





## THE SUSTAINABLE DEVELOPMENT GOALS

As an instrument of international cooperation, the SCO is in line with the Paris Agreement and the UN's Sustainable Development Goals.



## THEMES OF SCO PROJECTS

The projects that received the SCO certification label cover a variety of themes across different types of territories.

### THEMES



### ENVIRONNEMENTS



**Cover :**  
 Under the eye of Sentinel-3 is the Bengal delta, fed by the rivers Ganges, which flows over 2,400 km from the Himalayas, and Brahmaputra. The largest river delta in the world, it is closely monitored by the Band-SOS service.  
 © contains modified Copernicus Sentinel data (2020), processed by ESA, CC BY-SA 3.0 IGO

**Above :**  
 This is Elyx, the digital ambassador for the United Nations, and now for the SCO, to tackle the Sustainable Development Goals. © ELYX/CNES 2022



# SCO Portfolio

—  
2020-2023 Edition

**I**n 2017, during the first *One Planet Summit, the Space for Climate Observatory (SCO)* initiative was born to fully leverage the potential of Earth observation data in the adaptation and fight against climate change. Two years later, the French President officially announced its launch during the Paris Air Show, where twenty-three space agencies and international organizations met to sign the Joint Declaration of interest.

Today, the SCO has an International Charter signed by some fifty partners and federates more than seventy projects around the world. The SCO is recognized as a major player on the international stage as a federator of use cases to contribute to the climate effort. Within this ecosystem, our country and the national space agency (CNES) have played a leading role, as demonstrated by the vitality of the SCO France. Thanks to the mobilization of numerous French scientific organizations alongside public institutions and private companies, the general public and local decision-makers are gradually gaining access to crucial tools to better understand and anticipate present and future climate challenges. Whether it is a question of monitoring extreme weather events, water and forest mana-

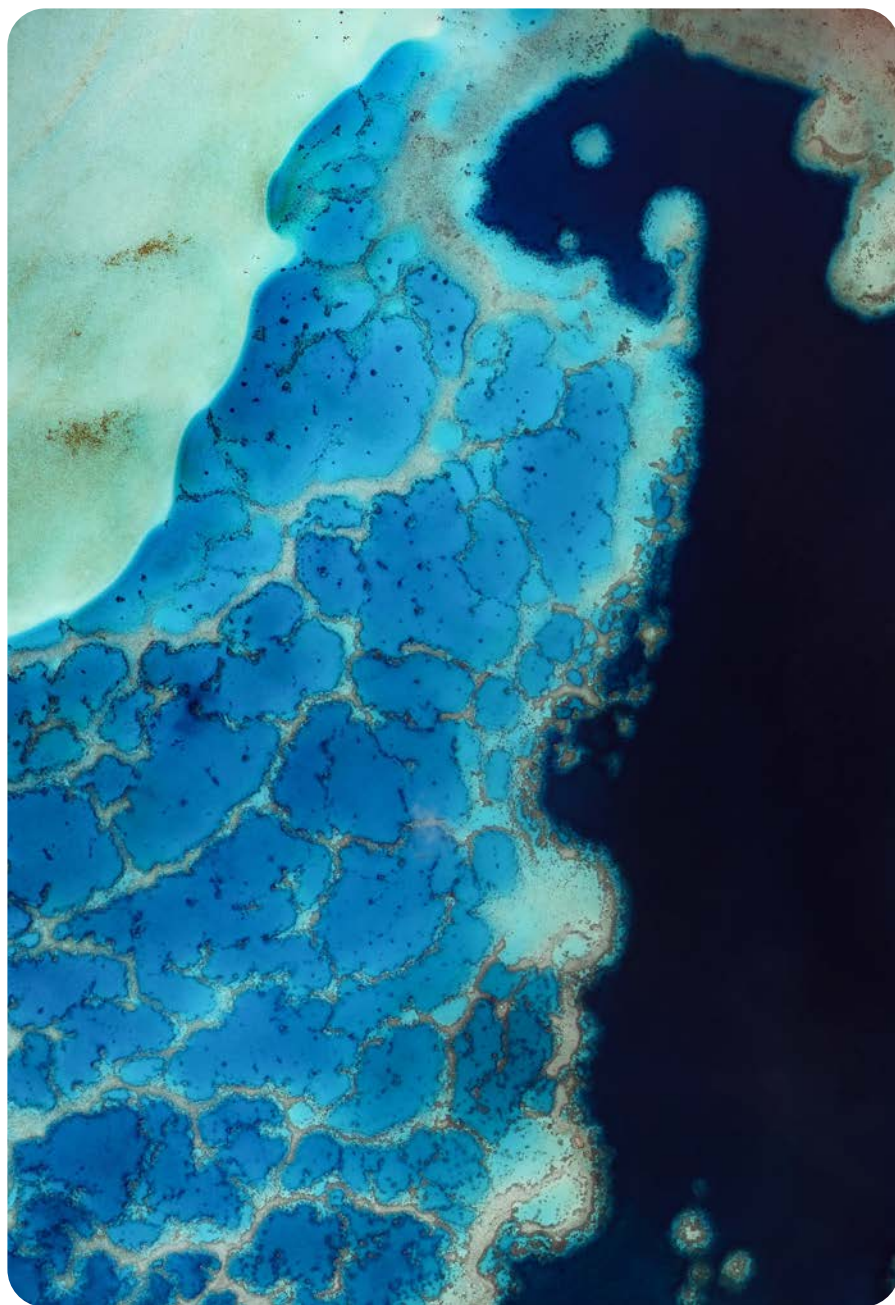
gement policies, biodiversity protection or prospects for adapting our cities and countryside, the services and platforms of the SCO provide essential decision-making tools for actors and stakeholders. These projects now allow many territories to move forward with resilient actions that are essential to the fight against global warming.

COP28 was the occasion for an unprecedented mobilization of space agencies, which met at a Space Agency's Leader Summit on Monday 4 December. The Space Agency's Leader Summit Pledge for Enhancing Space-Based Climate Initiatives adopted on this occasion sets out 4 strategic commitments : data sharing, strengthening climate research, the emergence of new programmes, promoting sustainable space operations, and raising the sector's awareness of climate change.

The SCO is set to play a central role in implementing these commitments, by providing its technical and field expertise to support the most vulnerable populations.

**Philippe BAPTISTE**  
*Chairman and CEO of CNES*





● The Maupiti Lagoon (French Polynesia) as seen by the Pleiades Neo satellite on 03 April 2023.  
© Airbus DS, 2023

# Introduction

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An essential and fundamental publication of the SCO, this notebook is a synthesis of the achievements, dynamism and energy that have been injected into the SCO alliance over the last four years. By turns a checklist, a breviary, a dictionary, an instruction manual, a directory and a bedside book, it is an invitation to discover the many applications of Earth observation data in the fight against climate change. It is a shining example of what makes the SCO so unique: the successful alchemy between public research and development institutions, players in a booming private sector ecosystem and user-decision-makers in charge of regional management. The only one of its kind on the international scene, the SCO responds to an urgent need for local authorities as the local impact of climate change increases.

The SCO label guarantees that projects meet the requirements of the International Charter. Once again, we would like to thank the members of the labelling committee who gave up their time, as well as the members of the Inter-Organizational Committee who have remained committed over the years.

Today, the SCO France federates a vast portfolio of projects, as shown in this SCO Portfolio, which brings together a great diversity of themes, methodologies, data and actors. 311 institutions and 50 companies took part in the four years of the initiative. At CNES, around 20 engineers devote part of their time to SCO and ensure that the 61 French projects run smoothly.

The SCO France acts as a driver of the broader global initiative, and endeavors to gain visibility by promoting the projects on the international scene, in order to contribute to the objectives of adaptation of our societies to climate change.

**Laurence Monnoyer-Smith et Frédéric Bretar,**  
*Heads of SCO France at CNES*



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# Gather and act for our planet

—  
A GLOBAL INITIATIVE TO STUDY  
AND ADAPT TO THE IMPACTS  
OF CLIMATE CHANGE  
—

- Tillaberi region, south-west of the Republic of Niger, as seen by the Pleiades satellite on 2 April 2021.  
© CNES/Distribution Airbus DS, 2021



# The SCO initiative

The Space for Climate Observatory (SCO) is an international initiative of the One Planet Summit, officially launched in June 2019 by French President Emmanuel Macron. The SCO aims to develop projects for local decision-makers to help them adapt to climate change. The projects monitor impacts on territories using satellite data, in situ data and local socio-economic data.

# The SCO Objectives

The primary objective of the SCO is to develop a set of operational tools for observing, evaluating and anticipating the impacts of climate change. Historical analysis of data, development of impact scenarios, warning systems: the SCO relies on science, space and digital technology to provide decision-making tools for public policies in the face of climate challenges. The tools, which are co-constructed with their users to meet local needs, must be easily transferable to other areas in the world once they are operational.

To achieve this, the SCO relies on the pooling of existing international (Copernicus, NOAA, Eumetsat, etc.) and national space data (DRIAS, etc.), whose interoperability with all types of local data, particularly environmental and socio-economic data, is promoted.

In the long term, the ultimate goal is to provide policymakers in all countries with a common set of tools to combat climate change or, failing that, to adapt to it.



# The SCO Charter

Co-drafted by the signatories of the declaration of interest in 2019, the founding Charter opens SCO membership to any international, public or private entity committed to climate action. The Charter came into force on September 1<sup>st</sup>, 2022, and had been ratified by 47 members by December 31, 2023.

## Members of the SCO

### INTERNATIONAL FOCAL POINTS



### OTHER SIGNATORIES







# SColutions

TO THE SUSTAINABLE DEVELOPMENT GOALS

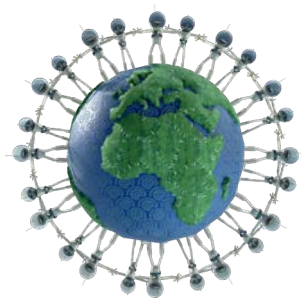
September 25, 2023 marked the mid-term anniversary of the 17 Sustainable Development Goals (SDGs) set by the UN and brought together in the 2030 Agenda. For the occasion, the SCO recalled the various responses it is implementing to concretely address several of these SDGs.

100% OF SCO PROJETS ARE IN LINE WITH SDGs 13 & 17



“Take urgent action to combat climate change and its repercussions”

This is the SCO’s raison d’être. Working alongside local authorities, the SCO certifies local projects to accelerate the development of operational solutions that can be replicated elsewhere.



“Partnerships to achieve objectives”

SDG17 is emblematic of the SCO’s modus operandi. From international alliance members to local project consortia, collaboration is in the SCO’s DNA.



SCO projects make a particular contribution to four other MDGs, always with a special focus on the most vulnerable countries :

• SDG2, “Zero hunger” : by supporting the transition of rural areas, facilitating crop monitoring, anticipating agricultural droughts...

• SDG11, “Sustainable cities and communities” : with tools to inform urban planning choices with regard to heat islands, thermal loopholes and air pollution...

• SDG6, “Clean water and sanitation” : by optimizing the management of water resources, monitoring the global load on dams and the quality of small reservoirs...

• SDG15, “Life on Earth” : by monitoring global tropical deforestation, restoring wetlands, monitoring the evolution of natural habitats, protecting migration corridors...

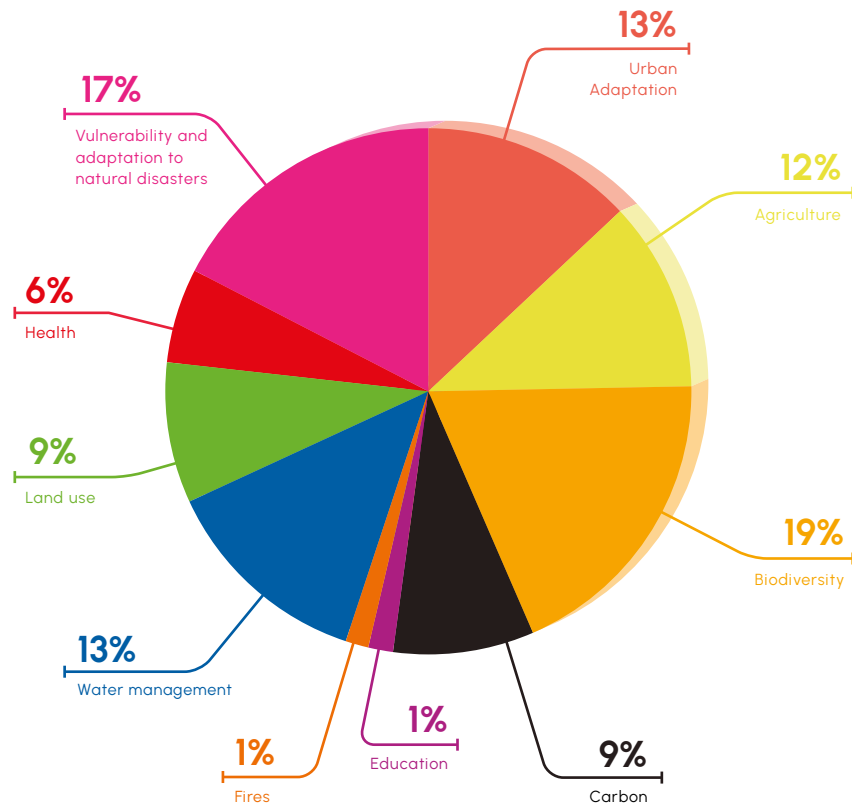
The story of Varaire, a small village in the Lot department of France, chosen by the UN to close its international exhibition on the SDGs, is surprising. Why was it chosen? Because the SDGs convey ancestral values and common sense that rural communities have managed to preserve. [Read all about it in our news!](#)





# 4 years of SCO

71 PROJECTS



12 STEERING COMMITTEES

## GOVERNANCE

- **Founding charter effective** September 1<sup>st</sup>, 2022
- **Adoption of rules of procedure** on May 24, 2023
- **Adoption of the work program** to be implemented from October 2023 to October 2025 (vote on October 3, 2023)
- **First international call for projects** in September 2023



Presentation of the Founding Charter and first signatures at the Cité de l'Espace (Toulouse, France) on June 27, 2022. © CNES

## PARTICIPATION IN MAJOR INTERNATIONAL EVENTS 2023



SCO members present at the 12<sup>th</sup> International Steering Committee meeting at IAC 2023 in Baku (Azerbaijan). © CNES



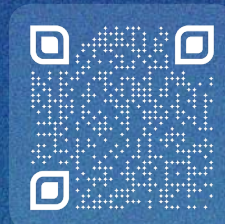
SCO presence at GLOC 2023, the IAF's first space conference on climate change, held in Oslo (Norway) from May 23 to 25, 2023. From left to right: Sara Toffoletti, Selma Cherchali, Laurence Monnoyer-Smith and Lionel Suchet (CNES), Harm van de Wetering and Joanna Ruiters (NSO), Frédéric Bretar (CNES) and Shereen Zorba (UNEP). © SCO



► COP28\_TR SpacePav GEO © UAE + COP28\_TR UKSA Space Pavillon © SCO For the first time, COP28 featured a Space Pavilion, where the SCO took part in a number of roundtables, notably on the role of long-term climate data (opposite) and new operational services based on Earth intelligence (below).



