SATELLITES GOING LOCAL

MARITIME EDITION

2021-2022

eurisy

ACTING COLLECTIVELY TO BRIDGE SPACE AND SOCIETY

Eurisy would like to thank the contributors to this publication for sharing their experiences and the time and efforts they have put into helping Eurisy to produce this collection of success stories

CONTENTS

EDITORIAL

Dear reader,

You are holding the last issue of the Satellites Going Local series. This new edition aims to raise awareness of some of the possible uses of satellite applications in the maritime domain.

More than 3 billion people around the world rely on blue resources for their living. But nowadays our blue world is threatened by multiple challenges such as sea level rise, pollution, algal blooming, coastal erosion, and anomalies in marine biodiversity behaviours, just to mention a few.

Space technology is an asset to help monitoring the impacts of these hazards deriving both from climate change and human activities on the seas and oceans. Satellites provide the maritime community and its operators with actionable, reliable and near real-time information on large and remote areas otherwise difficult to reach.

The examples included in this publication offer an overview of how the integration of satellite solutions can support decision and policy-makers to streamline processes and take informed decisions, as well as to design mitigation strategies and adaptation actions. You will read best practices showcasing how space innovation, often coupled with digital technologies, enables coastal communities to grow sustainably.

The stories collected are meant to stimulate awareness and knowledge exchange among those already using satellite applications and to trigger the curiosity of those who never heard about them. They also aim to inspire public and private actors to come up with new services for the maritime domain.

We sincerely hope that these testimonials will inspire and encourage you to follow suit!

Dominique Tilmans
President of Eurisy

ESA, with its Blue World Task Force, works to strengthen the relations between the maritime community and the space sector. ESA welcomes this publication as an important tool to contribute generating knowledge and raising awareness of how satellite-based solutions can support the maritime sector and boost the European blue economy.

CNES, through the Connect by CNES programme, greets the job done by Eurisy in collecting the most relevant examples on the uses of satellite applications for the growth of the blue economy and the implementation of best practices in the areas of interaction among marine biodiversity , the environment and human activities. Satellite-based solutions can contribute protecting our blue world and its resources, while supporting the green transition.

ENDORSEMENTS

AMA
Associazione Mediterranea Acquacoltori

The Mediterranean Association of Aquafarmers (A.M.A.) is pleased by the Eurisy publication and its focus on food production. We acknowledge the importance of pursuing sustainable fishing through space technology. Collecting information on water quality, sea water temperature, and the level of nutrients in the water, is necessary to ensure a sustainable production and to plan aquaculture activities according to seasonal trends. The adoption of satellite-based solutions can facilitate the daily job of aquafarmers and can help us to provide our customers with high-quality products.

Out-There Science & Technology Consulting is proud to support this publication. Today, it is important for many maritime actors to become more familiar with space technologies as a key factor to move towards a smarter and greener maritime industry. In this regard, Earth Observation is a driver for the development of more innovative & responsible downstream services that benefit both the industry and the marine environment, and that support decision makers to answer the challenges of climate change globally. The examples presented in this booklet will inspire maritime communities and will help them make a change in the maritime world.

EURISY MEMBERS

SPACE FOR MARITIME

The Eurisy "Space4Maritime" initiative aims to raise awareness and to stimulate the uptake of satellite data and signals to protect our blue world and to sustain the Blue Economy. Within this initiative, Eurisy seeks to identify and understand the needs of European maritime end-user communities, facilitating dialogue with the space industry to favour the uptake of satellite-based services.

In addition, the initiative categorises existing operational solutions applicable in the maritime domain through practical examples. Eventually, the initiative wants to spot the existing bottlenecks that harness the full exploitation of satellite applications in the maritime domain.

This 7th edition of the Satellites Going Local series showcases examples of operational uses of satellite-based services by public and private organisations operating in the maritime domain.

The case studies here collected bring under the spotlight early adopters. We hope to generate interest among communities new to space, which could benefit from the adoption of satellite-based solutions.

This booklet includes examples in the following areas:

- Environmental Monitoring
- Food Security and Production
- Safety and Security
- Port and Coastal Development
- Transport, Energy and Connectivity.

ENVIRONMENTAL MONITORING
Water quality
Emissions
Biodiverisity

FOOD SECURITY & PRODUCTION
Aquaculture
Planning of economic activities
Fishing guidance

SAFETY & SECURITY AT SEA
Situational awareness
Emergency response
Illegal fishing

PORT & COASTAL DEVELOPMENT
Coastal monitoring
Environmental impacts
Protected areas

TRANSPORT, ENERGY, & CONNECTIVITY
Green ships
Offshore wind energy
Connectivity

ENVIRONMENTAL MONITORING

EPIRUS REGION: RELYING ON SATELLITE IMAGERY TO MONITOR COASTAL WATER EUTROPHICATION

Satellite imagery supports local authorities in the Greek region of Epirus and Western Macedonia to monitor water quality in the Thesprotia regional unit.

IN A NUTSHELL

Country
Greece

User
Public administration

Challenge
Monitor water eutrophication

Solution
SAIMON service

Space Technology
EO

Benefits
Improved water quality monitoring

THE CHALLENGE

The province of Thesprotia, in the North-Western part of the Epirus region, has an economy relying mostly on fishing and tourism. The Epirus aquaculture sector represents 15% of the Greek export.

