



Space data for Healthcare

EUSPA, Market Development

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A new EU Space Programme

EU space activities **under one umbrella**



EGNOS

EGNOS "Makes navigation signals more accurate and trustworthy for Safety-critical applications"

Operational in **400+ airports** & helipads in 23 countries



Galileo

Global satellite navigation and positioning system (GNSS)

More than **3 billion Galileo receivers** worldwide



Copernicus

Earth Observation (EO), monitoring based on satellite & non-space data

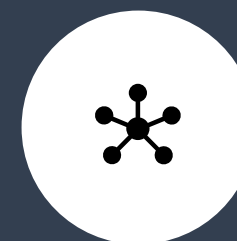
Nr.1 world provider of space data and information (>20TB/day)



GOVSATCOM

Secure satellite communications for EU governmental actors

Rapid support over crisis areas

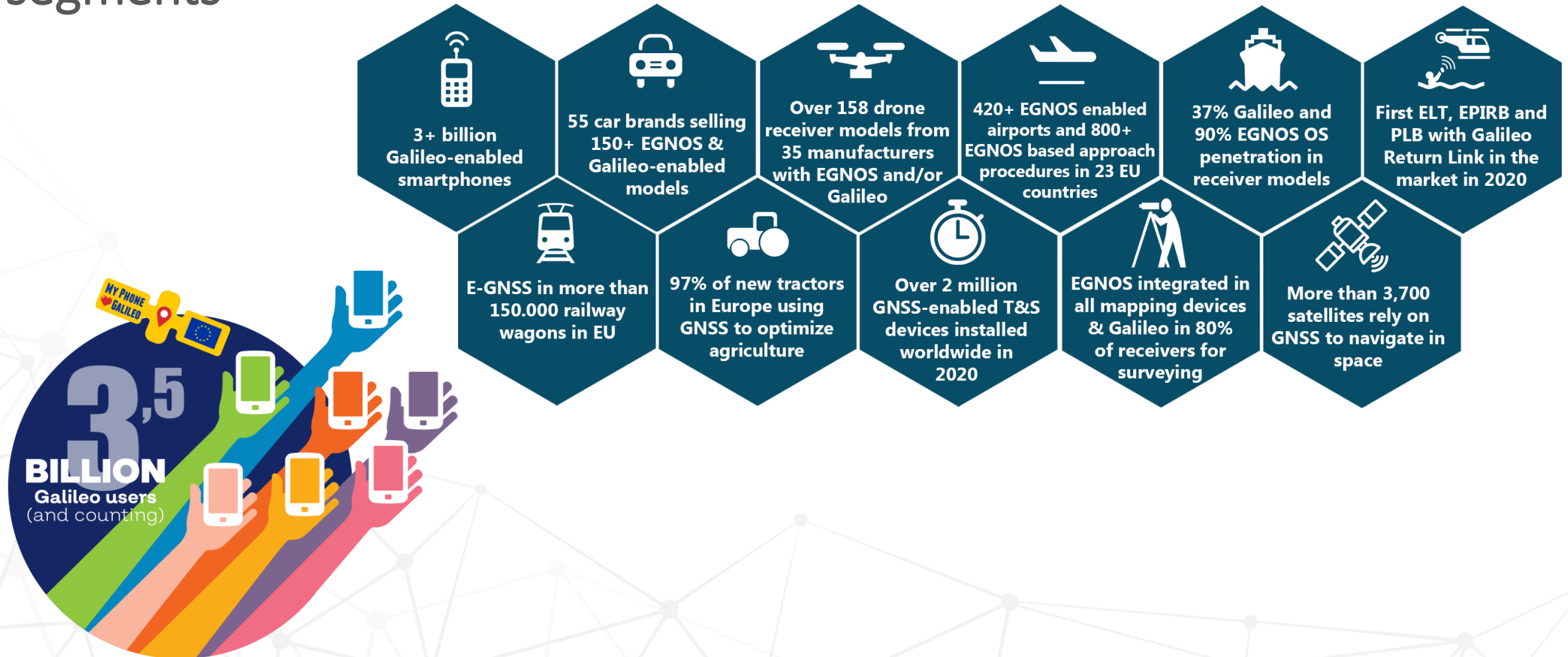


Others

Space Situational Awareness (SSA/SST)

Access to Space

Galileo and EGNOS: European success story enabling new business across different market segments



The EU space programme contributes to public health: Value added brought by Galileo



From emergency caller location to the monitoring of elderly patients, **Galileo** has a substantial impact on our **health and safety**

Galileo supports the development of **telemedicine, medical transport (UAVs)** and **guidance** for the visually and physically impaired.

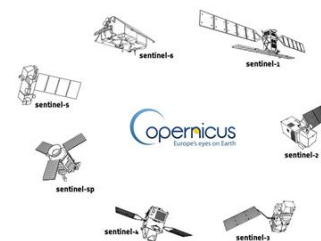
GNSS-enabled applications such as **fitness trackers** and **wellbeing smartphone applications** are already a natural part of a healthier lifestyle for many citizens

The EU space programme contributes to public health: Value added brought by Copernicus



Copernicus monitors health-related environmental phenomena by supplying information such as **air quality forecasts** and **UV forecasts**.

Copernicus can also help identify areas prone to the **emergence** and **spread of epidemics**, which depend on environmental factors such as **water, sanitation, food and air quality**



SPACE



In Situ

IN SITU



**Atmosphere
Monitoring**



**Climate
Change**



**Emergency
Management**

SERVICES

There are various data available for healthcare segment

Atmospheric data

- Air temperature
- Humidity
- Wind speed and direction
- Birch Pollen
- Solar radiation
- Natural emissions
- Greenhouse gas

Ocean data

- Temperature
- Colour
- Wave height
- Surface wind
- Salinity
- Algeas



Water bodies

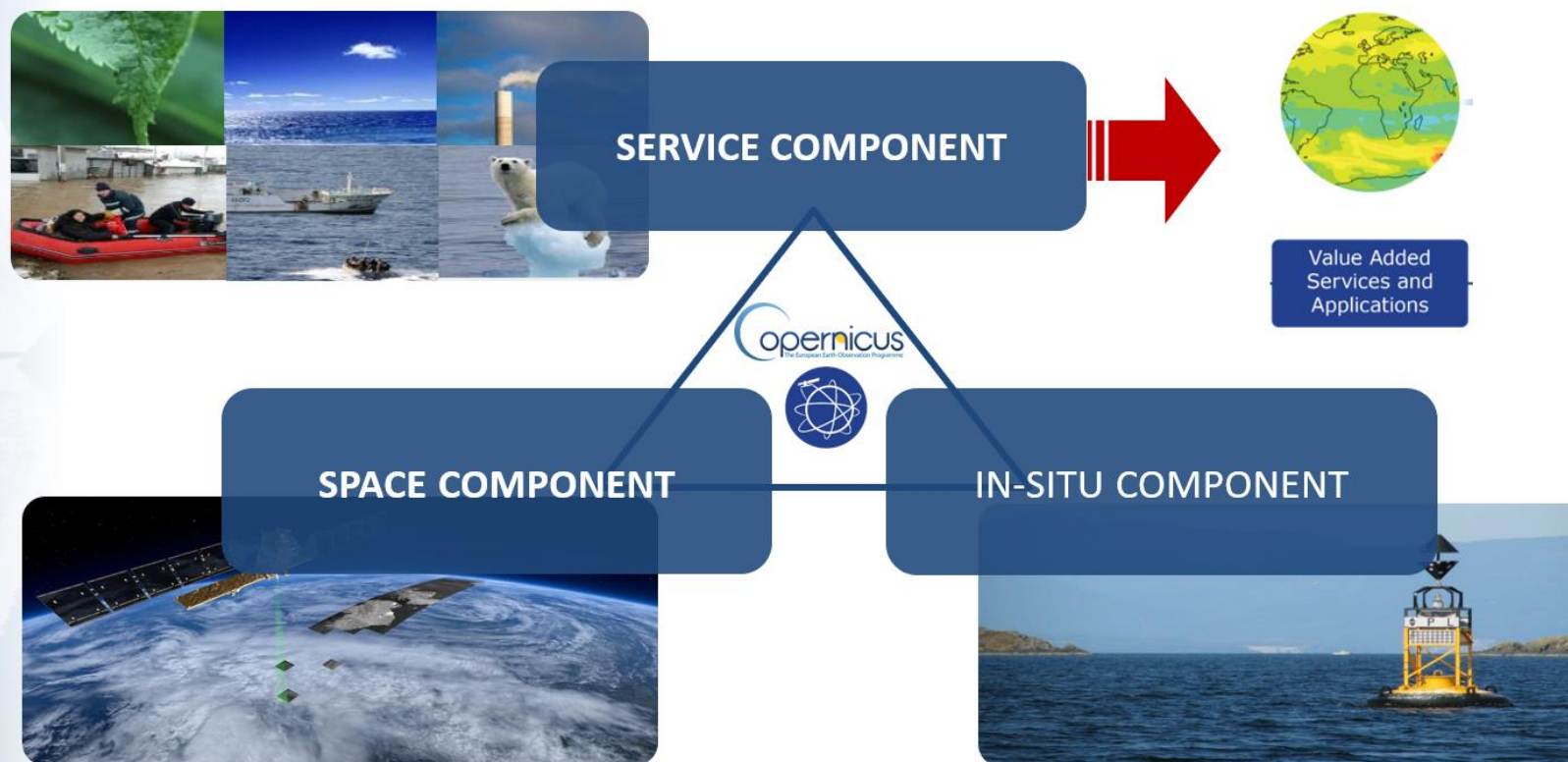
- Extend
- Water temperature
- Colour, reflectance
- Algeas
- Water colour
- Water level for lakes

