

Addressing the Millennium Development Goals for Water and Sanitation:

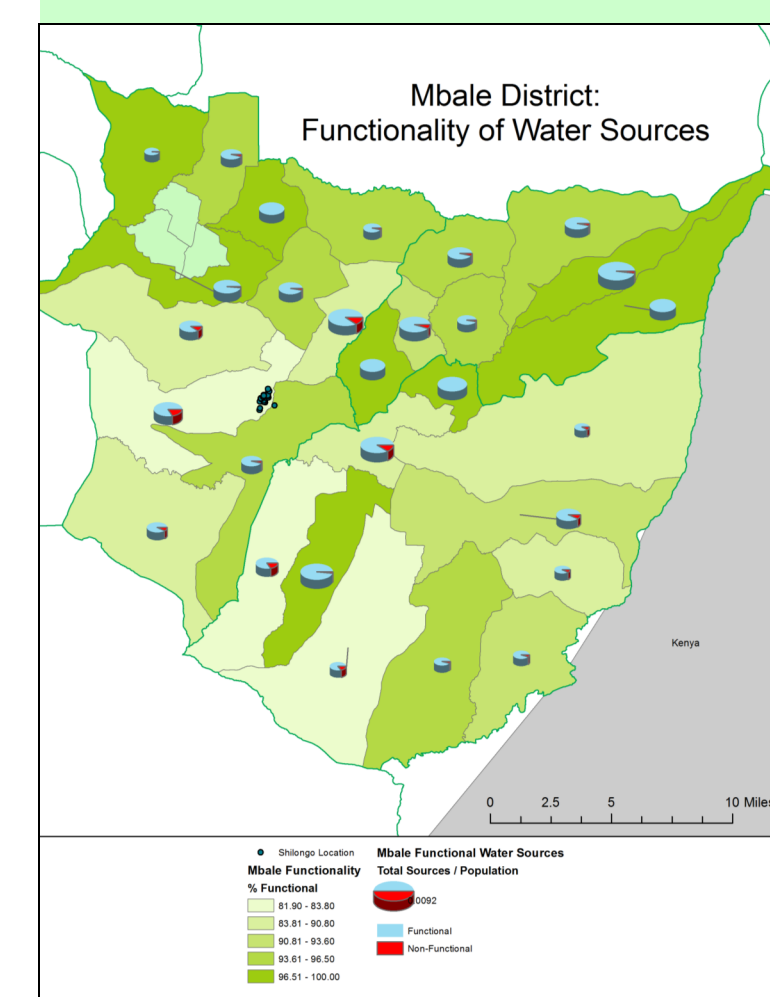
A Mapping Analysis of Uganda's Water and Sanitation Infrastructure