The Water Directorate of Epirus and Western Macedonia is tasked to monitor coastal water phenomena like eutrophication, an enrichment of water by nutrient salts that causes structural changes to the ecosystem, such as increased production of algae and aquatic plants, depletion of fish species, and general deterioration of water quality.

Traditionally, the techniques adopted to monitor eutrophication included the collection of in situ data and samples. These solutions are often not cost-effective, time-consuming, and they usually lack in reliability and completeness.

The Water Directorate of the Decentralised Administration of Epirus and Western Macedonia

www.apd-depin.gov.gr

THE SATELLITE SOLUTION

Since 2016, to ensure the continuous monitoring of the coastal waters of Thesprotia, reduce costs and acquire reliable data, the Water Directorate is using a cloud-based geo-information service created by Planetek. The SAIMON service (SAtellite Near Real-Time MOnitoring Network of the Eutrophication Risk) has been tailored for the monitoring of coastal waters in the Epirus region and, more specifically, in the province of Thesprotia. The service relies on data retrieved by the Copernicus Sentinel-3 satellite mission to obtain relevant information on water chlorophyll, sea surface temperature and water turbidity. The parameters are then included in the SAIMON service.

Once a Sentinel-3 image becomes available, the service automatically downloads it and performs all the measurements for the needed parameters. The final outputs are thematic maps with range bars legend for the measured parameters, downloadable from the SAIMON service.

THE RESULTS

The SAIMON service facilitates the monitoring tasks of the Epirus Water Administration. Moreover, it provides aquafarmers, researchers and citizens with reliable, easily accessible, and understandable data concerning the water quality in the regional coasts.

The service provides a sharable dataset that could be used by both Greek and Albanian authorities to plan and implement joint activities to better manage and protect the marine environment between the two countries.

THE NETHERLANDS HUMAN ENVIRONMENT AND TRANSPORT INSPECTORATE: MONITORING SHIP EMISSIONS ALONG THE COASTS

The Netherlands Human Environment and Transport Inspectorate (ILT) uses Earth observation data to identify ships not adhering to international regulations on ships emissions.

IN A NUTSHELL

Country
Netherlands

User
Public administration

Challenge
Monitor vessel emissions

Solution
Emission monitoring system

Space Technology
EO

Benefits
Improved monitoring system

THE CHALLENGE

Every year, Dutch seaports handle over 550 million tons of goods, making the country a central shipping hub worldwide. Since 2020, the international regulations imposed by the International Maritime Organization (IMO) require seafaring vessels to meet lower emission standards. Indeed, shipping contributes heavily to air pollution, due to Nitrogen oxides (NOx) and Sulphur dioxide (SO2) emissions. Such emissions lead to a growing concentration of pollutants and particulate matter in the atmosphere.

The ILT constantly monitors compliance with international rules for the Netherlands, especially observing emissions from ships. However, physically inspecting every ship coming to a Dutch port is practically impossible, and post-fact detection of non-compliant behavior outside of ports could be challenging.

The Netherlands Human Environment and Transport Inspectorate

Human Environment and Transport Inspectorate
Ministry of Infrastructure and Water Management

www.ilent.nl

THE SATELLITE SOLUTION

Since 2020, the ILT is developing a monitoring system to track NOx emissions and identify incompliant ships. The first step was the implementation of a study in cooperation with the Royal Netherlands Meteorological Institute (KNMI) and the universities of Leiden and Wageningen. Such entities developed an algorithm to measure ship pollution, that integrates EO data from TROPOMI (TROPOspheric Monitoring Instrument) with traditional monitoring means, as in-situ observations. TROPOMI is the satellite instrument on board the Copernicus Sentinel-5 Precursor satellite.

The algorithm combines ship location information in the hours before and up to the time when the satellite passes over the area, with data on wind direction and speed in the high seas, and with other satellite data on weather and air quality. Ship length and speed, together with EO data, help the ILT projecting the potential dispersion of pollutants by single ships.

THE RESULTS

Thanks to EO data, the ILT can steadily identify NOx emissions coming from big and fast ships, thus ensuring compliance with the national and international legislation about shipping emissions, while also contributing to emission monitoring globally.

Currently, the ILT is further developing the monitoring system by using machine-learning techniques that will improve plume location. TROPOMI data will be validated with low-altitude measurements by aircraft and individual ships will be tracked over longer periods of time.

SATBAŁTYK – SATELLITE MONITORING OF THE MARINE ENVIRONMENT IN THE BALTIC SEA

The SatBałtyk tool allows authorities to develop plans and decisions on how to protect the marine environment with satellite data.

IN A NUTSHELL

Country
Poland

User
Research centre

Challenge
Preserve marine biodiversity

Solution
SatBałtyk system

Space Technology
EO

Benefits
Improved knowledge of marine biodiversity

THE CHALLENGE

The nine countries located on the coasts of the Baltic Sea have all different economic and security priorities. Moreover, actions taken on one side of the coast may cause damage also to the other side, as in the case of a spread of industrial pollutants or agricultural wastewater into the sea.

Having knowledge of the marine environment and of the changes taking place there is vital to reconcile the needs of the many public and private stakeholders operating in the Baltic Sea in fields ranging from shipping to fishing, from mining to sewage, and from energy to maritime construction, among others.

Most importantly, a comprehensive overview of the area is fundamental to protect endangered species of marine plants and animals against the threats posed by human activities.

