SERVIR
Connecting Space to Village

Pietro Ceccato

SERVIR Applied Sciences Team

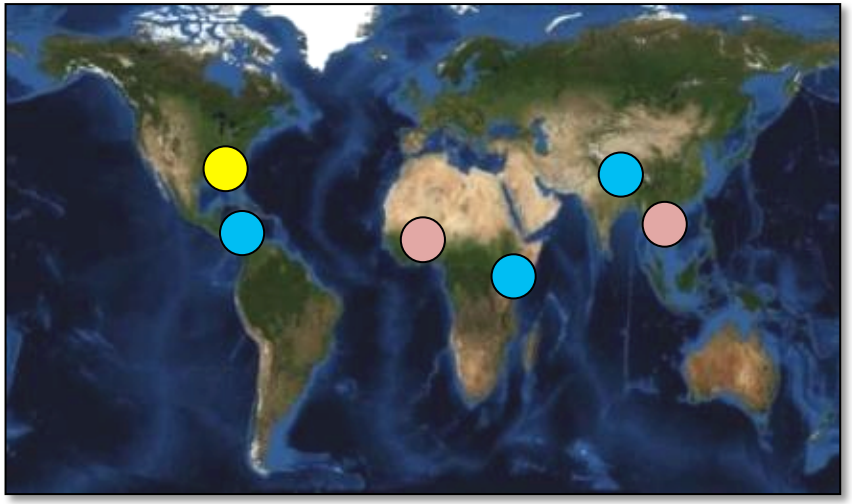
Sept 26, 2013

NASA Public Health and Air Quality Program Meeting

About 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 Hub

Program Office (NASA/MSFC)

Potential Future Hubs

SERVIR Network

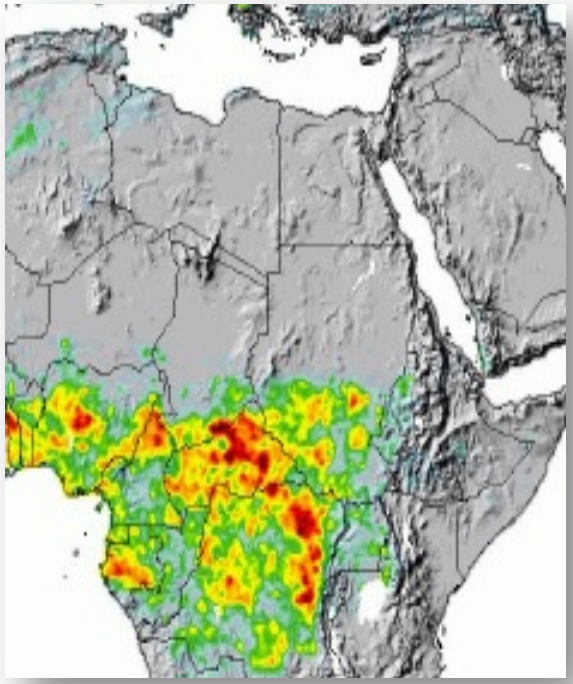
RCMRD – Host of SERVIR-East Africa

ICIMOD – Host of SERVIR-Himalaya

CATHALAC– Host of SERVIR-Mesoamerica

What We Do

- 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

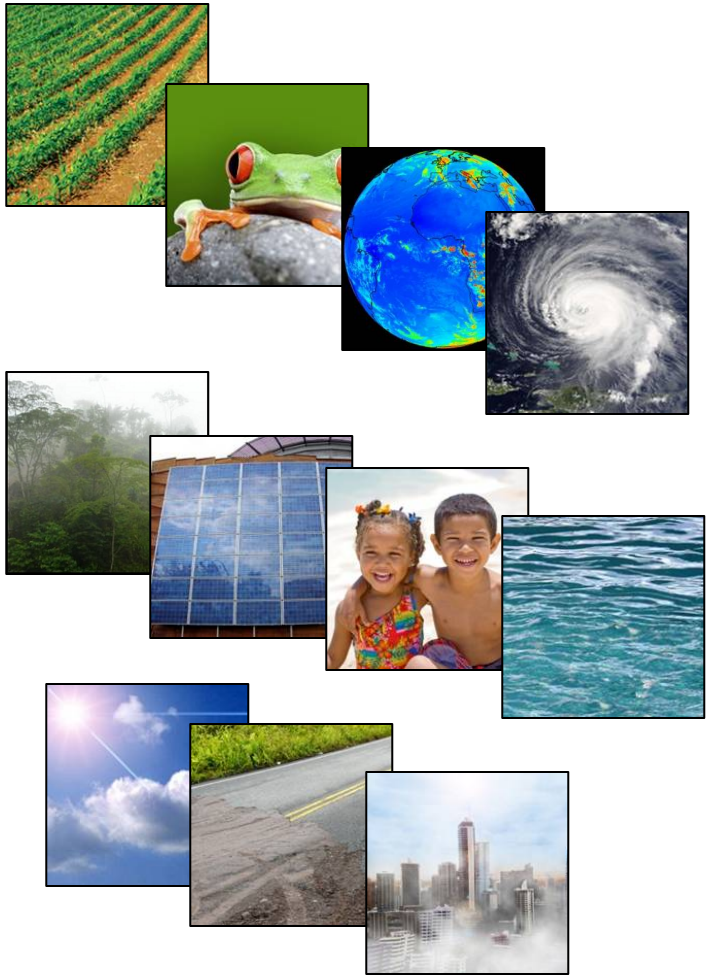


SERVIR GLOBAL

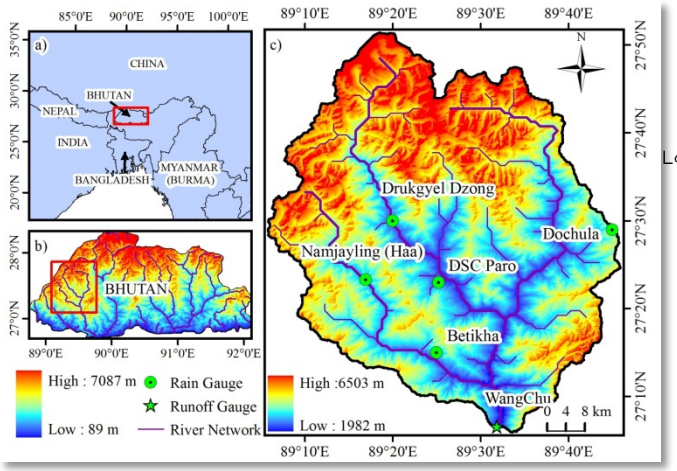
Connecting Space To Village

SERVIR Thematic Areas

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

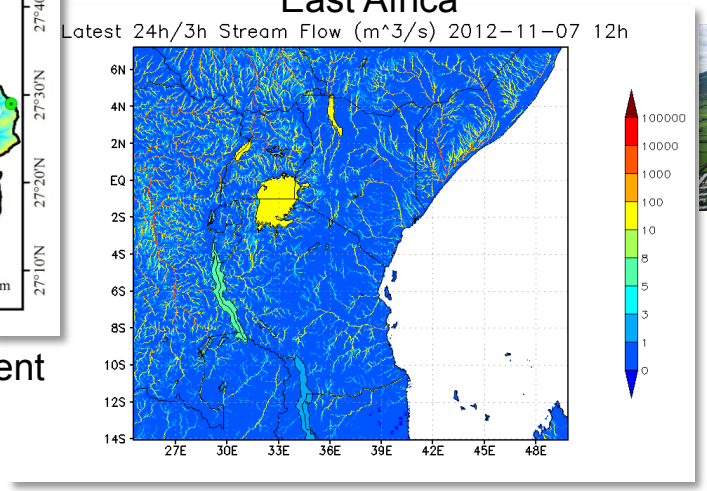


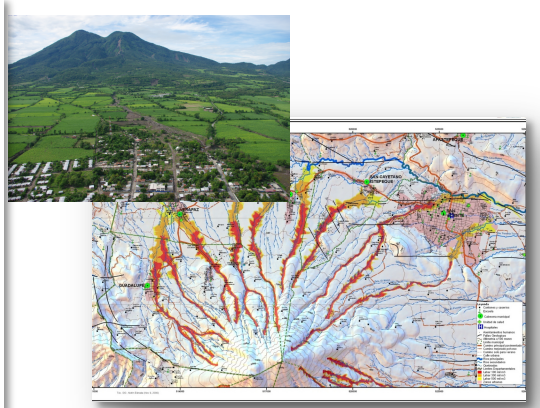
SERVIR Science Applications for Decision Making



Bhutan Water Resource Assessment

Real Time Streamflow in East Africa

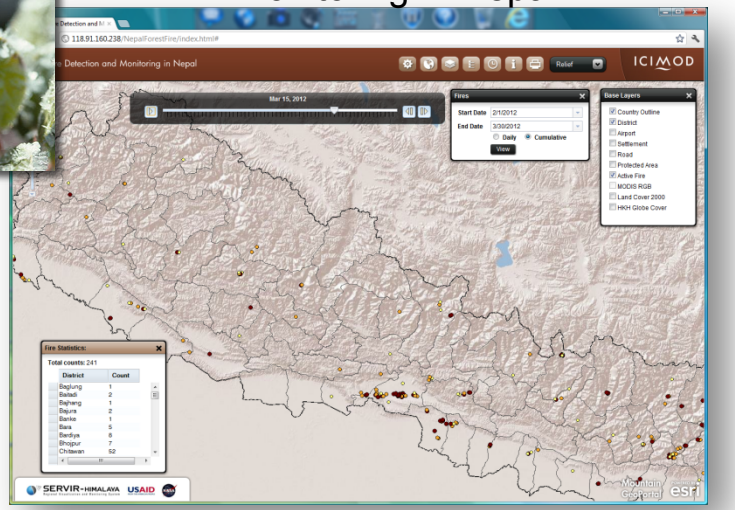


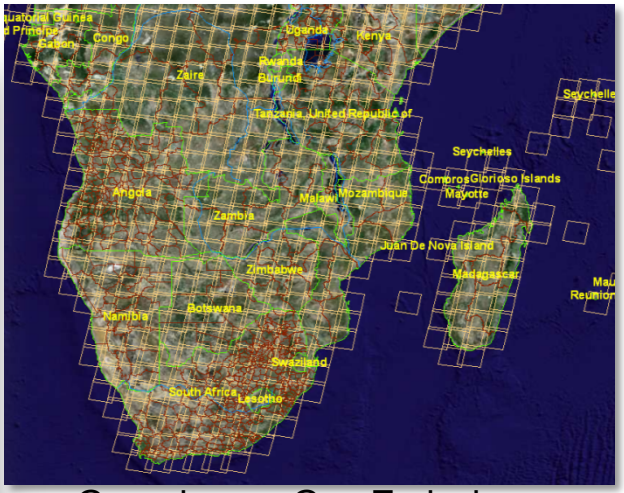


Landslide Prediction System in Mesoamerica

Frost Mapping in Africa

Near Real-time Forest Fire Monitoring in Nepal





Greenhouse Gas Emissions Inventory in Africa

Health Vector-Borne Diseases:

