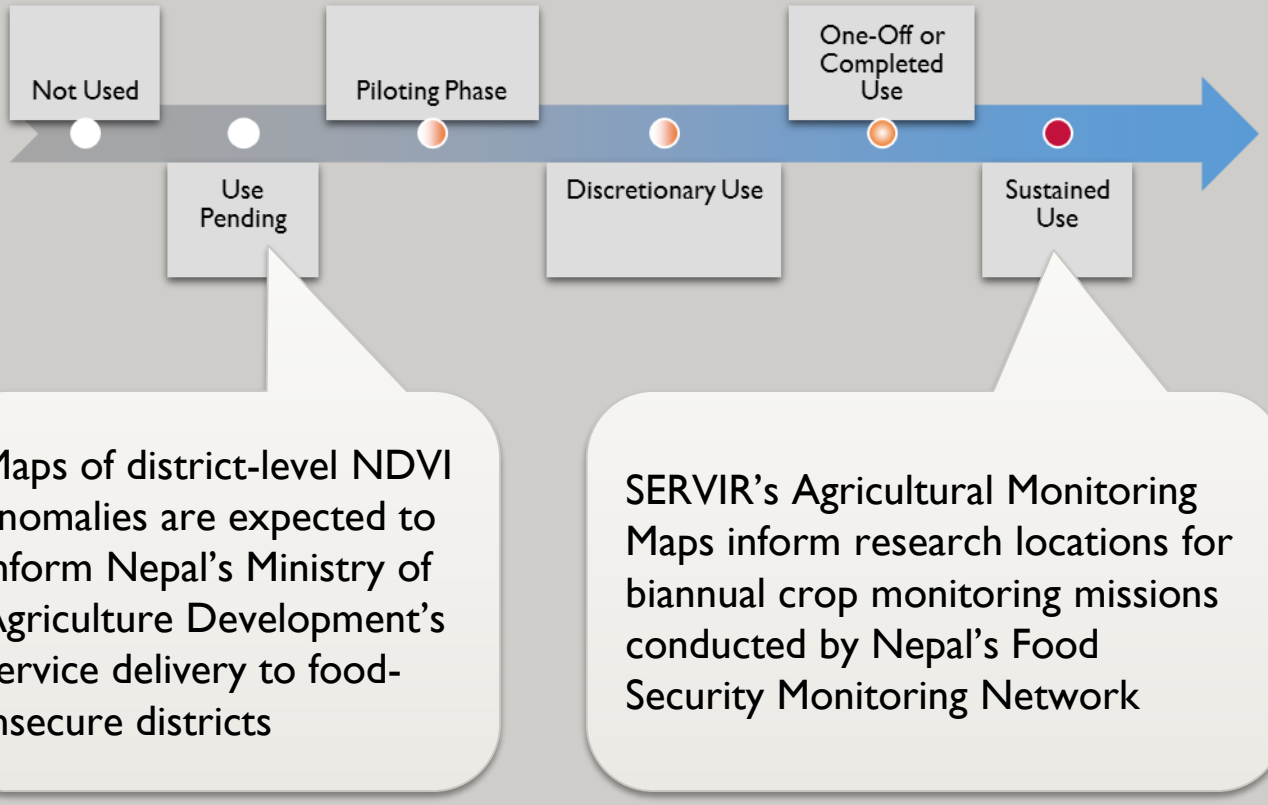
In Rwanda, maps were not used for other decision-making due to previously established forest policy and preexisting higher-resolution official maps

Provincial officials in Zambia's North-Western Province have used classification aspect of GHG inventory maps to select sites for reforestation

Land cover maps are being used in both countries to calculate Forest Reference Emissions Levels for regular UNFCCC reporting obligations

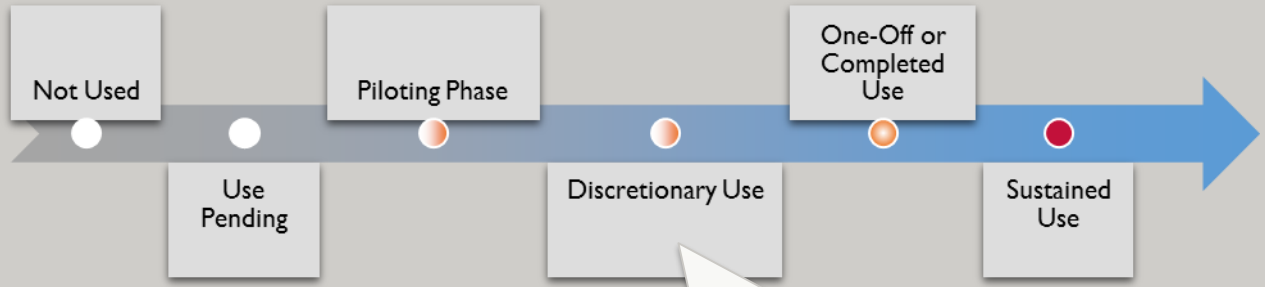
How are SERVIR's science application tools being used and what are the results/impact of those uses?