The Institute of Oceanology of the Polish Academy of Sciences

Institute of Oceanology
Polish Academy of Sciences

www.iopan.gda.pl

THE SATELLITE SOLUTION

In 2015, the Institute of Oceanology of the Polish Academy of Sciences launched the SatBałtyk system, a satellite-based platform to monitor the Baltic Sea environment in near real-time that is retrievable online. The platform features satellite data from multiple sources covering a time span of 20 years, as well as data collected through in-situ instruments, oceanographic databases, and mathematical models.

The platform targets users like public authorities responsible for maritime affairs, environment and trade, private entities and researchers. It contains information on eight parameters: atmosphere and meteorology, hydrology, ocean optics, solar radiations, seawater components, phytoplankton, coastal zones, and hazards.

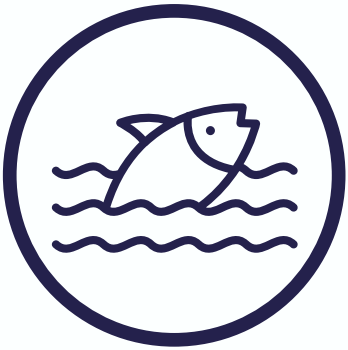
Such data are made available on the online tool in the form of coloured maps where each colour illustrates the distribution of the measured values in the whole Baltic Sea.

THE RESULTS

The SatBałtyk platform provides public and private entities, as well as researchers, with data on the multiple characteristics of the Baltic Sea, such as sea water temperature, salinity, the blooms of poisonous algae, or the appearance of pollution spots, including oil spills.

The Polish Navy relies on SatBałtyk to collect information for the planning and execution of offshore activities.

Widely promoted by Polish authorities, such as the Ministry of State Assets or the Marine Office in Gdynia, over 120 thousand people used the tool and downloaded the digital maps in the period 2019-2021.



FOOD SECURITY AND PRODUCTION

SOUTH IBERIAN COASTS: PLANNING SUSTAINABLE AQUACULTURE ACTIVITIES USING GEOSPATIAL TECHNOLOGY

The Andalusian Aquaculture Technology Centre relies on Earth Observation data to restore biodiversity, while developing profitable aquaculture.

IN A NUTSHELL

Country
Spain

User
Research centre

Challenge
Prevent loss of biodiversity caused by aquaculture

Solution
GIS Platform

Space Technology
EO

Benefits
Identification of aquaculture areas not threatening biodiversity

THE CHALLENGE

The south-western Iberian coast, shared between Portugal and Spain, has a common background and tradition in aquaculture, which is a major growing economic activity in the region. Over-exploitation of coastal waters is a tangible risk, which directly endangers biodiversity.

Ad-hoc policies are needed to favour the dialogue among the maritime actors operating in the area. At the same time, to plan aquaculture activities in advance is fundamental to preserve the biodiversity of coastal areas, as well as their profitability.

As an example, the identification of areas that do not conflict with the habitat of endangered local species would allow for the development of sustainable productions that would also improve the management of harvesting areas.

The Andalusian Aquaculture Technology Centre (CTAQUA)

ctaqua CENTRO TECNOLÓGICO DE LA ACUICULTURA

www.ctaqua.es

THE SATELLITE SOLUTION

Between 2017 and 2020, within the Interreg project "AQUA&AMBI", CTAQUA worked with the Andalusian Agricultural and Fisheries Management Agency, the Portuguese Environment Agency and the Portuguese Institute for Sea and Atmosphere to identify the interactions between aquaculture and the environment in the South-Western Iberian coast, and more specifically in the Alentejo-Algarve-Andalusia area.

The consortium developed a Geographic Information System (GIS) to monitor saline and aquaculture production areas. The GIS integrates multiple data, including Copernicus Sentinel-2 multi-spectral data on water temperature provided by the Spanish and Portuguese National Geographic Institutes.

The GIS includes a cartographic map that functions as a zoning and regulatory instrument for administrations and entrepreneurs to plan aquaculture activities.

THE RESULTS

Spatial planning based on satellite data provided an understanding of the south-western Iberian territory. The GIS allowed for the classification of different uses of the coastal zones, for the identification of suitable spaces for aquaculture development, and for the assessment of the compatibility of aquaculture farms with other economic activities in protected natural areas.

The Andalusian authority for agriculture and fishery relied on the GIS to identify the different uses of the Bay of Cadiz. With the support of the information derived from in-situ and satellite observations, it was possible to identify areas to be allocated to aquaculture in the region and to decide on which techniques to use.

BIVI SRL: PRECISION AQUAFARMING USING EARTH OBSERVATION

Satellite data supports aquafarmers in molluscs harvesting on the Italian Adriatic Coast.

IN A NUTSHELL

Country
Italy

User
SME

Challenge
Harvest optimisation

Solution
Rheticus Aquaculture system

Space Technology
EO

Benefits
Improved seasonal planning

THE CHALLENGE

Aquaculture represents a source of sustainable and high-quality sea food products. As for the agriculture sector, aquafarming companies are looking for detailed and precise information to plan the optimal time to harvest and sell their products.

Besides this, climate change effects are impacting the production and seasonal trends related to the harvesting of molluscs.

BIVI Srl is facing a series of challenges related to the frequent droughts that cause a depletion of nutrients and phytoplankton, with negative impacts on product quality (low meat products).

The risk is a reduction of the production impacting the profit margins. In particular, the company needs to assess chlorophyll levels, which reflect phytoplankton density and composition, and compare them with those of the previous years.

BIVI Srl

BIVI S.r.l.