Terrestrial

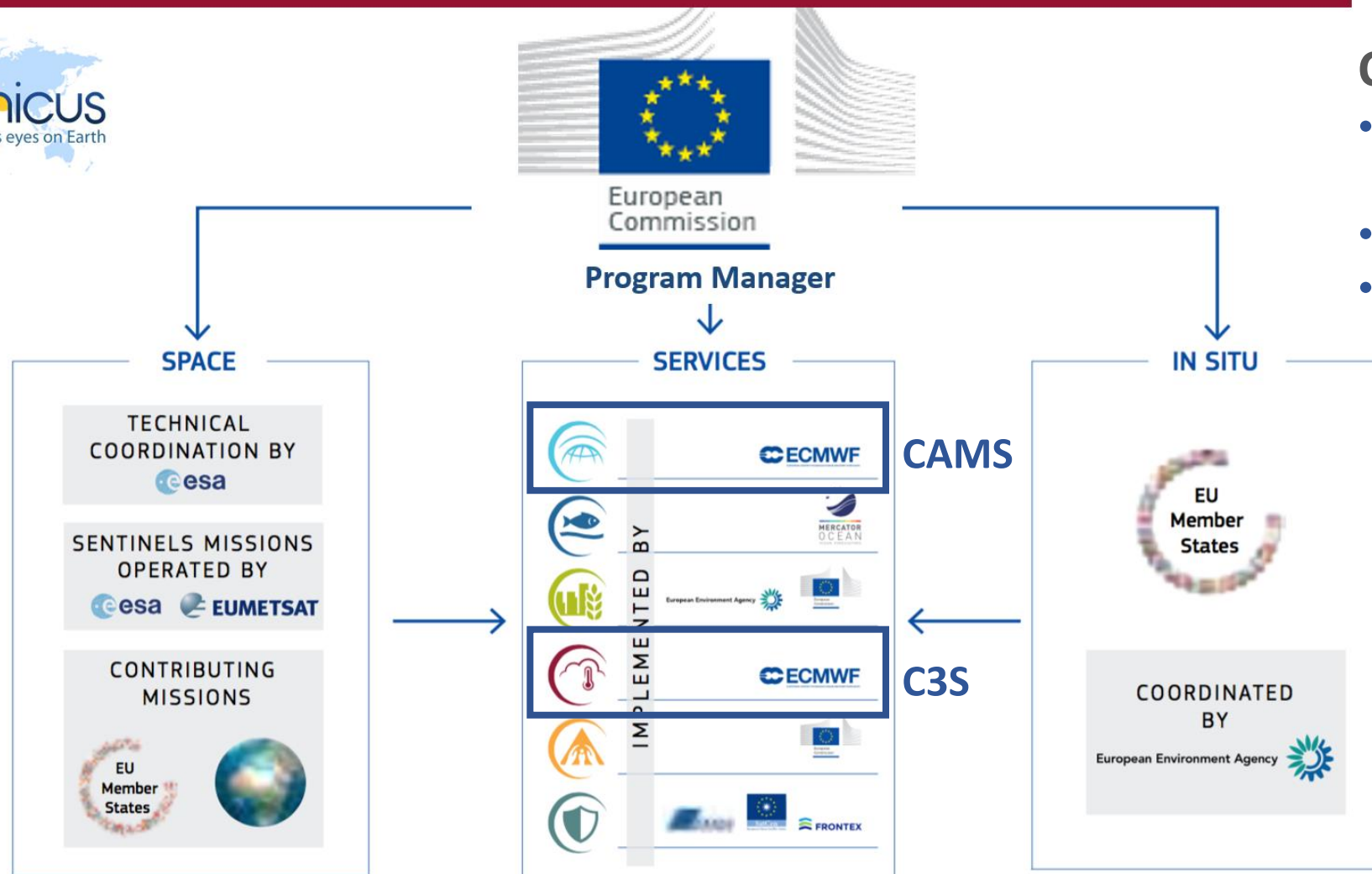
- Landuse, Landcover
- Land temperature
- Soil Moisture
- Fire disturbance
- Vegetation status

C O P E R N I C U S

Copernicus, previously known as GMES (Global Monitoring for Environment and Security), is the **European Programme** for the establishment of a European capacity for **Earth Observation**

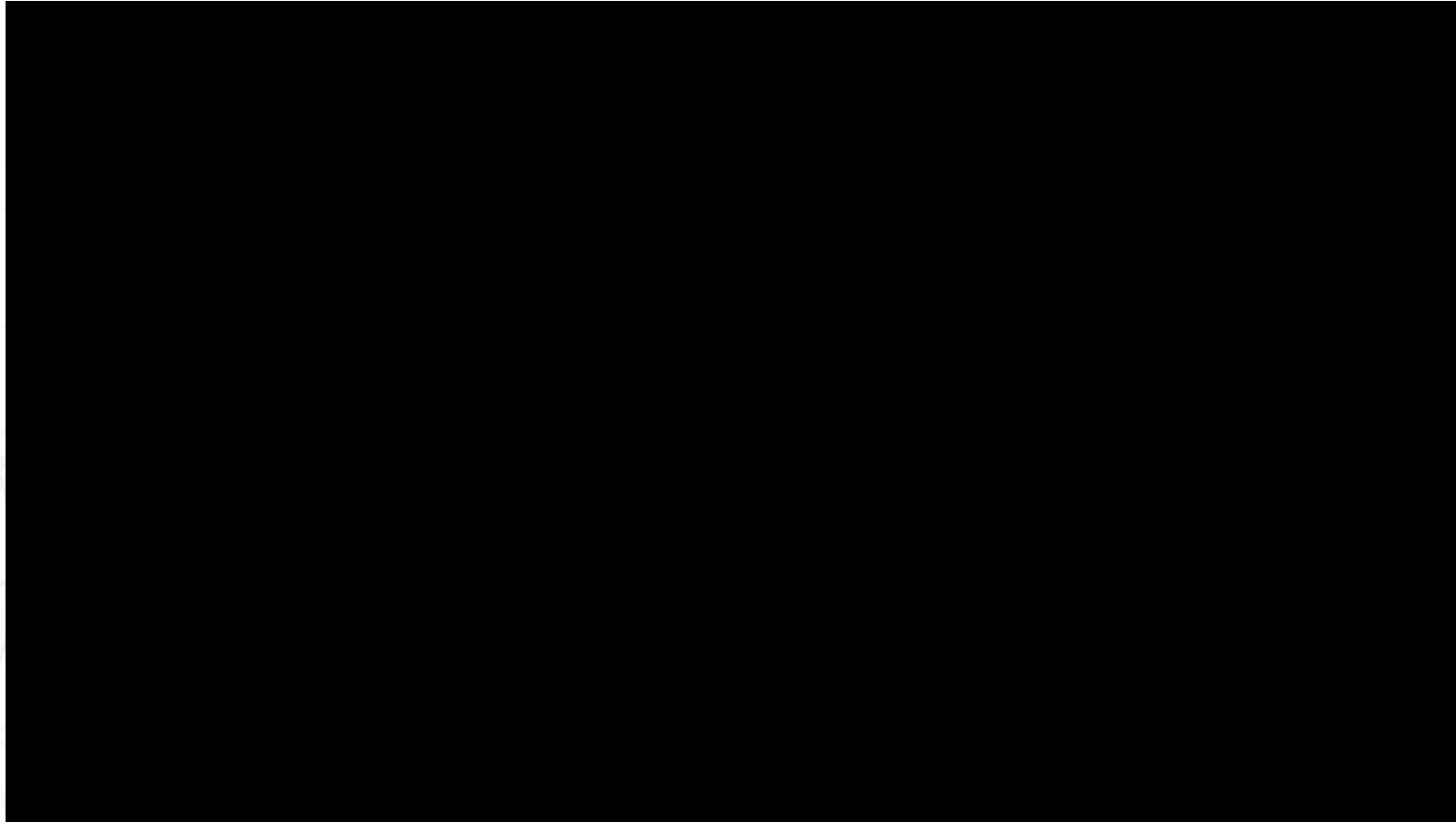


COPERNICUS



- Copernicus services:**
- **Added value products, indicators**
 - **Models**
 - **Archives, Near real Time and Forecasting products**

