

Introduction and background

Uganda is at high risk from a variety of hazards, which have the potential to adversely affect progress on poverty reduction and economic growth. The World Bank has estimated that at least 200,000 Ugandans are affected by disasters each year. The Government of Uganda has identified drought as the most severe disaster affecting the lives and livelihoods of its citizens.

There are currently significant levels of investment, across Uganda, into systems that collect and share early warning information on a range of hazards including floods and droughts. However, many of the current Early Warning Systems in Uganda do not appear to be sustainable from both a financial and technical point of view. They are mostly based on situational analyses and make little or no use of weather forecast information.

Project description and aims



The Drought & Flood Mitigation Service (DFMS) project is part of the UK Space Agency's International Partnership Programme, a five year, £152 million programme designed to provide a sustainable, economic or societal benefit to undeveloped nations and developing economies, by using UK organisations' space knowledge, expertise and capability.

The primary objective of the DFMS is to minimise the impacts caused

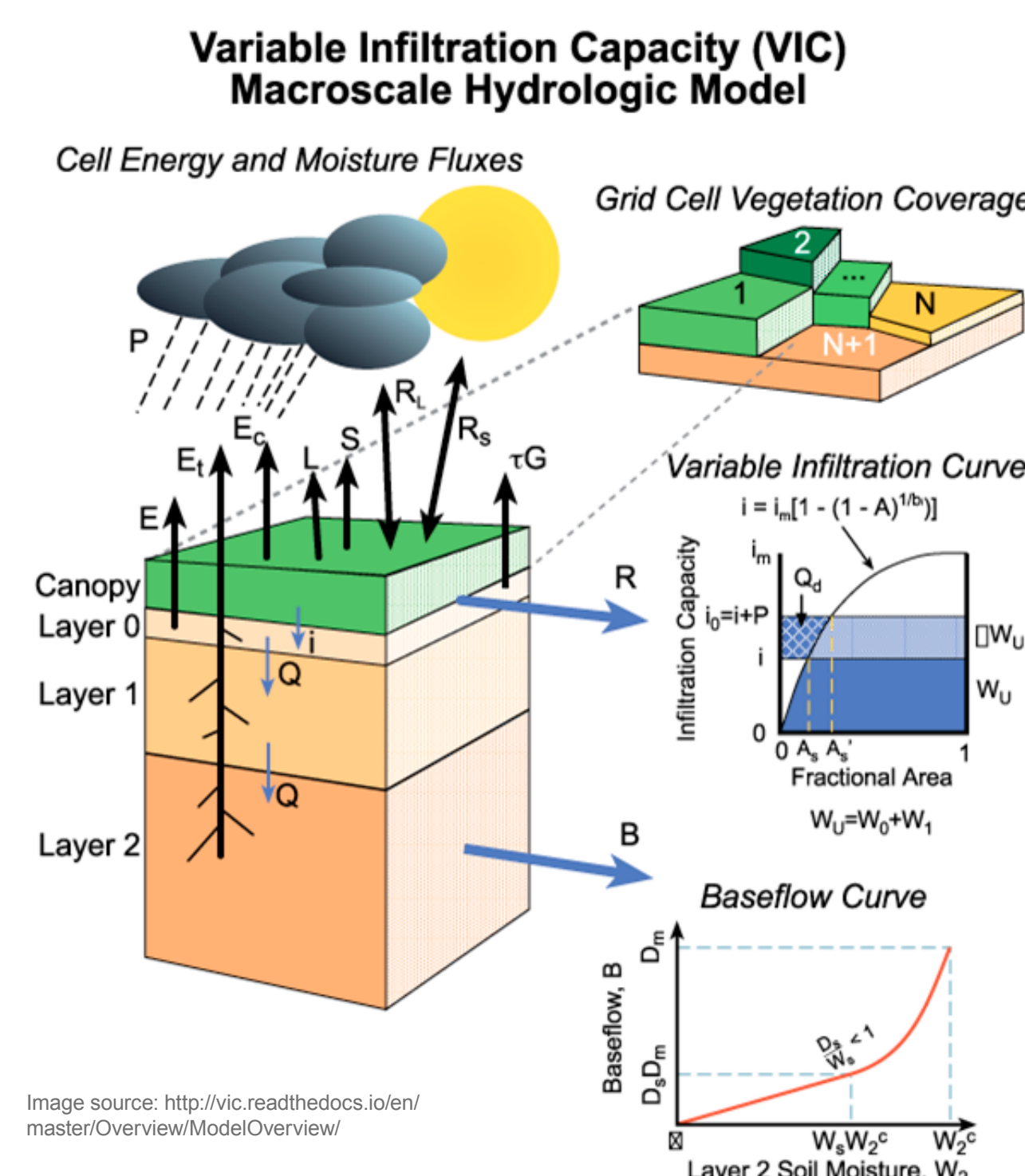
by extreme weather events by improving the guidance provided to Uganda's agricultural, water management and disaster risk reduction sectors.