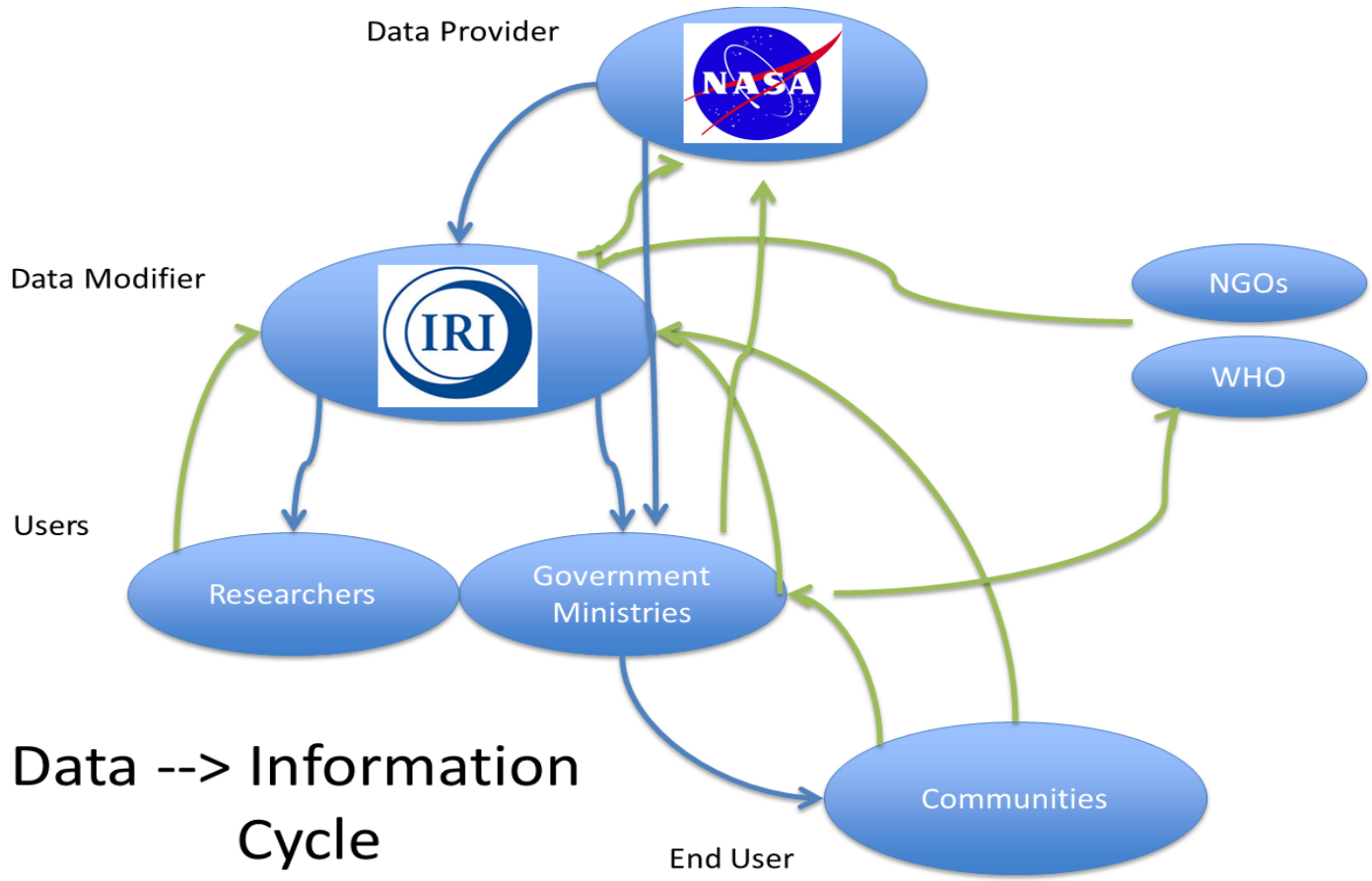
- Malaria
- Leishmaniasis
- Rift Valley Fever
- Schistosomiasis
- Trypanosomiasis

Who Are the Users?

- Ministries of Health in Africa
- World Health Organization "Climate-Health Strategy"
- Research Communities/Universities/NGOs
- USAID President Malaria Initiative

e.g. WHO TDR-IDRC scientific community in Africa (workshop at RCMRD June 2013)

What are the Approaches to Engage with Users?



Data --> Information Cycle

What Are the Requirements Expressed by the Users?

- Stratification Maps
- Early Warning Systems
- Impact Evaluation of Control Measures

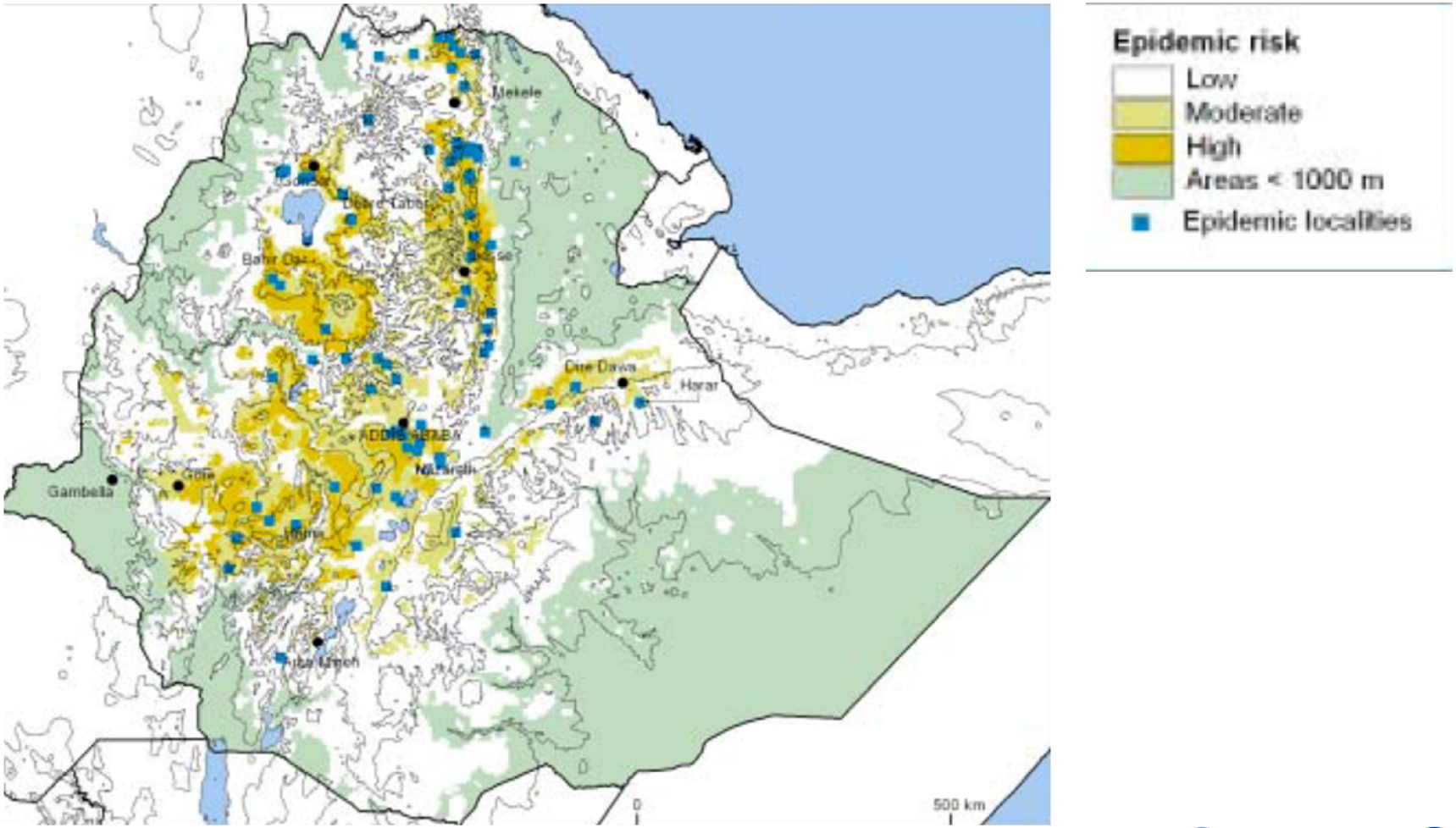
What Can We Provide?