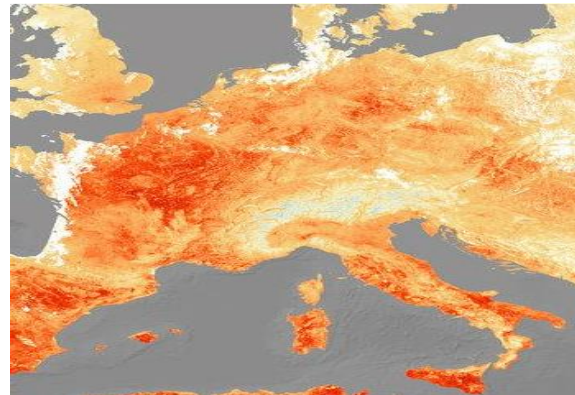
Copernicus for Health



Space data has become part of our healthy life



Earth observation (EO) helps to fight **vector-born diseases**, thereby support **prevention, early warning** and **health-care planning**



EO contribute to monitor **environmental pollution** and **risks** including **heatwave risks**



EO became part of **personal application and wearables**

Space data contributes to different application areas in healthcare

Vector-borne diseases



EYWA (Early Warning System for Mosquito borne diseases)

- lies under the umbrella of **EuroGEO Action Group "Earth Observation for Epidemics of Vector-borne Diseases"**
- a **prototype system** addressing the critical public health need **for prevention and protection** against **the Mosquito-Borne Diseases (MBDs)**
- The system combines **interdisciplinary scientific fields** (entomology, **epidemiology**, **ecology**, **EO**, **Big Data Analytics**, **AI/ML**, Ensemble Dynamic/Hybrid vs Data Driven models, **Data Fusion** and **Citizen sciences**) towards building new directions in **applied research and innovative services for public health**, such as outbreak **forecasting and decision support modeling** for vector control applications and other mitigation actions.

- **1st EIC Horizon Prize on Early warning for Epidemics**

<https://e-shape.eu/index.php/showcases/pilot-2-4-eywa-early-warning-system-for-mosquito-borne-diseases>



/ Key Datasets

- Earth Observation Data:
- Sentinel-2
- Landsat 7
- Landsat 8
- MODIS
- IMERG
- ERA5

Entomological data:

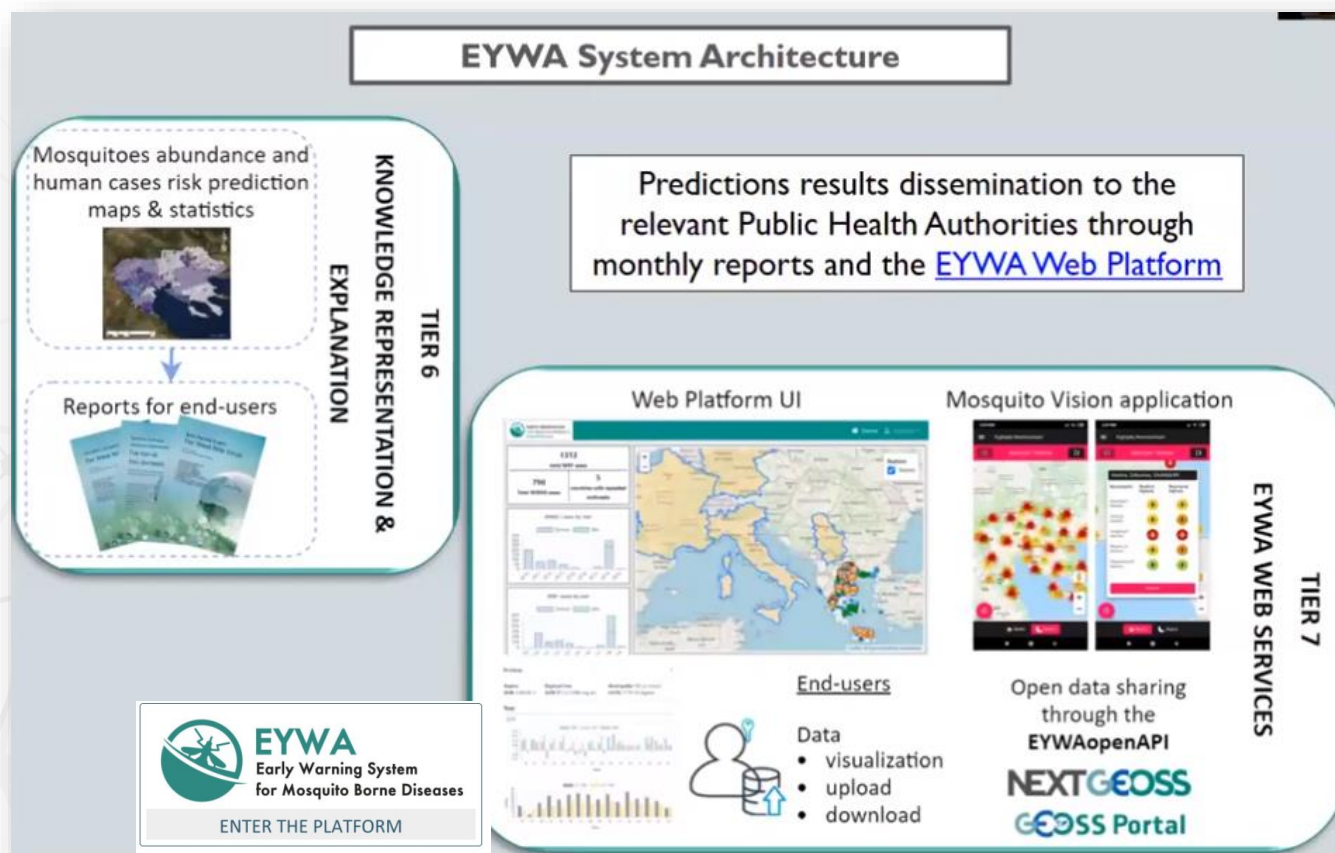
Mosquito abundance data as collected in-situ by partners

Epidemiological data:

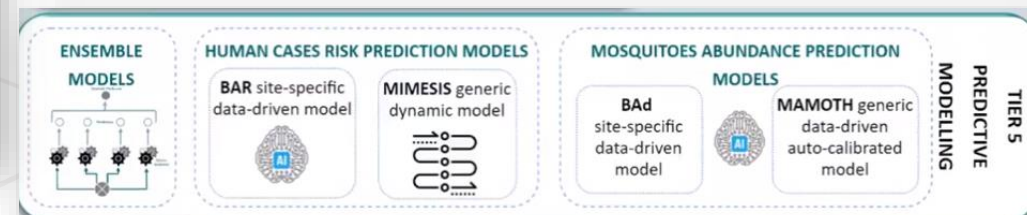
Pathogen data that are collected in-situ



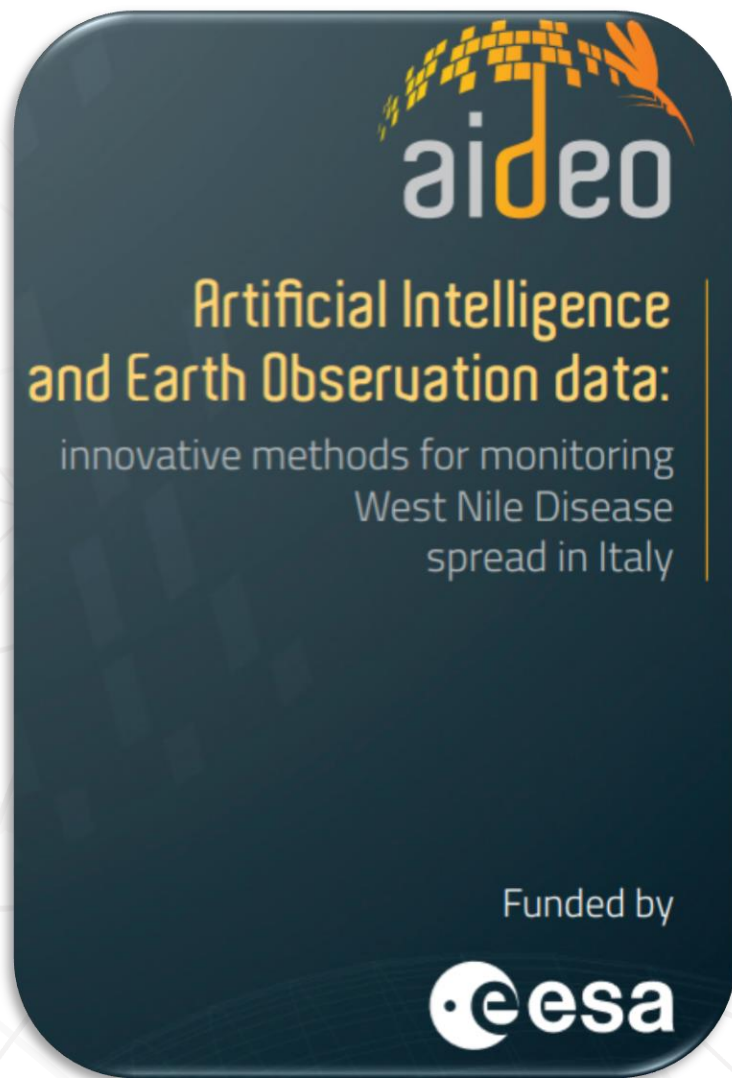
Vector-born diseases



- dynamic and **data driven models**, learning about the dynamics of **mosquitoes**
- abundance and **mosquito-borne disease transmisson**,
- provide monthly, wekly and daily predictions



Vector-born diseases



Aim of the project is to **develop an innovative, scalable and accurate** process to produce **West Nile Disease (WND) risk maps**, using **EO** data and specific **AI** algorithms.