Case Study from Shilongo



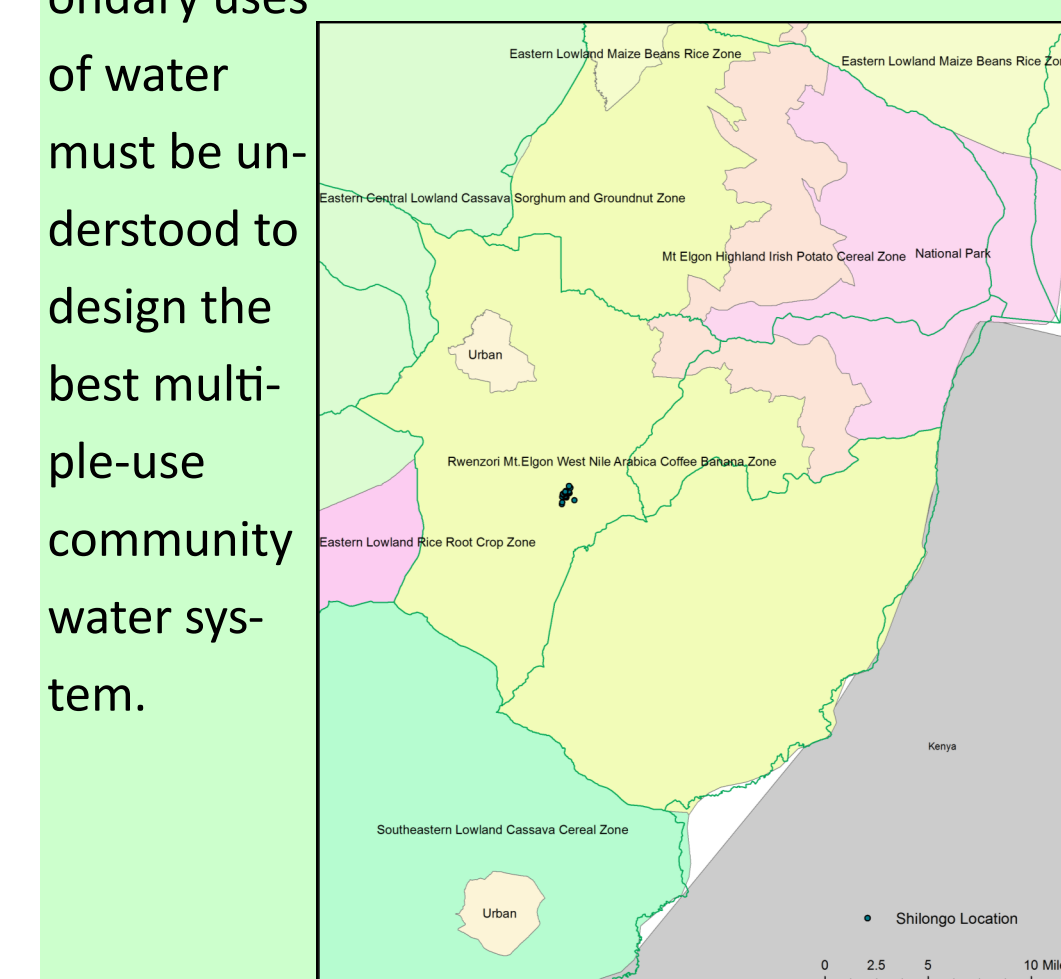
The experience working on a community water project in a rural village of approximately 800 people has served as a check against the reliability of government and internationally reported GIS data for Uganda. Several sources of error were found when mapping existing data on water source functionality, livelihoods, and safe water coverage statistics.

For example, the Uganda Ministry of Water and the Environment over-estimates the percentage of functioning water sources for the Eastern Region of the country; according to the MWE Water Supply Atlas 81.9% of water sources are functional in the Mbale district, but after visiting the district water office and talking with the community it was discovered that the gravity tap scheme installed by the

