Preserving Lake Sulunga with Satellite Data Technology

With the Africa Regional Data Cube, the Government of Tanzania is assessing water extent and improving policy to protect Lake Sulunga and the communities who depend on it for water, food, and income.

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Background

More than 70 percent of all natural disasters in Tanzania are climate change-related, linked to recurrent droughts and floods. Lake Sulunga in Central Tanzania is approximately 45 km west of the capital of Dodoma. It is a fertile oasis in the otherwise semi-arid and drought-prone region. Lake Sulunga is surrounded by a variety of settlements, with communities relying heavily on the lake not only for drinking water, but also for fishing, agriculture, livestock farming, and salt making.

Uncontrolled tree cutting, bird poaching, and climate change all threaten the health of the lake ecosystem, and thereby threaten its utility for surrounding communities.

Figure 1: Lake Sulunga

Collaborating for Change

In order to better understand the changes to Lake Sulunga and inform the most appropriate policy interventions, the National Bureau of Statistics (NBS) of Tanzania required access to, and a strengthened ability to use and analyze, high-quality environmental statistics. However, poor data quality, overlapping activities, various funding modalities, the fragmented data landscape, and inadequate data collection, analysis, and use have hindered the production of timely and good quality environment statistics.

Through the Environment and Climate Change Data Collaborative, the Global Partnership for Sustainable Development Data (the Global Partnership) is working closely with NBS to address data gaps like this. The collaborative works to strengthen monitoring and reporting on the Sustainable Development Goals (SDGs) and national development plans. One way the Global Partnership is working with NBS is through the use of the Africa Regional Data Cube (ARDC) – a tool that enables the government to access 17 years' worth of analysis-ready satellite imagery and Earth observation data. The ARDC makes it possible to generate environment statistics and analyze data on issues related to agriculture, deforestation, water access, and food security. NBS is using the ARDC to better understand the changes in Lake Sulunga, and specifically to monitor SDG indicator 6.6.1 – change in the extent of water-related ecosystems over time.

Diving into the Data

Using the water observation from space (WOFS) algorithm developed by Geoscience Australia, an analysis of the water extent of the Lake Sulunga region between January 2014 and January 2018 indicated that 55.4 percent of the region was never water, 44.6 percent of the region was sometimes water, and none of the region was always water (as shown in

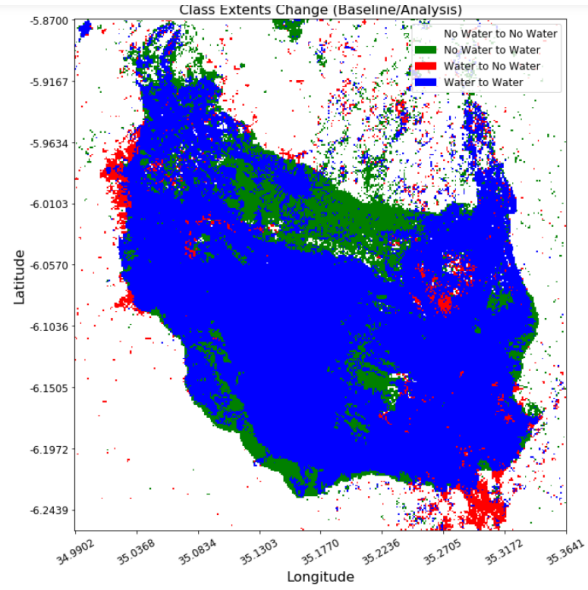

Figure 2: Variation of water levels captured by ARDC

Figure 2). This time period was chosen specifically to include 2015, which the local communities highlighted as a year of extreme weather events including drought and occasional floods. The ARDC provided NBS with continuous cloud-free Earth observation (EO) data for the country – data they did not have access to before.

Between 2014 and 2017, the results showed a -3.83 percent change in water classification, representing a loss in spatial area of water extent.

Better Data for Better Lives

Lake Sulunga measures about 25 km wide and 42 km long. The communities who live around the lake are dependent on fishing and animal husbandry for their livelihoods. Ground validation conducted by NBS revealed that as the lake shrinks, communities have been encroaching on the banks, which are more fertile for agriculture. When floods occur, properties and dwellings are destroyed.

As the pace of development increases alongside rapid development in Dodoma, the lake could be severely affected by expanding agriculture and climate change. Using imagery from the ARDC, NBS has been able to demarcate the actual boundaries of the lake. This was previously not possible, as it would have to be done manually and is prone to human error and inconsistencies as the water extent changes over time. This information is valuable to inform decision-making that can protect citizens from flooding.

Access to EO data through the ARDC has helped NBS conduct time-series analysis of critical areas of interest more quickly and thoroughly than was previously possible. In addition, it has increased the ability to monitor SDG 6.6.1 and gain high-level political support to build capacity to more routinely use EO data for monitoring the SDGs and national plans.

These steps combined allow NBS to make better policy decisions, in the interest of people and the environment. For example, NBS has worked closely with the Office of the Prime Minister to offer advisory services on environmental statistics based on EO data results. The results have been positive, and NBS has been tasked to use the ARDC to conduct further analysis. One upcoming project will focus on investigating land degradation in Shinyanga, Tanzania.

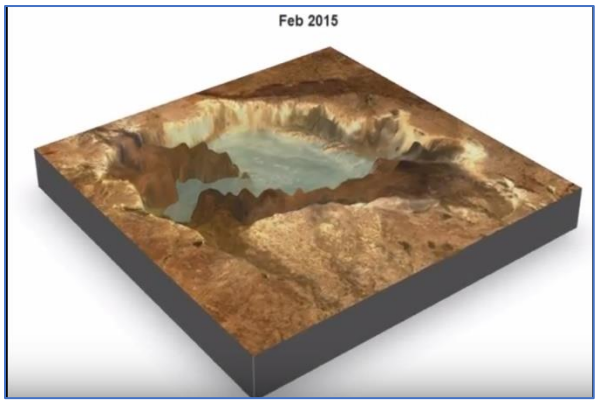

Figure 3: Animation of change in water extent in Lake Sulunga. Click for animation. (Source: Geoscience Australia)