- Information on Climate and Environmental Factors
- Methods to Integrate Climate and Env. in Decision-Making
- Capacity Building

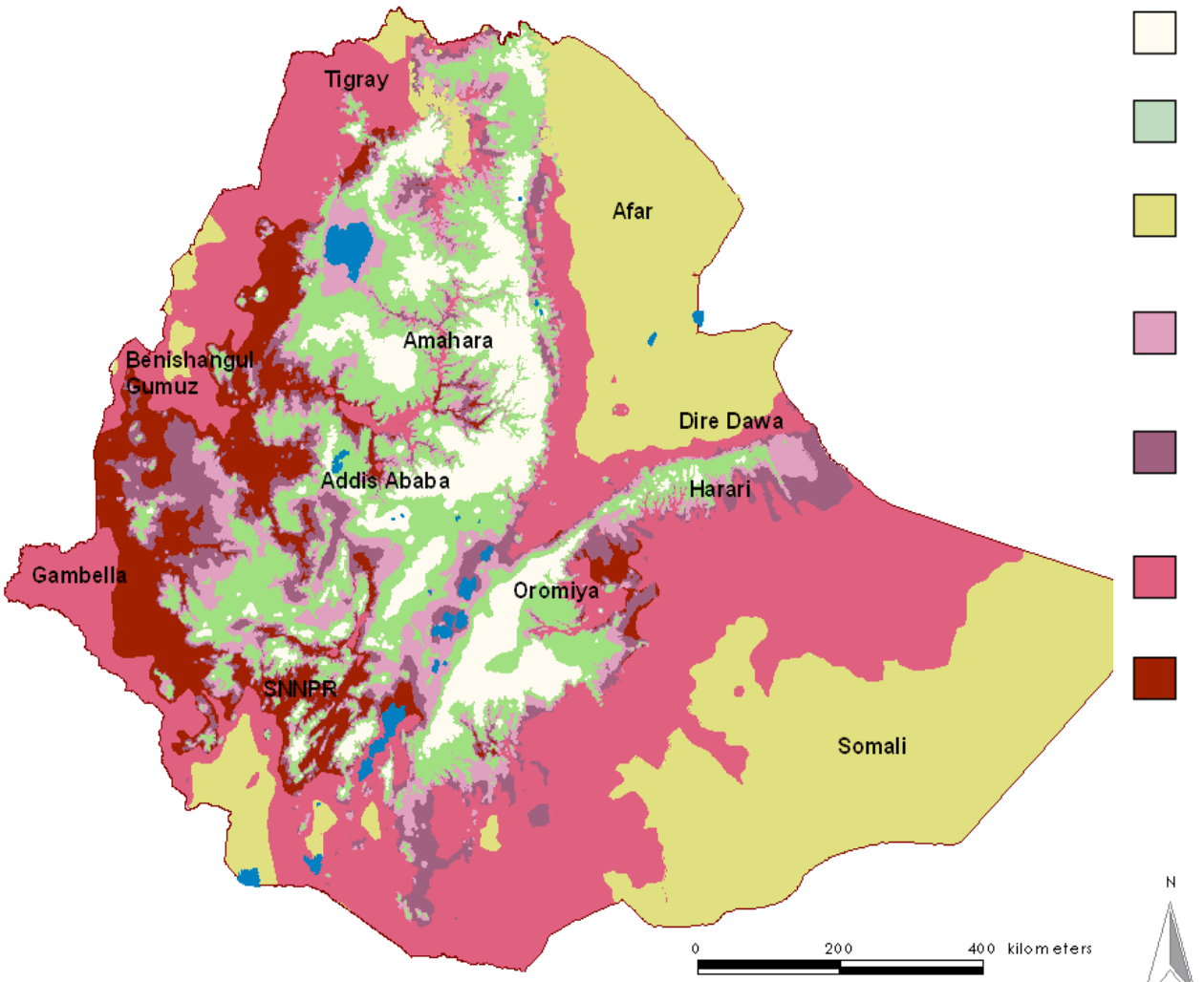
I. Stratification

SERVIR Health Stratification Map

Stratification Maps should indicate where resources must be allocated



SERVIR Health Stratification Map

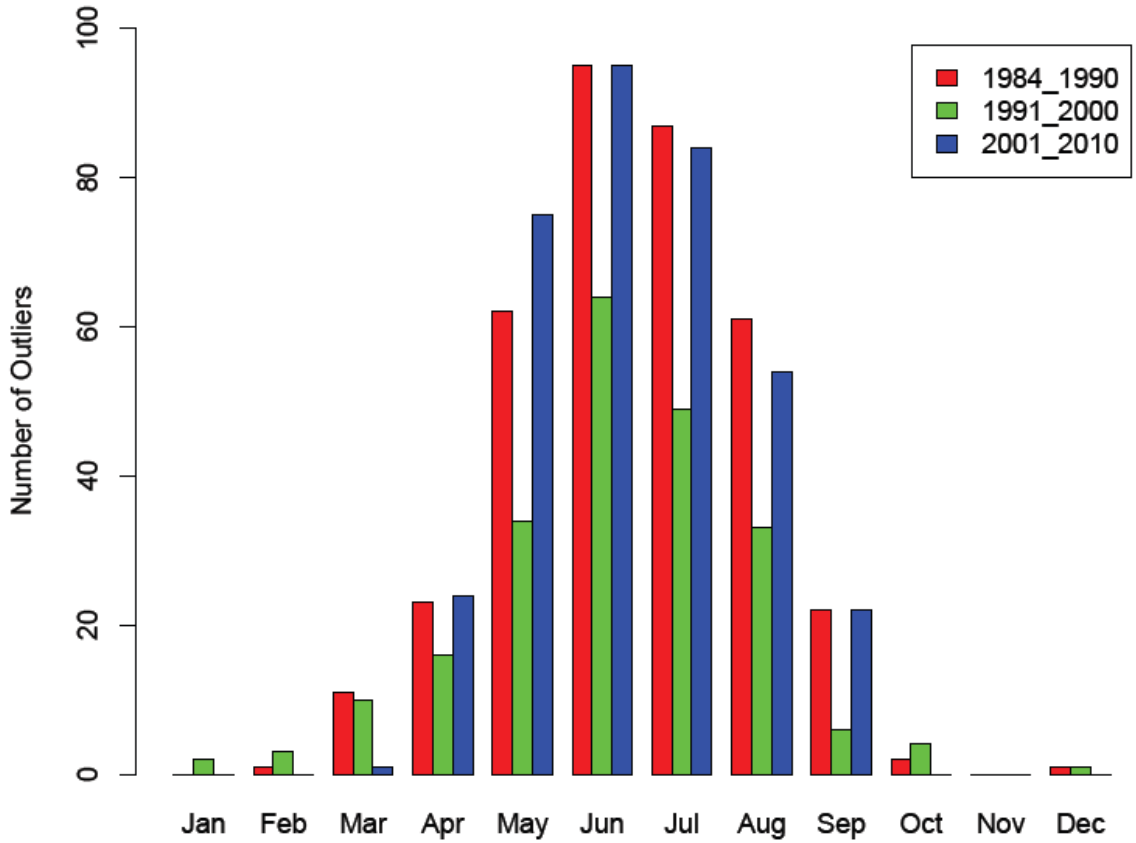


- A Malaria-free highlands (>2500m)
- B Highlands affected by occasional epidemics (>=2000 and <=2500m)
- C Arid lowlands affected by occasional epidemics; malarious near water (<1500m with rainfall <500mm)
- D Highland fringes with low transmission; epidemic-prone (>=1750 and <2000m)
- E Highland fringes with high transmission; epidemic-prone (>=1500 and <1750m)
- F Malarious lowlands with seasonal transmission (<1500m with rainfall >=500 and <=1000mm)
- G Malarious lowlands with intense transmission (<1500m with rainfall >1000mm)

© 2007 Ministry of Health, Ethiopia, and World Health Organization Country Office for Ethiopia

SERVIR Health Stratification Map

Temperature monthly average comparisons for three decades – 80s, 90s, 20s in highlands above 2000 m with temperature above 18 deg Celsius

