DRIP - Drought Resilience Impact Platform
Ending Drought Emergencies

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The Challenge

Millions of people living in the drought prone Horn of Africa face persistent threat from a lack of safe, reliable and affordable water year-round[1, 2]. The arid regions of Somalia, Kenya and Ethiopia are experiencing increasing frequency and severity of drought conditions[3]. Drought emergencies occur when reduced rainfall, exacerbated in recent years by climate change[4], combined with limited community capacity and institutional failures cause dramatic reductions in access to water for people, livestock and agriculture. These people are among the most marginalized communities in East Africa. This crisis results in catostrophic crop failures, public health stress, economic shocks and displacement of people.

The destabilizing impact of drought emergencies increases with each successive event, leading to **vulnerability** and **insecurity** in this complex region.

The Solution - DRIP

Drought-driven humanitarian emergencies **can be prevented** if groundwater is reliably made available at strategic locations during cycles of water stress. DRIP - The Drought Resilience Impact Platform's comprehensive systems design integrates early detection and planning with proactive groundwater management to ensure water availability, thus enabling drought-prone communities to become effective managers in the prevention of these humanitarian crises. It replaces reactive and expensive short-term assistance measures like water trucking, with a framework for drought resilience. Enacted within local institutional and governance framework, DRIP can **direct** adaptation responses, **secure** ongoing delivery of key services, and **deliver** assistance specifically when and where it is needed.

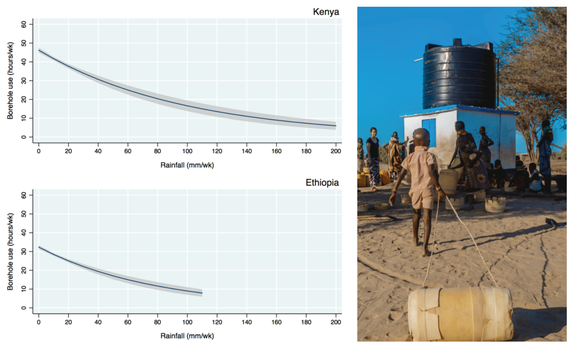


Figure 1: a) Model-estimated borehole runtime by total prior week rainfall. Shaded area represents 95% CI. b) Example water point.

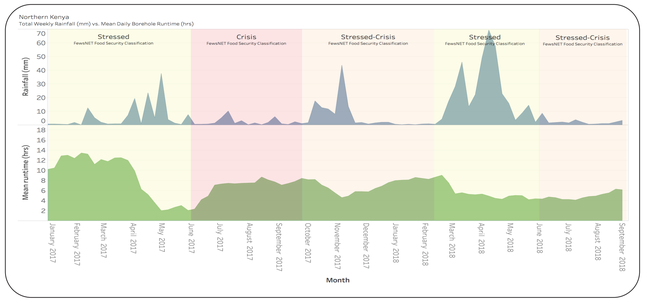
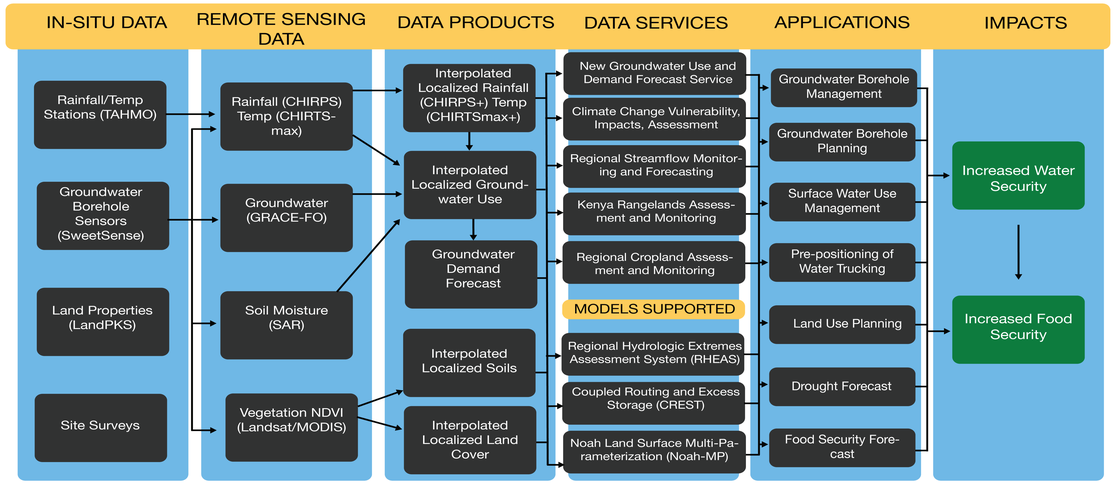


Figure 2: Northern Kenya total weekly rainfall (mm) vs mean daily borehole runtime (hrs) January 1, 2017–August 31, 2018. Shaded areas indicate the Famine Early Warning Systems Network Food Security Classification. The FEWS NET model is based in part on rainfall estimates using remote sensing data. As food security stress is forecast based on estimated agricultural yields after periods of rainfall, higher food security stress classifications lag periods of low rainfall (FEWSNet, 2019).