- Agricultural Monitoring for Food Security (Nepal)



How are SERVIR's science application tools being used and what are the results/impact of those uses?

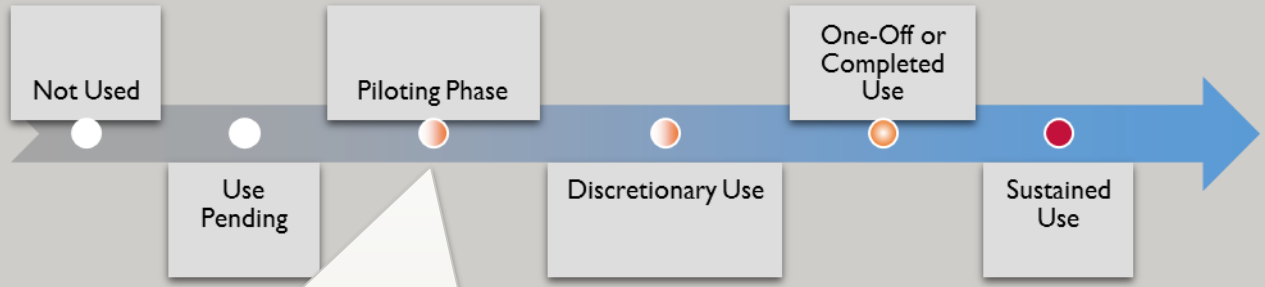
- Rapid Response Mapping for Disasters (Nepal)



Rapid response maps are generated by ICIMOD and shared with government agencies and NGOs as needed in response to natural disasters. These maps have been used to direct relief and assistance following disaster events such as earthquakes, landslides, and floods.

How are SERVIR's science application tools being used and what are the results/impact of those uses?

- JASON-2 Flood Forecasting (Bangladesh)



Bangladesh's Flood Forecasting and Warning Centre requires four years of piloting for the JASON-2 Flood Forecasting system. Full adoption will require verification of long-term product accuracy and reliability, relative to other products and methods.

How are SERVIR's science application tools being used and what are the results/impact of those uses?

Trust is essential to adoption and use of SERVIR products.

- Short-term trust in:
  - Product functionality
  - Product data accuracy
- Long-term trust in:
  - Continued product availability
  - Continued product relevance
  - Ongoing partnership with SERVIR and the hubs

How are SERVIR's science application tools being used and what are the results/impact of those uses?

- Understanding product effects and impacts

Environmental	Economic	Social Well-Being
• Ecosystem damages and losses averted • Preservati… restoratio… threatene… • Carbon se… reduced G… emissions	• Changes in market confidence	• Community sensitization/ changed …n of cultural …mental …ervice …nfrastructure • Improved community health