# SCO in France



SCO France is the national version of the international initiative, and its aim is to bring together the scientific community, public authorities and businesses to find solutions for mitigating and adapting to the impacts of climate change. Thanks to its «locomotive» action on a French scale, the SCO has become a major player in the field of initiatives using satellite data to contribute to the climate effort. Each September, it launches a call for projects, through which it selects those to which it will award the SCO label.

## Members of the SCO France INTER-ORGANIZATIONAL COMMITTEE





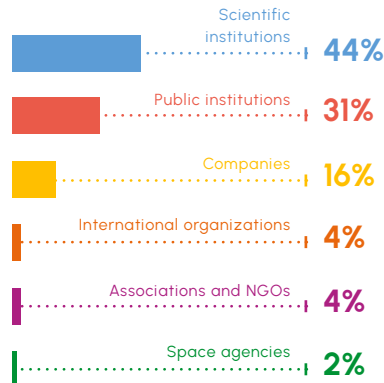
# SCO results in France

## PROJECTS

- 4 CALLS FOR PROJECTS
- 61 ACCREDITED PROJECTS
- 98 TEST SITES IN 28 COUNTRIES
- 27 PROJECTS COMPLETED AND AS MANY SERVICES OR OPERATIONAL DEMONSTRATORS DELIVERED
- 11 QUARTERLY MEETINGS

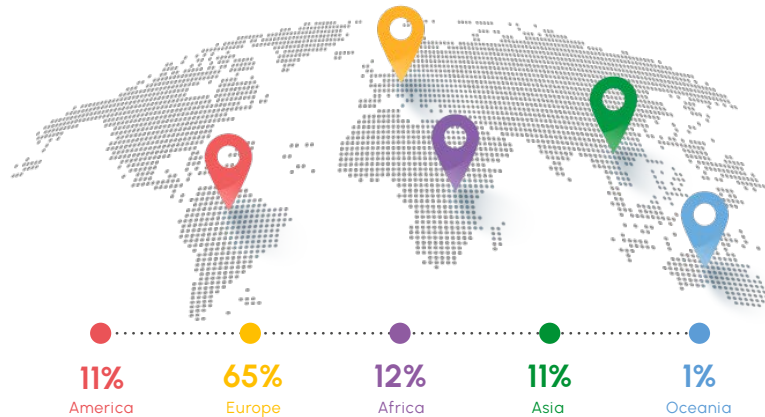
## NETWORK

311 STRUCTURES INVOLVED IN SCO IN FRANCE



22 MILLION EUROS TOTAL INVESTMENT

## CONTINENTAL BREAKDOWN OF COUNTRIES BENEFITING FROM DEMONSTRATOR PROJECTS FROM 2020 TO 2023



## HIGHLIGHTS OF SCO FRANCE IN 2023

As active in its governance (2 IOC's per year) as in its ambassadorial role (participation in GeoDataDays, Mayors' exhibition, etc.), in 2023 SCO France brought together its entire community for a major conference.



Moving from alert to action was the motto of the second SCO France Congress, held in Paris on May 30, 2023. With high-level speeches, round-table discussions and demonstrations of operational services, the event highlighted the fundamental way of working that makes the SCO a key alliance in the fight against climate change. © CNES

For its first Inter-Organizational Committee (IOC) of the year, SCO France met on January 26, 2023 in Montpellier. After a meeting at the House of Remote Sensing (Maison de la Télédétection), participants joined Predict Services for a demonstration of the monitoring and warning tools developed as part of the Gade Lapli project. © SCO



Hosted by Cerema Normandie Centre on July 5, 2023, the second IOC focused on coastal erosion, with in situ explanations at Pourville-sur-Mer. © SCO

## QUARTERLY SUCCESS

Already 11 Quarterly Meetings since June 1<sup>st</sup>, 2021, during which 2 to 4 SCO projects explain the solutions and methods they are developing on topics such as hydrology, agriculture, risk prevention...



All demonstrations are in replay on our website.



## Words from SCO

The SCO craftsmen are the ones who talk about it best. Here are a few testimonials from interviews and from the 2023 SCO France Congress.

« We need data. Since 2020, the SCO has shown just how important the exploitation of spatial data is as a lever for public policy, particularly for adapting territories to climate change. We already have some very convincing use cases. »

• **Thomas Courbe**,  
Director General of  
Enterprise (French Ministry  
of Economy and Finance)

« We have an imperative to provide the nation with a cockpit for understanding phenomena and anticipating them, so we can make the right decisions. [...] The SCO enables us to think in terms of usage and scaling up »

• **Sébastien Soriano**,  
Managing Director, IGN  
(Institut national de  
l'information géographique  
et forestière, France)

« We don't have time to think for years. However, the SCO France enables us to stimulate work with a strong operational component to deliver results in a relatively short timeframe, compatible with the urgency of needs. [...] The SCO is the Earth observation community working with other communities to find solutions. »

• **Laurence Rouil**,  
Director of Strategy, Scientific  
Policy and Communications,  
INERIS (Institut national de  
l'environnement industriel  
et des risques, France)



« SCO projects are inspiring and help us see where the needs are, where the development prospects are. »

• **Julie Letertre**, Copernicus  
Department, European Centre  
for Medium-Range Weather  
Forecasts (ECMWF)

« The SCO is a privileged place that enables us to better orient our research in relation to the impacts of climate change. »

• **Xavier Briottet**, Head of Optical  
Remote Sensing at ONERA  
(Office national d'études et de  
recherches aérospatiales, France)

« Thanks to SCO and Lab'OT, I've been able to realize the link we represent in relation to the global transformation we need to lead. »

• **Christelle Iliopoulos**,  
applications engineer at Lab'OT  
and CNES referent for SCO  
urban vegetation projects

« Working at SCO has revolutionized my vision of climate change. Conducted on a local scale, the projects take us out into the field to be able to analyze our data: we then realize just how complex and interwoven the problems are, forcing us to change our initial vision to find appropriate and technically feasible solutions. [...] There's no denying that the situation is serious, but not desperate: the SCO shows us the reality of what's going on, while giving us the means to deploy solutions. »

• **Thierry Koleck**,  
radar imagery expert and  
CNES referent for SCO projects  
related to forest dynamics

« The SCO uses concrete examples to show that local action can be taken in the face of an issue that, taken globally, may seem insoluble. »

• **Olivier Queyruet**,  
Head of the Earth Observation  
Laboratory at CNES





# The SCO- accredited projects

—  
URBAN ADAPTATION • AGRICULTURE  
BIODIVERSITY • CARBON • EDUCATION  
EXTREME EVENTS • FOREST FIRES  
WATER MANAGEMENT  
LAND USE • HEALTH  
—



# SCO

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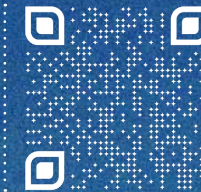
## RESPOND TO PROVEN NEEDS AND REPLICATE THE DEVELOPED SOLUTIONS

SCO projects are developed at the local level in partnership with local stakeholders to respond to their specific needs and problems. Once operational, the tools must be adaptable to fit other places in the world.

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## SPACE DATA

Optical, radar, thermal, altimetric, atmospheric and meteorological data... high and very high resolution space data time series are at the heart of each SCO project. Alone or, most of the time, combined with other data sets (field measurements, socio-economic data, citizen data...), they feed scientific models to transform them into operational decision support tools.



Charter for the functioning of the SCO in France, projects and valorization guides, FAQ... All resources are available online.

# fundamentals

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## THE SCO FRANCE LABELLING PROCESS

Every year in September, SCO France launches its call for projects. The proposals are studied by a labeling committee that verifies their feasibility and their adequacy to the SCO criteria. This process is detailed in the SCO France Charter and is shared with other national SCOs that wish to draw inspiration from it.

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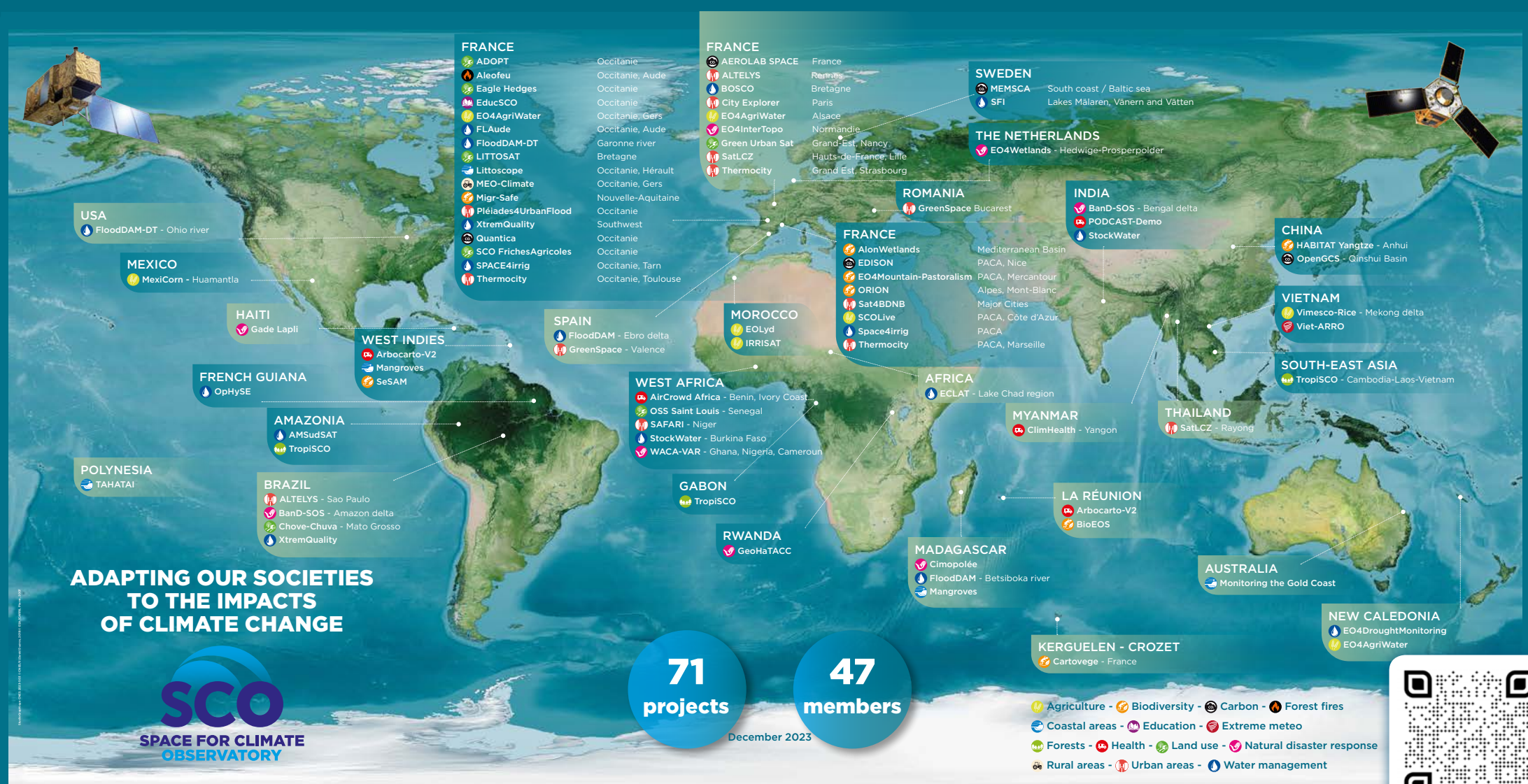
## PROJECTS DEVELOPMENT

In order to ensure that the resulting outcomes are beneficial to everyone, the promoters of the labeled projects are committed to carrying out actions of valorization: reusing elements of the code in a new application, sharing expertise, etc. Available online, a Valorization Guide has been designed to help project leaders with this pooling effort.



# Mapping of SCO projects

Obtaining the SCO certification label for a project means adhering to the SCO values and benefitting from international recognition. The label awarded by a local SCO is recognized by the International SCO.





## Operational tools

Since 2020, the SCO has accredited 10 to 15 projects each year, which are gradually delivering their tools, most of which can be transposed to other locations. A ToolBox menu has been added to our website to group them together and make them available to all. You can already find:



### Agripractice, WaterReserve, GreenEnergy (MEO-Climate project)

3 tools (soil erosion, water surfaces, photovoltaic installations) to support the rural world in its transformation. Services marketed by MEOSS : <https://meoss.net>

### MEO-Irrigation (Space4IRRIG project),

for monitoring irrigated plots and crop rotation. Service marketed by MEOSS : <https://meoss.net>

### SCOLive, an observatory for olive trees,

bioindicators of climate change : <https://scolive.eu/>

**VietSCO**, maps of rice cultivation and flooding in the Mekong delta : [www.vietsco.org](http://www.vietsco.org)



**ORION**, to map mountain vegetation dynamics and identify grazing habitats : <https://atlas.creamontblanc.org/explorer/prairies/>

**Qehnelo®PF (Tahatai project)**, to improve governance of the Polynesian coastline. Service marketed by Bluecham : [pole.operations@bluecham.net](mailto:pole.operations@bluecham.net)



**QUANTICA**, to estimate the amount of carbon sequestered in intermediate crops : <https://quantica.e2l-coop.eu>



**Band-SOS**, for monitoring cyclonic flooding in Bangladesh : <https://bandsos.github.io>

**FORO (FLAude project)**, for greater resilience to Mediterranean flooding : <https://apps.tereval.fr/foro/#/>



**EducSCO Temperatures**, to visualize temperature trends on a planisphere : <https://eolabcnes.users.earthengine.app/view/educsco-temperature>



Check out the ToolBox, which is regularly updated. Some projects make their data and/or application code freely available.

