D-MOSS - Dengue forecasting MOdel Satellite-based System

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What is the challenge?

Before 1970, only nine countries had experienced severe dengue epidemics. Today the disease is endemic in more than 140 countries. In Vietnam there is currently no system in place to forecast the probability of dengue outbreaks. Since 2000, there has been an increase of over 100% in the number of cases of dengue fever in Vietnam owing to the failure to maintain adequate control of the Aedes aegypti species of mosquito that spreads dengue fever. Considering the current regional trends in dengue epidemics, the setting up of a seasonal dengue forecasting system utilising Earth Observation (EO)-based information to provide probabilistic predictions of dengue outbreaks would greatly assist the Vietnamese Government to put cost effective early actions in place. The forecasting system could also be used to forecast the Zika virus which is transmitted by the same species of mosquito which spreads dengue.

Our objective

Our objective is to develop a suite of innovative tools that will allow beneficiaries to: issue alerts for dengue fever; and provide assessments of vector-borne disease risk under future climate and land-use change scenarios.

This will allow local communities to mobilise to eliminate mosquito-breeding sites thus reducing incidents of dengue. In combination with better outbreak response, we expect the project to contribute towards a reduction in dengue incidence over the project lifetime.

The project aims to:

> Develop a dengue fever forecasting system with a seasonal lead times of up to eight months;

> Develop a water availability forecasting system which feeds into the dengue fever forecasting system;

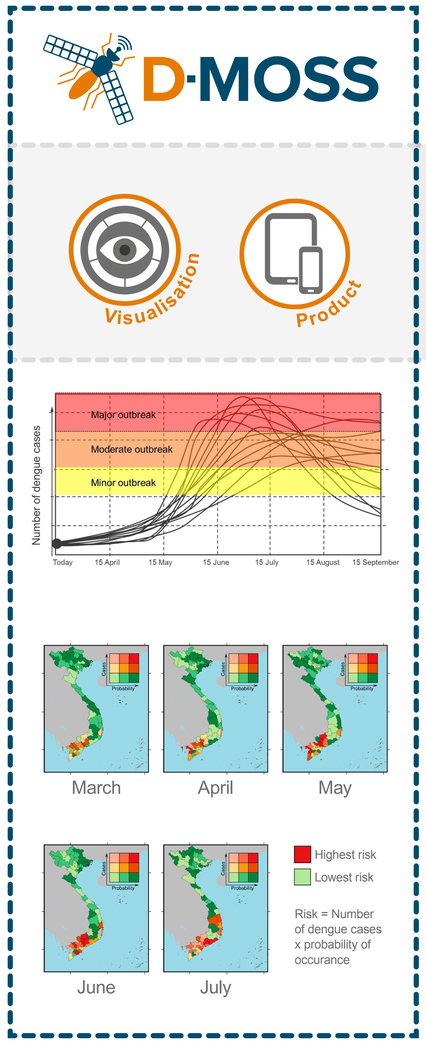
> Provide estimates of future dengue outbreaks under a range of different climate change scenarios.