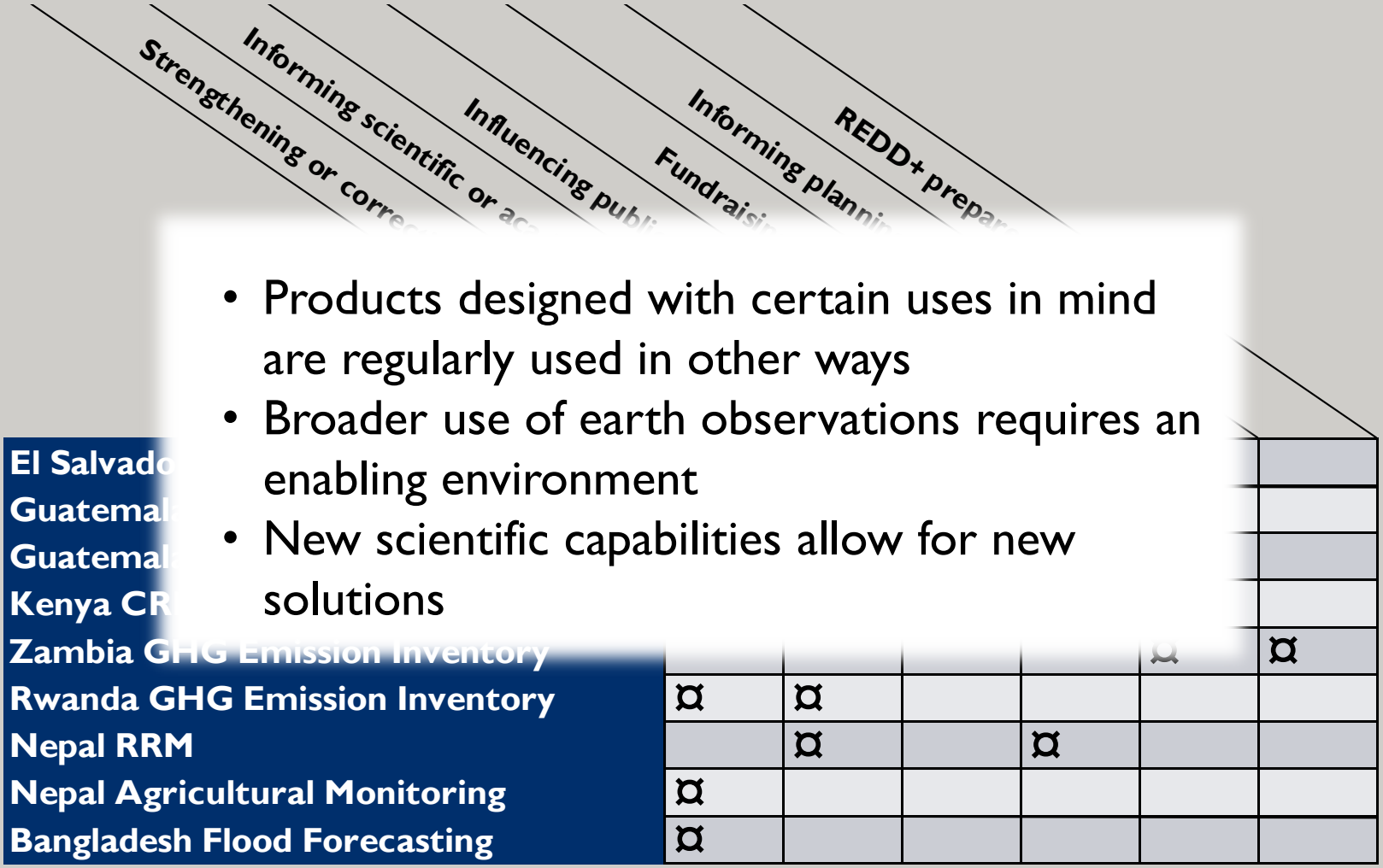
SERVIR products have a wide variety of social, economic, and environmental impacts

How are SERVIR's science application tools being used and what are the results/impact of those uses?

Product	Complementary Data Sources
El Salvador Algal Bloom Monitoring	• Lab results from monthly water tests • Lab results from monthly bivalve tissue samples
Guatemal	
Guater	
Kenya	ns
Z	
R	
	• Community based early warning system (CBEWS) • Reporting from district-level offices
Nepal Agricultural Monitoring	• Digital agricultural atlas of Nepal • Reporting from district-level offices
Bangladesh Flood Forecasting	• Upstream water height reporting from India • In situ daily measurement of stream height

Successful use of SERVIR products and data consistently happens within the context of other complementary data sources, limiting discussion of results to "contributory" rather than "causal"

How are SERVIR's science application tools being used and what are the results/impact of those uses?



- Products designed with certain uses in mind are regularly used in other ways
- Broader use of earth observations requires an enabling environment
- New scientific capabilities allow for new solutions

How are SERVIR's science application tools being used and what are the results/impact of those uses?

Across almost every case study, the most common uses for SERVIR product data were to improve data quality and cost-effective monitoring

	Strengthening or cor…	Informing scientific or…	Influencing pu…	Fundrai…	Informing plan…	REDD+ prep…	
El Salvado…							
Guatemal…							
Guatemal…							
Kenya CREST Hydrological Suite	¤	¤			¤		
Zambia GHG Emission Inventory					¤	¤	
Rwanda GHG Emission Inventory	¤	¤					
Nepal RRM		¤		¤			
Nepal Agricultural Monitoring	¤						
Bangladesh Flood Forecasting	¤						

Are the SERVIR hubs becoming stronger regional service providers?