THE SATELLITE SOLUTION

Back in 2019, BIVI Srl — member of the Italian Association of Mediterranean Aquafarmers — participated in a project funded by the Italian Ministry of Agriculture, Food and Forestry Policies, which aimed at fostering the adoption of new technologies in the aquaculture sector. In this framework, the Italian SME Planetek, in collaboration with Blue Farm, a spin-off of the Ca' Foscari University, developed the service platform Rheticus Aquaculture, mainly oriented towards molluscs harvesting.

It is a subscription and cloud-based service that provides geospatial information data, forecasting models and statistics based on data derived from Sentinel-3 images and Copernicus CMEMS and in situ observations.

Rheticus provides weekly information on chlorophyll concentration, temperature trends, mussels' weight, and growth predictions. In addition, Blue Farm developed an algorithm based on Earth Observation data enabling the assessment of mussel's growth rate.

THE RESULTS

Rheticus Aquaculture was used by BIVI Srl and other aquafarms along the Adriatic coast between 2019 and 2020, only for mussel farming. The solution provided the companies with clear and periodical information on chlorophyll levels in the Adriatic Sea and a forecast of the expected growth of mussels. The service helped BIVI Srl to save time and to better plan the harvesting season.

Planetek is upgrading the service and co-designing a new customised service that will include weather conditions and forecasts for aquafarmers. To make the platform as user-friendly as possible, Planetek is planning to make the service available as a mobile app.

TANZANIA: LOCATING PROFITABLE FISHING GROUNDS IN EAST AFRICA

The Tanzania Fisheries Research Institute (TAFIRI) is improving local fishing techniques using Earth Observation data and GNSS technology.

IN A NUTSHELL

Country
Tanzania

User
Research centre

Challenge
Access fishing offshore

Solution
Mobile application

Space Technology
GNSS + EO

Benefits
Guidance for offshore fishing

THE CHALLENGE

A quarter of Tanzania's population heavily depends on fishery for economic purposes and food. Fishery contributes for about 1.4% of the national GDP and represents an important source of work, employing over 180,000 people, and 19,000 in fish farming.

Due to climate change-related effects and overfishing, coastal fishery is slowly declining, threatening local communities and the economy. Furthermore, pelagic fish stocks are mostly unexploited, due to very limited means and tools, and to a lack of knowledge on how to locate fishing grounds in offshore waters.

Artisanal fishers are mostly dependent on inshore fishing and would need support to access profitable fishing areas offshore.

The Tanzania Fisheries Research Institute (TAFIRI)

www.tafiri.go.tz

THE SATELLITE SOLUTION

As part of the GMES and Africa programme, TAFIRI started a collaboration with local fishing communities in the areas of Fundo (Pemba), Nungwi (Zanzibar), Kipumbwi (Tanga), and Kilindoni (Mafia). The aim was to raise awareness of the uses of EO and GNSS data to identify profitable fishing areas, with the final objective of helping local communities to optimise their resources.

TAFIRI trained more than 100 ring-net fishers on the use of satellite navigation to track local fishing grounds and develop new safe fishing techniques.

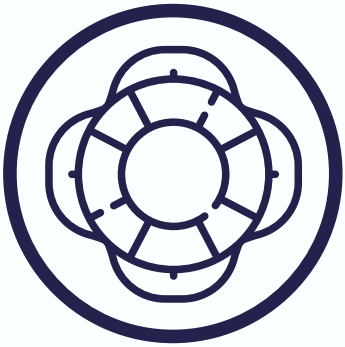
Fishermen were given mobile phones with a dedicated app to collect fisheries information. The app includes an SMS alert system, thanks to which the fishermen receive the coordinates of potential fishing zones, as well as data on water quality and temperature derived from Copernicus Sentinel-2.

Once leaving the coast, fishermen activate the GNSS signal and check on the app the vessel's course to reach the identified fishing station.

THE RESULTS

The use of satellite data to improve fishery techniques and to guarantee a sustainable fishery is bringing a series of benefits to local fishermen and responsible authorities. The information captured is used by the government to improve fishery management plans for small and medium species (e.g., sardines) along with large pelagic fish (tuna and tuna like species) in the coastal waters of Tanzania.

The app guarantees artisanal fishermen the possibility of working without risking their lives due to outdated maps or inadequate data on water and weather conditions, while helping to implement new policies and fishing strategies for the development of the country.



SAFETY AND SECURITY

VAKE: IMPROVING MARITIME SITUATIONAL AWARENESS USING SATELLITE DATA AND MACHINE LEARNING

VAKE, a Norwegian start-up, developed a dashboard that detects and monitors the behaviour of ships to supports governmental authorities in the prevention of crimes and illicit actions.

IN A NUTSHELL

Country
Norway

User
Start-up

Challenge
Monitor vessel behaviour

Solution
Online dashboard

Space Technology
GNSS + EO

Benefits
Improved Maritime Situational Awareness

THE CHALLENGE

Increased maritime traffic and activities in our oceans are generating multiple threats to the environment, to core economic sectors, and to the national security of coastal countries.

Illegal fishing, smuggling, and environmental crimes are the main challenges to be overcome. Indeed, detecting and identifying potential criminal vessels is key to filling information gaps and preventing illegal behaviours at sea.

Technology already supports governmental authorities and businesses in spotting illicit activities, via drones, airborne sensors, and cameras. Nevertheless, these methods do not allow for the easy monitoring of wide areas.

VAKE

www.vake.ai

THE SATELLITE SOLUTION

To support governmental authorities and maritime economic actors, VAKE developed a dashboard that combines two core features: area monitoring and vessel tracking.

