Citizens' Observatory for Coast and Ocean Optical Monitoring

(Grant Agreement number FP7-ENV-2012-308469)

In the **marine environment,** anthropogenic pressures on resources and non-anthropogenic causes may create harmful conditions that affect human society. Harmful algal blooms and habitat destruction are examples which pose serious threats to human-health and ecosystems, and severely affect numerous industries in the form of diminished tourist activity and unemployment. A widely adopted, scientific approach to assess the environmental status of water bodies is by measuring their **optical properties.** These properties provide indicators related to sewage, dissolved organic matter, sediment load, gross biological activity, as well as the distinction between pollution of bathing water and natural pigmentation.

Objectives of the project

1• To enable **citizens' participation** in acquiring environmental data in coastal and oceanic areas through the use of existing devices, such as smart phones as sensors.

2• To develop improved low-cost sensors and systems for monitoring water **colour, transparency** and **fluorescence**, in a location-aware manner allowing for the analysis of spatial patterns.

3• To provide recommendations in sectors such as energy, transport, fisheries, health and spatial planning, interpreting collected data through artificial **intelligence** techniques. .

4• To disseminate interpreted information to two kinds of users: citizens (individuals and associations) and **policy makers** (e.g. local administrations).

5• To produce **applied results** by developing: (1) new **applications for mobile devices**; (2) friendlier and more flexible user interfaces; and (3) social-networking capabilities to connect citizens and their associations to policy makers.

DATA INTEROPERABILITY AND CONTRIBUTION TO STANDARDS

The Citclops project will cooperate with the other projects funded under theme ENV.2012.6.5-1 (Developing community-based environmental monitoring and information systems using innovative and novel earth observation applications) within an open e-collaboration framework in order to establish common methodologies and standards for data archiving, discovery and access within the GEOSS framework, and also to assure coherence with initiatives such as GEO, INSPIRE and GMES. The projects will register components in the *GEOSS components and services registry.*

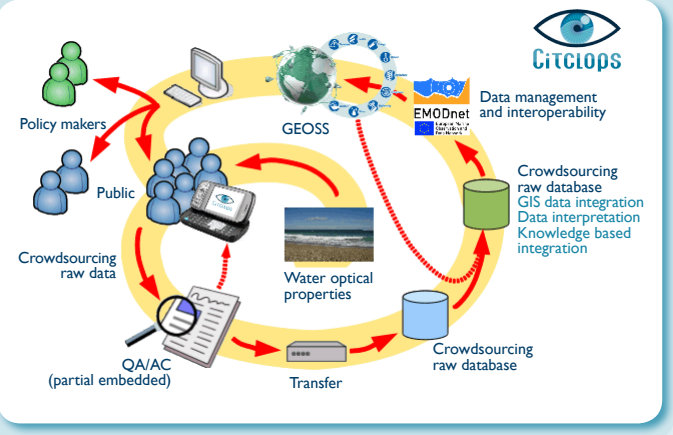
Use-case scenario

The goal of Citclops is to empower end-users to perform community-based environmental monitoring to accomplish goals that are otherwise impossible or difficult to achieve, or are subject to the availability of expensive governmental infrastructure. Specifically, Citclops is concerned with water-quality monitoring, a task generally assigned to local governmental agencies.

In the case of the region where one of the pilot case studies of the project is located (NE Spain), the Catalan Water Agency (ACA) is the official responsible of coast and beach monitoring during the bathing season. The monitoring program includes more than 200 control spots located at 200 different beaches. The human resources employed include 17 inspectors that sample each control spot on average four times per week. As a reference of the monitoring effort: During the summer period of 2010 the number of monitoring visits was 16.000 (around 130 visits per day). During those visits the inspectors had to complete a fairly complex paper questionnaire.

During the bathing season around five million tourists visit this area with an approximate average rate of 400.000 visitors per day. Tourism is one of the most important sources of income in the area. As a reference: 300.000 local workers (according to official sources) are involved in touristic activities in the coastal sector. If a small fraction of visitors and citizens (1‰ of the visitors and 5% of the local community associated to coastal economic activities) provides crowdsourced water quality data, there would be 6000 information inputs per day, a much higher rate than the one manually provided by the 17 inspectors in the conventional ACA monitoring.