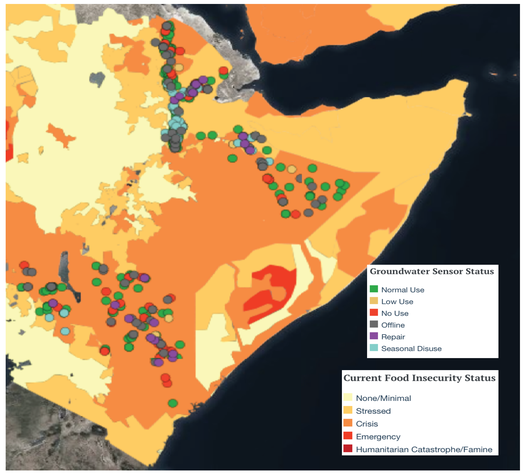
Theory of Change

Work Flow

Using localized drought forecasts and groundwater sustainability estimates to identify and prioritize strategically selected groundwater borehole systems, **DRIP can ensure water delivery during dry and drought seasons**. We will operationalize DRIP's borehole water services through pay-for-performance contracting, ensuring that all institutions and partners are incentivized to provide water asset management and year round safe water supplies.



DRIP targets many of the most vulnerable populations within sub-Saharan Africa – agriculturalists and pastoralists living on subsistence farming and livestock, who are prone to migration due to water and resource insecurity, and are often demographically marginalized ethnic groups. Preventable death and malnutrition, exacerbated by recurrent drought, hits hardest in the pastoral communities – UNICEF estimates that there are 19.5 million pastoral people in the Horn of Africa, of whom 40 percent survive on less than one dollar a day. USAID estimates that each for each $1 invested in resilience in areas of recurrent crises, nearly $3 will be saved in averted losses and humanitarian need. **DRIP seeks to empower these communities to increase their drought resiilence and water security, helping to preserve their way of life.**



Our Approach

In partnership with the SERVIR - Eastern and Southern Africa Hub, hosted by the Regional Centre for Mapping of Resources for Development (RCMRD) -

We are linking in-situ data collection tools managed by our team and deployed in East Africa with remote sensing data sets to develop machine learning supported interpolated data products for localized rainfall, localized temperature, localized groundwater use, forecast groundwater demand, and localized land properties.

Through data integration for drought forecasting, surface and ground water availability, and agricultural yield estimates, we will use these metrics to generate a new SERVIR ESA data service; Groundwater Use & Demand Forecast and enhance existing services.

We will disseminate our products to the Kenya National Drought Management Authority, the Ethiopian Ministry of Water, Irrigation and Energy, the Intergovernmental Authority on Development Climate Prediction and Applications enter and regional government partners. estimates with our Groundwater Use and Demand Forecast Service will support local and national government level drought response planning efforts, such as maintenance of groundwater boreholes, site selection for new boreholes, and pre-positioning of water trucking.

Our Consortium

Led by CU Boulder's Mortenson Center in Global Engineering with NASA and USAID SERVIR Applied Sciences Team, Famine Early Warning Systems Network (FEWS Net), and The Millenium Water Alliance. DRIP will operate through partnerships with the Ethiopian Ministry of Water, Irrigation and Energy, Somaliland State Ministry of Water Resources Development and Kenya National Drought Management Authority. **The Mortenson Center in Global Engineering** combines education, research, and partnerships to positively impact vulnerable people and their environment by improving development tools and practice. Supported by USAID, NASA, the National Science Foundation and others, the Center has successfully designed and deployed sensors that monitor and enable maintenance of water systems for over 3 million people yearly in the Horn of Africa. Our **USAID Sustainable Wash System Learning Partnership** leads a $15.3 million, four-country, multi-partner study to identify the institutional and governance conditions that result in effec-

[1] Bekele Shiferaw, Kindie Tesfaye, Menale Kassie, Tesfaye Abate, B. M. Prasanna, and Abebe Menke. Managing vulnerability to drought and enhancing livelihood resilience in sub-Saharan Africa: Technological, institutional and policy options. Weather and Climate Extremes, 2014. issn: 2212-0947. doi: 10.1016/j.wace.2014.04.004. **[2]** Ellen Viste, Diriba Korecha, and Asgeir Sorteberg. Recent drought and precipitation tendences in Ethiopia. Theoretical and Applied Climatology, 2013. issn: 1434-4483. doi: 10.1007/s00704-012-0746-3. **[3]** I. Masih, S. Maseko, F. E.F. Mussa, and P. Trambauer. A review of droughts on the African continent: A geospatial and long-term perspective, 2014. doi: 10.5194/hess-18-3635-2014.
[4] Funk, C., Harrison, L., Shukla, S., Pomposi, C., Galu, G., Korecha, D., Husak, G., Magadzire, T., Davenport, F., Hillburner, C., Eilerts, G., Zatchki, B., Verdin, J. Examining the role of unusually warm Indo-Pacific sea-surface temperatures in recent African droughts. Q J R Meteorol Soc. 2018; 144 (Suppl. 1): 365–383. https://doi.org/10.1002/qj.3296.

Partners

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FEWS NET FAMINE EARLY WARNING SYSTEMS NETWORK

MILLENNIUM WATER ALLIANCE