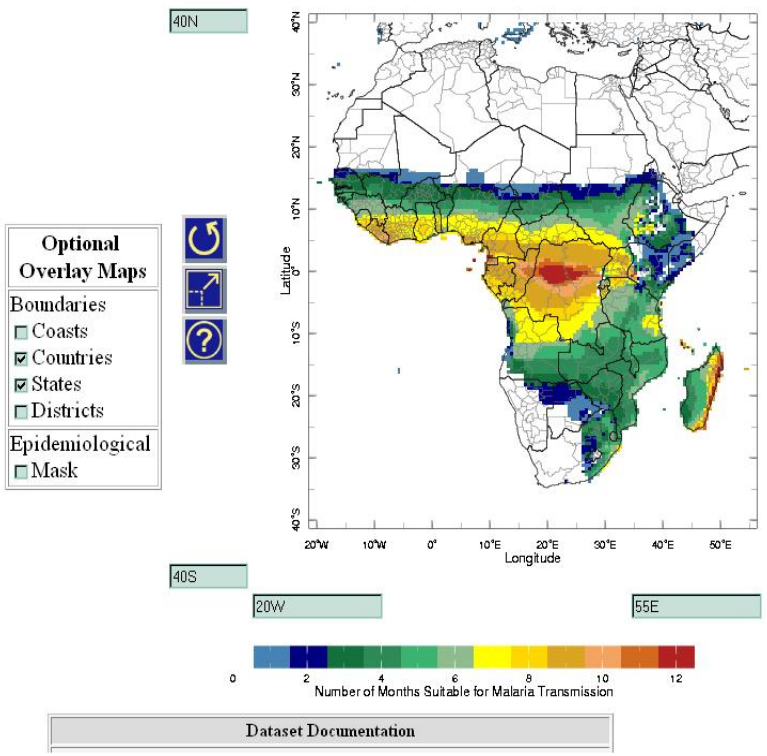


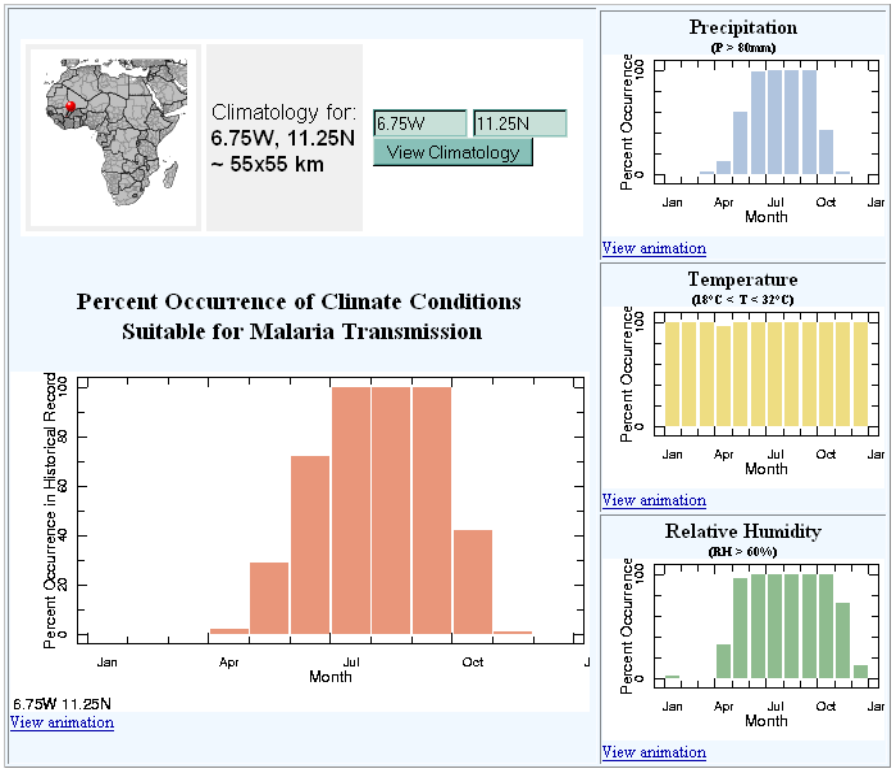
SERVIR Health Stratification Map

We provide via SERVIR platform

Climate suitability map for malaria

= 18-32ºC + 80mm + RH>60%

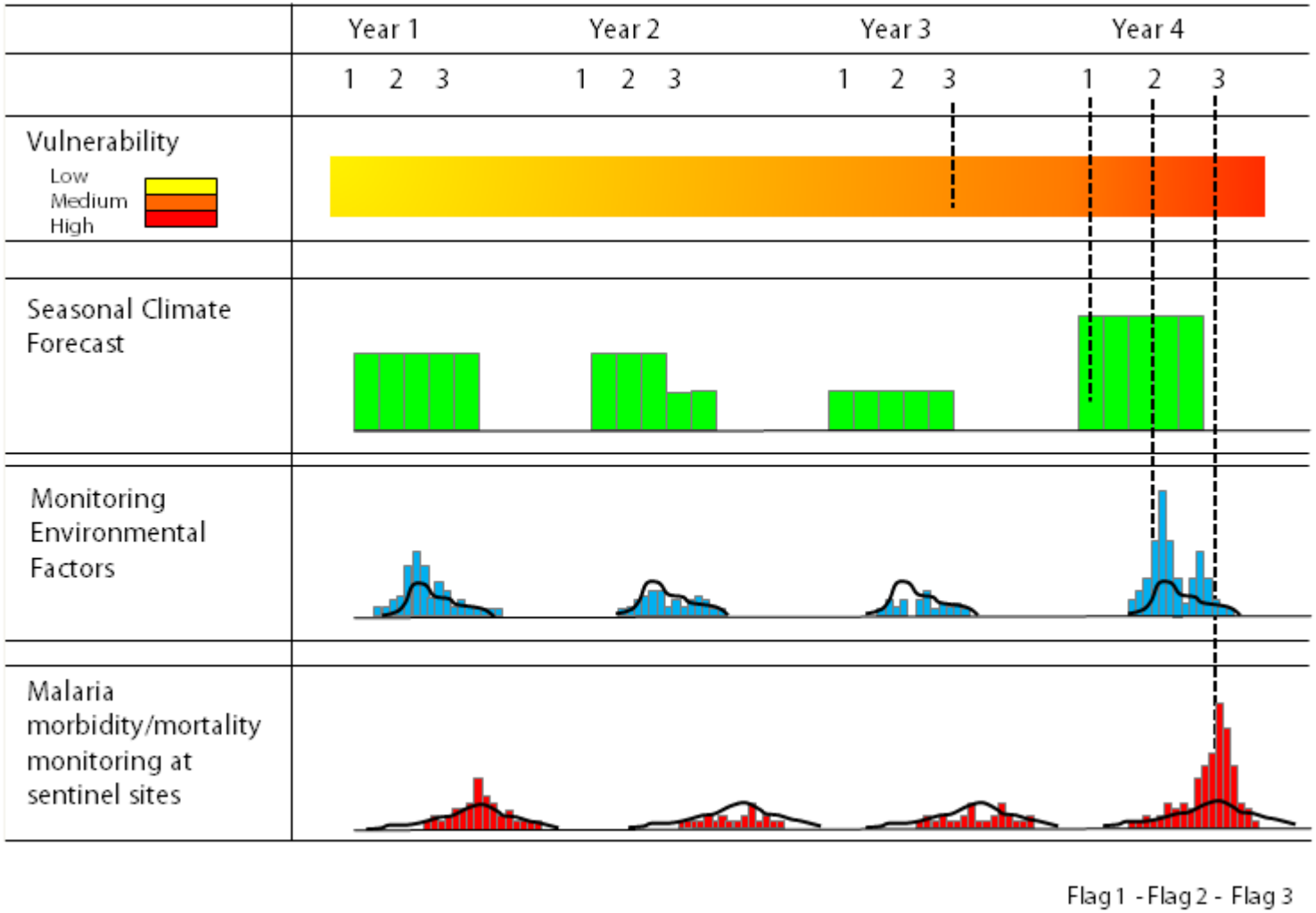




II. Early Warning Systems

SERVIR Health Early Warning Systems

WHO framework



SERVIR Health Early Warning Systems

IRI Data Library:
http://iridl.ldeo.columbia.edu/maproom/Health/Regional/Africa/Malaria/System.html

Vulnerability | Seasonal Climate Forecast | Monitoring The Environment | Observed Malaria Morbidity

Vulnerability

Insecticide Resistance

The Insecticide Resistance (IR) Mapper is a tool used to map results from World Health Organization susceptibility tests and insecticide studies using malarial mosquitoes collected from sites throughout the world.

Drug Resistance

Drug Resistance Maps is a project that maps the geographical distribution of resistance genes of malaria in Africa. These maps were developed by the London School of Hygiene and Tropical Medicine.

SERVIR Health Early Warning Systems

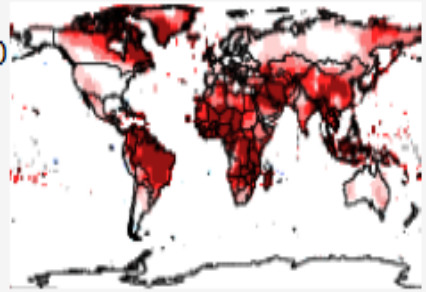
IRI Data Library:
http://iridl.ldeo.columbia.edu/maproom/Health/Regional/Africa/Malaria/System.html

Vulnerability | Seasonal Climate Forecast | Monitoring The Environment | Observed Malaria Morbidity

Seasonal Climate Forecast

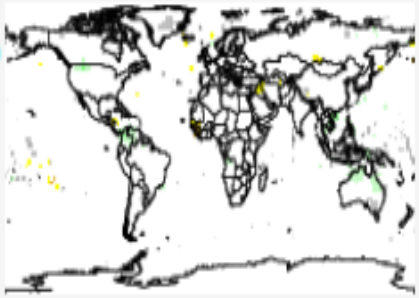
IRI Seasonal Temperature Forecast

The IRI Seasonal Forecast interface allows for graphs to be made easily by pointing and clicking on a location anywhere in the world.



IRI Seasonal Precipitation Forecast

The IRI Seasonal Forecast interface allows for graphs to be made easily by pointing and clicking on a location anywhere in the world.



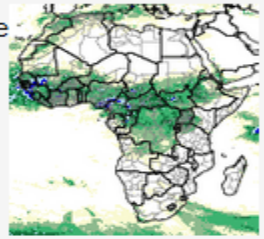
SERVIR Health Early Warning Systems

Vulnerability | Seasonal Climate Forecast | Monitoring The Environment | Observed Malaria Morbidity

Monitoring The Environment

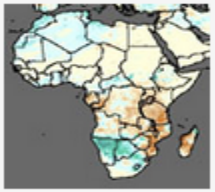
Dekadal (10-day) Precipitation

This map shows dekadal (10-day) precipitation estimates from the Climate Prediction Center.



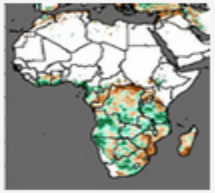
Precipitation Estimate Differences

This map shows dekadal (10-day) precipitation estimates as the difference from the short term average (from 2000 to last recent complete year).



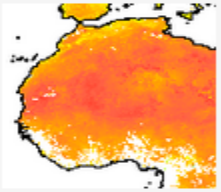
Precipitation Estimate Percentages

This map shows dekadal (10-day) precipitation estimates as a percentage of the short term average (from 2000 to last complete year).



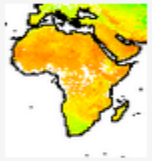
Inferred Maximum Air Temperature

This map shows approximated maximum air temperatures at 2 meters above the ground.



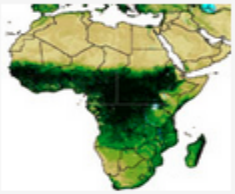
Minimum Land Surface Temperature (LST)

This map shows minimum land surface temperature (LST) used as a proxy for monitoring minimum air temperature.



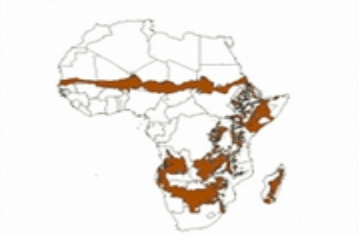
Measures of Vegetation

This tool produces maps of estimated vegetation using data from NASA's MODIS sensor.