**EO4DroughtMonitoring** to anticipate drought in New Caledonia. Service marketed by InSight : <https://insight.nc/>

**SAGUI (OpHySE project)**, for real-time monitoring of French Guiana's rivers : <https://sagui.hydro-matters.fr/sagui/>

**StockWater**, to find out how full the dams are : <https://www.sco-stockwater.org/>

**LITTOSCOPE**, for coastal flooding modeling. Service marketed by CLS : <https://datastore.cls.fr/products/littoscope-coastal-resilience/>

**SCO St Louis**, to assess the vulnerability of coastal populations and economic activities : <https://resalliance.users.earthengine.app/view/sco-st-louis>

**TropiSCO**, for monitoring global tropical deforestation : <https://www.tropiscope.org>

**ADOPT**, to help regional nature parks adapt : <https://adopt.e2l-coop.eu>

**Chove-Chuva**, to visualize the territorial dynamics observed in Mato Grosso (Brazil) in relation to the adaptation and mitigation strategies implemented : <https://www.sco.chove-chuva.org/>

**Arbocarto-V2**, to anticipate the risk of epidemics of mosquito-borne diseases : <https://www.arbocarto.fr>

**ClimHealth**, an early health warning system that monitors climate and the environment : <https://leptoyangon.geohealthresearch.org/>  
<https://sat4health.geohealthresearch.org/>



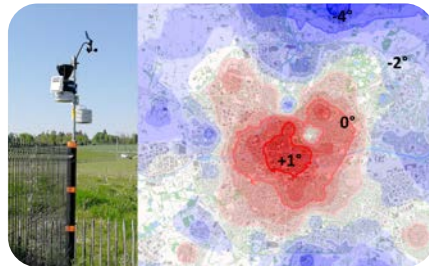


## ALTELYS

MONITORING HEAT ISLANDS USING CONNECTED SENSORS AND MULTI-SOURCE SATELLITE DATA

**ALTELYS** aims to develop a tool to support the territorial and energy transition of urban buildings. It is aimed at scientific players and local authorities in mainland France and Brazil.

ALTELYS draws on multiple, heterogeneous data sources, including satellite imagery, to produce a real-time map of urban heat islands that will help guide territorial management and strengthen the resilience of cities in the face of climate challenges. The tool will give pride of place to citizen collaboration through the collection of participatory data.



Heat island in Rennes: in-situ measuring station (left) and minimum temperature map for April 4, 2022 (right). © LETG-Rennes

### SATELLITES

LandSat 8 & 9, ASTER, Sentinel-2 & 3, Pléiades

### APPLICATION SITES

Rennes (France), Presidente Prudente (Brazil)

### PARTNERS

UMR LETG Rennes, Alkante, CNES, UNEPS

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## City Explorer

OPTIMIZING THE BENEFITS OF GREEN AND BLUE SPACES IN URBAN ENVIRONMENTS



**City Explorer** addresses the need for better information to help guide urban planning for nature-based solutions. The tool maps the expected



City Explorer interface

benefits of multiple ecosystem services associated with urban green and blue spaces. It allows users to add new green spaces to an urban environment to compare the relative benefits of different locations. They will be able to identify optimal spatial configurations that are adapted to the specific requirements of the city or region being assessed, taking into account the vulnerability or importance of the local population group.

### SATELLITES

Sentinel-1 & 2, ESA CC Soil Moisture, LandSat-8

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### APPLICATION SITES

Paris (France)

### PARTNERS

ESA, Future Earth, REGREEN, UK Centre for Ecology & Hydrology

### WEBSITE

<https://www.ceh.ac.uk/city-explorer>





## GreenSpace

SATELLITE MAPPING OF GREEN SPACES FOR GREEN AND HEALTHY CITIES

The [GreenSpace](#) project is developing a tool for assessing the ecosystem services provided by trees, particularly in the context of urban reforestation plans initiated by local authorities to tackle the issues of air pollution, increased greenhouse gas emissions and urban heat islands. GreenSpace uses very high-resolution spatial remote sensing to provide a range of maps for inventorying and estimating the environmental benefits of tree cover on a city-wide scale. Building on the results of its first demonstrator deployed over a dozen years in three cities (Aix-

en-Provence in France, Florence in Italy and Kaunas in Lithuania), the SCO GreenSpace project will extend the prototyping to Valencia (Spain) and Bucharest (Romania) in order to improve the methodology and draw up strategic recommendations.



**SATELLITES**  
*Pleiades AND WorldView-2*

**APPLICATION SITES**  
*Valencia (Spain), Bucharest (Romania)*

**PARTNERS**  
*Argans, CNES, IUFRO*

**THEMES**



**ENVIRONNEMENTS**



**SDGs SUSTAINABLE DEVELOPMENT GOALS**



## Green Urban Sat

MAINTAINING A HEALTHY A HEALTHY LIVING ENVIRONMENT IN METROPOLISES



Example of vegetation extraction from a Pleiades image of Toulouse. Terranis

Although highly urbanised areas have every interest in turning to solutions based on nature and vegetation, in particular to counter the heat island phenomenon, it is still difficult to understand precisely the effect and effectiveness of these solutions. Based on the use of satellite images, [Green Urban Sat](#) is developing methodologies for the quantitative and qualitative evaluation of ecosystem services provided by urban vegetation. The goal is to provide a fine-grained description of urban vegetation in order to see its effects, especially its benefits, with regard to climate change within the wider urban area.

**THEMES ENVIRONNEMENTS**



**SATELLITES**

*Pleiades and Pleiades Neo*

**APPLICATION SITES**

*Nancy, Strasbourg (France)*

**SDGs SUSTAINABLE DEVELOPMENT GOALS**



**PARTNERS**

*Cerema, A2S, CNES, Live, Metropole Grand Nancy, Terranis*





## Pléiades4 UrbanFlood

CONTRIBUTION OF PLEIADES TO THE ADAPTATION OF THE URBAN FABRIC TO THE FLOOD HAZARD

The strength of [Pléiade4UrbanFlood](#) lies in the development of a service capable of evaluating the sensitivity to flooding of urban or highly anthropized territories. Using Pleiades satellite imagery, the project classifies land use and produces quantitative indicators related to urban morphology and its dynamics, soil sealing and the evolution of flood risk.



Pleiades satellite image of flooding north of Narbonne (Aude) on 20 October 2018. © Airbus DS

### THEMES



### SATELLITES

*Pleiades and Pleiades Neo*

### APPLICATION SITE

*Montpellier (France)*

### PARTNERS

*Agenium 3D Lab, AIRBUS Defence & Space, Cerema, CNES, Terranis*

### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS

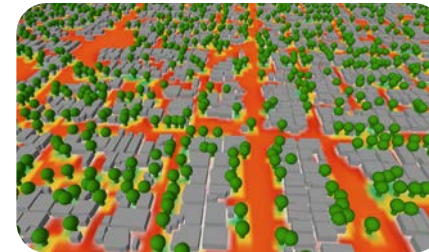


## SAFARI



SUPPORTING ADAPTATION TO FUTURE EXTREME HEAT IN AFRICAN CITIES

The exposure of urban agglomerations to extreme heat waves is tending to intensify, particularly in Africa where population growth is high. As a decision-support tool for resilient urban planning, the [SAFARI](#) project will overcome the lack of ap-



Modelled microclimate (thermal stress) in the Talladje area of Niamey © VITO, ACMAD, City of Niamey

propriate local climate information by using satellite data. Combining these with local socio-economic data will enable the construction of maps of current and future climate risks, at several scales, taking into account urban growth scenarios. Through its dynamic and evolving approach to the urban landscape, incorporating 3D visualization, the SAFARI project will support Niamey's land managers in assessing the effects of urban green infrastructure on local exposure to heat.

### THEMES



### ENVIRONMENTS



### SATELLITES

*Pléiades, SkySat, WorldCover, Copernicus Climate Data Store*

### APPLICATION SITE

*Niamey (Niger)*

### PARTNERS

*Vito, ACMAD, CO2logic, EPN, City of Niamey*

### SDGs SUSTAINABLE DEVELOPMENT GOALS







## Sat4BDNB

SATELLITE DATA FOR THE NATIONAL BUILDING DATABASE

Dedicated to French urban territories, [Sat4BDNB](#) addresses the vulnerability of certain districts to the effects of climate change. Thanks to an innovative combination of several data sets, the project provides an overheating indicator identifying urban heat islands and morbidity for the whole of France. Integrated into the French National Building Database (BDNB), the combination of this environmental and socio-economic data will inform, assist and guide the construction industry to design the best renovation strategies.



Extract from the French National Buildings Database © CSTB

### SATELLITES

*Pleiades, Sentinel-2*

### APPLICATION SITES

*Major French cities : La Rochelle, Marseille, Montpellier, Nice, Paris, Strasbourg, Toulouse*

### PARTNERS

*CSTB, CNES, CESBIO*

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## SatLCZ

IDENTIFYING THE VULNERABILITY OF URBAN ENVIRONMENTS DURING SUMMER HEAT WAVES



Pleiades image of Lille (left) and associated LCZ mapping (buildings, vegetation, rocks, soil...). © SatLCZ

[SatLCZ](#) has developed a methodology to classify local climate zones derived exclusively from very high resolution satellite images. The identified issues are the vulnerability of urban environments during summer heat waves, as well as the adaptation and mitigation of local heat peaks. The tool can also provide indicators of imperviousness and vegetation levels, as well as a socio-economic vulnerability index.

### AVAILABLE DATA

<https://www.spaceclimateobservatory.org/satlcz-lille>

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### SATELLITES

*Pleiades*

### APPLICATION SITES

*Lille (France), Rayong (Thailand)*

### PARTNERS

*Cerema, AIRBUS Defence & Space, CNES*



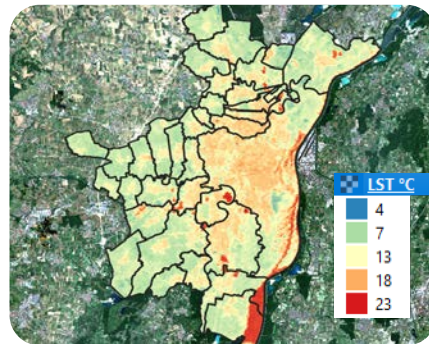


## Thermocity

— THERMOGRAPHY OF CITIES FROM SPACE —

A pioneering project in the use of satellite thermal data in cities, [Thermocity](#) has developed a tool for analysing urban thermography to support planning policy on a metropolitan scale. It can thus identify and characterize urban heat islands with the associated health risk, the thermal performance of vegetation, or detect thermal anomalies from the hottest points measured in winter. The project also provides indicators of the evolution of land use in the city and thus makes it possible

to monitor the implementation of adaptation policies.



Surface temperature at the Strasbourg Eurometropolis on 22/06/2018 at 21:26 © UTM. ONERA



### AVAILABLE DATA

On Theia :

<https://thisme.cines.teledetection.fr/home>

### SATELLITES

Sentinel-2, SPOT 6/7, Pleiades, ECOSTRESS, Landsat-8

### APPLICATION SITES

Marseille, Montpellier, Paris, Strasbourg, Toulouse (France)

### PARTNERS

CNES, Météo-France, CSTB, ONERA

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## EOLyd

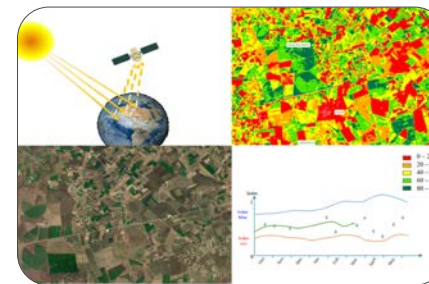
— EARTH OBSERVATION TO ESTIMATE YIELD LOSSES IN THE EVENT OF DROUGHT —



Morocco is exposed to a number of climatic challenges which have a particular impact on agricultural production, an important lever for the national economy. Based on a com-

bination of high-resolution satellite data and in situ data (rainfall, temperature, evapotranspiration, etc.) available at plot level, [EOLyd](#) aims to generate an index of agricultural production loss correlated with the indicators proposed by the SCO [IRRISAT-Morocco](#) project (see page 38).

Based on a composite drought index that evolves over the course of the agricultural season, the mapping tool will contribute to the development and implementation of adaptation plans and damage mitigation activities.



Loss of production in the event of drought © CRTS

### SATELLITES

Sentinel-2, Landsat

### THEMES



### ENVIRONNEMENTS



### APPLICATION SITE

Chaouia Plain (Morocco)

### PARTNERS

CRTS, Casablanca-Settat region, FSEC, Institut de recherche agronomique de Settat, IPL, MAMDA, MAPMDREF, Université Chouaib Doukkali

### ODD OBJECTIFS DE DÉVELOPPEMENT DURABLE







## IRRISAT-Morocco

MANAGING WATER RESOURCES



Daily evapotranspiration in the Gharb area  
© IRRISAT

### SATELLITES

VIIRS, Landsat, Sentinel-2,  
Mohammed VI-A & B

### APPLICATION SITES

Tadla irrigated perimeter, Berrechid  
plain, Sebou hydraulic basin (Morocco)

### PARTNERS

Royal Centre for Spatial Remote  
Sensing, CESBIO, National Institute for  
Agronomic Research, Regional Office  
of Agricultural Development of Gharb  
(ORMVAG), Mohammed V University

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## MEO-Climate

THE RURAL AREAS ADAPT  
TO CLIMATE CHANGE



Demonstration of the AgriPractice service :  
annual summary of vegetation cover. © MEOSS

**MEO-Climate** is a mapping platform for rural and semi-rural territories. The system offers local information, frequently updated and validated, to allow detailed monitoring of spatial and temporal evolutions as well as local management of actions. MEO-Climate offers three decision-making tools : AgriPractice for farming practices, WaterReserve for water reserve management, and GreenEnergy for the installation of renewable energy facilities.

