REMOTE SENSING SERVICES AND EXPLOITATION PLATFORMS

A product by:

gmv®
INNOVATING SOLUTIONS

BIGMIG

BIGMIG
SPACE-BASED SERVICES FOR MIGRATION
PREVENTION AND MANAGEMENT

AN ESA ARTES IAP PROJECT

esa | business applications

BIGMIG

gmv®
INNOVATING SOLUTIONS
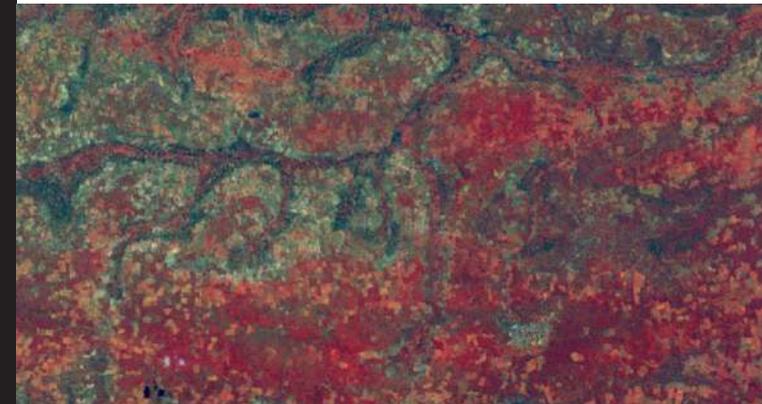
THE SERVICE - BIGMIG

Forced migration is a multidimensional and complex issue that requires comprehensive, historic and reliable information to be understood and then addressed.

BIGMIG space-based services are designed to provide the Aid and Development community with a systematic, consistent and accurate monitoring of direct (conflicts, environmental degradation, and disasters) and indirect migrations drivers (e.g. food security) to support the prevention and management of current and future crises.

BIGMIG products enable organizations to better carry out their decision-making processes and goals by equipping them with actionable information meeting the accuracy and frequency requirements.

BIGMIG will demonstrate (on-going) prove the value of an integral commercial operative service, based on a specific set of core technologies (EO, GNSS, AI…) but flexible enough so as to respond to a variety of applications/users' needs.

GMV, along with its anchor customers (NGOs contributing to the Demonstration and interested in buying the service after it), chose two operational scenarios for the Demonstration: one is in Mozambique and the second Libya. In the former EO, GNSS and AI are used to classify and monitor agricultural areas, evaluating trends and underpinning the improvement of local economies. In the latter, the goal is to demonstrate the use of EO to periodically monitor detention centres and other buildings likely to be used (illegally) as such.

BIGMIG PLATFORM

The proposed service includes a combination of remote-sensing analyses and platform design and operations for field data integration. The intended solution is made up by two standalone applications (Service Cases), hosted under a common platform.

The intention is for the **BIGMIG** processing and classification chain to be deployed to the cloud, providing end users with access to updated information products as the raw data becomes available.

MIGRATION PREVENTION THROUGH IMPROVING FARM EFFICIENCY

PROBLEM

The current Service Case concerns the Northern provinces of Mozambique. In this area agriculture is subject to frequent changes in the crop's species composition and to the traditional slash and burn practices, which depletes soil and forest capital. These conditions weaken domestic economies and bring food insecurity that, in the end, push people to leave the farms behind.

Our partner, Ayuda en Acción, is working with Mozambican farmers in a 5 years programme aiming at the introduction and adaptation of small scale irrigation, the increase of leguminous crops and the promotion of integrated weed management. Also, in line with government strategy, a main concern our partner is to develop new technological packages suitable for the Mozambican socio-demographic and geo-ecological conditions. That is: lean on technology to allow a sustainable agricultural production, allowing an adequate food and income production.

Yet Ayuda en Acción's programme became impractical when the target changed from 15,000 fields to 50,000 fields. Their methods, reliant on ground-data collection, turned out to be too time-consuming and labor intensive, which hindered the expansion of the program and the incorporation of further participants.

SOLUTION

EO, GPS and field data are being combined by GMV in this Service. Artificial Intelligence based methods are used to extract previously untapped information from EO data and transform it into useful geospatial products which can be used to make a real difference for the NGOs. The **goal of this service case** is to map cropland extent and to identify crop types over selected areas in the Northern Mozambique.

Client's requirements are:
- Baseline LULC map with particular interest in cropland extent.
- Crop type identification including sesame, pigeon pea, mung bean, kidney bean, peanuts, soya, onion, other green vegetables (tomato, lettuce, cabbage, garlic…), rice, cassava and maize.
- Comparison of recent up-to-date cropland map with historical cropland map.

The EO-based classification of crops and the deeper understanding of the seasonal changes enable our partner in Mozambique to optimize their future field inventories, and planning for the consolidation of specific crop value chains able to reinforce local economies.

METHODS

The great potential Sentinel 2A/B time-series for monitoring agriculture has already been proven by several projects. This Service case maximizes the use of Sentinel 2 (and Sentinel 1) data, along with several VHR datasets, intended to support the discrimination of the more complex crops.

The remote sensing analyses consider historical data (imagery and data sets) and present (2019) data. Such information will then be integrated in the System with socio-demographic information on farmers to allow for social segmentation. The main challenges identified relate to the specific environmental setting location and to the satellite data. These include:

- Small field size.
- Different crop types planted within the same field.
- Crops at different stages growing within the same field.
- Ground training/testing data sample size and accuracy.
- Need to stack up to several scenes to synthesize a single cloud-free image.
- Intense cloud/shadow masking required.
- Need to choose scenes as close as possible in time (short reference periods).
- Development of ad-hoc machine learning approaches.

BENEFITS

BIGMIG data products will empower programme managers, to better carry out their decision-making processes by equipping them with actionable information more accurate and frequent than their usual.

By increase farming efficiency and supporting definition of sustainable crop value chains, **BIGMIG** will increase the resilience of communities in Northern Mozambique to withstand market forces and climate change threats.

BIGMIG contributes to fight two main driving mechanisms of forced migration: hunger and poverty. In this way, the project aligns with UN Sustainable Development Goals: Zero Hunger and No Poverty.