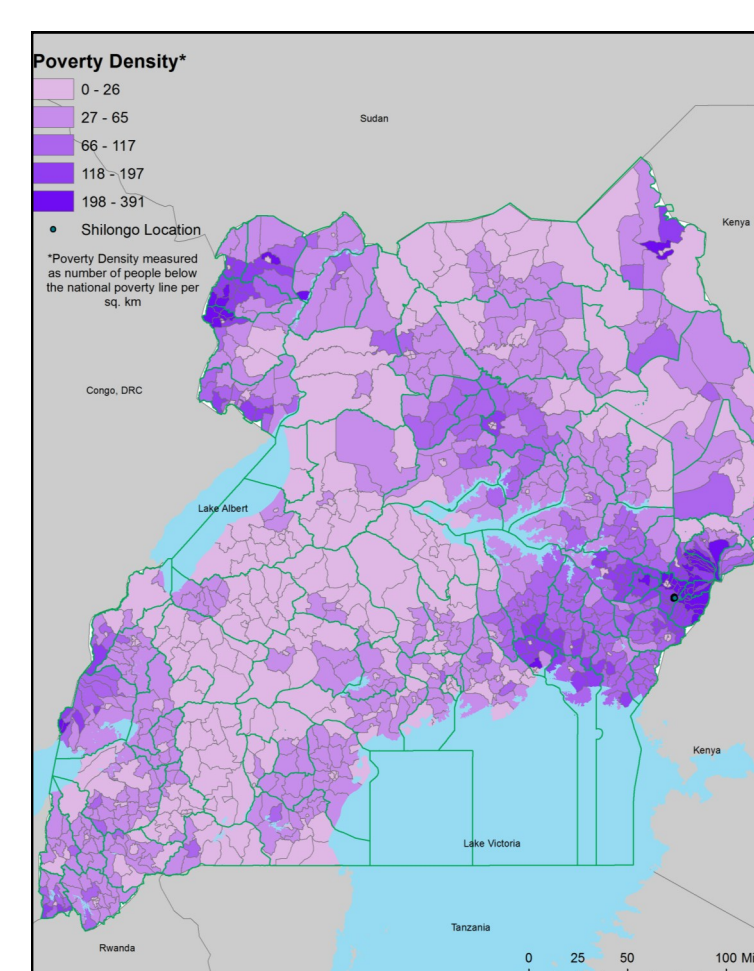
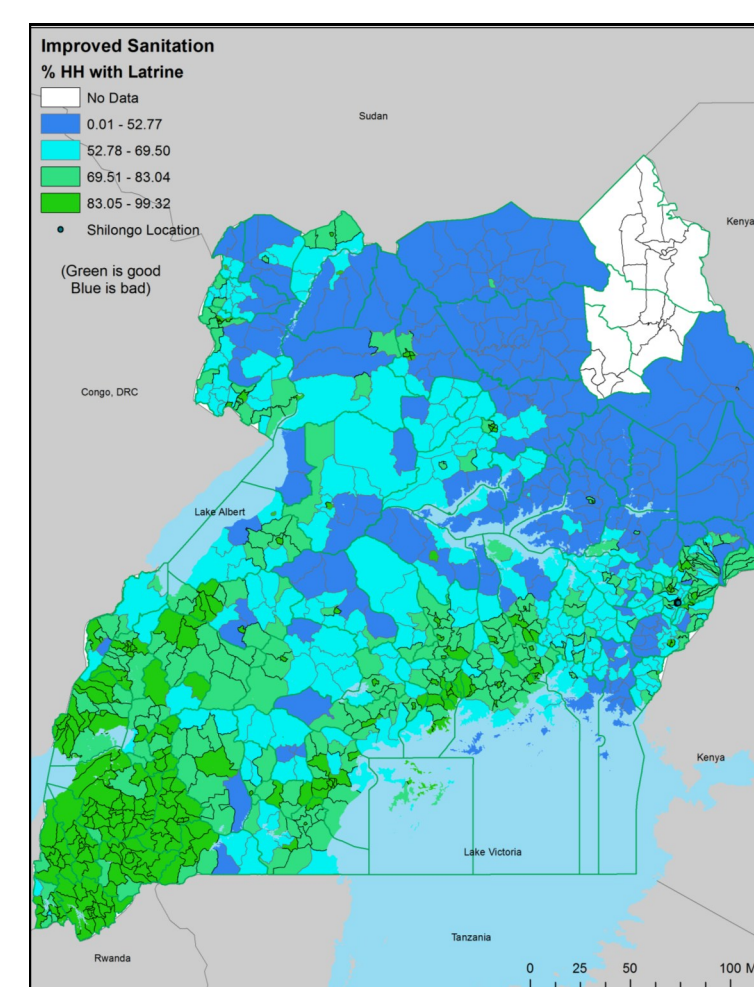
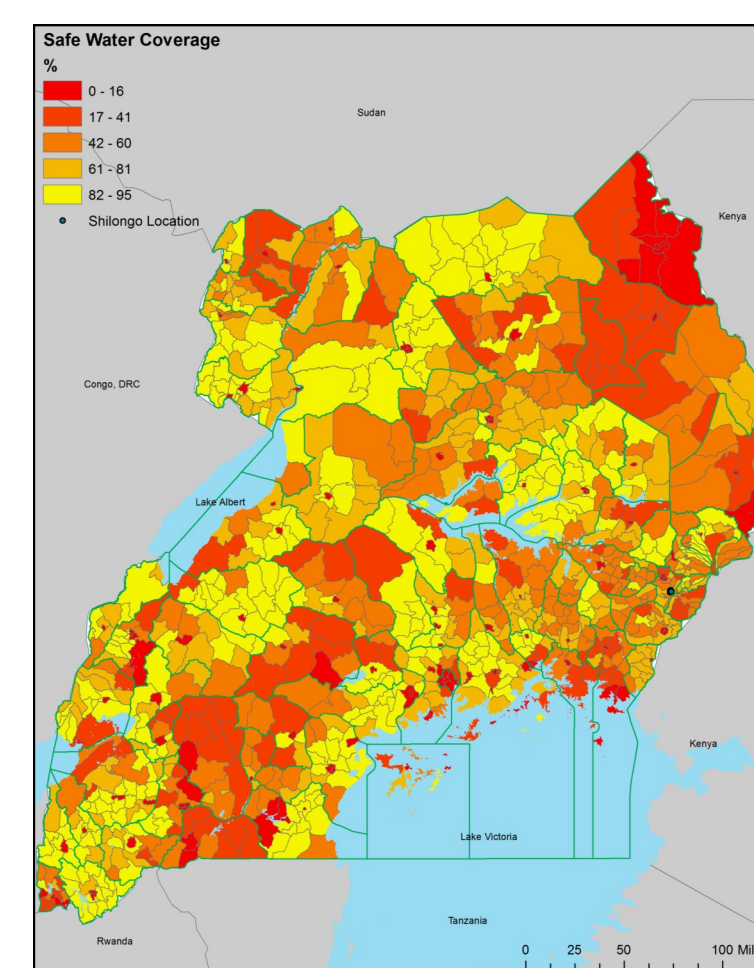


district government was actually not functioning regularly. This also calls into question the accuracy of safe water coverage statistics.