### SERVICES AVAILABLE

From MEOSS : <https://meoss.net>

### SATELLITES

Sentinel-1 & 2, SPOT 6/7, Pleiades

### APPLICATION SITE

SCOT de Gascogne, Gers (France)

### PARTNERS

MEOSS, SCOT de Gascogne

### THEMES



### ENVIRONMENTS



### ODD OBJECTIFS DE DÉVELOPPEMENT DURABLE







## Mérimée

REGULATING RICE-GROWING METHANE EMISSIONS

The [Mérimée](#) (*Mekong Rice Methane Emissions*) project aims to enhance the VietSCO application, developed as part of the [VIMESCO-Rice](#) (see page 44) and [Viet-ARRO](#) (see page 71) projects, to support Vietnam's low-carbon rice-growing strategy, a priority lever for reducing the country's methane emissions.

Integrating new data such as forest cover (which is a methane sink), estimated methane emissions from rice paddies and coastal vulnerability, the project relies on the synergy between satellite and in-situ data to develop a

dynamic mapping tool adapted to the challenges of Vietnam's coastal strip.



Test rice field for automatic and continuous water level measurement. Mérimée will provide dynamic maps of 1) rice field irrigation status (continuous or alternate) and 2) methane emission estimates. © Thuy Le Toan, Nguyen Lam-Dao

**SATELLITES**  
*ALOS-2-PALSAR-2, Sentinel-1, THR optics via Dinamis*

**APPLICATION SITE**  
*Mekong Delta (Vietnam)*

**PARTNERS**  
*CESBIO, CNES, GlobEO, VNSC*

**THEMES**



**ENVIRONMENTS**



**SDGs SUSTAINABLE DEVELOPMENT GOALS**



## MexiCorn

ADAPTING MEXICAN CORN TO DROUGHT



Faced with more frequent, longer and more intense droughts, local governments in Mexico are having to make short, medium and long



Mexicorn's ultimate goal: to preserve native corn cultivars adapted to new local climates. © Getty Images

term decisions in favor of corn production. To help them, [MexiCorn](#) is creating a tool that uses optical and microwave satellite data to monitor maize field parameters and reduce the impact of climate change on crop yield. Eventually, an online portal will show a monthly map of maize growing areas, a weekly map of soil moisture and water content of the vegetation, and the results of analyses of the climatic impact of observed changes.



**ENVIRONMENTS**



**SDGs SUSTAINABLE DEVELOPMENT GOALS**



**SATELLITES**

*Sentinel-1, Landsat, MODIS, SMAP, SMOS*

**APPLICATION SITE**

*Huamantla (Mexico)*

**PARTNERS**

*National Polytechnic Institute of Mexico, Mexican Space Agency AEM, Universidad Iberoamericana, CentroGeo*



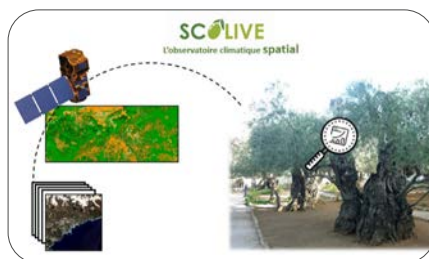


## SCOLive

OLIVE TREE, A BIOINDICATOR OF CLIMATE CHANGE

**SCOLive** is an olive tree observatory designed to map diseases and pests that can affect crops, and in so doing, use the olive tree as a bioindicator of climate change. As a citizen project, a mobile application is already operational and can be used to collect information such as the geographical location of olive trees and their state of maturity and phytosanitary status. By calling on all the players in the field, SCOLive strengthens the maintenance of olive-growing heritage and know-how, as well as

scientific advances on the olive tree. Tools and methods are replicable to all regions of the world.



SCOLive combines satellite and citizen observations, complementary techniques that can be reproduced anywhere. © ACRI-ST



### APPLICATION AVAILABLE

On blinds and on the [scolive.eu](http://scolive.eu) website

### SATELLITES

Pleiades, Sentinel-2 & 3

### APPLICATION SITE

Grasse region (France)

### PARTNERS

ACRI-ST, ARGANS France, CNES, Community of agglomeration of the country of Grasse

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## Space4IRRIG

SUSTAINABLE AND EQUITABLE WATER MANAGEMENT FOR FIELD CROPS



The **Space4IRRIG** project has developed a method for identifying irrigated and non-irrigated crops, tested and validated over several crop types and several years.



Mapping agricultural practices in the MEO-Irrigation interface. © MEOSS

The results are available via the MEO-Irrigation mapping platform and enhanced with data visualizations. Other spatial indicators have also been added, such as volumes withdrawn for irrigation, water surface monitoring and water quality. Users are thus free to cross-reference the desired indicators, track temporal trends and obtain key figures on a territorial scale (topographical basin, canton).



### SERVICE AVAILABLE

Meo-Irrigation, marketed by MEOSS : <https://meoss.net/accueil/contact/>

### SATELLITES

Sentinel-1 & 2

### APPLICATION SITES

Loiret department and Durance valley watershed (France)

### PARTNERS

BRGM, CESBIO, Regional Chambers of Agriculture of Tarn, Occitania and PACA, CNES, MEOSS, SCP, Smavd Durance

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS







## VIMESCO-Rice

MITIGATING CLIMATE EFFECTS  
ON RICE PRODUCTION

Using radar imagery, [VIMESCO-Rice](#) offers dynamic monitoring of rice crops in Vietnam, which are subject to the effects of slow-onset climate change phenomena (droughts, floods, saltwater intrusion, etc.). A freely accessible web portal provides monthly maps of rice-growing areas and growth stages, an annual map of crop density (number of harvests per year), and analysis results on the climatic impact of the changes observed. The complementary [Viet-ARRO](#) component (see page 71) focuses on the impact of extreme events.



The online platform allows to visualize different maps such as here the intensity of rice cultivation, but also floods and affected crops or projections of land suitability for rice cultivation, according to different IPCC scenarios. © VietSCO



### ONLINE INTERFACE

<https://www.vietsco.org>

### SATELLITES

Sentinel-1

### APPLICATION SITE

Mekong Delta (Vietnam)

### PARTNERS

CESBIO, CNES, GlobEO, IRD, Toulouse School of Economics, USTH, VAST, VNSC, UNDP

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## AionWetlands

SATELLITES TO MAP AND MONITOR  
MEDITERRANEAN WETLANDS



Sansouires in Camargue (Tour du Valat). In the Mediterranean, wetlands are the richest ecosystems, but also the most threatened by human activities. © Marc Thibault

[AionWetland](#) focuses on Mediterranean wetlands, known for their rich biodiversity and strategic dimension for human activities. To better characterize the state and evolution of these wetlands, the project promotes the joint use of time series of satellite observations with other relevant databases, notably from the Mediterranean Wetlands Observatory. An interactive and evolving geo-portal will offer a monitoring and alert service, as well as decision support to national and local authorities in charge of managing these fragile environments.

### THEMES



### ENVIRONNEMENTS



### SATELLITES

Landsat, Sentinel-2

### APPLICATION SITES

30 countries and territories of the Mediterranean basin

### SDGs SUSTAINABLE DEVELOPMENT GOALS



### PARTNERS

Tour du Valat, CNES, Geomatys, ICUBE, OFB





## BioEOS

PRESERVING COASTAL BIODIVERSITY

Between climate change and anthropogenic pressures, the biodiversity of coastal environments is declining rapidly and globally. In response to the need for simple and operational monitoring systems, [BioEOS](#) aims to provide adequate and replicable observation tools based on the analysis of the spatio-temporal dynamics of coastal biodiversity. The identification and precise monitoring of the state of coral reefs, the extension of seagrass beds and the geomorphological dynamics of the seabed are all relevant strategic areas for initiating climate resilience.

Trajectory indicators will be created to predict possible changes in these environments.



Biodiversity in the coral environment © W. Croizé-Fillon (illustration) & B. Brisset (Photo)

### SATELLITES

*Pleiades, Sentinel constellation, PRISMA*

### APPLICATION SITES

*South West Indian Ocean Region: Reunion Island, Glorieuses, Mayotte, Bassas da India*

### PARTNERS

*Ifremer, CNES, University Center of Mayotte, Gipsa-lab, IFRECOR, IMT Atlantique, INRAE, IRD, SHOM, Sorbonne University, Universities of La Réunion and Toulon*

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## Cartovege 1 & 2

PROTECTING THE SOUTHERN TERRITORIES



Rising temperatures are having a major impact on biodiversity, particularly in alpine and polar regions. Focusing on the French sub-Antarctic islands, [Cartovege](#) uses satellite



Several invasive plants, such as the dandelion, are colonizing the Terres Australes. D. Renault

and field data to develop a decision-making tool for the conservation of flora and habitats.

The first part of the project implemented a methodology for mapping natural habitats on Crozet and Kerguelen, together with a predictive modelling of changes that could affect them. In order to optimize this methodology, the second phase [Cartovege<sup>2</sup>](#) is transposing it to the islands of Saint-Paul and Amsterdam, enabling vegetation dynamics to be assessed as part of the ecological restoration project on the island of Amsterdam.

PART 1

Are you interested in these services? Contact the project team (directory on page 94 !)

COMPLETED

### SATELLITES

*Pleiades, Spot 6/7, Sentinel-1, SRTM*

### APPLICATION SITES

*French Southern Territories National Nature Reserve (RNN TAF)*

### PARTNERS

*Ecobio University of Rennes 1, CNES, CNRS including CIIL, INRAE, French Polar Institute, OFB, RNN TAF, UMS PatriNat, University of Lyon 1*

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS







## EO4InterTopo

OBSERVE CHANGES IN THE TOPOGRAPHY OF COASTAL INTERTIDAL ZONES

At the interface between land and sea, intertidal zones are natural buffers that play a vital role in protecting coastal regions. Human intervention and the effects of climate change have greatly weakened these areas, which are difficult to monitor due to the sharp variations in water levels. Enriching the work of the CNRS with data from several satellite missions, [EO4InterTopo](#) proposes to monitor, in the context of Normandy, the evolution of these zones through mapping tools (topography, sub-

strate characterization, vegetation) in order to support coastal defense and ecosystem management stakeholders in their decision-making.



The Bay of Veys in Normandy at low tide. © CNRS/Edward Salameh

### SATELLITES

*Sentinel-1 & 2, Landsat, Pléiades, Icesat-2, SWOT*

### APPLICATION SITE

*Normandy coastline (France)*

### PARTNERS

*M2C, CNRS, CNES, Ideas, ISPA, University of Rouen*

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## EO4Mountain-Pastoralism

SAVING HIGH ALTITUDE WETLANDS



Climate change has already modified highland wetlands, transforming agro-pastoral practices and habitats. Based on satellite images, [EO4Mountain-Pastoralism](#) is de-



Wetlands in the Mercantour National Park. © PNM

signed to provide a toolbox adapted to the needs of users to improve the monitoring and understanding of these areas, which provide important ecosystem services and contribute significantly to the reduction of greenhouse gases. The project aims to produce relevant data at short intervals (15 days) to detect and monitor the dynamics of high-altitude wetlands, but also to develop a methodology to statistically and physically link the variations of these data to indicators of the services provided by these environments.

### THEMES ENVIRONNEMENTS



### SATELLITES

*Sentinel-1 & 2, SPOT 7, Pléiades*

### APPLICATION SITE

*Mercantour National Park (France)*

### PARTNERS

*A2S, CNES, EOST of the University of Strasbourg, iPGP, Mercantour National Park, Séolane*

### SDGs SUSTAINABLE DEVELOPMENT GOALS



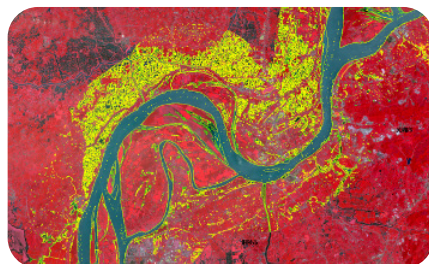




# HABITAT Yangtze

PROTECTING WETLAND HABITAT  
FOR MIGRATORY BIRDS

Taking advantage of the latest remote sensing sensors, AI algorithms and OpenGIS, [HABITAT Yangtze](#) aims to provide a high-resolution spatio-temporal database of wetlands in the middle and lower Yangtze River basin. Called Ecodata, the online platform for monitoring and mapping waterbird wintering habitats in monitored wetlands will be used by wetland managers, researchers and bird and climate change conservationists at local, national and international levels.



Artificial intelligence detection of large-scale water bodies. © Wu, Yan-lan

### THEMES



### SATELLITES

Gaofen-2 & 6, Landsat-8, Sentinel-2

### APPLICATION SITES

Anhui Province (China) : Shengjin Lake, Caizi Lake, Huayang Rivers & Lakes

### PARTNERS

Anhui University and its laboratories, Shengjin Lake National Nature Reserve

### ENVIRONMENTS



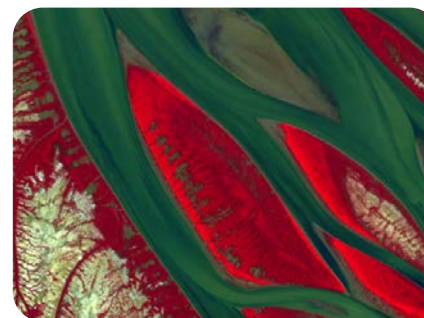
### SDGs SUSTAINABLE DEVELOPMENT GOALS



# Mangroves

PRESERVING AN ESSENTIAL  
NATURAL HERITAGE

Threatened, mangroves are nevertheless of great economic, heritage and environmental value. Understanding and monitoring these



Sentinel-2 image of Bombetoka Bay, Madagascar © Copernicus Sentinel data 2019

coastal environments is a constant priority to ensure their preservation, organize the management of their natural resources, and characterize the links between global changes and the state of the environment. Using satellite data and derived products available on the Data Terra research infrastructure, the [Mangroves](#) project is setting up an operational monitoring platform with spatial maps of the distribution of mangroves and their evolution, as well as indicators of natural or anthropogenic pressures.