Our methodology

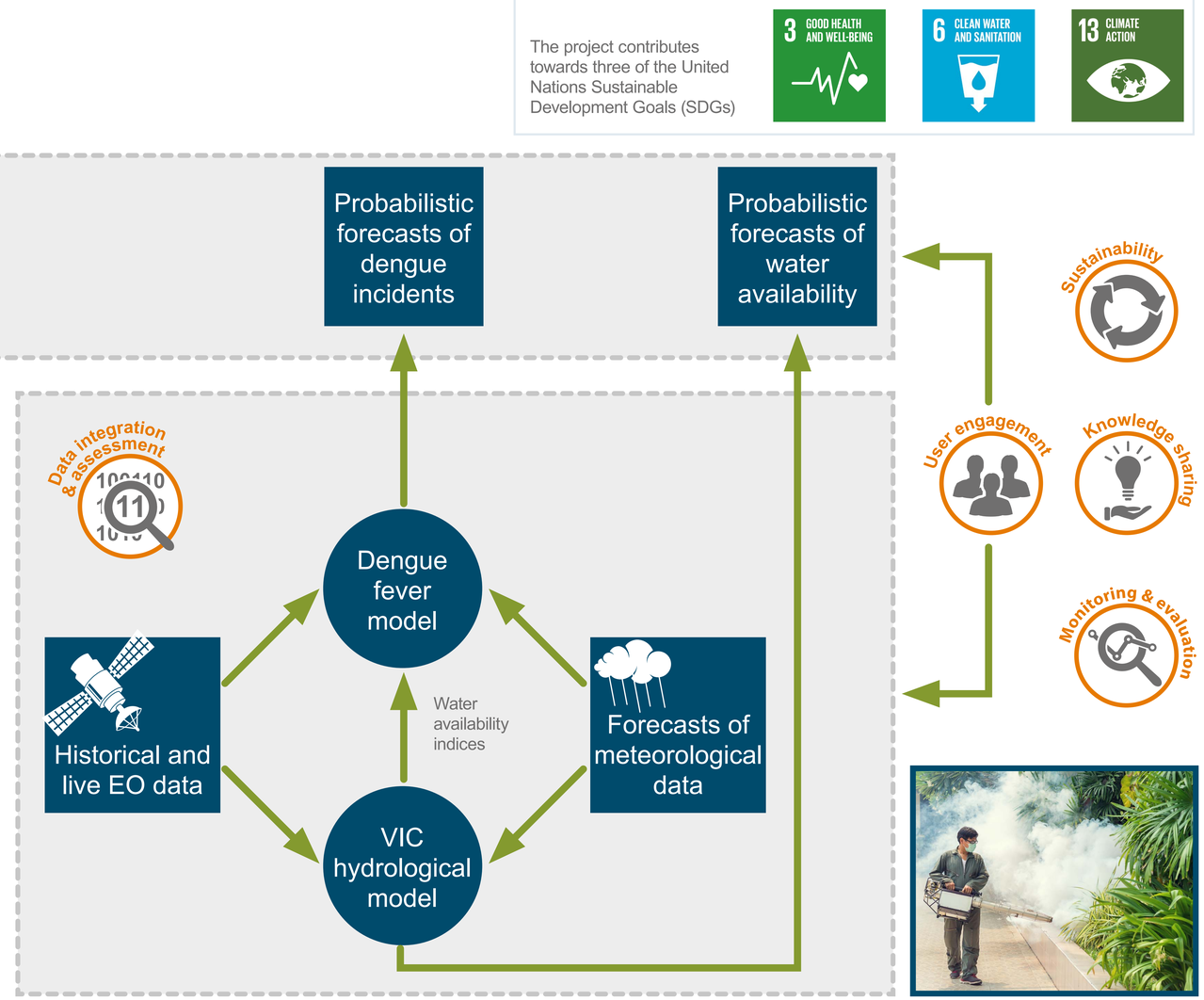
The D-MOSS project is developing a forecasting system in which Earth Observation datasets are combined with weather forecasts and a hydrological model to predict the likelihood of future dengue epidemics up to eight months in advance.

The early warning platform includes a water availability component. Water availability directly impacts dengue epidemics owing to the provision of mosquito breeding sites, it is rarely accounted for in dengue prediction models. The water availability forecasts are fed into statistical forecasting models of disease incidence, which integrate a range of other covariates important for dengue transmission (e.g. number of dengue cases, land-cover, precipitation and temperature).

The architecture of the solution relies on open and non-proprietary software, where possible, and on flexible deployment into platforms including cloud-based virtual storage and application processing.



The project contributes towards three of the United Nations Sustainable Development Goals (SDGs)



Benefits

> Early warning system for dengue fever at a district scale with an eight month lead time of where likely dengue outbreaks will occur.

> Water availability forecasting system.

> Dengue outbreak estimates for policy planning (i.e. climate change timescales up to the year 2100) for different scenarios that can feed into Vietnam's National Adaptation Plan.

Project team

The D-MOSS project is funded by the UK Space Agency's International Partnership Programme.

UK:
HR Wallingford leading the project, working with the London School of Hygiene and Tropical Medicine, the UK Met Office and Oxford Policy Management.

International:
The United Nations Development Programme, the World Health Organization, the Vietnamese Institute of Meteorology, Hydrology and Climate Change, the Pasteur Institute Ho Chi Minh City, and the National Institute of Hygiene and Epidemiology in Vietnam.