Livelihood information downloaded from USAID FEWSNET for the Mbale district is partially complete in listing the sources of subsistence farming, but excludes key crops grown in Shilongo such as cassava, millet, beans, mangoes and avocados, and livestock raising. Complete information on livelihoods is important to water projects because all primary and secondary uses



Uganda Country Maps



Purpose

The Millennium Development Goals (MDGs) announced by the UNDP in 2000 set a target of reducing by half the world population lacking access to improved water and sanitation (target 7c). The country of Uganda has inadequate water and sanitation access, as well as high poverty rates, but these statistics vary greatly by sub-county across the country. Therefore the purpose of this mapping analysis is to guide resource allocation by local governments and project location choice by Non-Governmental Organizations (NGOs) and foreign project teams such as Tufts-Engineers Without Borders in the future. The final map presented is meant to be a government and community analysis tool for targeting areas most in need of functional and sustainable water and sanitation coverage, in order to help break the water poverty cycle. This mapping analysis will be used as a resource to present to the Shilongo community, included in a water manual that provides information about project options, waterborne diseases, and education materials so that the community is truly able to claim ownership over improvements to the water supply. Grassroots or bottom-up action is necessary to ensure the sustainability of water access expansion geared towards reaching the MDGs.

Methodology

1. Download data from GPS units for Shilongo project location waypoints.
2. Obtain GIS data from World Resources Institute (WRI) from 2002 Environmental Health Census and 2008 Safe Water Coverage analysis; combine with sub-county and district political boundaries. Clean data to exclude sub-counties where no data is available (primarily in the politically unstable North where the Lord's Resistance Army is most active).
3. Join tables with water, sanitation, and poverty density data
4. Select by attribute tool for sub-counties with poor water and improved sanitation coverage and high poverty density; select by location tool to create smaller maps of Mbale district data
5. Create Excel table of functional water sources (# and %) and join to Water/Sanitation table; use Symbology tools to display the functionality by sub-county and in a pie chart normalized by population size.
6. Download DEM (Digital Elevation Model) data from USGS HydroSHEDS and Africa drainage network cells to create a hillshade; spatial overlay of Mbale district watershed
7. Download data from USAID FEWSNET Livelihoods Framework (2010); label features
8. Combine Water, Sanitation, and Poverty data; overlay with DEM shading to display the target regions for future projects by government or NGOs.