### THEMES



### SATELLITES

Pleiades, Sentinel-1 & 2, SPOT 6/7

### ENVIRONMENTS



### APPLICATION SITES

French Guiana, Martinique, Guadeloupe, Mayotte, French Polynesia, New Caledonia, Madagascar and, by extension, any territory with mangroves.

### SDGs SUSTAINABLE DEVELOPMENT GOALS



### PARTNERS

IRD, CNES, DINAMIS, GEODEV





## Migr-Safe

TOWARDS AN OBSERVATORY FOR MIGRATORY SPECIES

The pilgrimage of migratory birds is strongly affected by landscapes, human activities and climate change. Since ensuring their journey and stopovers requires new collaborations between local authorities and scientists, **Migr-Safe** proposes new tools and data that can be used by both. The methodology developed now makes it possible to consider the creation of a spatial observatory for migratory fauna based on three main services: enhanced tracking (monitoring of trajectories, status and change indicators, characteri-

zation of habitats, alerts), regional service (correlation of behaviors with local geographical data) and enhancement (pooling of data and educational resources).



Tracking of the migration path on the Migr-Safe interface © CLS



### SATELLITES

free data from numerous observation satellites and the ARGOS/KINEIS telemetry system

### APPLICATION SITE

New Aquitaine (France)

### PARTNERS

CLS, Aquitaine Regional Biodiversity Agency, New Aquitaine Chamber of Agriculture, CNES, GIFS, GIP ATGeRI, INRAE, UMR Tetis

### THEMES



### ENVIRONNEMENTS

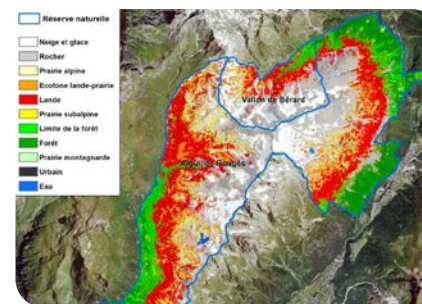


### SDGs SUSTAINABLE DEVELOPMENT GOALS



## ORION

MANAGING THE EXPANSION OF HEATHLANDS IN THE MOUNTAINS



Extract from the habitat map. Thanks to its high satellite resolution, ORION can distinguish moorland (in red), a particularly complex target to capture. © CC BY 4.0 CREA Mont-Blanc

Characterized by relatively low thickets, heathlands are very common in mountains and forests, but their distribution and expansion remains poorly understood, especially in the Alps. To fill this gap, **ORION** (*biOdiverSity Impacts of shrub expanSion*) is exploiting advances in satellite imagery to develop high-resolution mapping of 11 habitat classes in the Mont-Blanc massif, indicators of faunistic and floristic diversity, including an indicator of grazable area, and a map of areas at risk.



### MAP OF HABITATS AND INDICATORS AVAILABLE

on the Mont Blanc Atlas : <https://atlas.creamontblanc.org/explorer/prairies/>

### SATELLITES

Sentinel-2

### APPLICATION SITE

Community of Communes of the Chamonix-Mont-Blanc Valley (France)

### PARTNERS

CREA Mont-Blanc, Asters CEN-74, CCVCMB, LECA

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS





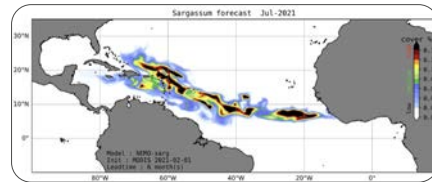


## SeSam

MONITORING SARGASSUM SEAWEED BLOOMS

Massive arrivals of Sargassum seaweed have multiple consequences (environmental, economic and health) in the tropical Atlantic. In this context, [SeSam](#) (*Seasonal Sargassum Alert and Monitoring*) aims to propose a tool for operational monitoring and seasonal forecasting of Sargassum seaweed, by exploiting the capacities of satellite data and digital twins of the ocean. The project thus aims to support the decision-making chain of each territory affected by the phenomenon.

The products will be hosted by AVISO / ODATIS on a dedicated web-site. Open and free of charge, results will be shared with international community centers (GeoBluePlanet, IOCARIBE...).



Sargassum surface coverage forecast for July 2021, initialized on February 1, 2021, i.e. 6 months in advance, with the NEMO-Sarg model © IRD

### SATELLITES

Sentinel-2 & 3, MODIS Aqua, Landsat 8&9

### APPLICATION SITES

Caribbean region,  
West Africa, Gulf of Mexico

### PARTENAIRES

CLS, CNES, IRD, Mercator Ocean

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## TAHATAI (Neo)

IMPROVING THE GOVERNANCE OF THE POLYNESIAN COASTLINE



PART 1

Are you interested in these services ? Contact the project team (directory on page 94 !)

COMPLETED



Example of use zoning in the Papeete port area in the Qehnelo® PF interface. © Bluecham

The Polynesian coastline, where sustained exchanges between land and sea are accompanied by a wide variety of uses, is highly vulnerable to climatic hazards. Combining satellite and in situ data, [TAHATAI](#) has developed a digital platform for monitoring coastal and maritime areas, providing three operational indicators for Arutua and Tahiti: water quality, anthropogenic pressures in the lagoon environment (including automatic boat detection) and coastal pressures. [TAHATAI Neo](#) is now working on extending the application to the whole of French Polynesia, and then internationally.

### OPERATIONAL SERVICE

Qehnelo® PF, marketed by Bluecham :  
[pole.operations@bluecham.net](mailto:pole.operations@bluecham.net)

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### SATELLITES

Sentinel-1-2-3, Aqua and Terra MODIS, SPOT World Heritage, Pleiades, Pleiades Neo, WorldView, Future Co3D, UnseenLabs, BlackSky, ECMWF and CAMS data

### APPLICATION SITES

French Polynesia, Vanuatu, New Caledonia, Australia, Fiji, India, Indian Ocean

### PARTNERS

BLUECHAM, CNES, CSIRO, DITRA Tech, DRM, IRD, QuintesensPty.Ltd, SWATI





## Aerolab SPACE

MONITORING GHGs AT THE REGIONAL LEVEL AND MAKING DECARBONIZATION EFFORTS CREDIBLE

**Aerolab SPACE** represents the space component of the initial AEROLAB project in order to create a synergy between AEROLAB's in situ measurements (ground, aircraft, balloon, etc.) and satellite measurements. In support of decarbonation policies, the project is developing a decision-making tool via greenhouse gas monitoring indicators and evidence of the impact of environmental policies. These results will benefit public authorities to give credibility to their decarbonisation efforts, and the scientific community, which will have access

to a set of quality measurement data that will also help validate the satellite data.



Extract of a Sentinel 2 image over the Eastern region. © 2022, Copernicus Sentinel Imagery, processed by SnapPlanet

**SATELLITES**  
*Sentinel-2 & 5, OCO2*

**APPLICATION SITE**  
*Great East Region (France)*

**PARTNERS**  
*GSMA/CNRS, Capgemini, CNES*

THEMES



ENVIRONNEMENTS



SDGs SUSTAINABLE DEVELOPMENT GOALS

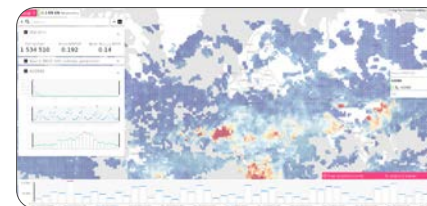


## EDISON

IMPROVING EMISSIONS INVENTORIES



**EDISON** aims to enhance existing inventories of atmospheric pollutants in French cities by focusing on emission sources. To this end, the project proposes a monitoring tool



Analog illustration of the final rendering of the WalTR platform for visualizing emission products. © Product from Gisaia.com

combining satellite data, existing inventories and atmospheric modeling, as well as data on real-time activities (transport, industry, etc.) and socio-economic data. By improving the measurement accuracy, spatial resolution and speed of greenhouse gas (CO<sub>2</sub>) and air quality (NO<sub>2</sub>/NO<sub>x</sub>, PM<sub>1</sub>/PM<sub>2.5</sub>) emission inventories, EDISON will help municipal managers and regulators visualize the impact of their activities and implement priority action plans.

THEMES



ENVIRONNEMENTS



**SATELLITES**  
*Sentinel-3 & 5P*

**APPLICATION SITE**  
*Mainland France*

**PARTNERS**  
*WalTR, AtmoSud, CNES*

SDGs SUSTAINABLE DEVELOPMENT GOALS





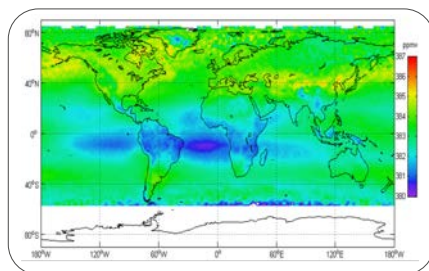


## OpenGCS

MONITORING GEOLOGICAL  
CARBON SEQUESTRATION

[OpenGCS](#) provides dynamic monitoring of CO<sub>2</sub> leakage from geological carbon sequestration sites. Combining real-time monitoring of wireless sensor networks and regional satellite observations, OpenGCS is designed to provide safety, environmental impact and risk assessment studies of geological carbon sequestration. In particular, it will produce maps of the spatial distribution of CO<sub>2</sub> and CH<sub>4</sub> (methane) with monthly and annual variability, as

well as an impact analysis of the observed changes on the environment.



Global distribution map of the annual average XCO<sub>2</sub> AIRS (from 6 to 8 km) between 2003 and 2011 © AIRS

### SATELLITES

NASA AIRS, OCO-2, TROPOMI

### APPLICATION SITES

Qinshui Basin, Shanxi Province (China)

### PARTNERS

Chinese University of Mining and Technology  
(School of Resources and Geosciences,  
Artificial Intelligence Research Institute),  
China United Coalbed Methane Co.

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## QUANTICA

SUPPORTING CARBON STORAGE  
IN INTERMEDIATE CROPS



Capturing CO<sub>2</sub> in soil would reduce global warming. As part of the Label Bas Carbone initiative, the [QUANTICA](#) project has combined two models to assess the carbon storage potential of intermediate plant

cover on the scale of agricultural plots. This spatial block has now been validated by the Bas Carbone label, and can be integrated into a larger model, in particular to remunerate farmers who commit to these carbon storage practices.



Many species, such as mustard here, are suitable for intercropping. © Getty Images



### WEBSITE AVAILABLE

<https://quantica.e2l-coop.eu>

### SATELLITES

Sentinel-2, Landsat-8, SPOT 6/7

### APPLICATION SITE

Occitania Region (France)

### PARTNERS

AIRBUS, ARVALIS Vegetal Institute,  
ASP, CESBIO, Chambers of Agriculture  
of Occitania, CNES, E2L, Occitanum

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS





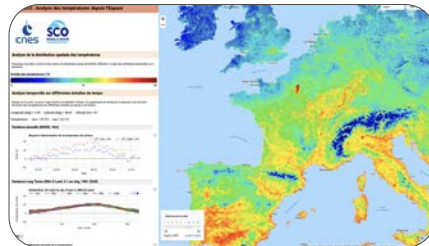


# EducSCO

—  
EDUCATING TOMORROW'S CITIZENS  
—

**EducSCO** is a cross-cutting action supported by the Interagency Committee of SCO France. Intended for teachers, this project aims to disseminate knowledge about the mechanisms, causes and consequences of climate change in order to accelerate awareness of the issues at stake. To this end, EducSCO organizes a customized annual training course for secondary school teachers and regularly produces online resources (all levels), including classroom

packs and educational videos based on solutions implemented by SCO projects.



Simple and intuitive, the EducSCO web tool allows to visualise the temporal evolution of the surface temperature on several time scales. ©SCO

### ONLINE APPLICATION

*EducSCO-temperature, an application dedicated to studying temperature trends from space : <https://eolabcnes.users.earthengine.app/view/educsco-temperature>*

### APPLICATION SITE

Academy of Toulouse (France)

### SATELLITES

*Optical and radar imaging, atmospheric sounding, oceanography, meteorology, this project uses all families of Earth observation satellites.*

### THEMES



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### PARTNERS

*CNES, Maisons pour la science, Académie de Toulouse, Esero, Esa*

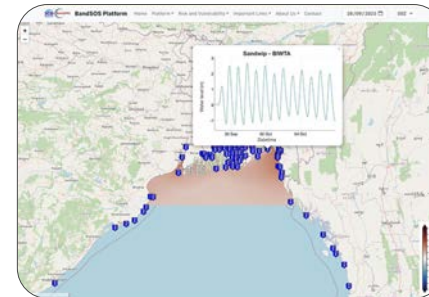
# BanD-SOS

—  
IMPROVING THE RESILIENCE OF  
DELTA TO CYCLONIC FLOODING  
—



Every three years on average the Bengal Delta is struck by a major tropical cyclone resulting in serious conse-

quences. In response, **BanD-SOS** is developing a pre-operational system for forecasting (between 36 and 48 hours) cyclonic flooding and the associated societal risk, to ensure the population's resilience over the medium-to-long term. Already used by the flood forecasting center in Bangladesh, the platform provides the real-time information needed to implement evacuation and protection operations when a cyclonic event occurs.