- **West Nile virus (WNV) infection** is one of the most **widespread mosquito-borne zoonosis in Italy** and Europe. Its **transmission cycle** is well understood, whilst **Identifying suitable environmental conditions** across large areas **containing multitude species of potential hosts and vectors** can be difficult.

[AIDEO: Artificial Intelligence and Earth Observation Data](https://www.aideo.eu)
<https://www.aideo.eu>

Vector diseases

a. Time step 10 from May 24 to June 8



b. Time step 15 from August 12 to 27



AIDEO

- The goal is to connect the power of Artificial Intelligence (AI) to Earth Observation (EO) data to **explore hidden patterns** and to assess the potential of **automated processes** in making accurate **predictions of the spatio-temporal re-emergence and spread of the disease** in Italy.
- **AIDEO** aims to develop an innovative, scalable and accurate process to produce West Nile Disease (WND) risk maps, using EO data and specific AI algorithms.

Vector-born diseases







Fighting diseases like Dengue, Zika and Chikungunya

DIPTERON is a Start-up founded in January 2018 with the goal of providing an application for detecting *Aedes* mosquito risk areas.

<https://dipterion.com/>

The **early identification of vulnerable areas** is crucial to control the advancement of diseases. **DIPTERON application** can **detect such risk areas based on artificial intelligence that combines satellite and ground data** with a prediction model of **4 weeks in advance for *Aedes* outbreaks.**

Copernicus data: NASA MODIS, Landsat and Sentinel-1, -2 and 3

 <p>Powered By Artificial Intelligence</p> <p>Our team of experts train complex Machine Learning algorithms that predict the <i>Aedes</i> mosquito risk areas.</p>	 <p>Satellite Driven Data</p> <p>We use satellite data from several space agencies and organizations.</p>	 <p>High Precision Predictions</p> <p>Our algorithm shows <i>Aedes</i> mosquito risk areas with accuracy.</p>	 <p>Award Winning Product</p> <p>Our idea has been winning awards and appreciation in innovation events in the Space sector.</p>
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Environmental pollution and risks

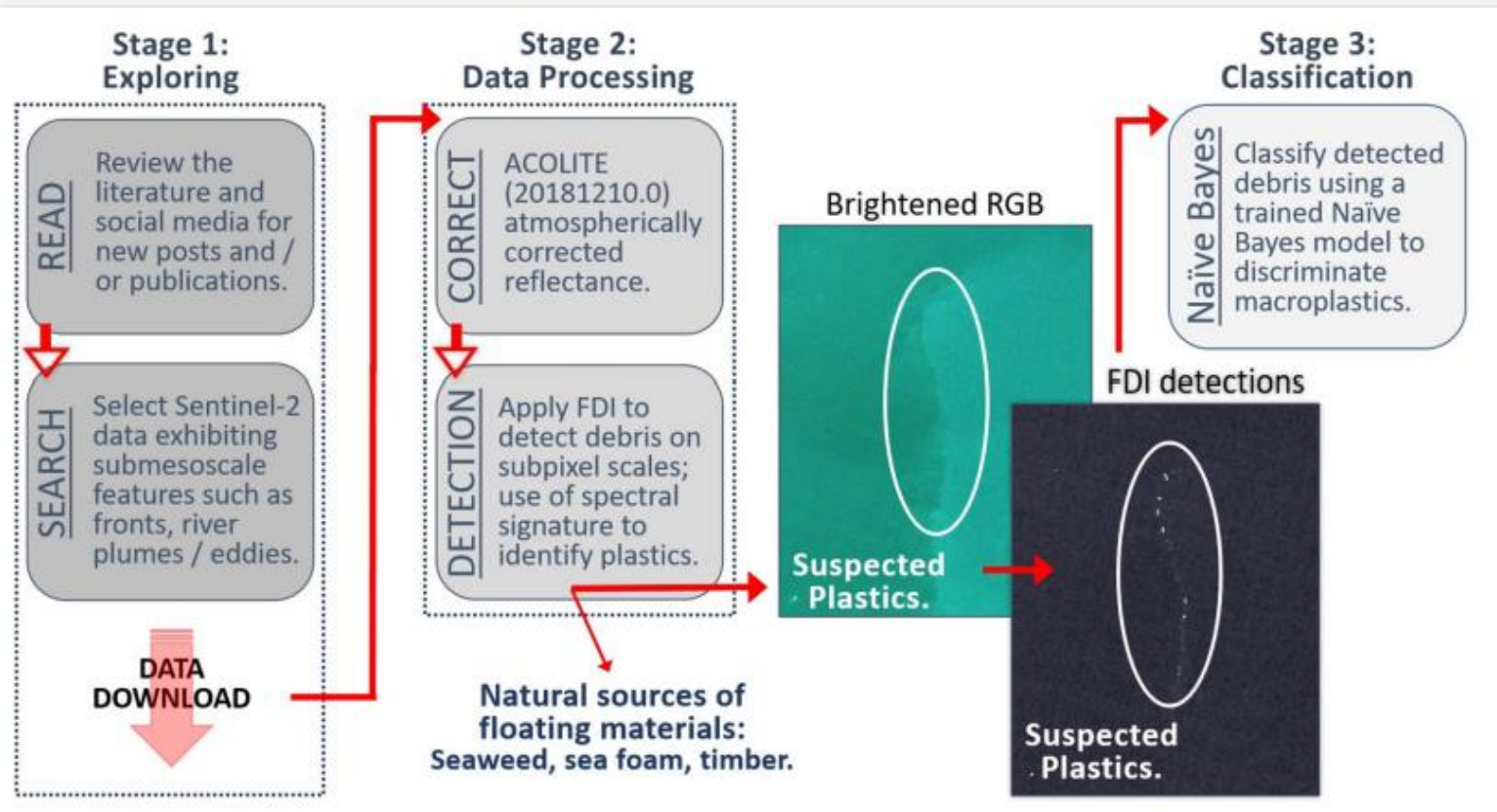
Finding Plastic Patches in Coastal Waters using Optical Satellite Data

- **Satellites optical data** offer a unique perspective to observe the problem of **plastic litter in the marine environment**, but **few studies** have successfully demonstrated their use for this purpose.
- **Patches of floating macroplastics are detectable** in optical data acquired by the European Space Agency (ESA) **Sentinel-2** satellites and, furthermore, are **distinguishable** from naturally occurring materials such as seaweed.

<https://www.nature.com/articles/s41598-020-62298-z>

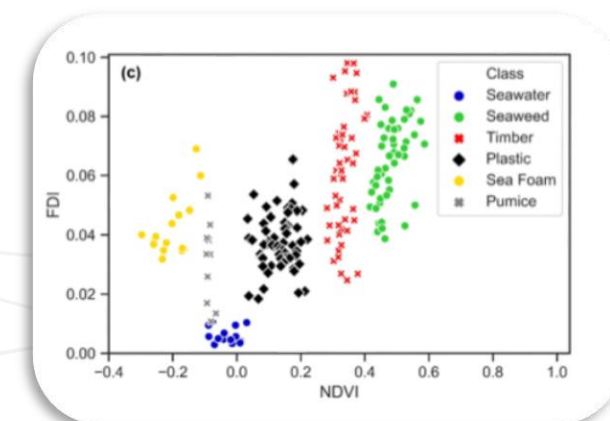


Environmental pollution and risks



Finding Plastic Patches in Coastal Waters using Optical Satellite Data

- Patches of materials on the ocean surface were highlighted using a novel **Floating Debris Index (FDI)**.
- In all cases, **floating aggregations were detectable on sub-pixel scales**, and appeared to be composed of **a mix of seaweed, sea foam, and macroplastics**.
- Suspected plastics were successfully classified as plastics with an **accuracy of 86%**.