Vectorial Capacity

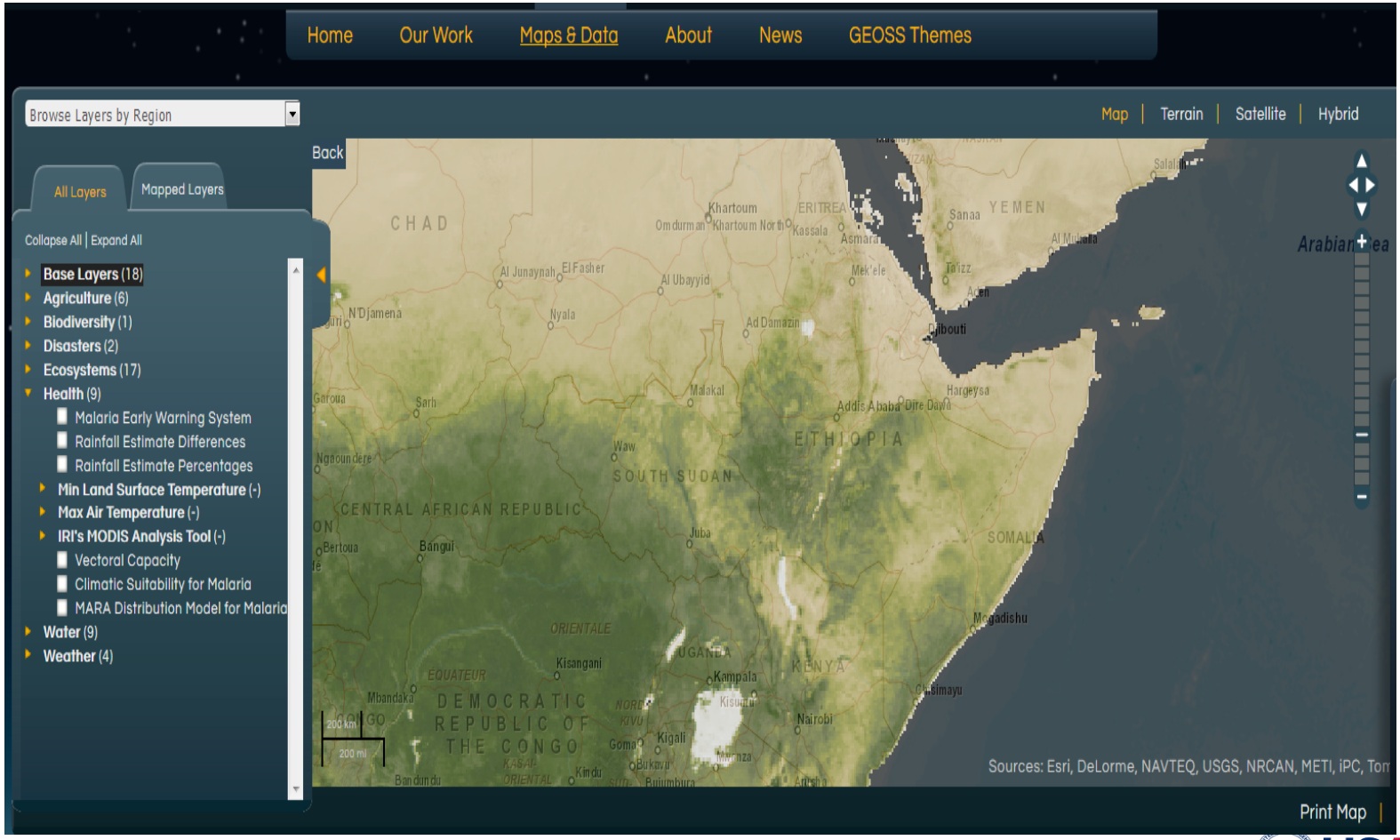
This map shows a Vectorial Capacity (VCAP) model that defines precipitation and temperature as the limiting factors of malaria incidence. VCAP is the daily rate at which future malaria inoculations could arise from a currently



SERVIR Health Visualization System

Monitoring Environmental Factors using:

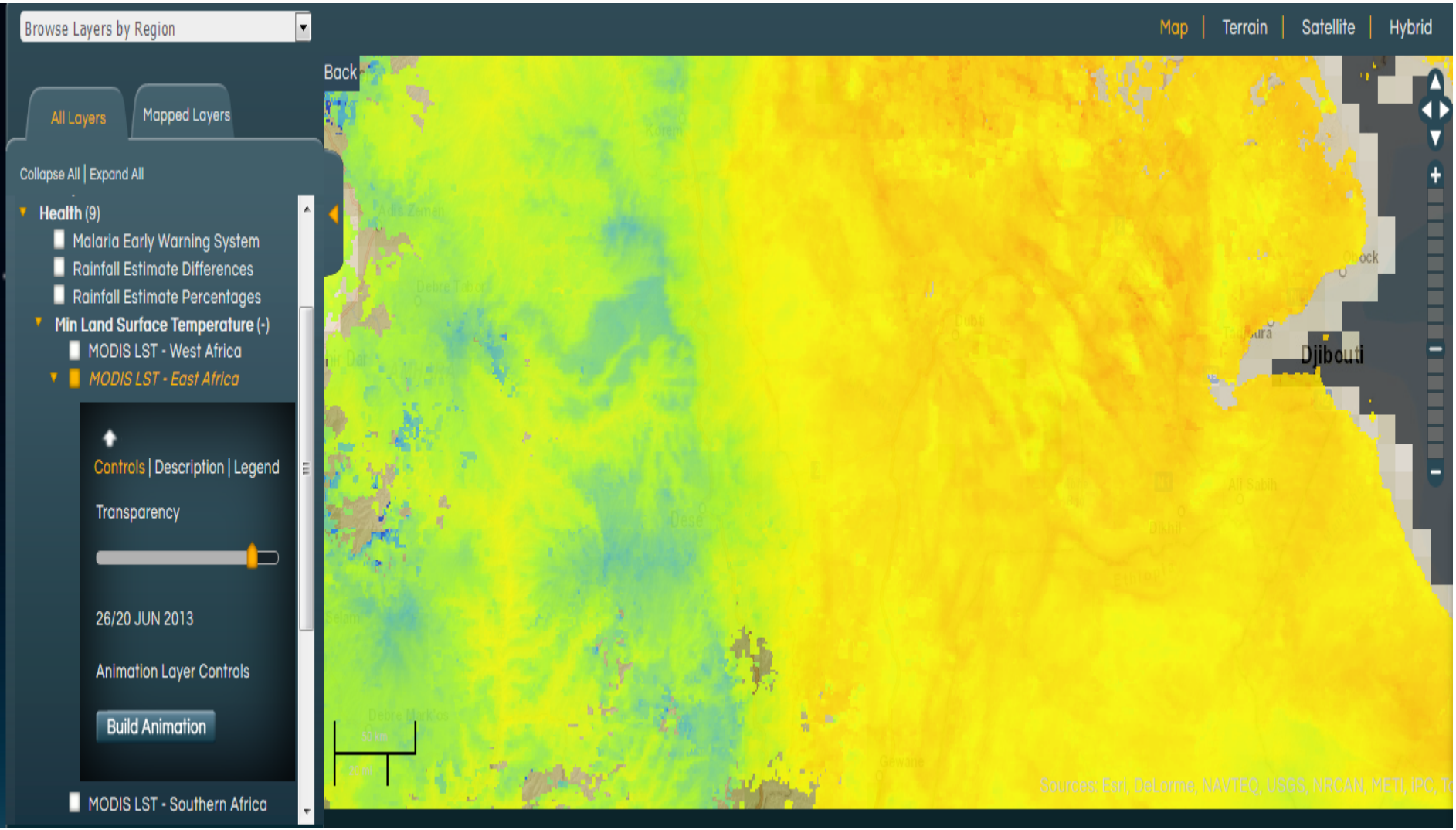
SERVIR Regional Visualization and Monitoring System



SERVIR Health Early Warning System

- **Health** (9)
  - Malaria Early Warning System
  - Rainfall Estimate Differences
  - Rainfall Estimate Percentages
  - **Min Land Surface Temperature** (-)
    - MODIS LST - West Africa
    - MODIS LST - East Africa
    - MODIS LST - Southern Africa
  - **Max Air Temperature** (-)
    - Air Temp - West Africa
    - Air Temp - East Africa
    - Air Temp - Southern Africa
  - **IRI's MODIS Analysis Tool** (-)
  - Vectoral Capacity
  - Climatic Suitability for Malaria
  - MARA Distribution Model for Malaria

SERVIR Health Early Warning System



SERVIR Health Early Warning System

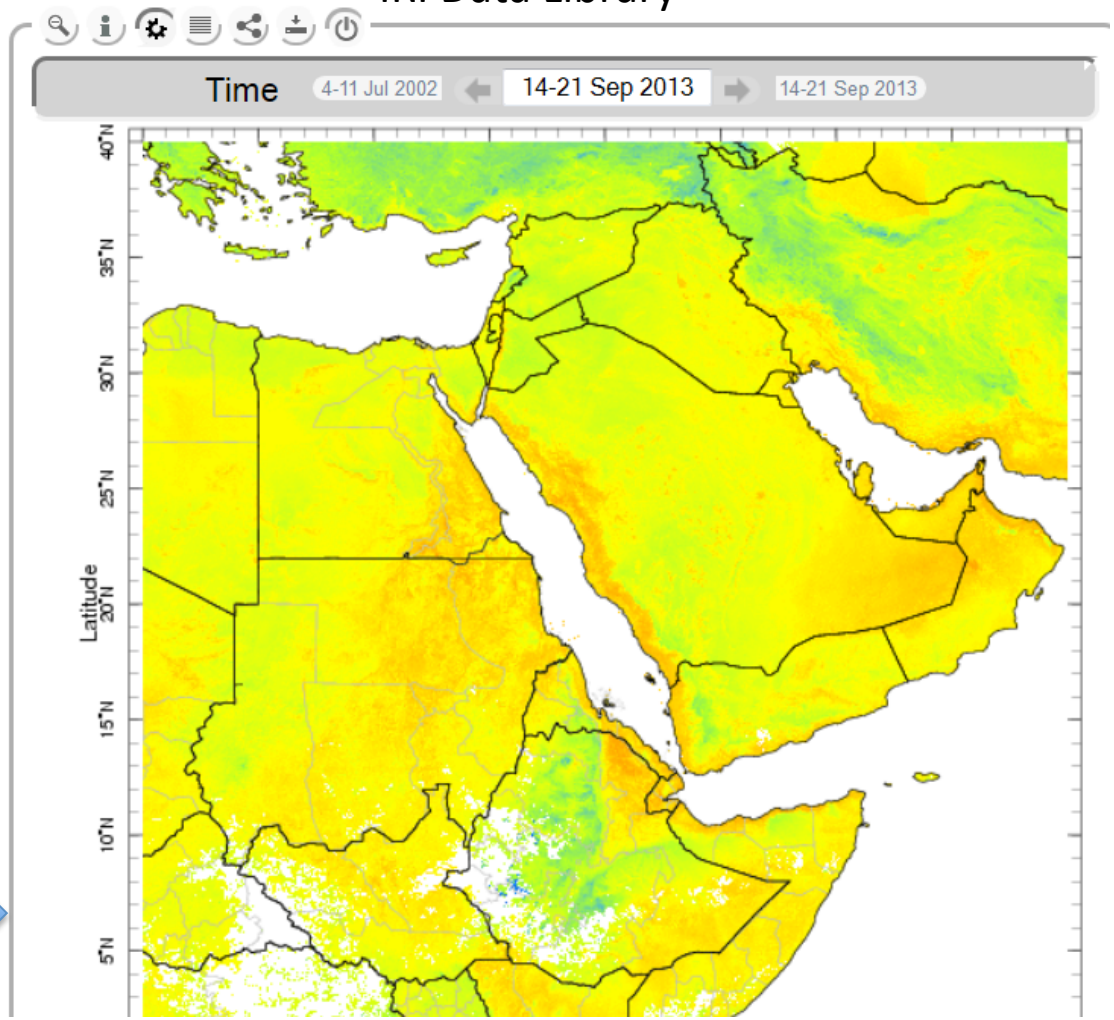
IRI Data Library

Controls | Description | Legend

This map shows minimum land surface temperature (LST) used as a proxy for monitoring minimum air temperature. Minimum air temperature is one important component for the transmission of malaria.