The platform allows users to detect ships by using data from the Copernicus Sentinel-2 satellites, coupled with machine learning techniques, and cross-referenced with other vessel monitoring solutions, such as the Automatic Identification System (AIS) signal based on GNSS technology.

The dashboard allows users to select their area of interest and a temporal frame to obtain data on the ships located there, such as their size and direction. Users can access the images and information in the form of an interactive web report or download the data as a report file. In addition, the dashboard allows for the detection of dark and potentially illegal ships.

Users can monitor their area of interest to verify if suspicious vessels are sailing with their AIS signal off, which can be an indicator for potentially illegal activities.

THE RESULTS

VAKE's dashboard helps national authorities to improve sea monitoring, especially for the implementation of fishing analysis, and to prevent and prosecute environmental crimes. The algorithms that power the dashboard can find additional applications to detect human trafficking, smuggling and seawater emissions.

VAKE is working with the Netherlands Coast Guard to complement and improve their maritime situational awareness. The collaboration with Vake allows the Coast Guard to extract insights on maritime activities covering a wider portion of sea than the area they currently monitor.

SPANISH COAST: SUPPORTING EMERGENCY RESPONSE WITH THE IBISAR SERVICE

The Spanish Maritime Safety and Rescue Agency (SASEMAR) relies on remote sensing data and in-situ observations to improve emergency response at sea.

IN A NUTSHELL

Country
Spain

User
Public Authority

Challenge
Improve emergency response at sea

Solution
IBISAR service

Space Technology
EO

Benefits
Optimised search and rescue operations

THE CHALLENGE

Oil spills and illegal discharges from ships are a serious threat for the Spanish coasts. The Prestige oil spill incident that occurred in November 2002 off Galicia's coasts underlined the importance of a fast response system to pollution-related incidents, to contain both contamination and economic damage.

Understanding wind currents and waves is crucial for SASEMAR to steadily intervene and to limit the immediate consequences of an environmental incident at sea.

Often, search and rescue operators spend a considerable amount of time to collect and layer the data by retrieving them from multiple datasets to then create forecast models. To optimise this phase, SASEMAR needed an improved preparedness and response system.

The Spanish Maritime Safety and Rescue Agency (SASEMAR)

www.salvamentomaritimo.es

THE SATELLITE SOLUTION

SASEMAR, together with the Balearic Islands Coastal Observing and Forecasting System and the Spanish Port System, developed the IBISAR service, a science-based data downstream service that allows to visualise, compare and evaluate ocean currents and wind predictions in near real-time in order to facilitate rescue operations at sea.

The SASEMAR service provides predictive models built on in-situ measurements and data collected thrugh radars and satellite-tracked drifters operated by the Iberia Biscay Irish – Monitoring Forecasting Centre of the Copernicus Marine Monitoring Service.

The service consists of a web-based platform, a customisable GIS-based graphical user interface, and a Skills Assessment functionality to evaluate the accuracy of the ocean current predictions. Users can access different data layers in a GIS interactive map that can be downloaded for free.

THE RESULTS

By integrating the IBISAR service in its preparedness system, SASEMAR can increase the emergency capabilitiesits of search and rescue operators in case of an incident at sea.

By selecting the most relevant data from the service, SASEMAR optimises its response time to maritime emergencies, benefitting from a single access point to multiple datasets.

Through the IBISAR service, SASEMAR could improve its operations related to search and rescue and pollution control. Thanks to the service, it is possible to minimise response time, to optimise search area planning, and to better protect the cleanliness and safety of seas and coasts.

OCEANMIND: EARTH OBSERVATION AND AI TO SUPPORT SUSTAINABLE TUNA FISHING

A UK-based not-for-profit organisation developed a platform that helps food retailers validate tuna fishing methods.

IN A NUTSHELL

Country
United Kingdom

User
NGO

Challenge
Ensure sustainable tuna fishing

Solution
Online platform

Space Technology
GNSS+ EO

Benefits
Validated tuna fishing techniques

THE CHALLENGE

Overfishing is one of the main factors causing the decline of the ocean's wildlife populations. According to the United Nations Food and Agriculture Organization (FAO), between 2017 and 2018, 1/3 of global fish stocks were classified as overfished and no longer biologically sustainable.

In Europe, about 38% of fish in the North-East Atlantic and the Baltic Sea is overexploited. In the Mediterranean and the Black Sea, this percentage reaches a total of 87%.

Aggressive and destructive fishing methods are indeed one of the main threats to biodiversity and habitats. For example, Fish Aggregation Devices (FADs) dramatically increase catch rates and reduce the resource and effort required per catch. To validate the fishing methods of seafood suppliers is today vital to provide consumers with a sustainable product.

OceanMind

www.oceanmind.global

THE SATELLITE SOLUTION

In 2017, the OceanMind team developed an independent method to validate fishing source, legality and methods. The methodology merges a wide variety of data, including Vessel Monitoring System (VSM) data, Automatic Identification System (AIS) data, fishing vessels' authorisations, and oceanographic and geospatial data derived from satellite images collected through multiple sources, including private companies as Spire and Earthwatch.

Such data represent the main validation tool for OceanMind. The output of this data analysis is a risk assessment report delivered by OceanMind to their partners, mainly seafood suppliers and food retailers, to support traceability and inform their buying decisions.

The multi-layered information analysis on the seafood supply chain allows users to verify the claims of the fishing practices made by a supplier and provides information on any suspected illegal behaviour.

