**NASA DEVELOP National Program**

****International Research Institute for Climate and Society

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**Zanzibar Health & Air Quality I**

*Creating a Land Cover Map Using NASA Earth Observations to Identify Locations of Malaria Transmission in Zanzibar*

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**Team Members:**

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**Applied Sciences National Applications Addressed:**

Health and Air Quality

**Study Area:**

Zanzibar

**Study Period:**

Jan 2002 - Jun 2014

**Partners/Collaborators**

Zanzibar Malaria Control Program (ZMPC): Dr. Abdul-Wahid Al-Mafazy, Head of Malaria Control Program

**80-100 Word Blurb**

This project created a land cover map for Zanzibar and explored its relationship with malaria transmission. The land cover map was derived from sensors found on Landsat 8 and images from the ISS SERVIR Environmental Research and Visualization system (ISERV). The project helped the United States Agency for International Development (USAID)-led President’s Malaria Initiative (PMI) and the Zanzibar Malaria Control Program (ZMCP) in identifying the locations of malaria transmission with the objective of eradicating malaria in Zanzibar.

**Community Concerns**

* Over half a million people die from malaria each year.
* A majority of malaria victims are children under the age of 5.
* Sub-Saharan Africa holds 90% of all malaria deaths.
* Increasing consensus that the practical policy option for dealing with malaria is to pursue a global policy of progressive elimination and aggressive control in high burden areas with the goal of eventual eradication.
* National malaria control programs and their partners need to understand the current malaria distribution, its seasonal transmission dynamics, the location of persistent hotspots, the likely timing of outbreaks, and the impact of current measures to control malaria in the context of current and future transmission drivers.

**Current Management Practices & Policies**

Currently, Zanzibar employs malaria control methods such as insecticide-treated nets, indoor-residual spraying, and artemisinin-combination therapy. Links have previously been found between environmental factors and vector-born disease outbreaks. Unfortunately, many times meteorological and ecological data are difficult to procure, thus remote sensing is employed to fill the void. The ISERV camera system aboard the International Space Station (ISS) along with the Landsat 5 satellite was used to identify land cover where malaria transmission is still prevalent in Zanzibar.

**Abstract**

Malaria is still present on the island of Zanzibar although, transmission of the disease has declined significantly over the past two decades. There is an increasing scientific consensus that the practical policy option for dealing with malaria is to pursue a global policy of progressive elimination and aggressive control in high burden areas with the goal of eventual eradication. African countries choosing this path are already developing malaria control and elimination strategies, and roadmaps for delivery approaches to target resources, which will prevent the reintroduction of malaria into regions where control strategies have been successful. New strategies to eradicate malaria require an understanding of how interventions affect the transmission of the disease across different geographic areas (at multiple spatial and temporal scales), in a varying climate, and where detailed land-surface processes affect vector population dynamics and behavior. Such requirements are not unique to the eradication community, but they are important for control and elimination. In particular, national malaria control programs and their partners need to understand the current malaria distribution, its seasonal transmission dynamics, the location of persistent hotspots, the likely timing of outbreaks, and the impact of current measures to control malaria in the context of current and future transmission drivers. These drivers include climate variability and change at multiple spatial and temporal scales. In addition to these drivers, links have been found between several environmental factors and vector-borne disease outbreaks. Unfortunately, many times meteorological and ecological data are difficult to procure, thus remote sensing is employed to fill the void. Data from the ISS SERVIR Environmental Research and Visualization system (ISERV) camera system aboard the International Space Station (ISS) along with the Landsat 5 satellite were used to identify various land covers across Zanzibar. These land covers were used to identify various climatological and environmental factors that allow for the presence of malaria in the region.

**Decision Support Tools**

* Land Cover and Water Body Maps – Created new methods, which produced maps that show current land cover and water bodies, and thus can be used to locate areas to focus malaria mitigation efforts.
* Early Warning System – A decision system that will calculate probable locations of malaria outbreaks based on environmental factors, historical epidemiological data, and current land cover.

**Benefit to End-User:**

* Land cover maps were used to identify various climatological and environmental factors that allow for the presence of malaria in the study area and therefore show where relief efforts would be most effectively allocated.
* An early warning system will identify areas in which potential malaria outbreaks could take place thereby allowing for better mitigation practices related to relief efforts.

**Earth Observations & Parameters**

Landsat 5, TM, ETM+, OLI/TIRS - Land Cover

International Space Station, ISERV - Land Cover

**Ancillary Datasets Utilized**

Zanzibar Malaria Control Program (ZMCP) - Malaria epidemiological data

**Software Utilized**

ENVI - Land classification of Landsat and ISERV imagery

Erdas Imagine - Land classification of Landsat and ISERV imagery

ArcGIS - Raster Manipulation/Analysis, Image Enhancement & Map Creation