Conducted 3 regional surveys with more than 1,200 clients from SERVIR hubs in Central America, the Himalayas, and Eastern and Southern Africa

- Used survey responses and 7 follow-up focus groups to better understand regional service needs and client perceptions of SERVIR
- Hubs are consistently well regarded across all regions, particularly for their training and tool provision

What is the value of SERVIR as demonstrated through measurable effects and their monetary value?

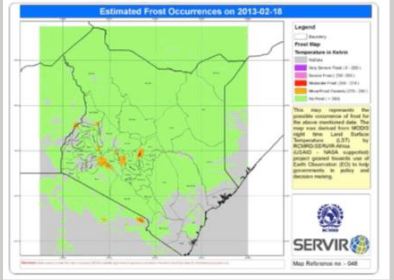
Valuation is often challenging due to confounding factors and limited opportunities for control/treatment scenarios

- **Damage and Loss Avoidance** – Calculated based on the value of damages or losses prevented or avoided through its use
  - Modeled potential value of a product that is not yet widely available, for a single, highly structured sector
- **Choice Experiment** – Survey of product attribute choices provides estimation of relative attribute value (ranking) and total economic value of product as a function of attributes
  - Viable because of long-term product use by experienced sectoral professionals

Potential Value of Kenyan Tea Sector Damage and Loss Avoidance through SERVIR Frost-Prediction Tool

Frost and the Kenyan Tea Sector

- 3rd largest tea exporter in the world producing 10% of the world's black tea
- 60% of Kenya's tea comes from 600,000+ smallholder tea farmers across Kenya
- **But – existing data on the impact of frost on Kenan tea crops is limited**



Potential Value of Kenyan Tea Sector Damage and Loss Avoidance through SERVIR Frost-Prediction Tool

Survey of 400+ Kenyan tea farmers on:

- Characterization of smallholder tea producers
- Effects of frost on tea production
- Responses to frost attacks by tea producers

- **Average smallholder tea farm size is 1.04 acres and generates $1,075 annual net income ($1,700 gross)**
- **Average annual smallholder tea farm crop losses from frost are ~$200**

Potential Value of Kenyan Tea Sector Damage and Loss Avoidance through SERVIR Frost-Prediction Tool

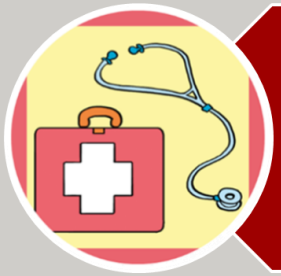
Tea farmers have two viable response strategies for short-term mitigation of frost-induced tea damage:

- **Early harvesting**: Young tea leaves are harvested in rotation. 72 hours is sufficient notice to mobilize manpower and salvage all available leaves before frost strikes.
- **Skiffing**: Light pruning helps tea bushes resist the effects of frost, reducing damage and speeding up the post-frost recovery time.

Potential Value of Kenyan Tea Sector Damage and Loss Avoidance through SERVIR Frost-Prediction Tool

- 72 hours of advance warning is **enough time for preemptive action** that can **reduce average annual losses by $80**
- **$80 in reduced crop losses could mean many things to a smallholder farming household:**

25 days of household food spending



60 days of household health spending

A full year of school tuition for one child

Perceived Value of SERVIR Forest Fire Monitoring Tools in Guatemala

Forest Fire Monitoring Tool:

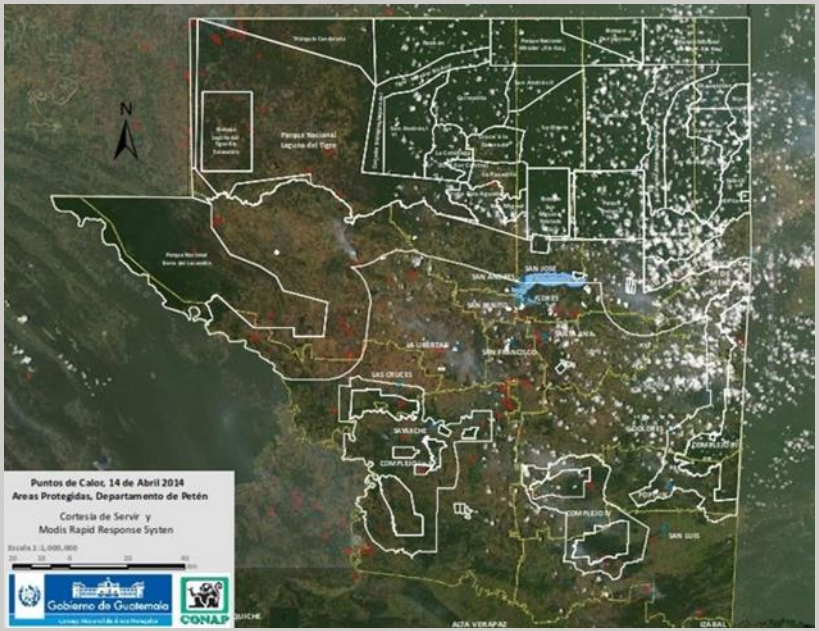
- The use of SERVIR satellite data for forest fire management has been **widely institutionalized** in the Mayan Biosphere Reserve of northern Guatemala
- Forest fire management teams face **scarce institutional resources, limited local response capacity, and difficult terrain**
- SERVIR's daily hot-spot maps are a vital tool in addressing these challenges

Perceived Value of SERVIR Forest Fire Monitoring Tools in Guatemala

Choice Experiment: Respondents make a series of product trade-off choices from a set of random product options with variable levels of attributes, selecting based on levels of utility

Hot-spot map attributes include:

- Spatial resolution
- Frequency of hot spot maps
- Climate forecast
- Inclusion of land cover, land use and deforestation data
- Accuracy (False positives)
- Cost per year



Hotspot map distributed by CEMEC, April 14, 2014.

Perceived Value of SERVIR Forest Fire Monitoring Tools in Guatemala

	A	B	C (status quo)
Spatial Resolution	100m	100m	1000m
Frequency of hotspot maps	Weekly	Weekly	Daily
Climate forecast	8 days	1 day	8 days
Land use/ land cover mapping	Bi-weekly	Seasonally	Bi-weekly
Accuracy	15% false positive	5% false positives	15% false positive
Cost	1200 Q	2600 Q	No cost

Perceived Value of SERVIR Forest Fire Monitoring Tools in Guatemala

Survey distributed to 159 individuals from Guatemala's forestry, natural resource management, forest fire-fighting, and related sectors, with 73 responses (46% response rate)

Implied ranking of the attributes based on willingness-to-pay responses

1. Frequency of reporting
2. Accuracy
3. Land use/land cover mapping
4. Climate forecast
5. Spatial resolution

Perceived Value of SERVIR Forest Fire Monitoring Tools in Guatemala

Willingness to Pay (WTP) results for all attributes:

Attribute	WTP	Lower 95% CI	Upper 95% CI
Spatial Resolution	$0.10	-$0.01	$0.18
Frequency of reporting	$68.11	$11.56	$124.67
Climate Forecast	$4.79	-$3.16	$12.74
Land use / land cover mapping	$46.86	-$9.08	$102.80
Accuracy	$12.41	$6.38	$18.44
Total	**132.26Q**		

Value estimations for land use/land cover mapping, climate forecast, and spatial resolution fell outside of a 95 percent confidence interval (CI), so the model did not regard these as statistically significant

Perceived Value of SERVIR Forest Fire Monitoring Tools in Guatemala

WTP results (Quetzales) for attributes within 95% confidence interval

Attribute	WTP	Lower 95% CI	Upper 95% CI
Frequency of reporting	$68.11	$11.56	$124.67
Accuracy	$12.41	$6.38	$18.44
Total	$80.52		

- **If SERVIR's goal is to improve the marginal benefits of hotspot monitoring for its user community, it should prioritize improving the frequency of reporting and accuracy**

SERVIR Evaluation Takeaways

- SERVIR products have a higher likelihood of success when they are embedded in existing systems and decision-making processes
- Valuation methods can help identify which aspects of SERVIR products are most important to the user, as well as how the products can be modified or adapted to ensure their utility and value
- Limited, but critical, use of SERVIR products in recent post-disaster efforts suggests an area of focus for future SERVIR action
- Earth observation data are sometimes the only cost-effective option for gathering information in remote or data-limited environments
- SERVIR should establish clear theories of change for products to improve its ability to monitor and evaluate product performance in the future

QUESTIONS?

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