THE RESULTS

OceanMind developed its first report on FAD fishing methods for the British food retailer Sainsbury's to validate the fishing methods adopted by the vessels in their tuna supply chain. They are working together to ensure a long-term and independent feedback mechanism to validate the legality and responsibility of tuna suppliers from the moment of capture.

Leveraging on OceanMind data and assessment, Sainsbury's farmed fish sources are today 100% certified, and 82.3% of their wild-caught fish and seafood is considered as sustainable and environmentally friendly by the UK Marine Stewardship Council standards.

PORT AND COASTAL DEVELOPMENT

CYPRUS AUDIT OFFICE: EO TO SUPPORT BEACH INSPECTIONS, IMPROVE COASTAL MANAGEMENT AND PREVENT ENVIRONMENTAL DAMAGE

The Cyprus Audit Office used satellite imagery in an audit of the country's beaches to detect illegal activities and anthropogenic and natural phenomena.

IN A NUTSHELL

Country
Cyprus

User
Public authority

Challenge
Ensure effective coastal management

Solution
GIS platform

Space Technology
EO

Benefits
Increased evidence to monitor the coast

THE CHALLENGE

Cypriot coastline and beaches are the habitats of many animal and vegetal species, some of which are considered as endangered by the International Union for Conservation of Nature (IUCN).

Every year, beaches bring millions of tourists to Cyprus. Indeed, tourism represents a vital source for the country's economy, but its substantial increase, with the creation of new touristic infrastructure, could also pose threats to the island's biodiversity.

To ensure effective coastal management, the Audit Office conducted an audit to evaluate the measures implemented by the competent authorities to protect the coastline and contain the effects of the potential threats related to mass tourism and illegal activities.

The Cyprus Audit Office

AUDIT OFFICE | REPUBLIC OF CYPRUS

www.audit.gov.cy

THE SATELLITE SOLUTION

To realise the audit, the Office submitted questionnaires to local authorities, realised visits to collect in-situ data, and interviewed public officers and non-governmental organisations. Moreover, the Cyprus Audit Office relied on GIS technology to obtain information on land ownership and protected coastal zones. This information was needed to assess the potential effects of illegal buildings and mass tourism on coastal erosion.

Satellite imagery from multiple sources, including Sentinel-2 images, Google Earth and orthophotos from the Department of Lands and Surveys, was used to map the entire island and to draw a temporal perspective of the evolution of the coastline.

The satellite images used by the Audit Office were retrieved by the digitised cadastral maps developed by the Cyprus Department of Lands and Surveys and made freely available online through a dedicated portal.

THE RESULTS

The use of satellite data provided the Audit Office with a broad vision of the geographic area surrounding the island, allowing it to perform a broad inspection of the coastline, while drastically reducing the time and costs dedicated to the audit. Indeed, in-situ observations were only necessary to validate contrasting data and information.

Thanks to the GIS technology, the Audit Office was able to assess the evolution of coastal erosion and of illegal building sprawl during the last years, and to estimate the potential economic impacts on the long run.

PORT-LA-NOUVELLE: SATELLITE DATA TO MONITOR WATER TURBIDITY DURING THE PORT EXTENSION WORKS

The Occitanie/Pyrénées-Méditerranée region used Copernicus data to monitor sea water quality during the extension works in the harbour of Port-la-Nouvelle.

IN A NUTSHELL

Country
France

User
Public authority

Challenge
Monitor water quality

Solution
Forecast model

Space Technology
Earth Observation

Benefits
Improved monitoring of water turbidity

THE CHALLENGE

As part of the Plan Littoral 21, the Occitanie/Pyrénées-Méditerranée region decided to start important works to adapt the commercial harbour of Port-la-Nouvelle to new traffics and allow for the development of new sectors.

Notably, the regional plan foresees the installation of floating wind-turbines and the creation of a green hydrogen production plant as from 2024.

Carrying out such works implies dredging, which can bring back to the surface sediments on the seafloor, hence endangering the marine environment and the natural areas nearby.

To guarantee that the port expansion works were carried out sustainably, the Directorate for the Sea needed a reliable water quality monitoring system in the area of the works.

The Occitanie / Pyrénées-Méditerranée Region

La Région Occitanie Pyrénées - Méditerranée

www.laregion.fr

THE SATELLITE SOLUTION

i-SEA, a company based in Aquitaine, supported the port authorities to monitor water turbidity nearby the works, by using data from the Sentinel-2 and Sentinel-3 Copernicus satellites.

The satellites provided data on water turbidity in the past and the near future.

Before the port extension works started, satellite imagery allowed I-SEA and the region to improve their knowledge on the hydro-sedimentary processes of the site of Port-la-Nouvelle.

During the works, the data contributed to in-situ monitoring, by providing a big-picture of water turbidity levels and a forecast within the next three days.

THE RESULTS

Thanks to the Copernicus data, it was possible to avoid damage to the nearby natural areas during the the works and to prevent the infiltration of a turbid plume in the pond of Bages Sigean.

The predictive method provided the personnel responsible for the works in the Region with daily objective tools to monitor the impact of the expansion of the port on water turbidity and to adapt the works according to the forecasted turbidity levels.

In 2024, the commercial harbour of Port-la-Nouvelle will welcome the first floating wind turbines in the Mediterranean Sea.

This operation is part of a regional strategy to achieve sustainable development in the littoral by using technology to boost the local economy, while also safeguarding the environment.