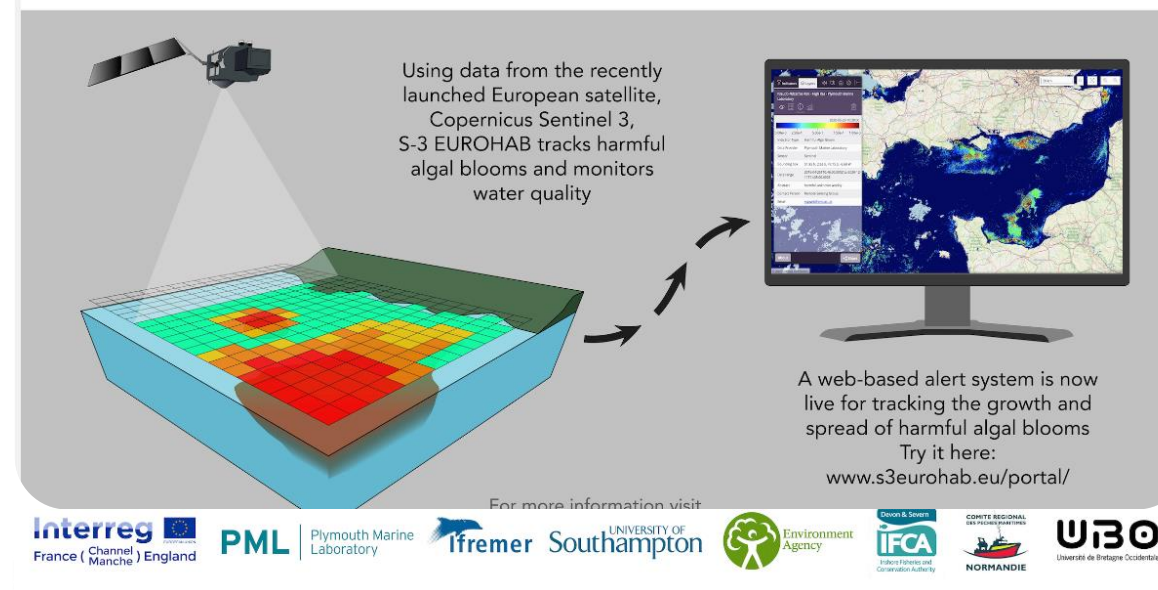
Environmental pollution and risks

S-3 EUROHUB

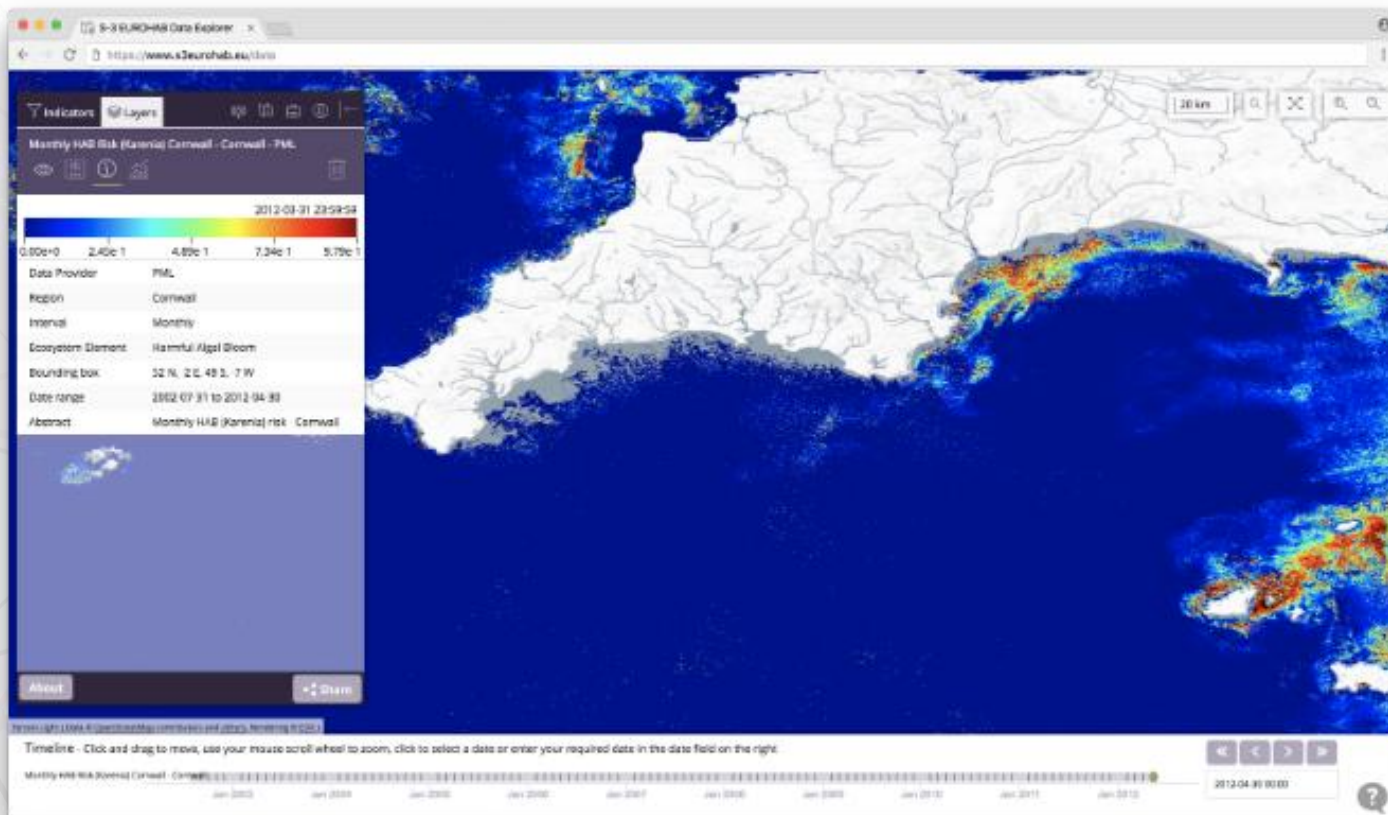
- Harmful Algal Blooms (**HABs**) are caused by **excessive growth of marine algae** which release **harmful toxins** into the water that can kill fish, shellfish and even humans when they consume contaminated fish.
- As a result they can have an extremely damaging effect on the tourism and fishing industries.
- The project use **S-3 satellite data** to create a web based **HAB and water quality alert system** that will be designed for marine managers and industry end users to enhance the marine monitoring of HAB's in the French-English Channel region.

S-3 EUROHAB

Sentinel-3 satellite products for detecting Eutrophication and harmful algal bloom events in the French-English Channel



Environmental pollution and risks



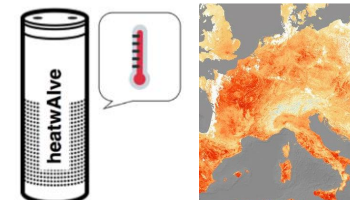
S-3 EUROHAB has produced a [web based alert](#) system for a selection of the most important Harmful Algal Bloom Species. Currently the **system provides data covering**;

- **Karmenia** - responsible for **reducing oxygen** in the water column
- **Phaeocystis** - responsible for **producing foam**
- **Pseudo-nitzschia** - responsible for **Amnesic Shellfish Poisoning**

Images in the portal are provided **in near real time** so data up to a few days ago should be available.