An additional advantage on the proposed crowdsourcing system is that information is automatically inserted and analyzed into the information system, providing up-to-date information that can be consulted in almost real time.



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Project description

Aquatic ecosystems are characterized by an extraordinary mix of human activities, e.g.: tourism, fishing and industry (petrochemical plants and aquaculture, etc.). Given the frequently **conflicting interests between conservation and exploitation,** the fate of aquatic ecosystems is often a hot political issue. The attitudes and values of stakeholders in environmental issues are an essential part of the stewardship of conflicting environments. New policies concerning environmental resources should have citizens' support and consider public attitudes from the beginning.

When managing complex ecosystems, the approach of **seeking public support** can present serious difficulties. It is unrealistic to expect everybody to understand the whole tangle of potential ecological problems, and therefore it is important to ask how much of an educational effort is necessary.

In general, **public attitudes** show a strong preference for protecting aquatic ecosystems as well as returning already-damaged ecosystems to their original, natural status for a variety of reasons. Given the state of affairs that exists in aquatic ecosystems, the word "natural" is open to a variety of interpretations. Usually, scientists narrowly define "natural status" to mean "unaltered by human beings". Citizens usually define it to mean "natural appearing". A great many people who value natural resources value them as something to look at. It will take generations of environmental education to create a **general public understanding** of the fact that the importance of nature and its processes goes far beyond scenery (e.g. not all colour-changes represent a risk).

Part of this education and understanding can be realized through **citizens' effective participation in environmental stewardship**. This is especially true in the **monitoring of coastal and ocean waters,** which need extensive data measurements due to their highly complex dynamics with high variability in space and time.

The Citclops project aims to develop systems **to retrieve and use data on seawater colour, transparency and fluorescence,** using **low-cost sensors** combined with **people acting as data carriers**, contextual information (e.g. georeferencing) and a community-based Internet platform, taking into account existing experiences (e.g. Secchi Dip-In, Coastwatch Europe and Oil Reporter).

Methods are being developed to rapidly capture the optical properties of seawater, e.g.: colour through Forel-Ule observations, and transparency through a variant of the Secchi disc. People will be able to acquire data **taking photographs of the sea surface** on ferries or other vessels, on the open sea or from the beach.

Expected results & impacts

The project will produce major impacts in both the research and policy environments. Colour and transparency classification will **facilitate the interpretation of long-term water quality** data series and at the same time facilitate a connection between the present and the past. The project will greatly contribute to the **effective implementation of EU directives**, such as the Quality of Bathing Water Directive. The directive dictates that the public should receive appropriate and timely information on bathing-water quality and risk-management measures to prevent health hazards. Special focus is on predictable short-term pollution or abnormal situations (including jellyfish-related hazards). This goal is reached by modeling the needs of central (policy makers) and local (citizen communities) actors, and designing a **decision support system** based on the results of **crowdsourced monitoring**.

Citclops's tight focus on case studies will enable in-depth analysis and understanding of the needs for economically-sustainable water monitoring. Also, projects like Citclops can bridge the gap between local sampling and satellite information. Making the connection between the citizen observatory and satellite-based information will engage the users to the water quality arena and will give support to the innovation in space-based research and services. **Citclops's results and experience can be directly linked to GEO**, thanks to one of the partners, which is task leader of the information component that will make the earth-observation products better accessible for the public and the local managers.

PROJECT INFO

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Citclops involves eleven European partners from five European countries

- Fundació Privada Barcelona Digital Centre Tecnològic [Spain]
- Agencia Estatal Consejo Superior de Investigaciones Cientificas (CSIC) [Spain]
- Carl von Ossietzky University Oldenburg [Germany]
- Royal Netherlands Institute for Sea Research (NIOZ) [The Netherlands]
- Kinetical Business S.L. [Spain]
- TriOS Mess- und Datentechnik GmbH [Germany]
- Mariene Informatie Service MARIS BV [The Netherlands]
- Noveltis SAS [France]
- Trinity College Dublin (Coastwatch Europe) [Ireland]
- Stichting VU/Vumc [The Netherlands]
- Stichting Deltares [The Netherlands]

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