BLUEDISCOVERY: IMPROVED MANAGEMENT OF MARINE PROTECTED AREAS

Blue Thread, an SME based in Rome, developed the Blue Discovery app to support the management of Marine Protected Areas (MPAs).

IN A NUTSHELL

Country
Italy

User
SME

Challenge
Monitor Marine Protected Areas

Solution
Mobile App

Space Technology
GNSS

Benefits
Optimised overview of activities within MPAs

THE CHALLENGE

According to the FAO's definition, Marine Protected Areas (MPAs) are marine geographical areas that need greater protection than the surrounding waters for biodiversity conservation or fishery management purposes.

In its geographic diversity, Italy counts around 29 MPAs across the country. Each of these areas is classified according to the protection needed, based on its natural, geomorphological, physical, scientific, economic, and educational relevance.

Monitoring and safeguarding MPAs is a complicated task for the local authorities responsible for these areas. When it comes to MPAs that are also touristic destinations, like the MPA in Porto Cesareo in the Apulia region, monitoring the flux of tourists, their activities, and behaviours, becomes quite challenging.

Blue Thread

BLUE THREAD
NAVIGATION TECHNOLOGY

www.blue-thread.eu

THE SATELLITE SOLUTION

In 2019, Blue Thread developed Blue Discovery, a GNSS-based free mobile app available for IOS and Android. The app allows visitors to get information on the rules to access and visit a Marine Protected Area, on the itineraries to follow and the spots of interest in the surroundings.

The app relies on GNSS technology embedded in smartphones and allows the authorities responsible for managing the MPA to obtain reliable information and increased position accuracy on the visitors of the area through the Operational Portal.

Through the app, visitors can send to the managing authority short reports on the sighting of protected species or on environmental crimes by uploading geo-referenced photos with the time and additional details to help authorities to intervene timely.

Moreover, Blue Discovery provides visitors with the opportunity to request, pay, and issue permits for activities to be carried out in the MPA.

THE RESULTS

The app was tested by the marine protected area of Porto Cesareo to monitor the flow of visitors and to keep track of their position in the area. The Blue Discovery app helped the authority of Porto Cesareo to optimise the time and resources deployed to patrol the area, and to validate the fares paid by the visitors and their permits.

Blue Thread is planning to include Earth Observation imagery in the app to provide additional support for navigation routes, through ad hoc ship detection maps.

TRANSPORT, ENERGY AND CONNECTIVITY

D-ICE: REDUCING THE CARBON FOOTPRINT OF SHIPS

The French SME D-ICE relies on Copernicus Data to help the maritime transport community reducing the fuel consumption of ships with optimised routing services.

IN A NUTSHELL

Country
France

User
SME

Challenge
Reduce vessels' environmental impact

Solution
SATORI software

Space Technology
EO

Benefits
Foster wind-assisted propulsion systems on ships

THE CHALLENGE

More than 3% of global carbon dioxide emissions can be attributed to ocean-going vessels, which is equivalent to the annual greenhouse gas emissions from over 205 million cars. Moreover, boats powered by fuel also cause noise pollution that negatively affects marine life.

The carbon dioxide emissions of ships are directly proportional to fuel consumption and speed. To reduce their environmental impact and to align with the objectives of the International Maritime Organization (IMO), the shipping industry is looking for solutions to reduce fuel consumption by using wind-assisted propulsion systems.

D-ICE decided to create systems to help ship operators to assess the interest of adding wind-assisted ship propulsion systems onboard their ships.

D-ICE

D - ICE ENGINEERING

www.dice-engineering.com

THE SATELLITE SOLUTION

Since 2020, D-ICE developed the SATORI software, an online service that estimates the fuel consumption of ships on specific routes. SATORI is particularly interesting to evaluate the performances of wind-assisted ship propulsion systems.

The service relies on free data from Copernicus satellites that provide historical data on weather, wind, waves, and sea currents on sea routes. The data are used to calculate ships' motions and interactions with the environment.

Shipowners, naval engineers and providers of propulsion systems can perform statistical weather routing studies on the online interface, choose a route and the time periods on which they wish to assess their ship's average consumption, and create their own data visualisation to obtain the required forecasts (environmental conditions to be encountered, fuel saving associated with wind-assisted propulsion, ship motions).

THE RESULTS

With SATORI ship owners and operators can assess the reduction of consumption that will be reached installing Wind Assisted Ship Propulsion systems, either on a direct route or on an optimised route. Since its launch, SATORI has been adopted by some notable clients. For example, Total and Z&B are today using the software on some of their ships, while AYRO and Chantiers de l'Atlantique rely on it to design wind-assisted ship propulsion systems.

In 2021, the boat Maître Coq won the greatest sailing race around the world, solo, non-stop and without assistance: the Vendée Globe. D-ICE provided the skipper, Yannick Bestaven, with a software that contained a database of historical routes that was computed with the same algorithm as SATORI. This tool helped him to confirm his routes' choices and to eventually win the race.

NORTH SEA: PLANNING OFFSHORE WIND ENERGY IN THE DIGITAL TWIN OF THE SEA

The Dutch Ministry of Infrastructure and Water Management uses a platform based on in-situ and Earth Observation data to plan offshore wind farms.

IN A NUTSHELL

Country
Netherlands

User
Public authority

Challenge
Engage stakeholders in spatial planning in the North Sea

Solution
Marine Spatial Planning Simulation Platform

Space Technology
EO

Benefits
Improved planning of offshore wind farms

THE CHALLENGE

The Maritime Spatial Planning Directive requires EU Member States to draw and apply maritime spatial plans. The Ministry of Infrastructure and Water Management is the coordinating ministry for the integrated North Sea policy and manages the Dutch part of the North Sea.