Heatwaves

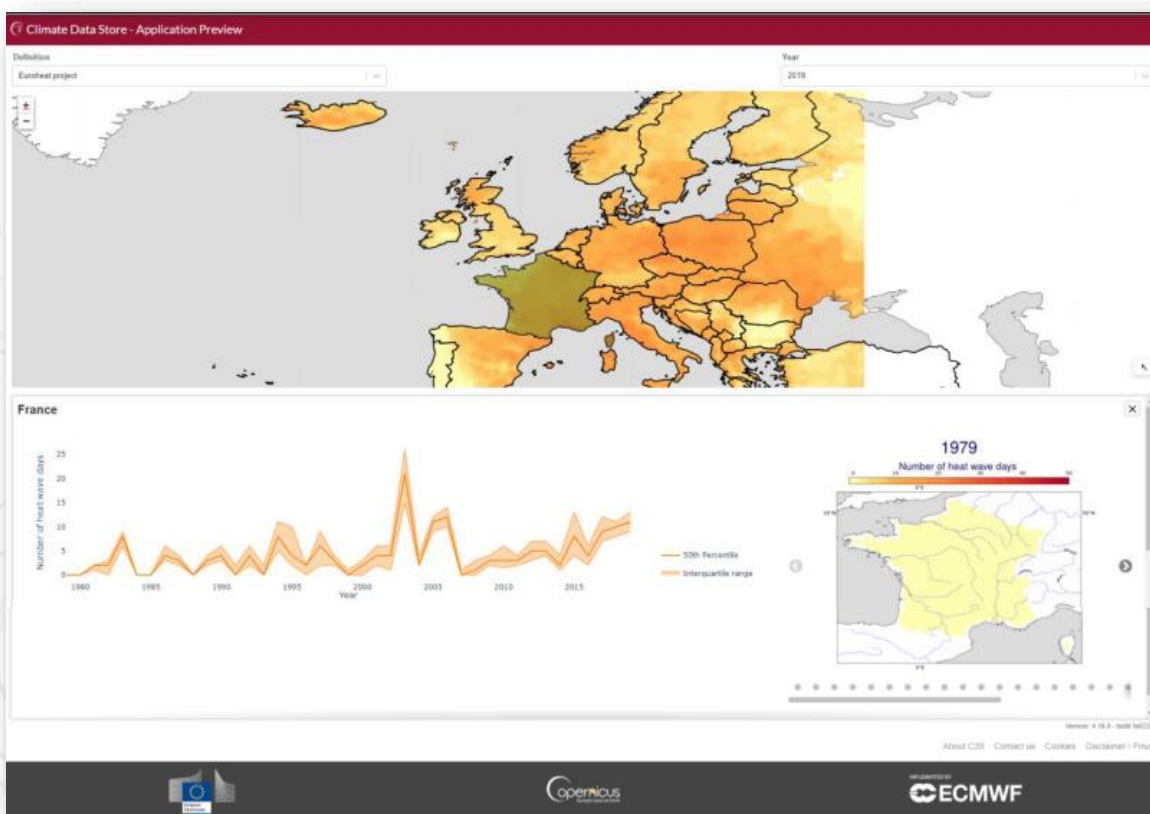
esa business incubation centre



HeatwAve

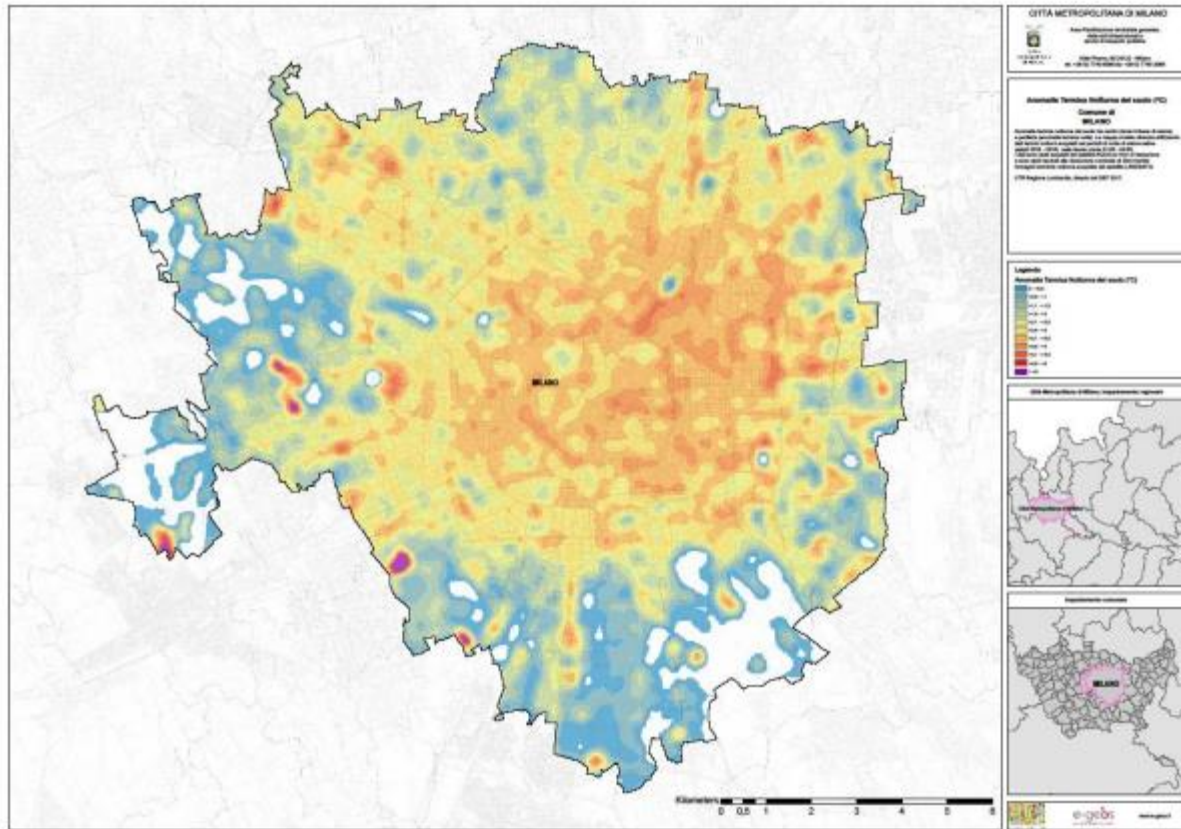
This application allows users to **explore the number of heat waves in European countries** based

- A **heatwave is a prolonged period of high temperature, relative to the region**. A number of qualifying definitions of heat waves are used in the climate and health communities. This application, and underlying dataset, presents the following heat-wave definitions
- **The time-slider allows users to see how the number of heat wave days has changed from 1979 to 2022**. The interactive map data has been averaged on to the NUTS level 3 administrative regions. By clicking on a country or region it is possible to view time-series of the number of heat wave days for that country/region. Zoom in/out to click on smaller/larger regions.



<https://business.esa.int/projects/heatwaive>

Heatwaves



URBAN HEATWAVES: ANALYSIS OF THE IMPACTS ON THE POPULATION USING SATELLITE DATA

- analyzing the phenomenon of **urban heat islands UHI**
- analyzing the **relationship between temperature and drought** in the agricultural areas of the Metropolitan City of **Milan** exploiting **satellite remote sensing technologies**

Air pollution

EO-based pollution-health risks profiling in the urban environment

'Health Surveillance Air Quality' Pilot (HSAQ), Earth observations for AQ (e.g. in situ monitoring stations, satellite retrievals, atmospheric numerical models, citizen observatories) are **fused with population and health data** towards **tailored, added value products that support public air quality and health assessments**, informed decision making as well as urban planning. **In particular:**

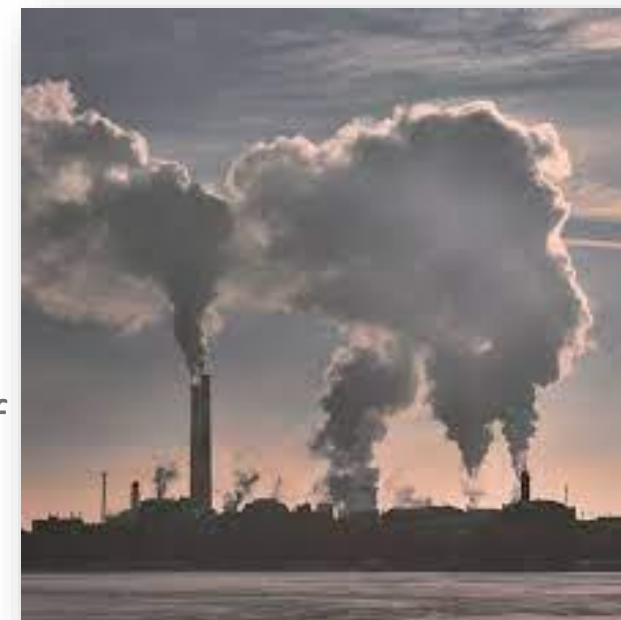
An Aggregated Risk Index for pollution impacts on health for several megacities of the UNESCO list.

Satellite-based observations are converted into NO₂ surface concentrations to support for the first time the **national AQ assessment of Finland** delivered to the European Environmental Agency (EEA).

Health risk due to exposure to air pollutant mixture (PM_{2.5}, PM₁₀, NO₂, O₃, SO₂) is assessed for **Munich** (at the zip postal level) and **other megacities of the globe**