With BandSOS, prevention services and local residents can visualize the forecast water levels and potential flooding for the next five days, every six hours, across the entire Bengal delta. © BandSOS

### ONLINE INTERFACE

<https://bandsos.github.io>

### SATELLITES

*Sentinel-2*

### APPLICATION SITES

*Bengal (Bangladesh, India) and Amazon (Brazil) deltas*

### PARTNERS

*LEGOS, Arizona State University, BWDB/FFWC, CNES, LIENSs, Ohio State University*

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



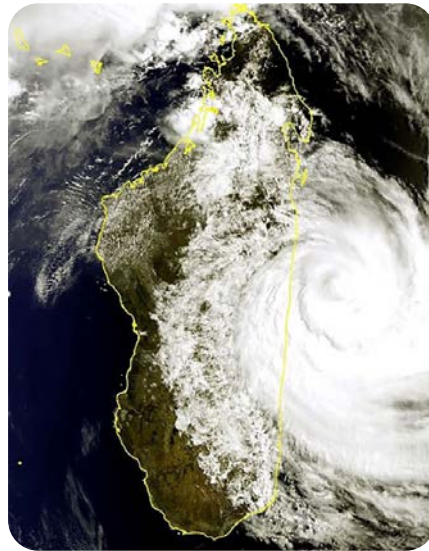




## Cimopolée

MAPPING THE IMPACT OF CYCLONES FOR ADAPTATION AND RESILIENCE

The consequences of climate change can already be measured in terms of tropical cyclones, whose power and area of influence are increasing as ocean temperatures rise. The [Cimopolée](#) project aims to develop an operational tool capable of processing strategic data for risk management related to extreme weather events in the south-west Indian Ocean. Based on optical and radar satellite images, a web interface will provide users with indicators of natural disasters a posteriori, in order to quantify the damage and better manage the consequences of their occurrences.



Cyclone Emnati, février 2022 © ESA, Sentinel-3

### SATELLITES

Sentinel-1 & 2

### APPLICATION SITES

Madagascar and Reunion Island (Indian Ocean)

### PARTNERS

University of La Réunion, BNGRD, CNES, IOGA, IRD, IST, UMR EspaceDEV

### THEMES



### ENVIRONNEMENTS



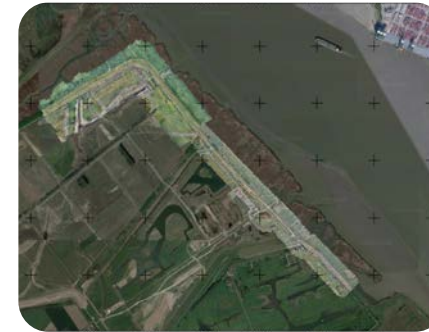
### SDGs SUSTAINABLE DEVELOPMENT GOALS



## EO4Wetlands

MULTI-SCALE MONITORING OF WETLAND RESTORATION

Monitoring wetlands has become a major strategic issue given their key role in biodiversity, climate change



Satellite view and drone orthoimage overlay of the LLHPP application site

and hydrology. In this perspective, [EO4Wetlands](#) aims to provide a wetlands monitoring tool for French, Belgian and Dutch users. Through the joint use of in situ data, UAV overflights and high-resolution satellite data, the tool will allow the analysis of surface conditions and their spatio-temporal changes in order to support decision-makers concerned about the potential occurrence of extreme climatic events such as floods.

### THEMES



### ENVIRONNEMENTS



### SATELLITES

Sentinel-1-2-3, Landsat, Ecostress, Pléiades

### APPLICATION SITE

LLHPP Living Lab Hedwige-Prosperpolder (Belgium/Netherlands)

### PARTNERS

Cerema, CNES, Geomatys

### ODD OBJECTIFS DE DÉVELOPPEMENT DURABLE

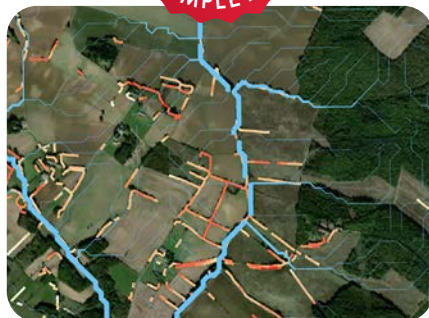






## FLAude

BE MORE RESILIENT TO FLOODING



Thanks to FORO, the location of the hedges with respect to the hydrological network and the slope of the land makes it possible to identify the areas at stake. © FLAude

Developed in a department particularly affected by extreme hydro-meteorological events, **FLAude** has delivered its FORO platform, *Flood Observatory for Resilient Occitanie*. Based on satellite imagery, the tool enables local stakeholders to visualize and gain a better understanding of the risks linked to flooding by runoff, and to implement resilience plans. Already in use in the Aude region, FORO will be deployed from 2023 in several territories of the Mediterranean Arc. It will rapidly offer the detection of ice jams and damaged vines.

### ONLINE INTERFACE

Results for the Aude :  
<https://apps.tereval.fr/foro/#/>

### SATELLITES

Pléiades, Sentinel-1 & 2, SPOT, Landsat

### APPLICATION SITES

Aude department and Occitania region (France)

### PARTNERS

DDTM Aude, CNES, Copernicus C3S, Météo-France, SGEvT, University of Toulouse 2/LISST

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## FloodDAM-DT



FLOOD ALERT

Completed in its first phase, **FloodDAM** laid the technical foundations for a near-real-time flood warning



Rapid flood mapping generated with the FloodML algorithm from Sentinel-1 radar images for a flood event over Seattle (US) and Vancouver (CA) on 16/11/2021. © CNES-CLS

and mapping system based on analysis of optical and radar satellite imagery, in situ data and virtual stations via machine learning methods. Following on from this work, **FloodDAM-DT** is the result of Franco-American cooperation to provide an automated service capable of reliably detecting, monitoring and forecasting floods on a global scale. This *Digital Twin* development is part of an international effort to design a digital twin of the terrestrial system based on the water cycle and focused on floods.

### SATELLITES

Sentinel-1-2-3, Pléiades, TerraSarX

### APPLICATION SITES

- FloodDAM : Garonne and Seine rivers (France), Mississippi (USA), Ebro (Spain), Betsiboka (Madagascar)
- FloodDAM-DT : Garonne (France) and Ohio (USA) river basins

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### PARTNERS

CNES, NASA/JPL, VIGICRUES, Vortex.IO, AIRBUS Defense & Space, CERFACS, CLS, CS Group, QuantCube Technology, USGS





## Gade Lapli

MANAGING HYDRO-METEOROLOGICAL  
CRISES IN REAL TIME

Gade Lapli takes advantage of COSPARIN (space contribution to flood risk) data to quantify the risks associated with extreme precipitation events in regions that are extremely vulnerable to climate change and often poorly equipped with forecasting means, such as Haiti. The tool can be used to create an index to monitor changes in rainfalls caused by climate change, particularly during the hurricane season, but also

to support civil security authorities in monitoring hydro-meteorological hazards in real time, including an alert service.



Estimation of rainfall and potential flood zone in Haiti in the PREDICT Observer tools - result from COSPARIN. © Predict

### AVAILABLE TO PREDICT SERVICES

[contact@predictservices.com](mailto:contact@predictservices.com)

### SATELLITES

GOES, MSG, METEOSAT, FY, HIMAWARI, MetOp, TerraSAR-X, TanDEM-X

### APPLICATION SITE

Haiti (Caribbean)

### PARTNERS

Predict Services, CEREMA, CNES, CNIGS, DGPC, LMI Caribact, Météo-France, Ministry of Agriculture, Natural Resources and Rural Development of Haiti, ONQEV Haiti, UHM HAITI

### THEMES



Are you interested in these services ? Contact the project team (directory on page 94 !)

PROJECT COMPLETED

### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## GeoHaTACC

DOCUMENTING THE EFFECTS OF  
CLIMATE CHANGE IN TROPICS



Example of a typical landslide in Rwanda © O. Dewitte & B. Smets, RMCA, Tervuren

The GeoHaTACC project focuses on geo-hydrological hazards such as mass movements and flash floods, more specifically on the territory of Rwanda. Combined with other sources of information, satellite data can make a real contribution to the detection and analysis of the spatio-temporal evolution of such events. In a context of data scarcity, the objective is to provide tools to assess the effects of climate change on meteorological hazards on the wider scale of Central Africa.

### AVAILABLE TO PREDICT SERVICES

[contact@predictservices.com](mailto:contact@predictservices.com)

### SATELLITES

### SATELLITES

Sentinel-1 & 2, Landsat-8/9, PlanetScope

### APPLICATION SITE

Haiti (Caribbean)

### PARTNERS

Predict Services, CEREMA, CNES, CNIGS, DGPC, LMI Caribact, Météo-France, Ministry of Agriculture, Natural Resources and Rural Development of Haiti, ONQEV Haiti, UHM HAITI

### SDGs SUSTAINABLE DEVELOPMENT GOALS



### THEMES



### ENVIRONMENTS



### APPLICATION SITE

Rwanda (East Africa)

### PARTNERS

Earth and Environment Institute of the University of Strasbourg, A2S, CNES, CRED, Royal Museum for Central Africa



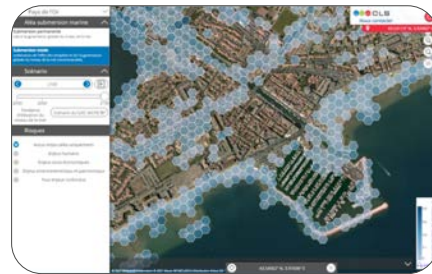


# Littoscope

— MODELLING MARINE SUBMERSIONS —

The [Littoscope](#) project has developed an operational solution using satellite data to model the vulnerability of a coastline to flooding hazards and to assess the associated risks by combining socio-economic and space data. The tool can thus generate maps of permanent (due to the global rise in water level) and temporary (during an extreme event involving exceptional waves) marine submersion risks. Fully functional, the solution is capable of es-

timating risks on all coasts, both in France and internationally.



Littoscope shows how far seawater can penetrate inland under different scenarios. © CLS



### ONLINE SOLUTION

<https://datastore.cls.fr/products/littoscope-coastal-resilience/>

### SATELLITES

Pléiades, Copernicus Marine et Climate Change Services

### APPLICATION SITES

Palavas-les-Flots and Montpellier Metropole, Gâvres (France)

### PARTNERS

CLS, BRGM, CNES, GCF, LEGOS, SIRS

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



# Monitoring the Gold Coast



— RECOVERING BEACHES AFTER A STORM —

Australia's Gold Coast is seeing increasing damage to its beaches from



The coastline of the Australian Gold Coast. © Pixabay

the onslaught of stronger and more frequent storms. To support research advances in post-storm breach recovery, [Monitoring the Gold Coast](#) is developing an automated and repeatable methodology that uses radar satellite imagery to extract the waterline and tidal data from tide gauges. The tool can then study net accretion or erosion, depending on whether the waterline is moving offshore or inshore.



### TOOL AVAILABLE

Contact [Telespazio UK](#)

### SATELLITES

Sentinel-1, données ESA Sea State CCI (L3 & L4 products)

### APPLICATION SITE

Gold Coast (Australia)

### PARTNERS

Telespazio UK, CMRC of Griffith University, ESA, Future Earth

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS





## OSS Saint Louis

ACCESSING THE VULNERABILITY OF COASTAL POPULATIONS AND ECONOMIC ACTIVITIES



The SCO St Louis interface can be used to visualize the risks and vulnerabilities of the coastal city, simulate flooding scenarios and identify current and future risk zones. © Resalliance

available and reproducible to guide adaptation strategies for tomorrow's coasts and coastal cities.

Developed on the Senegalese coastline, [OSS Saint Louis](#) has delivered a cartographic interface whose indicators and simulations can help coastal areas cope with the hazards and risks induced by climate change (rising sea levels, increased number and intensity of storms). Cities can thus visualize their exposure to risks, with indicators of the vulnerability of populations and economic activities, and ultimately strengthen their resilience. Using multi-satellite and socio-economic data, the method is

### ONLINE INTERFACE

<https://resalliance.users.earthengine.app/view/sco-st-louis>

### SATELLITES

Sentinel-1-2-3, SPOT 6/7, Pléiades

### APPLICATION SITE

Coastline of Saint Louis du Sénégal (Africa)

### PARTNERS

M2C, CNES, CNRS, Ideas, LEGOS, Resalliance, UNDP, University of Rouen

### THEMES



### ENVIRONMENTS

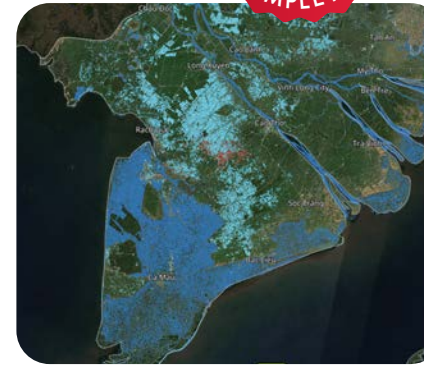


### SDGs SUSTAINABLE DEVELOPMENT GOALS



## Viet-ARRO

AN OBSERVATORY FOR AGRICULTURAL RESILIENCE IN THE MEKONG DELTA



Map of flood extent and affected crops in the VietSCO interface. © VietSCO

Conducted as part of the [Vimesco-Rice](#) project (see page 48) devoted to the adaptation of rice growing in Vietnam, the [Viet-ARRO](#) component focuses on managing the impacts of typhoons on Vietnamese agriculture. In collaboration with the Vietnamese Ministry of Agriculture, the system produces relevant decision-support information for authorities to rapidly assess impacts in the post-event period, and proposes resilient options for territorial recovery. This rapid mapping is based on free Sentinel-1 imagery analysis.

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### ONLINE INTERFACE

<https://www.vietsco.org>

### SATELLITES

Sentinel-1

### APPLICATION SITES

Central Vietnam (Southeast Asia) and typhoon affected areas

### PARTNERS

GlobEO, Vietnam Space Agency VAST, CESBIO, CNES, IRD, TSE, USTH





## WACA-VAR

VULNERABILITY, ADAPTATION AND RESILIENCE OF WEST AFRICAN COASTS

Faced with the lack of data and knowledge on the dynamics of African coasts, even though the west coast is particularly threatened by climate change, [WACA-VAR](#) is an interdisciplinary program with a dual ambition : to produce new data from satellite imagery to better characterize coastal ecosystems, and to disseminate the results via a web-GIS platform to support public policy decision-making by coastal managers. The project will produce regional

geodata useful for planning infrastructure projects. It will focus on the themes of marine submersion, erosion and resilience building.