Additional information and capabilities to create/download customized map subsets and time series graphs for a location of interest are available at the Provider URL listed below.

Provider URL:
http://iridl.ldeo.columbia.edu/maproom/Health/Regional/Africa/Malaria/LSTmin/index.html

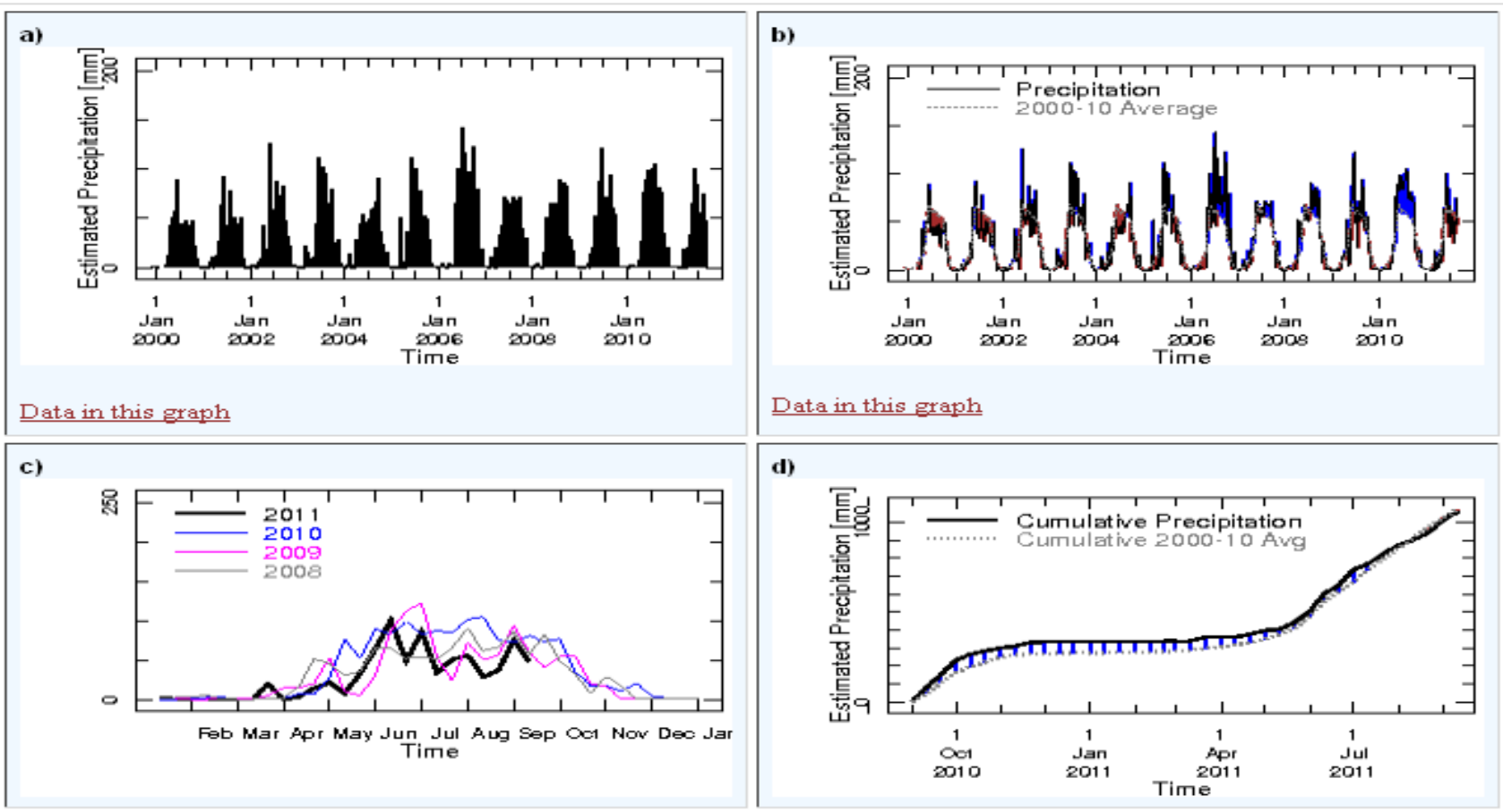


SERVIR Health Early Warning System

Observations for:
Kemashi, Benshangul, Ethiopia

district | 36.1E | 9.3N

Generate new time series

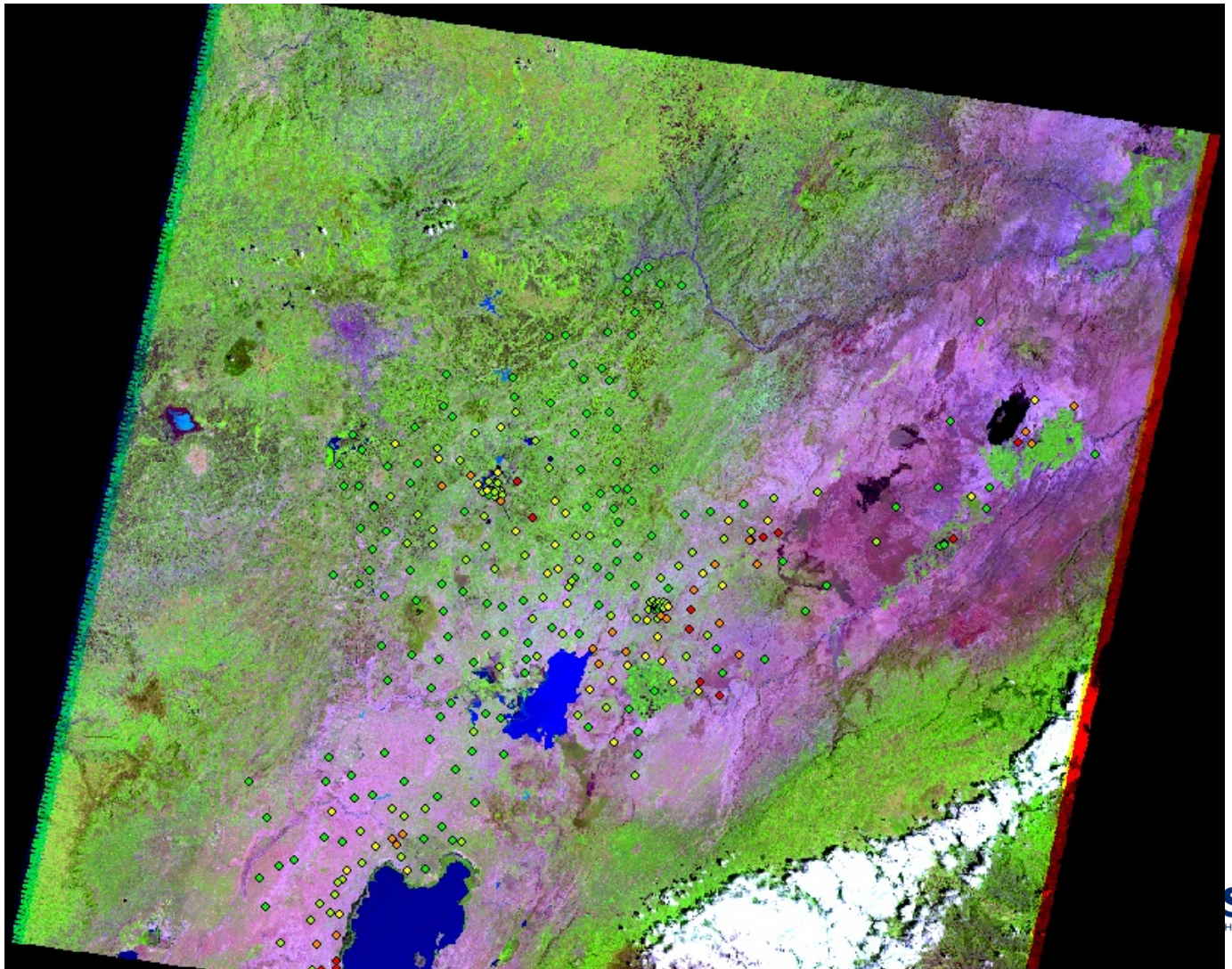


Development of New Products:

Monitoring Water Bodies

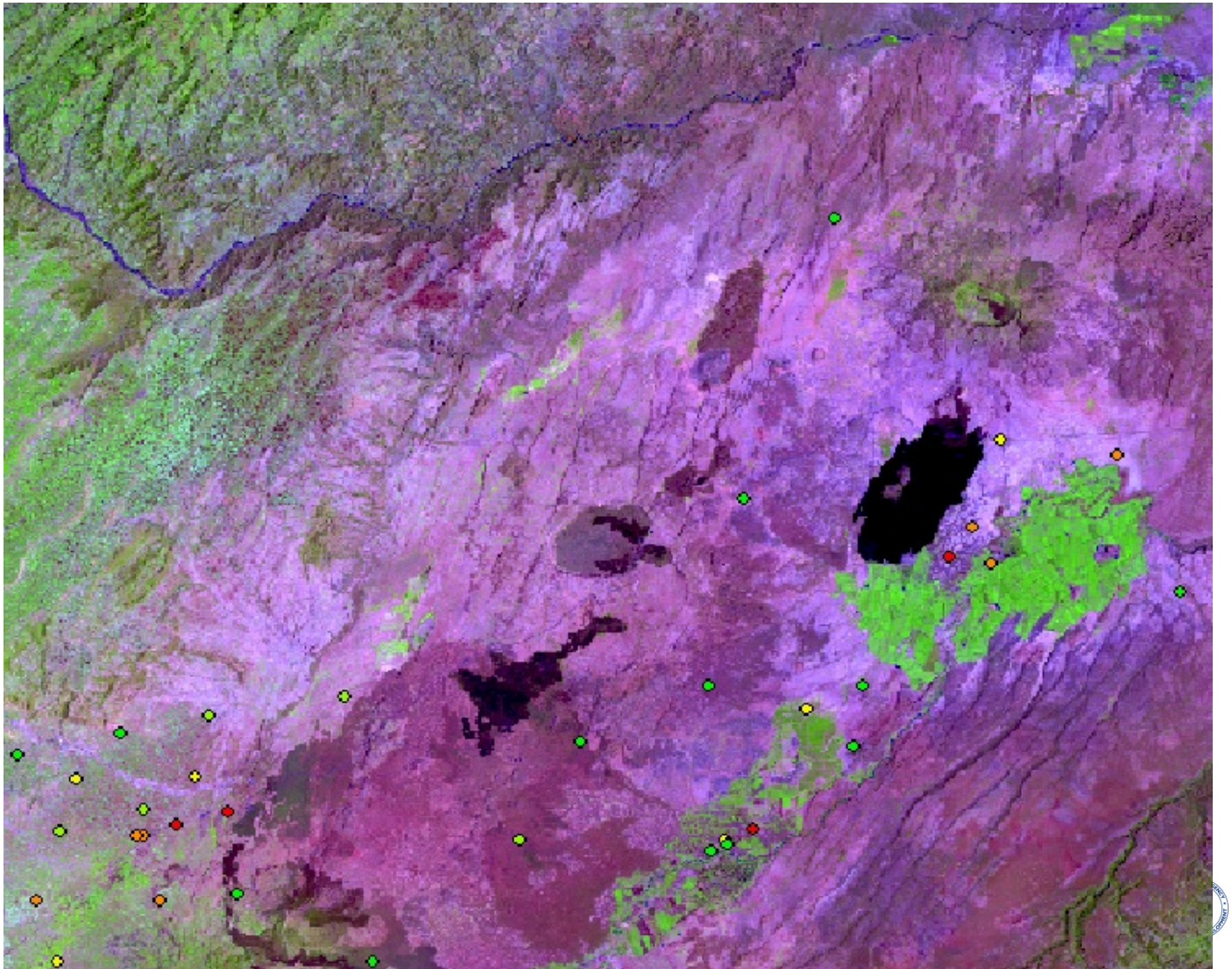
SERVIR Health Early Warning Systems

Monitoring Water bodies with Landsat (East Shewa, Ethiopia)



SERVIR Health Early Warning Systems

Monitoring Water bodies with Landsat (East Shewa, Ethiopia)



SERVIR Health Early Warning Systems

Monitoring Water bodies with Landsat (East Shewa, Ethiopia)

SERVIR Health Early Warning Systems

Long-lasting transition toward sustainable elimination of desert malaria under irrigation development

Andres Baeza[a], Menno J. Bouma[b], Ramesh C. Dhiman[c], Edward B. Baskerville[a], Pietro Ceccato[d], Rajpal Singh Yadav[c,e], and Mercedes Pascual[a,f,g,1]

Author Affiliations

Edited by Burton H. Singer, University of Florida, Gainesville, FL, and approved July 22, 2013 (received for review March 29, 2013)

Significance

It is recognized that the risk of malaria in dry areas is increased in the proximity of irrigation infrastructure. Although historical evidence shows that eventually malaria risks subside on the road to greater prosperity and food security, how this comes about remains poorly understood. We studied changes in land use and malaria risk in a large irrigation project in a semidesert region in northwest India. The transition phase we describe, characterized by elevated malaria despite raised control efforts, has already lasted for over a decade. The protracted nature of this transition highlights the need for a long-term commitment by health authorities and international agencies supporting irrigation schemes, to monitor health impacts and sustain control measures.

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September 10, 2013
vol. 110 no. 37
Masthead (PDF)
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Published online before print August 13, 2013, doi: 10.1073/pnas.1305728110
PNAS September 10, 2013 vol. 110 no. 37 15157-15162

Classifications

Biological Sciences
Sustainability Science

Access

- Abstract
- Full Text (HTML)
- Full Text (PDF)

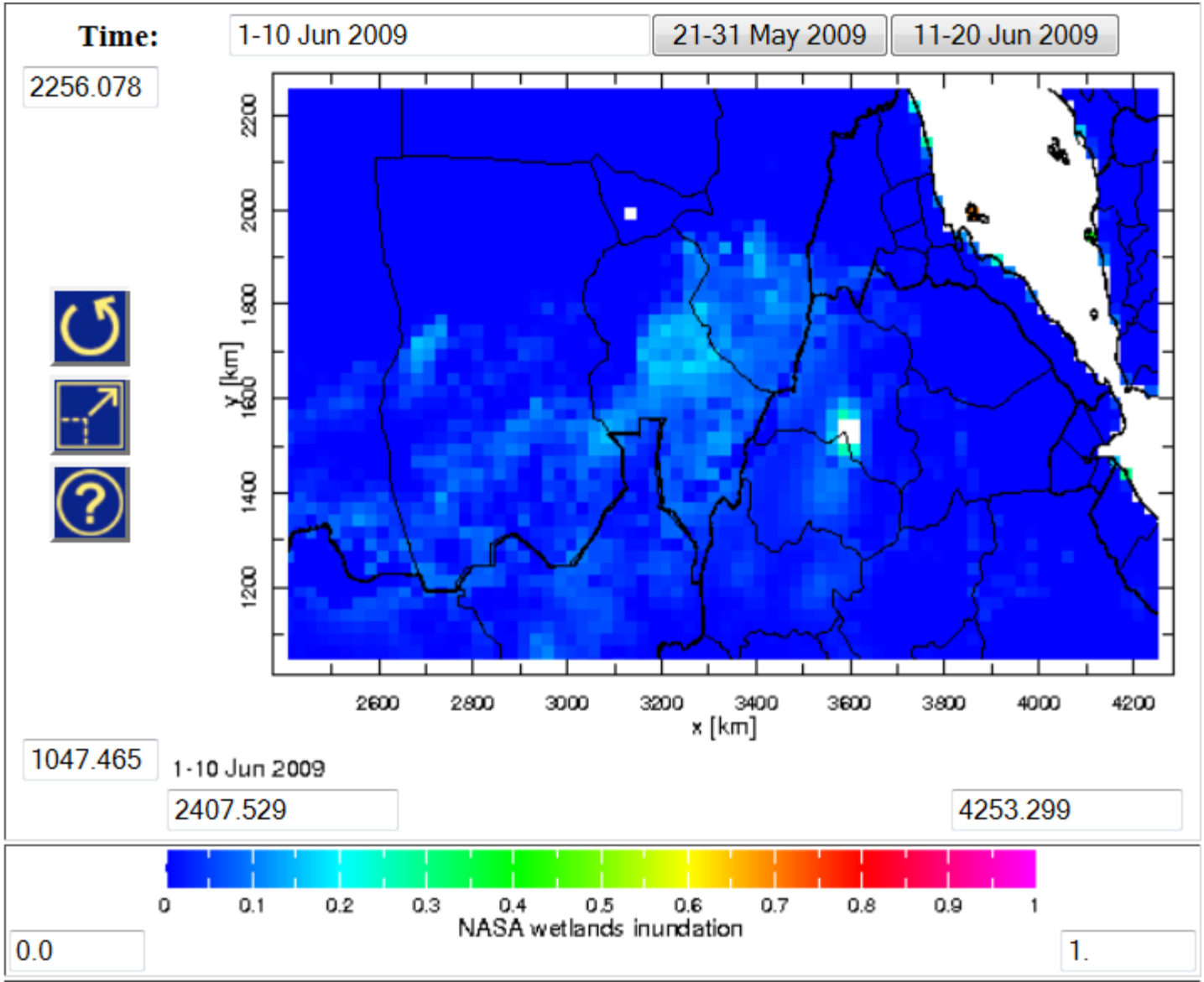
Leishmaniasis in Sudan

SERVIR Health Early Warning Systems

AMSR-E on Aqua, SeaWinds on QuikScat, & PALSAR on ALOS to derive Wetland Inundation