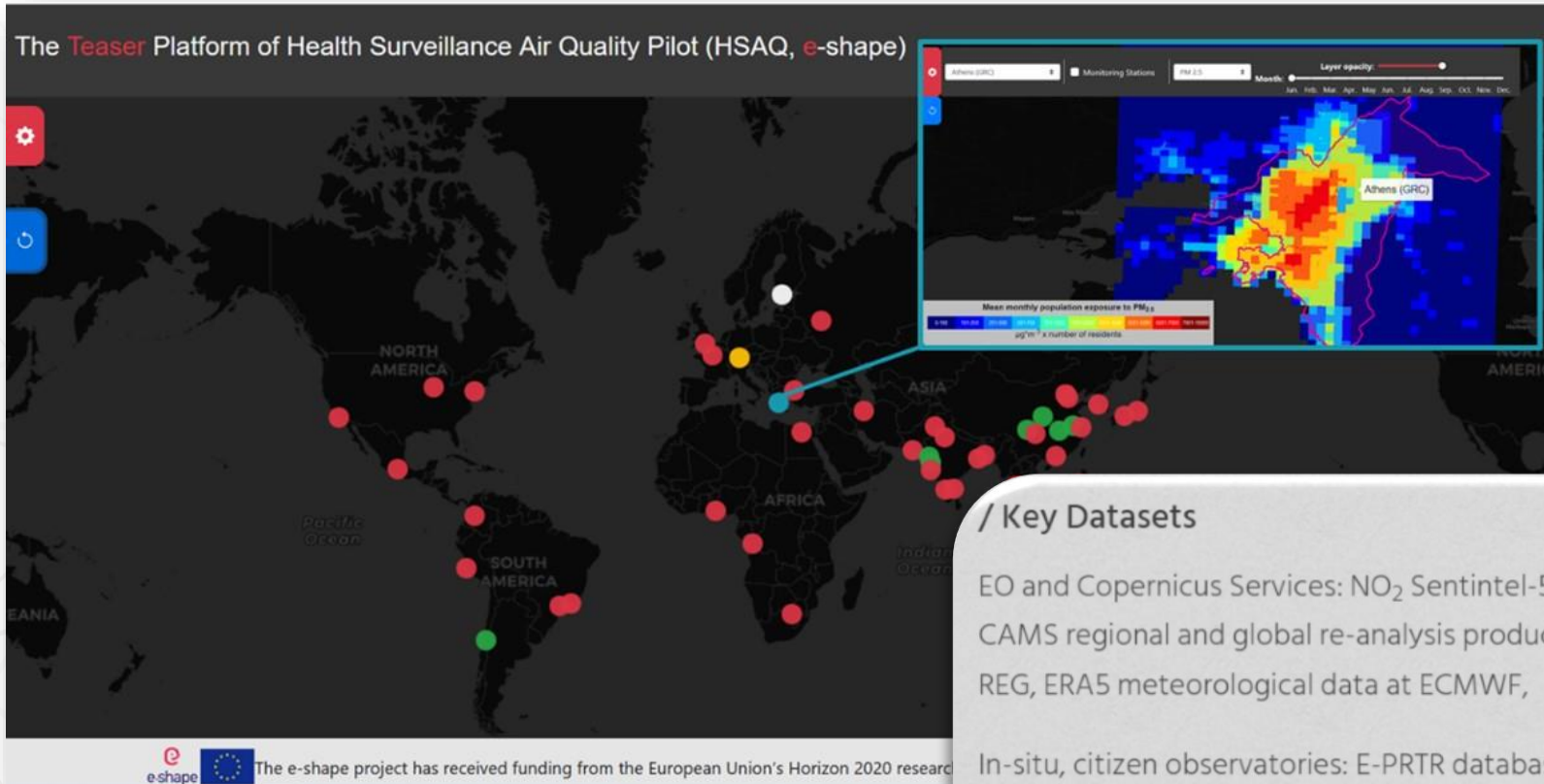
High resolution, population weighted PM_{2.5} concentration levels are assessed for the city of Bari

Dynamic mapping of population exposure to air pollution is estimated, with emphasis on the exposure for NO₂ and PM_{2.5}, in Athens.



<https://e-shape.eu/index.php/showcases/pilot2-3-eo-based-pollution-health-risks-profiling-in-the-urban-environment>

Air pollution



- An Aggregated Risk Index for pollution impacts on health is calculated, based on satellite data, for several megacities of the UNESCO list.

/ Key Datasets

EO and Copernicus Services: NO₂ Sentinel-5P, GHSL distribution of population, World Settlement Footprint, CAMS regional and global re-analysis products for AQ, European anthropogenic emission database CAMS-REG, ERA5 meteorological data at ECMWF,

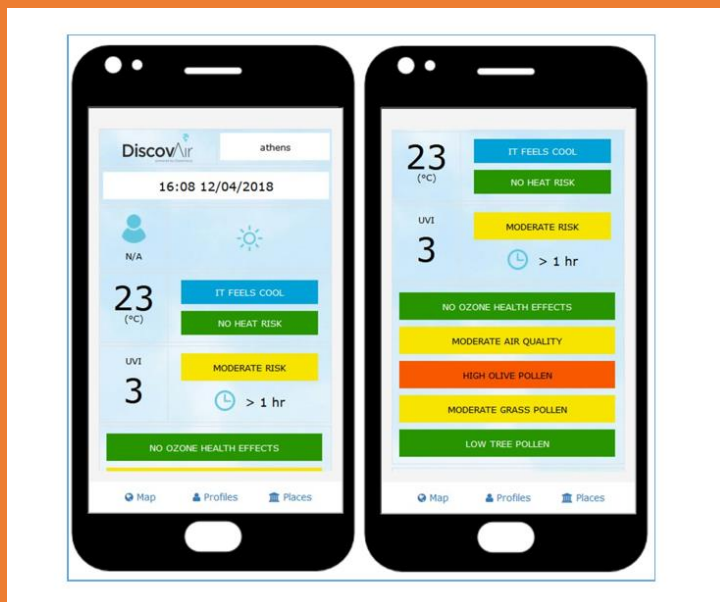
In-situ, citizen observatories: E-PRTR database of stationary emission sources, national regulatory monitoring networks of AQ (Greece, Finland, Germany), National RI PANACEA network of sensors (<https://air-quality.gr/>)

Numerical modeling datasets/services: POLYPHEMUS model product, GEOS-CHEM global AQ model predictions, EPISODE-CityChem CTM outputs

m-Health applications benefiting from Copernicus



DiscovAir: keeps residents and visitors in Greece and Cyprus

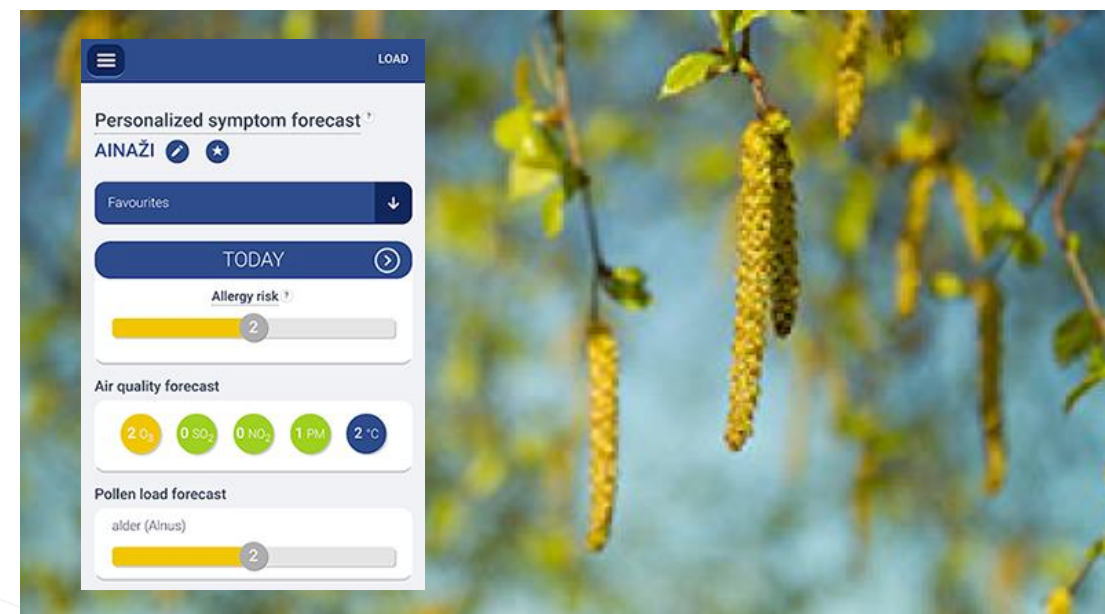


It recommends an **optimal time to visit** any given **location**, based on its **air quality**, **UV index**, **pollen**, and **temperature**.

Copernicus data: CAMS

Examples

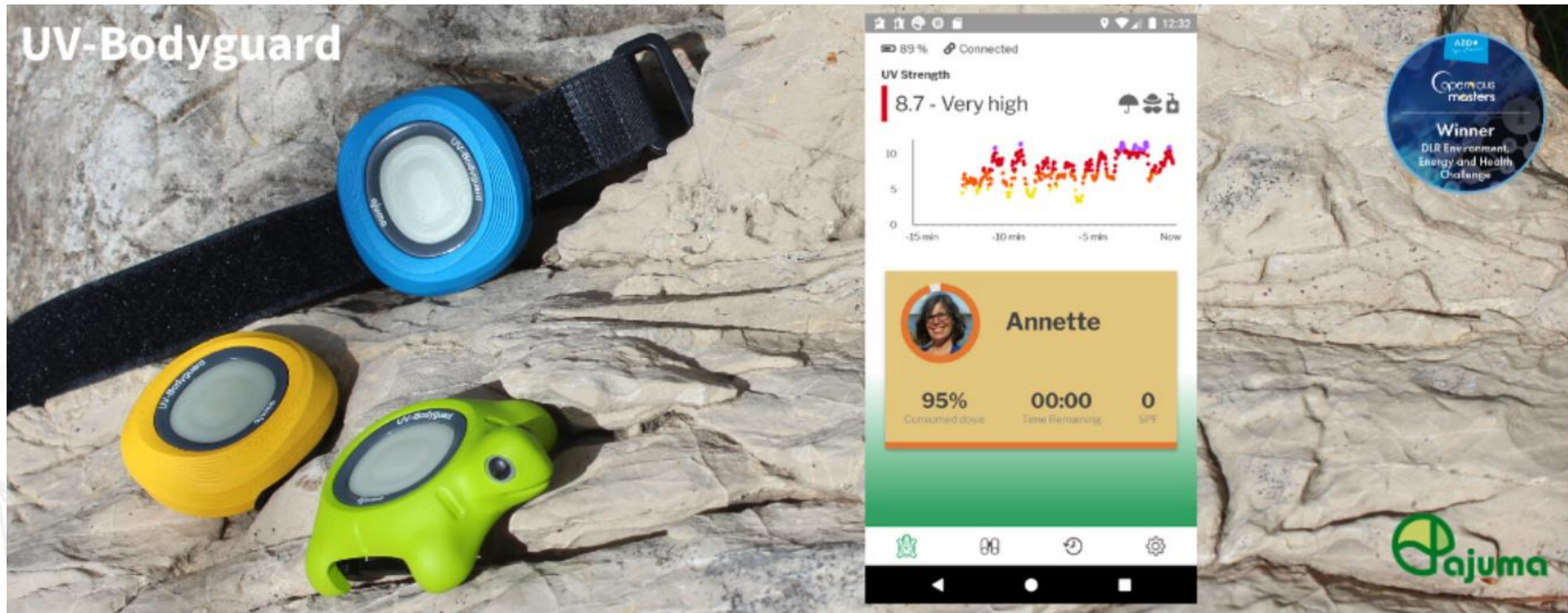
Pasyfo: Personal Allergy Symptom Forecasting System



