



afrialliance socialinnovation

AfriAlliance
MOOC#2
Final
Assignment

Innovation in satellites data Management and their potential In Water Quality Monitoring Services

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DESCRIPTION AND BACKGROUND

Water resources are of increasing importance nowadays. The world economic forum assigns water related topics (water crisis, climate changes) with the highest related and ranked risks, with the highest probability and impact, to our society. Data, current and historic geospatial data, are relevant for management and monitoring in most water related applications.

In relation to water quality, taking water samples and analyzing those in the lab is a laborious and costly activity. For that reason, in many freshwater bodies there are just a few samples taken every year.

It is possible to elaborate maps of some quality indicators concentration such as Chlorophyll with data collected from satellites.

This solution has two main advantages:

- Compared to the sampling of the Environment Agency, satellite data maps show the distribution of Chlorophyll because the algae are not distributed in a uniform way. The selected sampling point is not necessarily in the best location to detect excessive Chlorophyll concentrations.
- The cost of this solution in time and money is not compared to traditional sampling methodology because Copernicus satellite data is free for users.

Copernicus is the European Union's Earth Observation and Monitoring Programme. Thanks to a variety of technologies, from satellites in space to measurement systems on the ground, in the sea and in the air, Copernicus delivers operational data and information services openly and freely in a wide range of application areas.

This solution can be analyzed through the four social innovation dimensions: Technological solutions, Capacity development, Governance structures and Business road map.

Abstract

Society is facing numerous global threats, including climate change, a looming energy crisis, population growth, potential food shortages, and a higher frequency and intensity of natural and manmade disasters.

Satellite data can facilitate the management of such threats and enable progress towards societal goals in areas such as renewable energy, food security, disaster risk reduction and climate change mitigation and adaptation.

Water monitoring can be used to reduce water quality sampling costs and to allow a fast reaction if a pollution event occurs



TECHNOLOGICAL SOLUTIONS



The Copernicus programme is supported by a family of EU-owned satellites – the Sentinels specifically designed to meet the needs of the Copernicus services and their users. Since the launch of the first of these – Sentinel-1A – in 2014, the Union set in motion a process to place a constellation of more than a dozen satellites in orbit over the course of the next ten years. The Sentinels fulfil the need for a consistent and independent source of high-quality data for the Copernicus services (European Union, 2015).

Copernicus enables an improved understanding of the Earth as an integrated system. It can be used for Monitoring water bodies quality. For many freshwater bodies, there are just a few samples taken every year. However, climate change is affecting water temperature. Warm water, combined with high nutrient concentrations, creates perfect circumstances for algal blooms in surface water. Some swimming areas were closed due to floating algal blooms. These pose health problems for the swimmers and fishers that are in contact with waterbodies. Breathing in the water droplets may cause respiratory problems or other allergic reactions.

The advent of the two Sentinel-2 satellites is key to create the water quality monitoring service because they produce data updated every few days.

It is necessary to set up a satellite data processing workflow so that it runs every time a new data entry from the overlying satellite enters. Automating this part of the processing is key to reducing cost and uncertainty. It is also necessary to make a user-friendly user interface for the service. [European Union, 2015]

SOCIAL INNOVATION

GOVERNANCE STRUCTURES



« Governance is essentially the processes and institutions through which decisions are made » [Lauce et al., 2011]

A multi-level governance is required. They should be committed public sector and government, civil society, academia, and private sector in a local, national, and global scale.

Governance structure may address quality water monitoring at the level of a country, region, or down to a village or a farmland. It is convenient to use the Environment Agency's structure and naming conventions for the water bodies to make the app feel "familiar". And also put in the legal concentration limits for the different water bodies.

The application of decentralized infrastructure provides the possibility for small-scale local companies to enter this market. Large scale infrastructure is often implemented by international consortia, limiting local economic benefits.

At country level, it is recommended to develop a policy on where large-scale sewer-treatment-reuse systems should be applied with preferably decentralized small-scale systems.

Satellite data management combine environmental protection and human being health prevention. It is important that the public health authorities' control and manage health risks to acceptable levels.