The DFMS Early Warning Platform combines weather and hydrological forecasting with Earth Observation products, to provide information at a range of temporal and spatial scales. The project uses an innovative, open-source Early Warning Platform deployed in the cloud. The flexible platform will provide a wide range of outputs such as historical monitoring data, forecasts, hazard maps and early warning alerts.

HR Wallingford is developing the hydrological forecasting component, which allows warnings of drought and flood conditions to be issued. The Variable Infiltration Capacity (VIC) Macroscale Hydrologic Model (Liang et al., 1994) is applied in the DFMS platform.

The main user of DFMS is the Government of Uganda and in particular:

- > the Ministry of Water and the Environment, intended to be the main user, with further users including:
- > the National Emergency Coordination and Operations Centre in the Office of Prime Minister,
- > the Ugandan National Meteorological Authority,
- > the Ministry of Agriculture Animal Industry and Fisheries and
- > the National Agriculture Research Organisation.

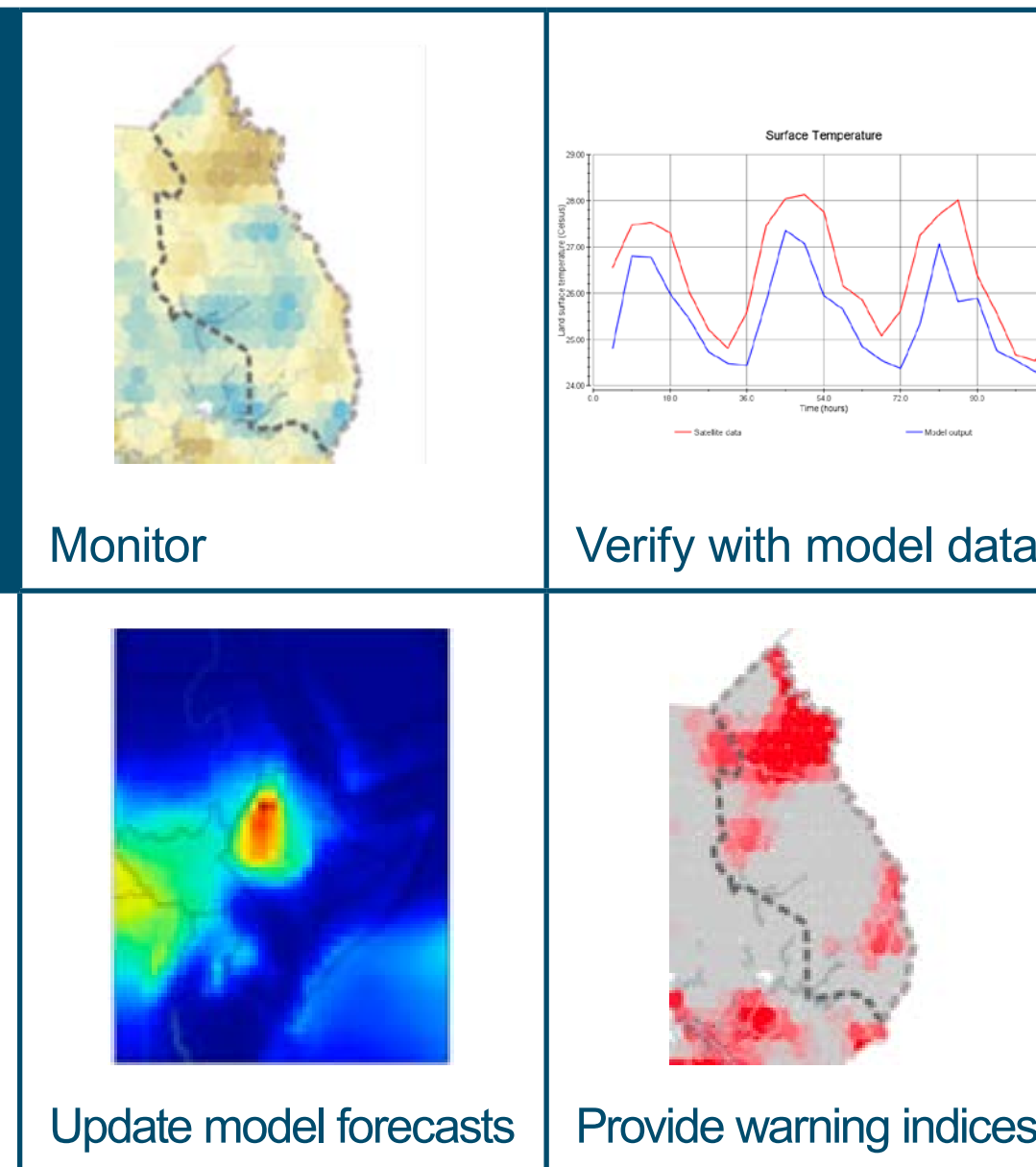


Why a space-based solution?

In data-scarce countries like Uganda, the use of data and space technology can make it possible to enhance the on-the-ground collection of data, especially in the remotest areas of the country. When compared to ground stations (e.g. weather stations), remote-sensing products enable a more accurate representation of the spatial variation of meteorological parameters, which may vary significantly at the local scale, particularly in regions with high elevation variation.

EO data also enables scalability of the solution up to international level. This project will help to bridge the gap between academic and operational application of EO technologies, as presently space solutions are very rarely used by practitioners and decision makers in the water resources sector.

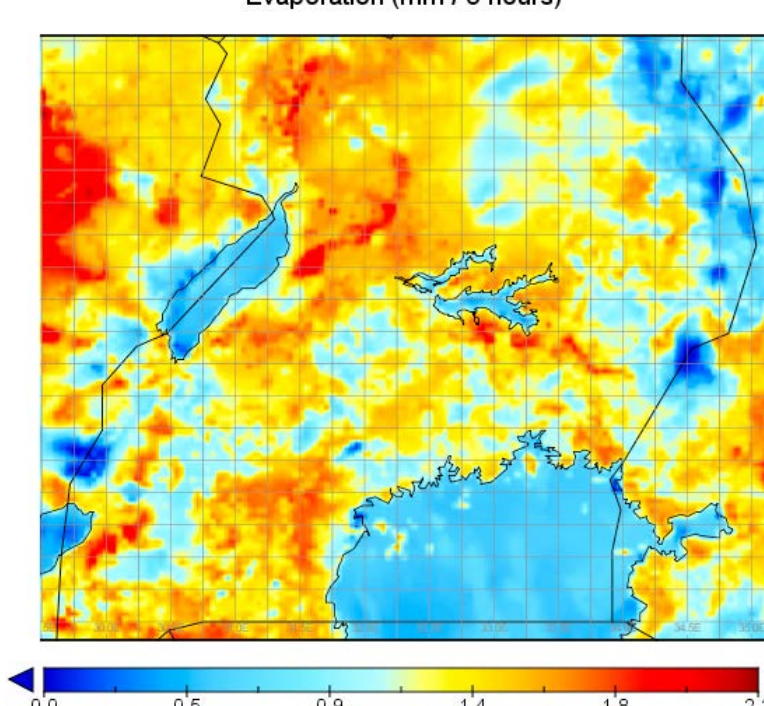
How are satellite images being used in DFMS?



