

IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Applications, Societal Challenges and Economic Benefits (5)

Author: Ms. Ufuoma Ovienmhada
Massachusetts Institute of Technology (MIT), United States, ufuoma@mit.edu

Dr. Danielle Wood
Massachusetts Institute of Technology (MIT), United States, drwood@media.mit.edu
Dr. Fohla Mouftaou
Benin, fohla.mouftaou@gmail.com

EARTH OBSERVATION TECHNOLOGY APPLIED TO COASTAL WATER ECOSYSTEMS IN WEST
AFRICA

Abstract

All over Africa, experts use satellite Earth Observation (EO) data for applications such as monitoring crop health or assessing the risk of disease vectors. These applications are often done at a national scale meaning there is a challenge to ensure that end users such as small companies, rural communities or otherwise marginalized groups benefit from EO systems. This paper explores an EO application with the enterprise Green Keeper Africa (GKA) based in Cotonou, Benin, that addresses the management of an invasive plant species that is threatening local economic activities such as fishing. GKA helps control the infestation of the water hyacinth on Lake Nokoue by repurposing the plant into a product that absorbs oil-based waste. The EO application is an online Environmental Observatory that utilizes satellite, aerial and ground data to map the location of the water hyacinth over time, providing valuable information for government, private and public users. The research outcomes presented in this paper address processes that (i) outline the steps for a small company in Benin to setup and operate a new EO technological capability, and (ii) enable low cost data collection of parameters describing the coastal water ecosystem. In the observatory, the technique Normalized Difference Vegetation Index (NDVI) is applied to free satellite data to identify likely locations of the hyacinth in the target region of Lake Nokoue. The team uses aerial drone imagery to improve the classification of water hyacinth from other vegetation. Next, the estimates of hyacinth dynamics are improved by measuring chemical characteristics of the lake - including conductivity, temperature and dissolved oxygen - which are informed by past work by scientists at the University of Abomey-Calavi in Benin. To routinize this data collection, the team is designing a sensor kit optimized for low cost and non-expert usability. Finally, the Environmental Observatory combines the different data streams. In future work, the team plans to design a computational model that enables predictive capabilities of the water hyacinth proliferation and dynamics. Thus far, several rounds of co-design of the observatory have commenced in Benin, most recently in January 2019. If successful, this work aims to: i) optimize GKA operations through increased knowledge about their products' raw material, potentially aiding expansion efforts to new markets, ii) improve the ability for local management to address threats to economic activities and iii) increase accessibility to value-adding EO tools through the design of a new low-cost data stream.