Saint Louis, Senegal (December 2016) © Rafael Almar

### THEMES



### ENVIRONMENTS



### SATELLITES

Sentinel-2, Pléiades, VENµS

### APPLICATION SITES

Saint-Louis in Senegal, Dansoman (Ghana), then the entire West African coast, from Mauritania to Cameroon

### PARTNERS

LEGOS, IRD, CNES, egis

### SDGs SUSTAINABLE DEVELOPMENT GOALS

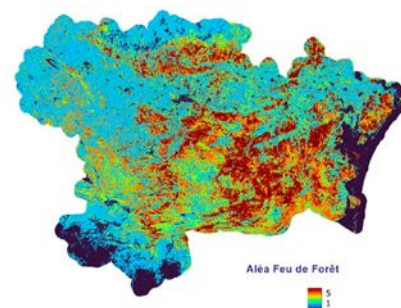


## Aleofeu

MODELLING THE DYNAMIC FOREST FIRE HAZARD

Preventing and fighting forest fires are key areas for adaptation to climate change. [Aleofeu](#) is building operational tools that integrate the observed

and modelled evolution of climatic and territorial conditions. The first objective is to produce dynamic and up-to-date maps of the Aude department in order to construct forecasts of fire behavior on the scale of the forest areas studied, thus allowing to decide on the adequate course of action. The second objective is to provide analyses of the vegetation based on the various scenarios established by the IPCC in order to refine the fire risk levels.



Dynamic mapping of the forest fire hazard, updated annually and based on 5 levels of vegetation sensitivity to fire. © Aléofeu

### SATELLITES

Pleiades, Sentinel-1 & 2, Spot (including Spot World Heritage), Landsat, Modis

### APPLICATION SITE

Aude (France)

### PARTNERS

DDTM Aude, CNES, INRAE, Météo-France, ONF, SDIS Aude

### THEMES ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS





## AMSudSAT

SOUTH AMERICAN WATERSHEDS AND THEIR IMPACT ON GLOBAL CLIMATE CHANGE

The [AMSudSAT](#) project aims to monitor water flows in Amazonian watersheds and provide both quantitative and qualitative forecasts of flows in the Paraná River. In collaboration with the Brazilian National Water Agency and the Paraguayan Ministry of the Environment, the aim is to provide relevant information and create strategic indicators through the joint use of satellite and in situ data. The final objective is to promote integrated water resource management and to improve the

anticipation and monitoring of extreme events in the area.



In Brazil, the Rio Negro and Solimões rivers join to form the Amazon River. © contains modified Copernicus Sentinel data (2018), processed by ESA, CC BY-SA 3.0 IGO

### SATELLITES

Sentinel-1-2-3, MODIS, GPM, Hydroweb/  
Theia data, Copernicus products

### APPLICATION SITES

Amazon Basin, Brazil, Bolivia, Colombia, Ecuador, France, Guyana, Peru, Suriname, Venezuela, Paraguay

### PARTNERS

CLS, BRL, CESBIO, CNRS, Ensat, GET-IRD, Functional Ecology and Environment Laboratory, University of Toulouse III

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## BOSCO

MONITOR THE EVOLUTION OF THE WATER CONTENT OF SOILS



The ambition of the [BOSCO](#) project is twofold. Firstly, to monitor changes in soil water content and the persistence of dry conditions on the scale of the Brittany region,



Soil moisture mapping in the BOSCO Geosias interface. © BOSCO

consistent with the scale of water management and runoff. Secondly, to co-construct diagnostic, analysis and service tools with stakeholders and managers to assist in decision-making, in support of public policies (water resources, agriculture, preservation of ecosystems). Already online, the BOSCO interface displays three major items of information at very high spatial (plot) and temporal (2-3 day) resolution: surface moisture, root water content and recharge to the water table.

### SATELLITES

Sentinel-1 & 2

### ONLINE INTERFACE

<https://geosas.fr/bosco/>

### APPLICATION SITE

Brittany Region (France)

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### PARTNERS

Géosciences Rennes/CNRS, BRETTEL, Chamber of Agriculture Brittany, CNES, DREAL Brittany, Eau du bassin Rennais, Ecobio Rennes, GéoBretagne, INRAE, IUEM, KERMAP, Météo-France, Observatory of Sciences of the Universe of Rennes, OEB, Rennes Metropolis, TerraScience, UMR LETG, UMR SAS, UMR Tetis





# ÉCLAT

CLIMATE CHANGE IN THE LAKE CHAD REGION

Using satellite images, the [ECLAT](#) project has developed a replicable methodology for mapping land use in extreme and complex environments. Developed in three areas of Africa, the indicators cover natural and urban environments, linked to the dynamics of water resources. As a further step from operational remote sensing to users, it has demonstrated the possibility of producing sustainable development indicators from free data and indices derived from space remote sensing.



Lake Chad, seen here by Sentinel-2 in 2018, has shrunk by about 90% since the 1960s. © contains modified Copernicus Sentinel data, processed by ESA



### SATELLITES

*Sentinel-2*

### APPLICATION SITES

*Africa : Lake Chad Basin (Cameroon, Niger, Nigeria, Chad), Tocc Tocc Community Nature Reserve (Senegal), W National Park (Niger)*

### PARTNERS

*CLS/SIRS, Dakar Ecological Monitoring Center, World Customs Organization, African Union, UNDP*

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



# EO4AgriWater

EARTH OBSERVATION FOR AGRICULTURAL WATER MONITORING



[EO4AgriWater](#) aims to provide a decision-making tool in the form of a web-mapping application for public and private players in the fields of agriculture and water management. EO4AgriWater capitalizes on the knowledge acquired from three SCO projects : drought monitoring

([EO4DM](#), see page 78), water bodies ([MEO-Climate](#), see page 39) and irrigation ([Space4Irrig](#), see page 43), and aims to bring together a number of indicators to provide a customized representation specific to the challenges faced by each region. The combination of satellite and in-situ data will provide a strategic tool for monitoring water needs, particularly in agriculture, for integrated resource management in line with the constraints imposed by climate change.



**EO4AgriWater**  
OBSERVER - SUIVRE - DÉCIDER

### SATELLITES

*Sentinel-1&2, Landsat-9, MODIS, ASCAT*

### THEMES ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### APPLICATION SITES

*Gers and Alsace (mainland France), New Caledonia*

### PARTNERS

*MEOSS, iNSiGHT, New Caledonia Rural Agency, CESBIO, Chambers of Agriculture of Gers, Alsace and New Caledonia, CNES, UMR Espace Dev/IRD*

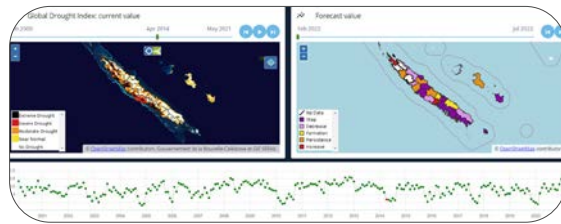


## EO4Drought Monitoring

CHARACTERIZING, MONITORING AND FORECASTING DROUGHT IN NEW CALEDONIA

**EO4DroughtMonitoring** is a tool for characterizing and monitoring drought on a territorial scale. It is designed as a tool aiming to assist in the rational management of farms and as a decision-making aid for institutions. The system is capable

of assessing the intensity of drought episodes, estimating their severity by analogy with a historical reference state and, coupled with current data, providing an indication of the plausible future trajectory of a hydrological season.



EO4DroughtMonitoring interface © InSight

PROJECT

Are you interested in these services? Contact the project team (directory on page 94 !)

COMPLETED

### SATELLITES

Sentinel-2, Landsat-7/8, MODIS, ASCAT

### APPLICATION SITES

New Caledonia  
Targeted extension territories: French Polynesia, Wallis & Futuna and Vanuatu

### PARTNERS

iNSIGHT, New Caledonia Rural Agency, CNES, IRD, Météo-France, Theia, UMR Espace Dev

### SERVICE AVAILABLE

From InSight :  
[geo-contact@insight.nc](mailto:geo-contact@insight.nc)

### THEMES



### ENVIRONNEMENTS

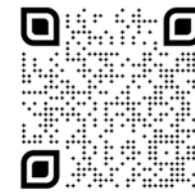


### SDGs SUSTAINABLE DEVELOPMENT GOALS



## OpHySE

SUIVRE L'ÉTAT DES FLEUVES EN TEMPS RÉEL



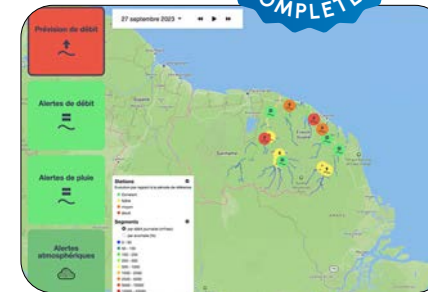
Climate change risks causing substantial changes to the hydrological cycle, affecting rivers and their navigability in particular. In this respect,

the **OpHySE** (*Operational Hydrology from Space and modElS*) project offers a platform for real-time monitoring of river conditions and navigability assistance, providing real added value for understanding hydrometeorological phenomena. Operational in French Guiana and transposable to other basins, the SAGUI cartographic interface displays a colored representation of river status (flows and flow anomalies). Navigation tabs provide differentiated views of hydrometeorological indicators such as flow, rainfall and air quality.

PROJECT

Are you interested in these services? Contact the project team (directory on page 94 !)

COMPLETED



Overall view of the platform and flow forecasts to 08/07/2023 (highlighted in terms of anomalies compared with the reference period). © HydroMatters

### ONLINE INTERFACE

<https://sagui.hydro-matters.fr/sagui/>

### SATELLITES

Jason-3, Sentinel-3 & 6, GPM (Global Precipitation Measurement) constellation

### THEMES



### ENVIRONNEMENTS



### APPLICATION SITE

French Guiana (South America)

### PARTNERS

HydroMatters, CNES, DGTM French Guiana, French Guiana Water Office, International Water Office

### SDGs SUSTAINABLE DEVELOPMENT GOALS







## Stock Water

GLOBAL MONITORING OF THE LOAD OF HYDRAULIC DAMS

Dams are strategic tools for countries and their management of water resources, the availability of which is an increasingly essential issue. [Stock Water](#) has set up a dam load monitoring system based on satellite data and a specific processing chain, with a method whose replicability has been proven in several countries. Results from 110 reservoirs for 3 years are now available on the [sco-stockwater.org](https://www.sco-stockwater.org) platform, enabling inter-annual comparisons and regional water balance reporting. The DEM-based bathymetry estimator is published under an open source license.



StockWater interface. Radar-measured volumes for the years 2018 (red), 2019 (yellow) and 2020 (blue) in the Ramappa reservoir (Hyderabad, India). © SCO/CNES



### OLINE INTERFACE

<https://www.sco-stockwater.org/>

### SATELLITES

Sentinel-1 & 2, DEM TandemX

### APPLICATION SITES

India, Tunisia, Laos, Burkina Faso, Brazil

### PARTNERS

CNES, CESBIO, CS Group, GET, INAT, INGRES Tunisia, IRD, LISAH, MONRE Laos, National Geophysical Research institute India, NTPC Laos, Sertit/iCube

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## XtremQuality

MONITOR THE WATER QUALITY OF SMALL ARTIFICIAL RESERVOIRS



## XTREM QUALITY

The [XtremQuality](#) project addresses the issue of the evolution of the quality of water stored in small artificial water reservoirs, which have been seldom studied in France until now. With the implementation of indicators on the trajectory of these surfaces by aggregating multi-source data, including remote sensing, it aims to improve our knowledge and raise awareness of the impacts of climate change on these water reservoirs, which are essential for a number of uses.

### THEMES



### SATELLITES

Sentinel-2

### APPLICATION SITES

Southwest France and the Parana sub-basin in Brazil

### SDGs SUSTAINABLE DEVELOPMENT GOALS



### PARTNERS

IRD/GET, ANA, CNES, eAU, HETWA, LEFE, Magellium, RECOVER



## ADOPT

HELPING NATURE PARKS TO ADAPT



Are you interested in these services? Contact the project team (directory on page 94 !)



For PNR Causses du Quercy, temperatures in degrees/day can be used to identify late mowing of meadows. © ADOPT

The aim of the Regional Nature Parks (PNR) is to allow the sustainable development and conservation of region's heritage, which implies anticipating and countering the effects of climate change. As part of a Living Lab approach, the **ADOPT** project has immersed itself in the issues faced by the PNRs to identify and co-construct, with them, indicators derived from satellite imagery that meet their needs. An ADOPT website has been created, where each pilot PNR can access its own visualization interface.

### SATELLITES

Sentinel-1 & 2, Pleiades, SPOT 6-7, MODIS, Landsat 8

### APPLICATION SITES

Regional nature parks of Occitania (France)

### PARTNERS

E2L Space & Living Labs, CNES, IDGEO, La Telescop, Regional Nature Parks of Occitania

### ONLINE INTERFACE

<https://adopt.e2l-coop.eu>

### THEMES



### ENVIRONNEMENTS



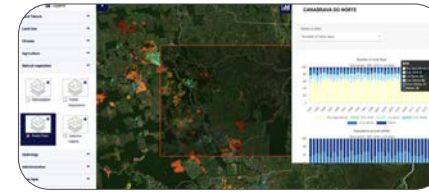
### SDGs SUSTAINABLE DEVELOPMENT GOALS



## Chove-Chuva

ACCOMPAGNER LES TRANSFORMATIONS SOCIO-ENVIRONNEMENTALES AMAZONIENNES

**Chove-Chuva** has developed a tool for monitoring and disseminating territorial dynamics in the Brazilian



Gain a better understanding of territories by coupling forest fires and precipitation statistics, for example. © Alkante

state of Mato Grosso. Intended to be easy to use to facilitate access for many people as possible, especially citizens, the tool provides a series of synthetic indicators on the change in the climatic variables and the dynamics of land occupation (forest, agriculture, water resources) and land use (low-carbon agricultural practices advocated under the ABC plan), and a regional vulnerability indicator. The demonstrator is on-line and open to all.