The DFMS platform

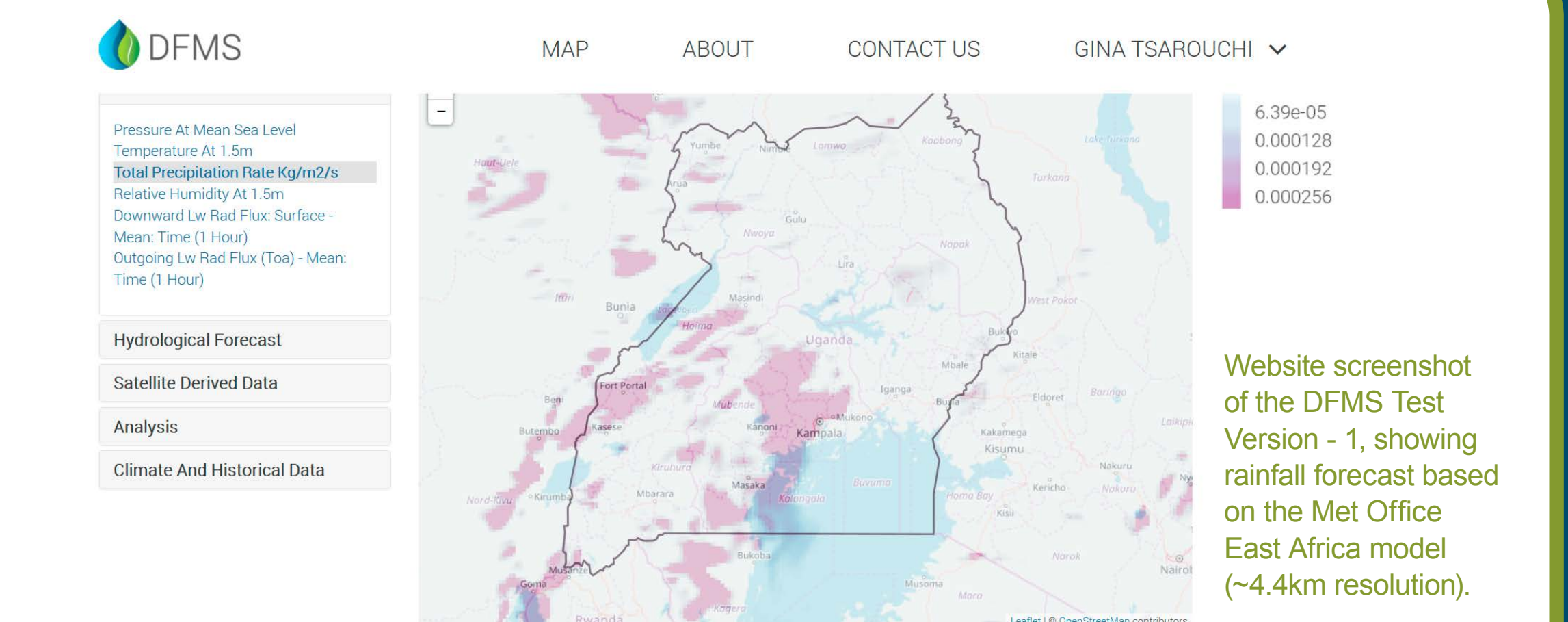
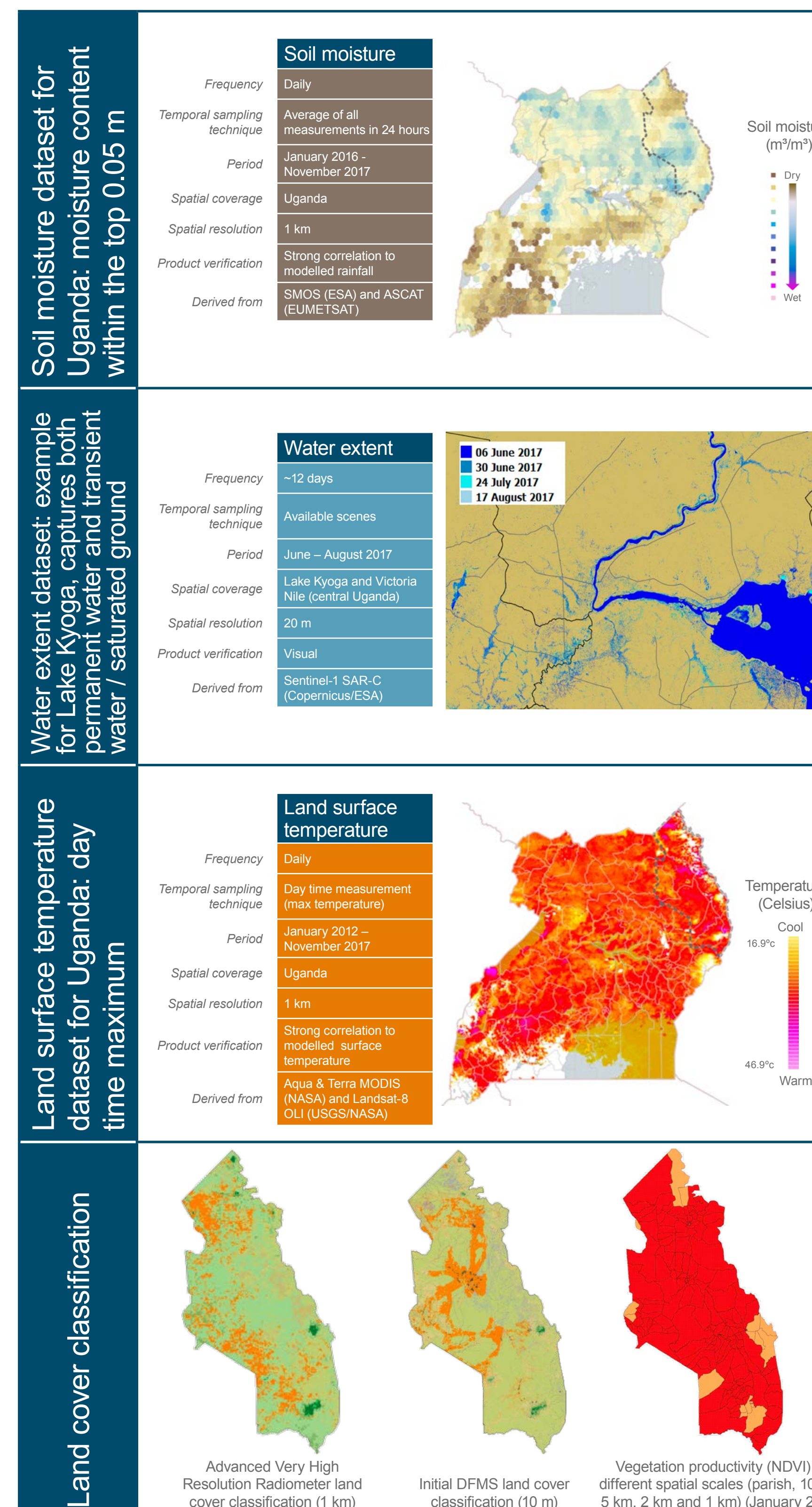
The DFMS brings together information from a variety of fields to improve the guidance provided to the agricultural and water management / disaster risk reduction sector through:

- Weather forecasts for Uganda using the latest Met Office models, including seasonal forecast information tailored for Uganda's climate.
- A hydrological forecast driven using a consistent set of weather forecast information to forecast river flows, runoff, soil moisture and evaporation.



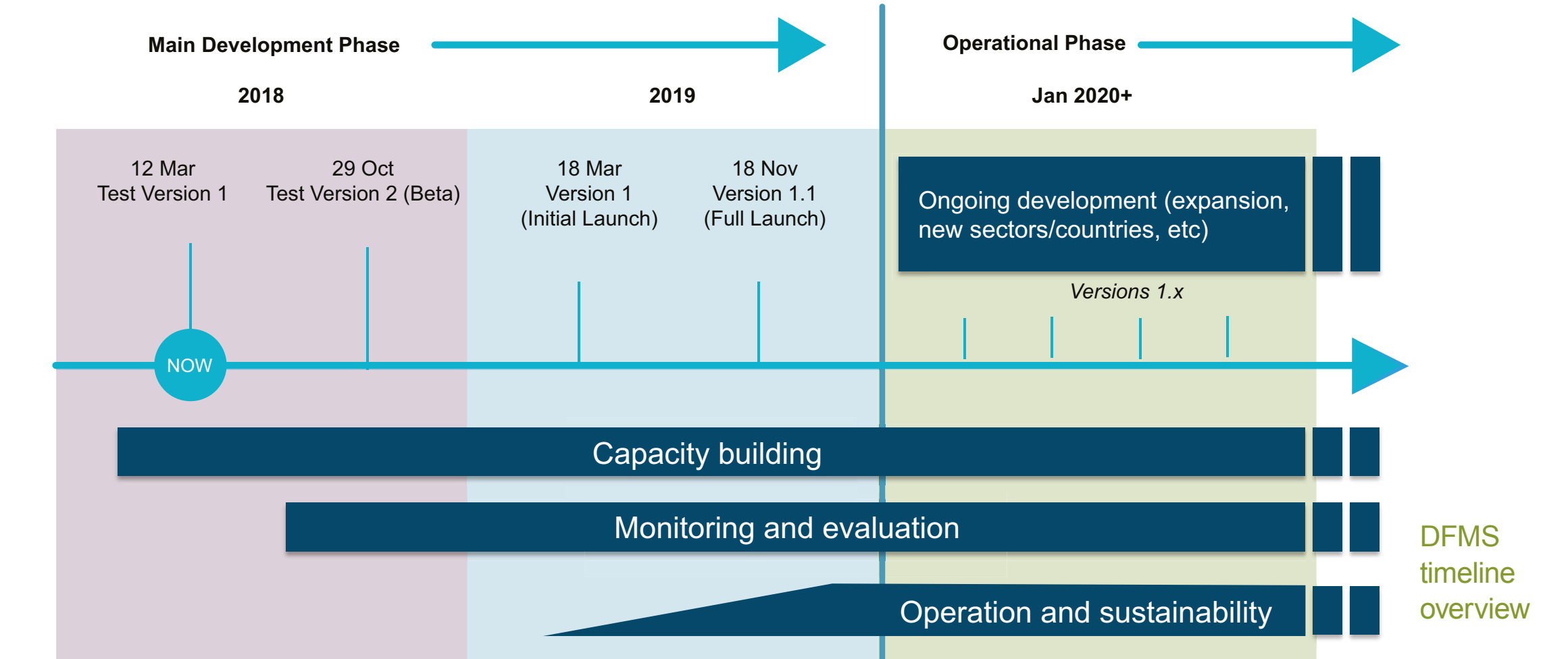
Forecast evaporation from the VIC model, which is driven by outputs from the Met Office's East Africa model (a high resolution deterministic model). The forecast period is 2 days (T+48).

- Local measurements from a network of ground based environmental sensors installed by DFMS, including meteorology and soil moisture.
- Provision of satellite derived hydrological, soil and vegetation products to complement hydro-meteorological forecast information. This includes: a range of tailored, high/medium resolution, satellite-derived products from optical and microwave imagery including: soil moisture, land surface temperature, vegetation indices, water level extents, water height and land cover classification.
- A scalable, cloud based platform to enable integration of other models where available (e.g. crop / landslide models).
- Provision of on the ground Pictorial Evaluation Tools to ground truth satellite and forecast products of agricultural community-based measurements including crop and livestock condition.



Implementation and next steps

- > The DFMS will be rolled out in the first half of 2018 and over several months, starting within the government sphere, including integration with data inputs from government sources.
- > The underpinning architecture is in place and EO datasets are being generated, and can be displayed alongside the localized hydro-meteorological forecasts.
- > The next step is further integration of the input data streams so that platform starts to generated information that makes the most of all the available data streams.
- > Feedback from users will be used to adjust the dissemination channels to ensure the system is user friendly and accessible.
- > After deployment of the system, users will be trained on how to use and disseminate weather and hydrological forecasts, flood and drought risk indexes and Earth Observation-derived indexes generated by the system.
- > Government staff will also be trained on the use of early warning data for decision and policy making.



Authors

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