Transforming governmental ambitions of sustainable use of the sea into something concrete means fitting all the needs in one coherent spatial plan, which implies trade-offs.

Understanding the capacity of the electricity grid, the infrastructure required to get the energy from wind farms on the national grid and boundary conditions is crucial to meet the national ambitions for offshore wind farm development.

The Dutch Ministry of Infrastructure and Water Management

Rijkswaterstaat
Ministry of Infrastructure and Water Management

www.rijkswaterstaat.nl

THE SATELLITE SOLUTION

The Academy for Games and Media of the University of Breda developed a Maritime Spatial Planning Simulation Platform. It is used within the Digital Twin North Sea project, a cooperation between government agencies, knowledge institutes and the business community to create a support tool for policy makers, stakeholders, scientists, and citizens.

This 'digital replica' of the North Sea simulates spatial plans and their effects. The current Digital Twin North Sea consists of a browser version, the Maritime Spatial Planning (MSP) Challenge simulation platform, and a virtual reality prototype module.

The tool offers a map of the North Sea basin to simulate the energy production and the infrastructure needed to get the maximum capacity from wind farms installed there to the national grid.

The Copernicus programme is an important contributor to the tool. It provides free and open marine data (satellite images, models and data visualisation tools) that are integrated in the different layers of the platform.

THE RESULTS

The MSP Challenge Simulation Platform provides an engaging tool for students, professionals and policy makers to better understand basic electrical engineering in offshore wind power development and the spatial implications of it. Using GIS data, the platform provides direct feedback while testing out different scenarios.

Thanks to the platform, policy makers can now engage stakeholders in a pragmatic way. The multi-user system allows for the creation of shared servers to work in a co-creative setting with multiple stakeholders. The platform also covers the Baltic Sea, the Clyde Marine Region, and the Adriatic Sea.

MEDASSIST LIVE: PROVIDING MEDICAL SUPPORT AT SEA THANKS TO SATELLITE COMMUNICATION

MedAssist.Live provides assistance in case of a medical emergency at sea, allowing crew members to take better care and to save lives.

IN A NUTSHELL

Country
Netherlands

User
SME

Challenge
Improve medical support at sea

Solution
MedAssist Live app

Space Technology
SATCOM

Benefits
Connected assistance for crews at sea

THE CHALLENGE

Providing medical support to people in remote areas is very challenging. Telemedicine has proved to be a game-changer in multiple occasions, especially during medical emergencies at sea.

Ship crews can spend weeks far out at sea, often thousands of miles away from the nearest shore. At sea, medical emergencies happen daily, and regular ships have no doctor on board. Just in Europe, every year there are on average 21,000 telemedicine consultations at sea, and this number is constantly increasing.

Depending on the medical need, vessels are often forced to change their plans, diverting their course, and extending the duration of their trip. To provide crews with better and faster care, an additional telemedicine tool was needed.

MedAssist.online

MedAssist.online™
Medical Care - Anywhere

www.medassist.online

THE SATELLITE SOLUTION

The Live App by MedAssist meets the need of ship crews to get medical assistance at any moment and anywhere. It relies on satellite communication and a patented Two-Ways-Augmented-Reality (TWAR) technology. Satellite ship-to-shore-to-ship communication provides an essential feature to make the Live app work at sea.

With support from ESA and the Netherlands Space Office, the TWAR technology was optimised for reliable use over satellite connections. Once users download the app, they can create their profile and require live assistance, access tutorials or create new ones in case of specific accidents.

TWAR allows a medical professional to instruct, point out, guide and coach a ship's officer as if the two were physically in the same place: they can examine and treat a patient as if the doctor were on board, or the doctor can show to the officer what to do. The officers on board will see the hands of the doctor superimposed on their owns on the screen and will be guided in their movements live.

THE RESULTS

The Live App helps crews or people in remote locations to get the best possible medical care anytime and anywhere. It also reduces the human and financial costs of medical emergencies at sea. The app has been tested by both KLM and onshore medical staff and has already been positively evaluated by several shipping companies.

The app is being used all over Europe, especially by Dutch and German shipping companies. Soon, it will be also available for users in Asia and America. Considering the importance of providing medical assistance to people in remote areas, MedAssist is planning to adapt the app to other contexts, such as rural areas.

PREVIOUS EDITIONS

Eurisy has been publishing "Satellites Going Local: regions, cities and SMEs share good practice" since 2011.

The objective of the publication is to encourage regions, cities and SMEs to make the most of European investments in space, by learning from their peers how to use satellite applications in many different sectors, and by following suit.

This publication, and its online counterpart, Eurisy's database of success stories (www.eurisy.eu/stories), is an important resource in Europe, which systematically and regularly collects examples of how satellite navigation, imagery and communication are used in practice, shared by the users themselves.

Today, Eurisy is still searching for success stories exploring new sectors to bring satellite technologies closer to society.

For previous editions, and more success stories in your country and field of interest, visit www.eurisy.eu

Editor: Eurisy
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ACTING COLLECTIVELY TO BRIDGE SPACE AND SOCIETY

Eurisy is a non-profit association of space agencies and government offices dealing with space affairs in Europe.

It is mandated and financed by its members to increase the access of society to the benefits of innovative satellite information and services.

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