Collaboration

IRI-JPL-CCNY



III. Impact Assessment

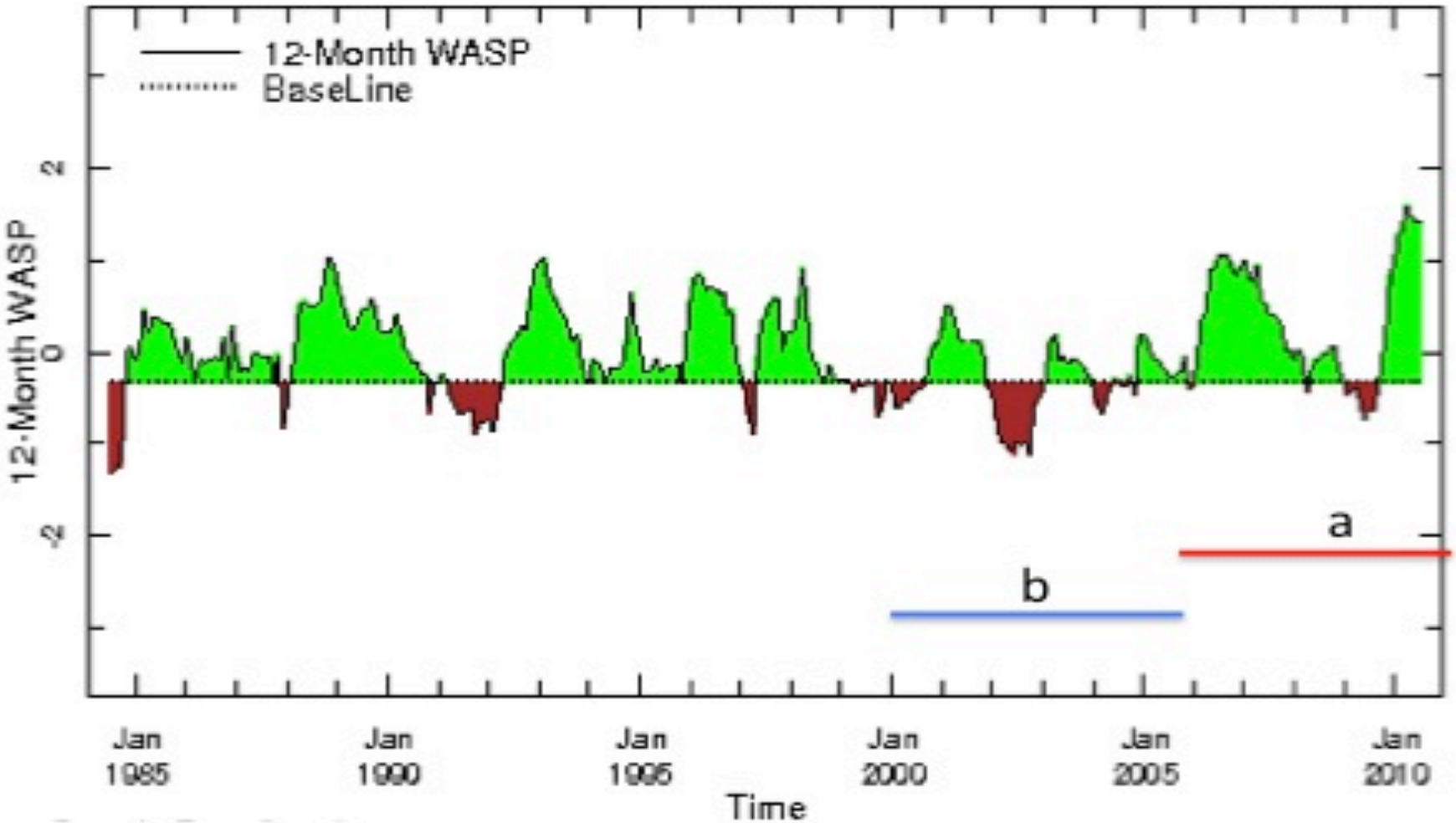
Objectives

Enable USAID/CDC PMI to account for the confounding effect of climate variability when evaluating the national malaria control program's malaria interventions.

Establish a methodological framework for removing the confounding effect of climate from routine impact assessment activities carried out by the Monitoring and Evaluation Reference Group.

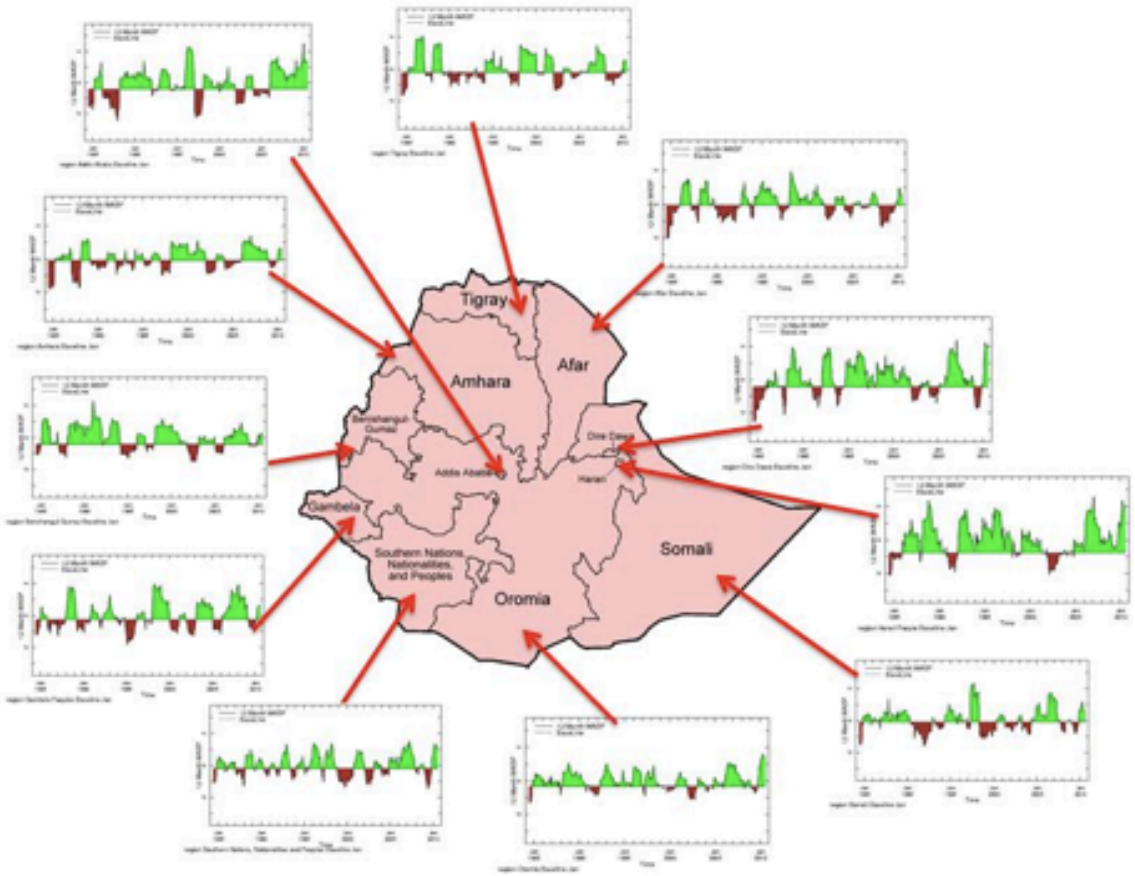
SERVIR Health Impact Evaluation

Weighted Anomaly Standardization Precipitation (WASP) index
Lyon, B., and Barnston A. G. , 2005



SERVIR Health Impact Evaluation

Figure 7-9. Zonal WASP analysis for Oromia, Ethiopia using ENACTS products with a 2000-2005 baseline



SERVIR Health Impact Evaluation

Climate Analysis Tool Exploring Precip. and Temp. Data for Oromia

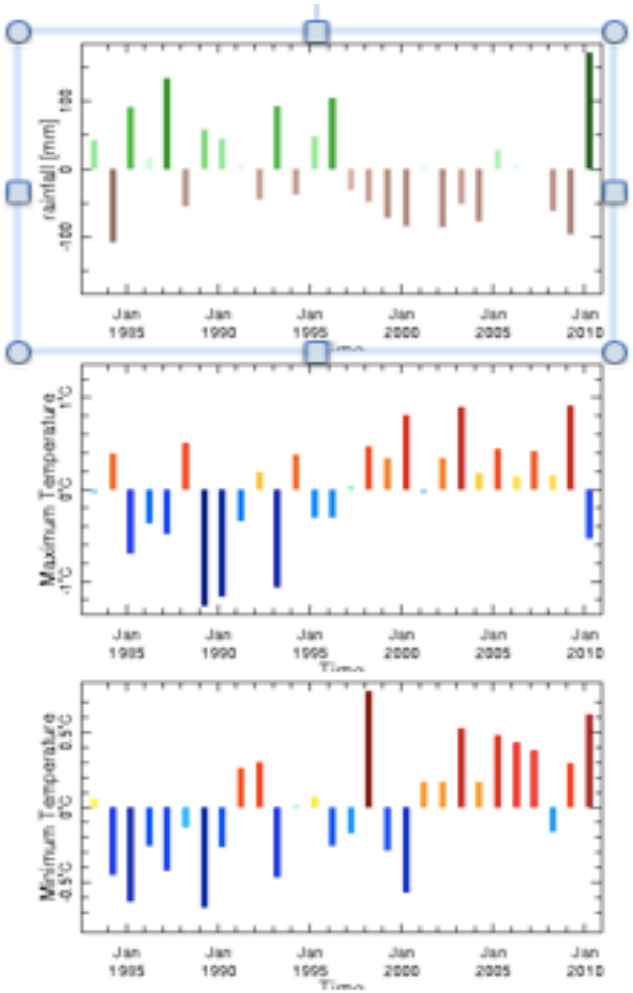


Figure 7-6abc Trend in rainfall (top) max T (middle) and min T (bottom) for the Belg rainy season (Feb-May)

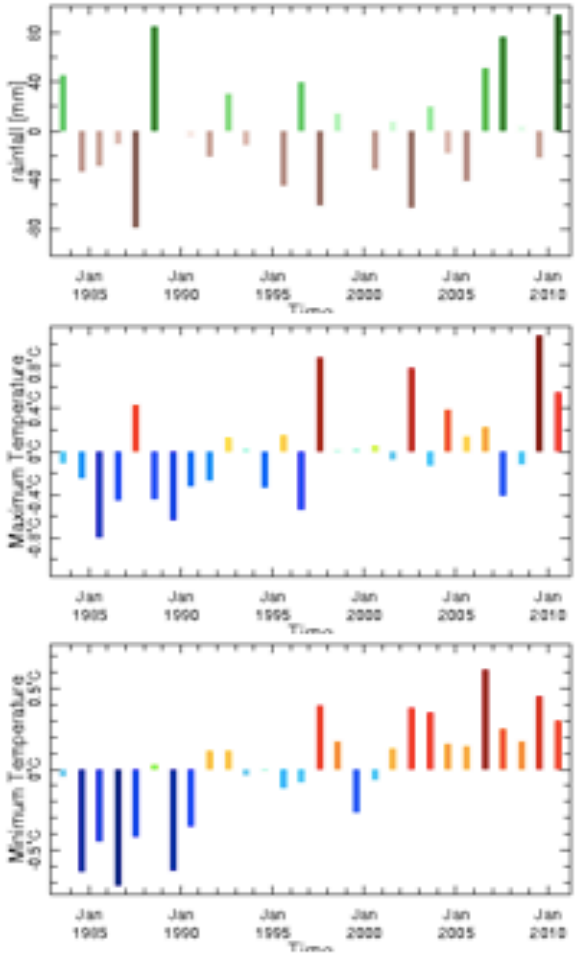
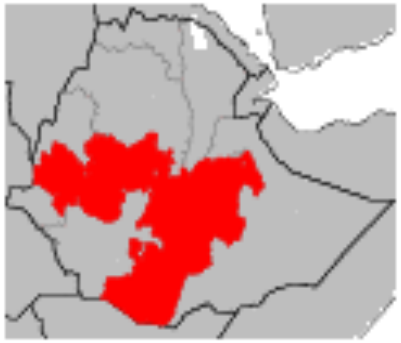


Figure 7-7abc Trend in rainfall (top) max T(middle) and min T (bottom) for the Kiremt rainy season (Jun-Sep)



Evidence suggests that climate risk for malaria has increased during the intervention period when compared with the baseline period.

SERVIR Health

SERVIR GLOBAL
The Regional Visualization and Monitoring System

https://www.servirglobal.net/