Are you interested in these services? Contact the project team (directory on page 94 !)

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### ONLINE INTERFACE

<https://www.sco.chove-chuva.org/>

### SATELLITES

Sentinel-2, Landsat, MODIS

### APPLICATION SITE

Mato Grosso (Brazil)

### PARTNERS

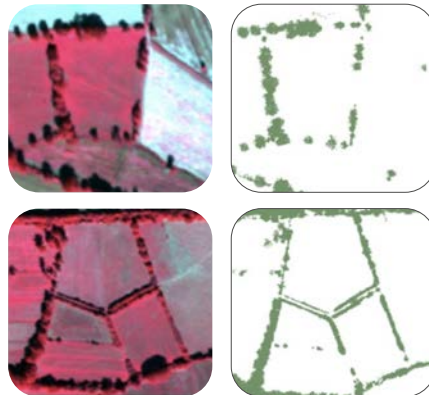
UMR LETG, Alkante, CAT, CIRAD, CNES, CNRS, Embrapa, FEC, GEODEV, ICV, SEMA-MT, UERJ, UMR Tetis, UNEMAT, University of Rennes 2





## Eagle Hedges

FOLLOW HEDGEROWS



Hedge extraction layer (©UMR Dynafor) from satellite images (© DigitalGlobe).

Hedges act as a refuge for biodiversity and provide many ecosystem services. It nevertheless remains difficult to assess their exact effect. [Eagle Hedges](#) responds to this challenge to support the implementation of national agro-ecological transition policies. It consists firstly in setting up an operational service for extracting the surface areas and linear coverage of hedges in a given region in order to monitor how they evolve, and secondly of developing a robust tool for characterizing the network of hedgerows and its functions in various regions.

**THEMES**

**ENVIRONNEMENTS**

**SATELLITES**  
*Pleiades, Spot 6/7*

**APPLICATION SITES**  
*Pyrenees-Gascony workshop area, Aude and Haute-Garonne departments (France)*

**PARTNERS**  
*TerraNis, AFAC, CNES, DYNAFOR, IGN, OFB*

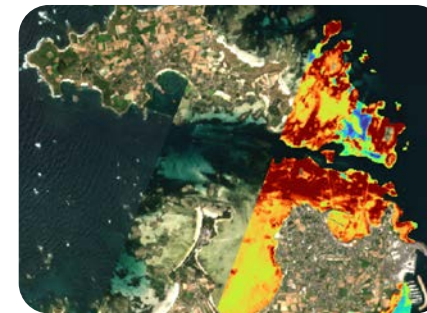
**SDGs SUSTAINABLE DEVELOPMENT GOALS**

## LittoSat



LE LITTORAL SUIVI PAR SATELLITE

[Littosat](#) offers an innovative dashboard including new data for the analysis of coastal territories and



Overview of LITTOSAT satellite products: high tide, low tide and vegetation index mosaics over a portion of the Breton coastline © Hytech imaging, contains modified Copernicus Sentinel 2 (2020) data

marine protected areas. These environments are both weakened by the effects of climate change and strong anthropic pressures. By making it possible to monitor the spatial evolution of coastal vegetation and the effects of climate change over a short period, LITTOSAT also aims to assess the impact of current policies for preserving these areas. In particular, the project will provide up-to-date and strategic satellite data for monitoring sensitive areas in shallow waters and intertidal zones.

**THEMES**

**ENVIRONNEMENTS**

**SATELLITES**  
*Sentinel-2, Pleiades, Planet*

**APPLICATION SITES**  
*Brittany and Normandy, including the Iroise Marine Natural Park and the Armorique Regional Natural Park (France)*

**PARTNERS**  
*Hytech imaging, CNES, GIS BRETEL, IUEM, OFB, PNRA*

**SDGs SUSTAINABLE DEVELOPMENT GOALS**



## SCOFriches Agricoles

ENHANCING THE VALUE OF AGRICULTURAL WASTELAND

[SCO FrichesAgricoles](#) enables the identification of agricultural wastelands and their spatialization on a dedicated web interface. The methodology developed is based on machine learning techniques using satellite observation : the WaSaBI algorithm is trained using ground truths from the Vigifriche application. The proposed service will serve as a decision-making aid for players in the fields of land-use planning, environmental protection and agricultural development, with a view to creating more resilient territories.



Low shrubby wasteland - Commune of Mèze in the Hérault © Safer Occitanie

### SATELLITES

Sentinel-1 & 2, Spot 6/7, Pleiades

### APPLICATION SITES

Several municipalities in the Occitania region (France)

### PARTNERS

Safer Occitania, CNES including Lab'OT, National Federation of Safer

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



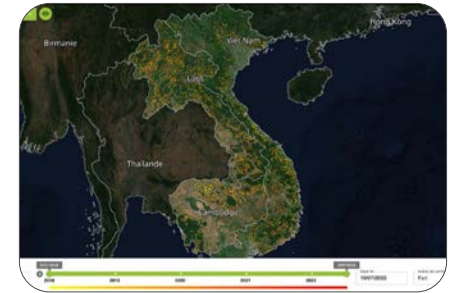
## TropiSCO

TRACKING GLOBAL TROPICAL FOREST LOSS



Despite their essential role, forests are shrinking drastically, especially in the tropics. [TropiSCO](#) is developing a platform for weekly monitoring of global tropical forest loss by means of Sentinel-1 radar images. The first results are online thanks to close collaboration with certain partner countries of programmes conducted by France in the Amazon, Africa and Southeast Asia. Reliable and easy to

use, TropiSCO data can help combat illegal logging and mining, illegal farming and wildlife trafficking.



Visualization of deforestation in Southeast Asia on tropisco.org.

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



### ONLINE INTERFACE

<https://www.tropisco.org>

### SATELLITES

Sentinel-1

### APPLICATION SITES

Africa, Amazonia, South East Asia

### PARTNERS

GlobEO, CESBIO, CNES





## AirCrowd Africa

AIR QUALITY AND HEALTH IMPACTS IN DEVELOPING COUNTRIES

Against a backdrop of worsening air pollution in developing countries, those involved in health and air quality monitoring are faced with major health, environmental and economic issues, and lack reliable data to assess the consequences of this pollution on human health. Piloted in West Africa, [AirCrowd Africa](#) aims to develop an innovative “multi-functional” technical solution, capable of monitoring air pollution levels and assessing their impact, by merging different data sources (ter-

restrial and spatial environmental, real-time health data and Big Data). The aim is to produce high-resolution maps and model alternative urban development strategies.



© Diginove

### SATELLITES

Sentinel-5P, Copernicus Atmosphere Monitoring Service (CAMS)

### APPLICATION SITES

Cotonou (Benin), Dakar (Senegal), Abidjan (Ivory Coast)

### PARTNERS

Diginove, AtmoSud, IRD, MASK-air, CNES-Lab'OT

### THEMES



### ENVIRONNEMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS

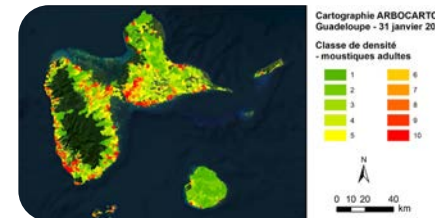


## Arbocarto-V2

ANTICIPATING THE ABUNDANCE OF MOSQUITOES

Mosquitoes are vectors of human arboviruses such as dengue and chikungunya. Designed for Regional Health Agencies and mosquito control opera-

tors, the [Arbocarto-V2](#) application can be used to guide vector control actions and to adjust field actions in high-risk areas. To this end, the tool generates predictive maps of the abundance of *Aedes albopictus* or *aegypti* mosquitoes in a given territory, depending on the user's choice, and allows the simulation of different prevention or control scenarios. Since July 2023, V3 version has included a module for calculating the basic reproduction rate (R0) for the dengue virus.



Arbocarto simulation of *Aedes albopictus* adult mosquito densities in Guadeloupe. © Arbocarto



### APPLICATION AVAILABLE

On request <https://www.arbocarto.fr>

### SATELLITES

SPOT 6/7, Sentinel-2

### APPLICATION SITES

Montpellier, Grenoble, Bordeaux, La Réunion, Mayotte, West Indies (France)

### PARTNERS

CIRAD, Marie Demarchi, CNES, French Ministry of Health and Prevention

### THEMES



### ENVIRONNEMENTS



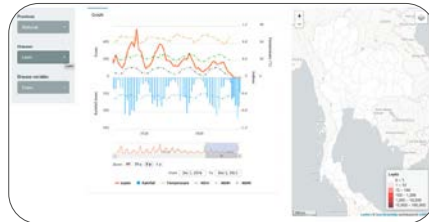
### SDGs SUSTAINABLE DEVELOPMENT GOALS





## ClimHealth

PREVENTING EPIDEMIOLOGICAL RISKS  
BY MONITORING THE ENVIRONMENT



Developed in Thailand, the ClimHealth interface provides disease-specific graphs of rainfall, temperature, vegetation and humidity data. © ClimHealth

Using climate and environmental information from satellites, the [ClimHealth](https://climhealth.geohealthresearch.org) project has developed two online early warning system demonstrators to provide information on environments conducive to disease transmission: LeptoYangon, a local tool to prevent leptospirosis in MyanMar, then ClimHealth, the generic tool that can address all diseases and symptoms influenced by the environment. Adaptable to any location, the application is open source on Framagit.

### ONLINE APPLICATIONS

ClimHealth :

<https://climhealth.geohealthresearch.org>

LeptoYangoon :

<https://leptoyangon.geohealthresearch.org/>

### APPLICATION SITES

Yangon (Myanmar)

Thailand

### PARTNERS

IRD, CNES, Pasteur Institute of Cambodia, Seas-OI (Indian Ocean), University of La Reunion

### SATELLITES

Sentinel-1 & 2

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS



## PODCAST-Demo

STEMMING THE SPREAD OF CHOLERA



*Vibrio cholerae*, hosted by planktonic and detrital hosts, survives transport by ocean currents. © Getty Images

Cholera, a waterborne disease, affects 1.3 to 4 million people worldwide each year. New cases of *Vibrio cholerae* pathogen emergence and associated epidemics have been reported in relation to global warming and increased extreme weather events. Developed in consultation with end-users, [PODCAST-Demo](https://podcast.eofrom.space) has provided public health authorities with cholera risk mapping tools and products, including based on climate-related *Vibrio cholerae* hotspots.



### AVAILABLE TOOLS

<https://podcast.eofrom.space>

### SATELLITES

Essential climate variables of the ESA-Climate Change Initiative

### APPLICATION SITE

India

### PARTNERS

Plymouth Marine Laboratory, ESA, Japan Agency for Marine-Earth Science and Technology, National Center for Earth Observation

### THEMES



### ENVIRONMENTS



### SDGs SUSTAINABLE DEVELOPMENT GOALS

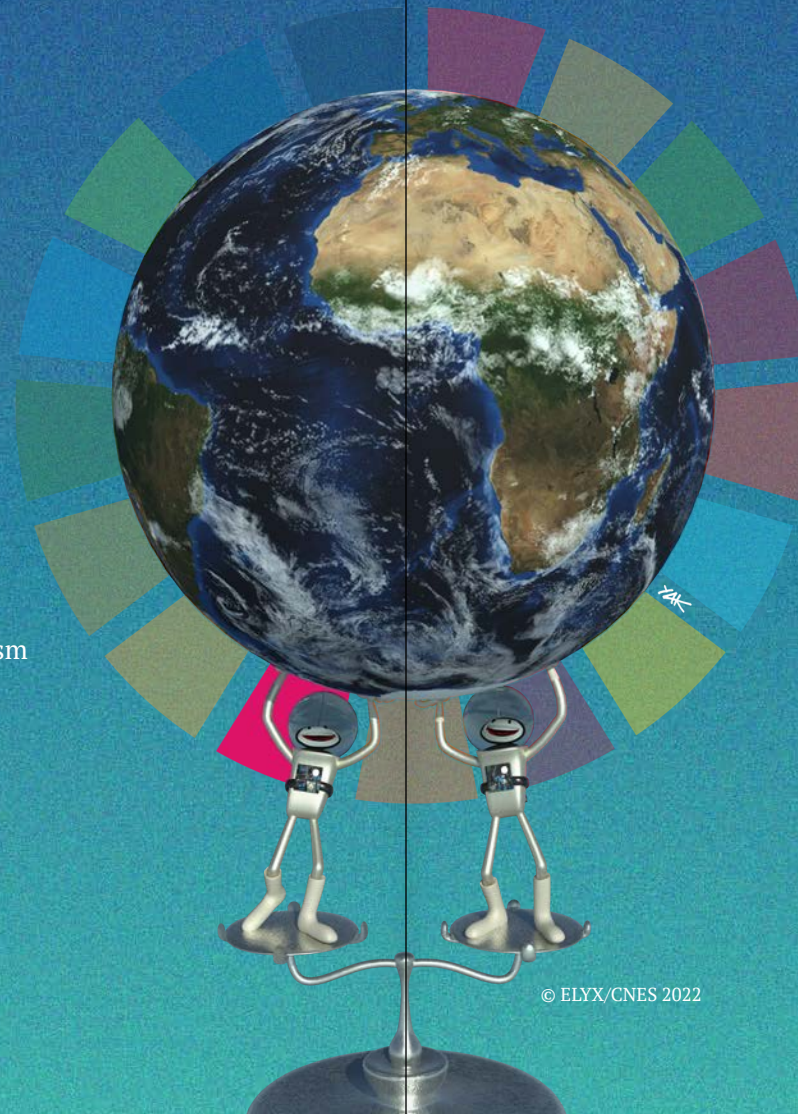




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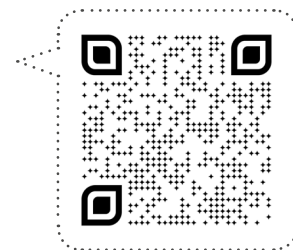
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