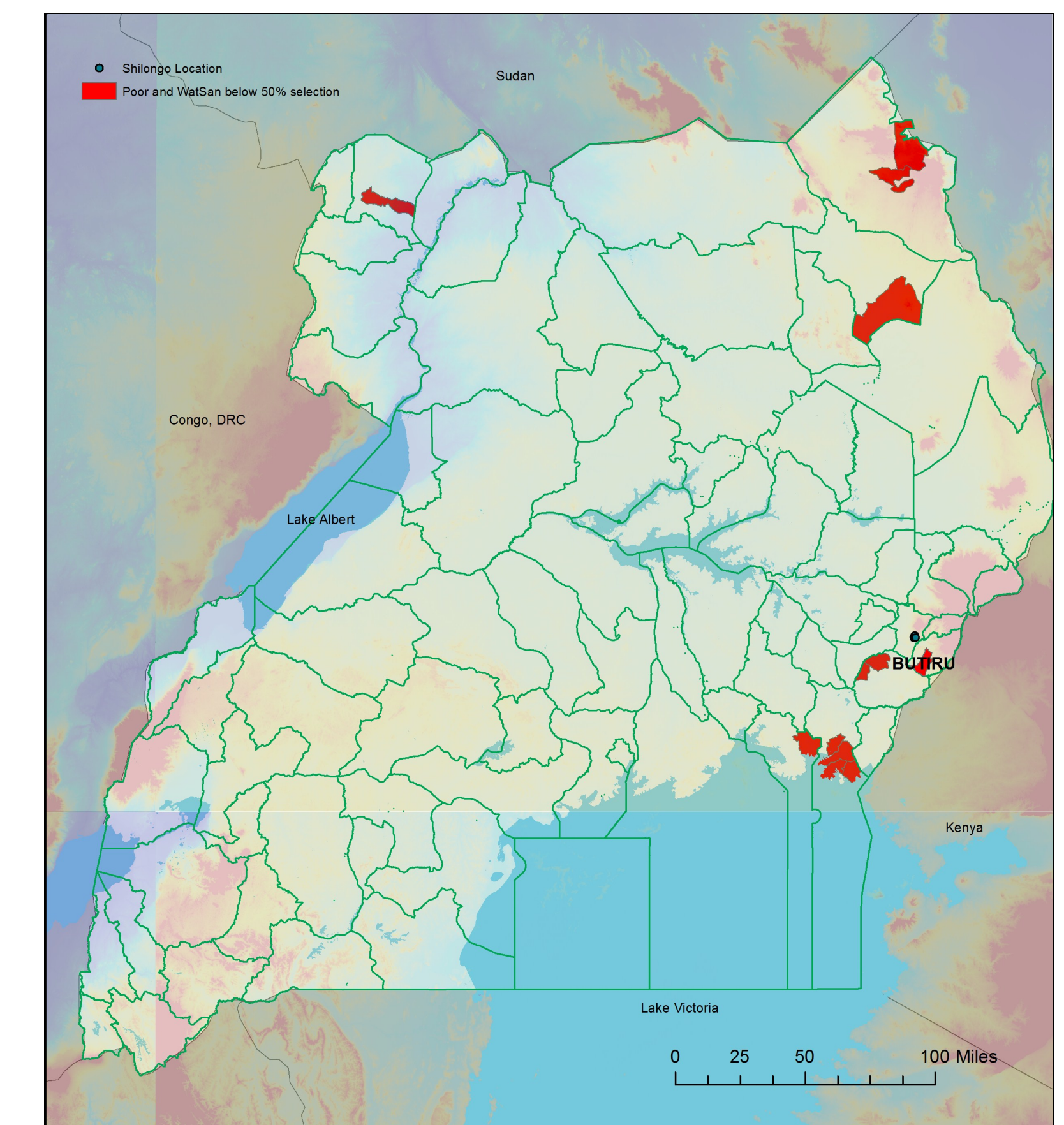
Challenges

Because of the difficulty in accessing reliable data from a standardized database or government records for Uganda, there were several limitations to the mapping analysis and several goals that were unattainable. For example, despite placing a request with the Uganda MWE, I was not able to access GIS files with exact locations of boreholes, gravity taps, and water distribution systems for the Mbale district. Therefore it was impossible to conduct a distance analysis of average walkability to water sources in order to determine where in a specific community a well or tap stand should be located. This information would be especially useful once a community or sub-county was chosen for a water project, if it were available on a detailed level (narrow geographic extent). There is also little data available on mapping health statistics or combining water and sanitation analyses, but it has been found that addressing water and sanitation projects together is best for achieving lasting positive change (*Waterlines* journal "Integrated Water Resource Management" Volume 28 No. 1, 2009).

Results

The government and NGO planning recommendations are shown in this map of priority areas for water and sanitation projects (select for: water and sanitation coverage below 50% and poverty density above 100 people below the poverty line per square kilometer).

Target Sub-Counties for Water and Sanitation Improvements



Conclusions and Future Directions

Of the 12 highlighted sub-counties, it would be most logical for Tufts-EWB to start a future project in close proximity to Shilongo, meaning a community in the Butiru sub-county. Since Tufts-EWB students already have experience working in the Mbale district and have met with the District Water Officer, it would be most feasible to scale up the group's involvement using the Shilongo project as a model (assuming it is successful; further monitoring and assessment is required to verify if this is the case). An assessment trip would have to take place in the Butiru sub-county to further investigate site suitability for a water/sanitation project based on non-geographic variables such as community organization, desire, willingness to pay, etc. For a different project team, local NGO, or the national government any of the sub-counties in the Southeastern regions would be the best areas of focus for water and sanitation improvements because project success is unlikely in the North due to violence and political instability.



Tufts
UNIVERSITY

Cartographer: Laney Siegner

UEP232, December 2011

Map Projection: Arc 1960 UTM Zone 36N, meters

Resources: World Resources Institute, USAID FEWSNET Livelihoods Framework, USGS HydroSHEDS 2006, Uganda Ministry of Water and the Environment (MWE) Water Supply Atlas 2010