CAPACITY DEVELOPMENT



«Capacity Development (CD) is conceived as the inherent responsibility of people, organizations and societies themselves in which support by external parties can play an important role» [Vallejo et al., 2015]

To strengthen the capacity to plan and implement projects of satellites data in quality water monitoring, the key aspects are:

For national water ministries or environmental agencies who are responsible for monitoring the water quality using satellites data reduced the cost of taking water samples and analyzing those in the lab which is a laborious and costly activity. They can be prepared to react fast if a pollution disaster occurs.

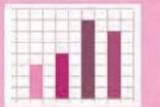
For implementing organizations, such as data analyzers it can be a way of creating new job positions.

For users such as citizens, farmers, recreational companies (aquatic sport activities) can be a powerful tool to know how quality status of water is almost instantaneously.

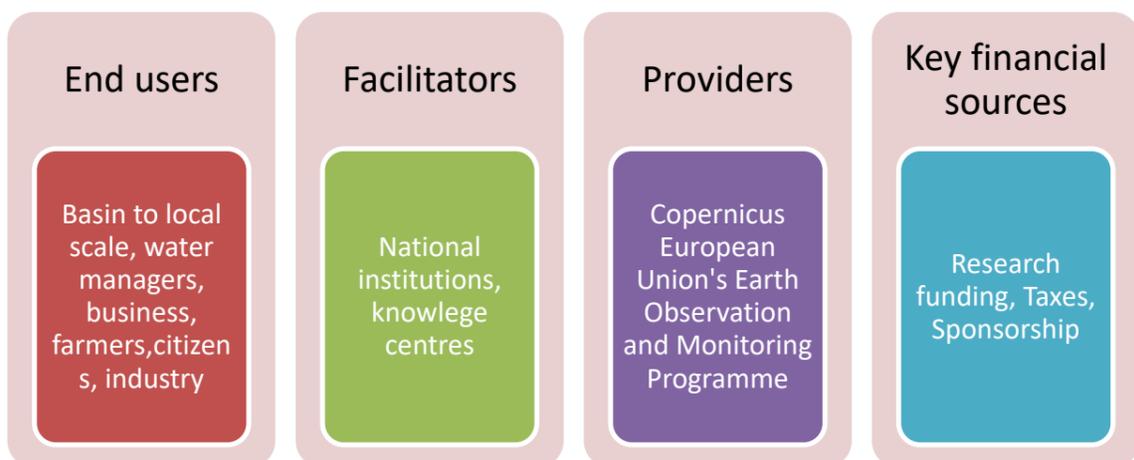
For public health authorities, this solution can result in a reduction of illnesses like diarrhea, respiratory problems, or other allergic reactions.

For environmental authorities to ensure that the water quality of these water resources is fit for the different uses of water.

BUSINESS ROAD MAP



Stakeholders from both sides (solution providers and potential users) need to interact during the different stages of the innovation process to create a common ground for the co-production of the required knowledge: from the comprehension of the need to the design, implementation and use of innovative solutions. The following graphic show the co-creators.



The key business opportunities that exist are the following: co-understanding of the challenge based on the data satellites analysis and its different applications. Uptake at end users' scales enabling participatory decision-making and co-management of infrastructure and water resources. Co-implementation at the local scale: pilot selected in a specific river basin.

Satellite data management is a cost efficiency opportunity to improve the water quality monitoring system saving time and costs and allowing a rapid intervention when a pollution crisis occur.

Copernicus programme allow citizens to access to a big amount of satellite data freely.

The main advantages of this technology are the spatial distribution of the data, the availability (more than once per week) and the reduced costs.

This technology has a wide range of possible users, such as public administrations, private sector, farmers, industry, recreational users, etc.

To apply it in a complete way, it is necessary to develop a multi-level governance system that includes local, national and global stakeholders.

Besides the environmental protection, satellite data management prevent water-related illnesses.

Afrialliance Social Innovation Facsheets.

European Union, 2015: Copernicus Europe Eyes on Earth ISBN 978-92-79-45666-4 doi 10.2873/93104

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