Allergy symptoms forecast build especially for you
Possibility to compare your allergic complaints with
the concentrations of pollen in the air

Copernicus data: CAMS

UV-Bodyguard: Warns you before you get sunburned



It measures UV radiation, sends the data to your smartphone
and warns you on time
Copernicus data: Sentinel-5p and UV forecast of the CAMS

Galileo for Personal Applications & Wearables

Oculus Tracker: the world's first 25HZ GPS tracker for alpine ski racers



Using GNSS high precision to provide detailed analysis of your performance directly on your smartphone, tablet or PC

Example

Follow-Me by RunBlind: precision guidance solution based on sound augmented reality



Accurate & reliable positioning is the key enabler of a trustable and easy-to-use product dedicated to visually impaired peoples' outdoor activities

EUSPA Market Report presents GNSS and EO market trends and applications

- **The EO and GNSS Market Report** combines the market and application insights into a **single report** that provides global coverage of the EO and GNSS applications across multiple market segments
- **Selected market segments relevant to health**



Editor's Special: Innovative solutions for Health

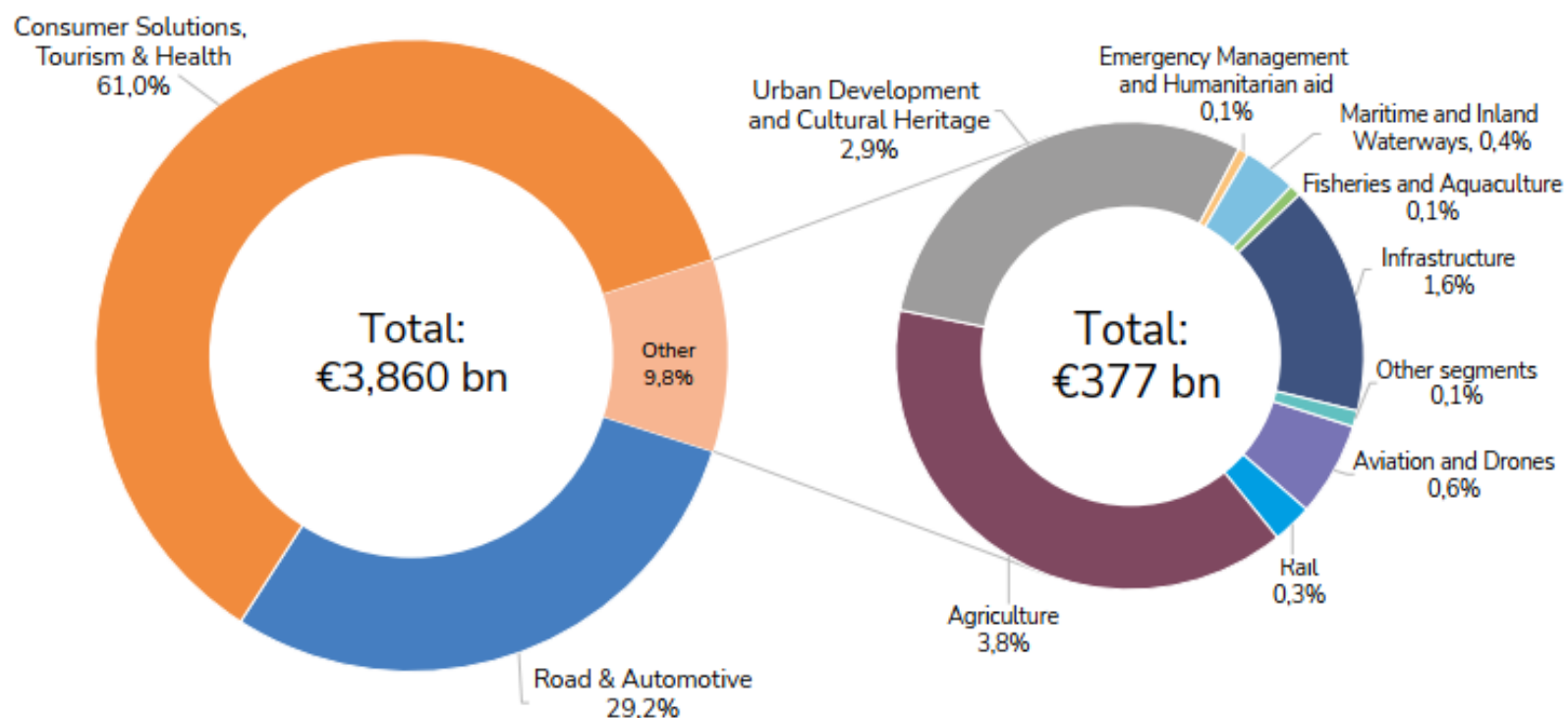


Get your free copy:

https://www.euspa.europa.eu/sites/default/files/uploads/euspa_market_report_2022.pdf

Consumer solutions dominate all other market segments in terms of cumulative revenue

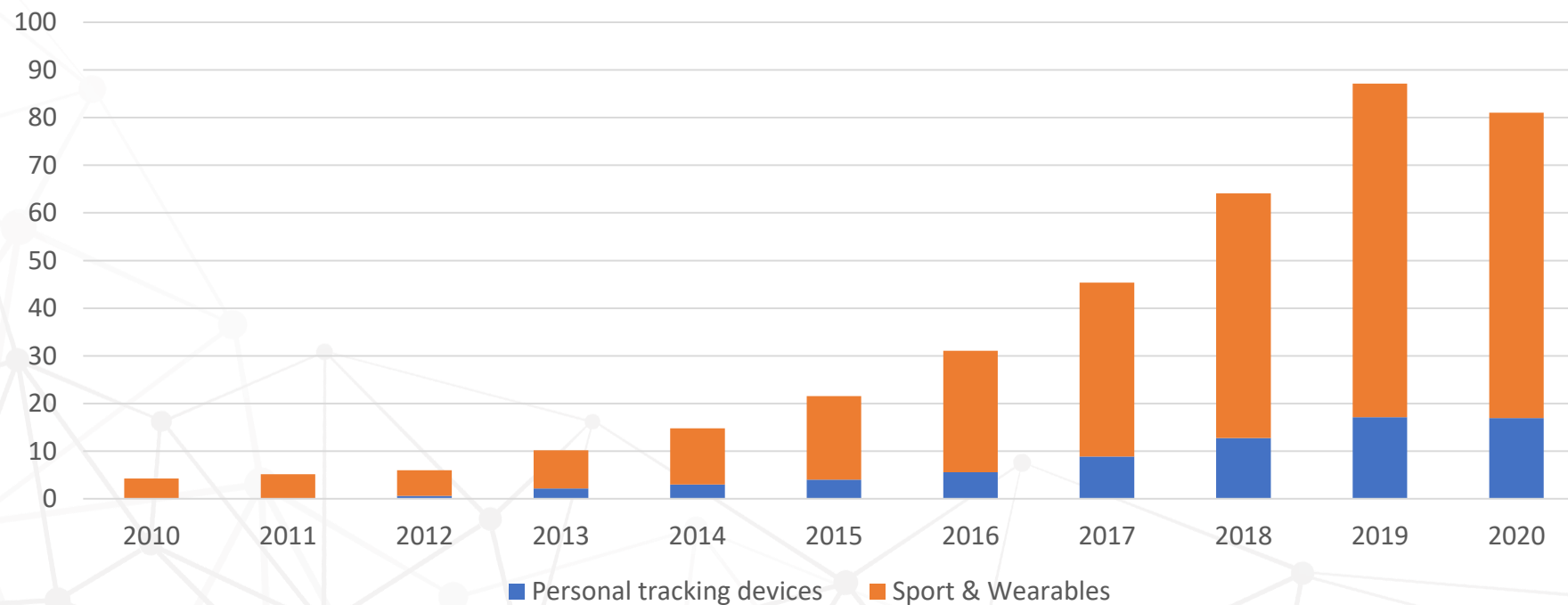
Cumulative revenue by segment 2021–2031



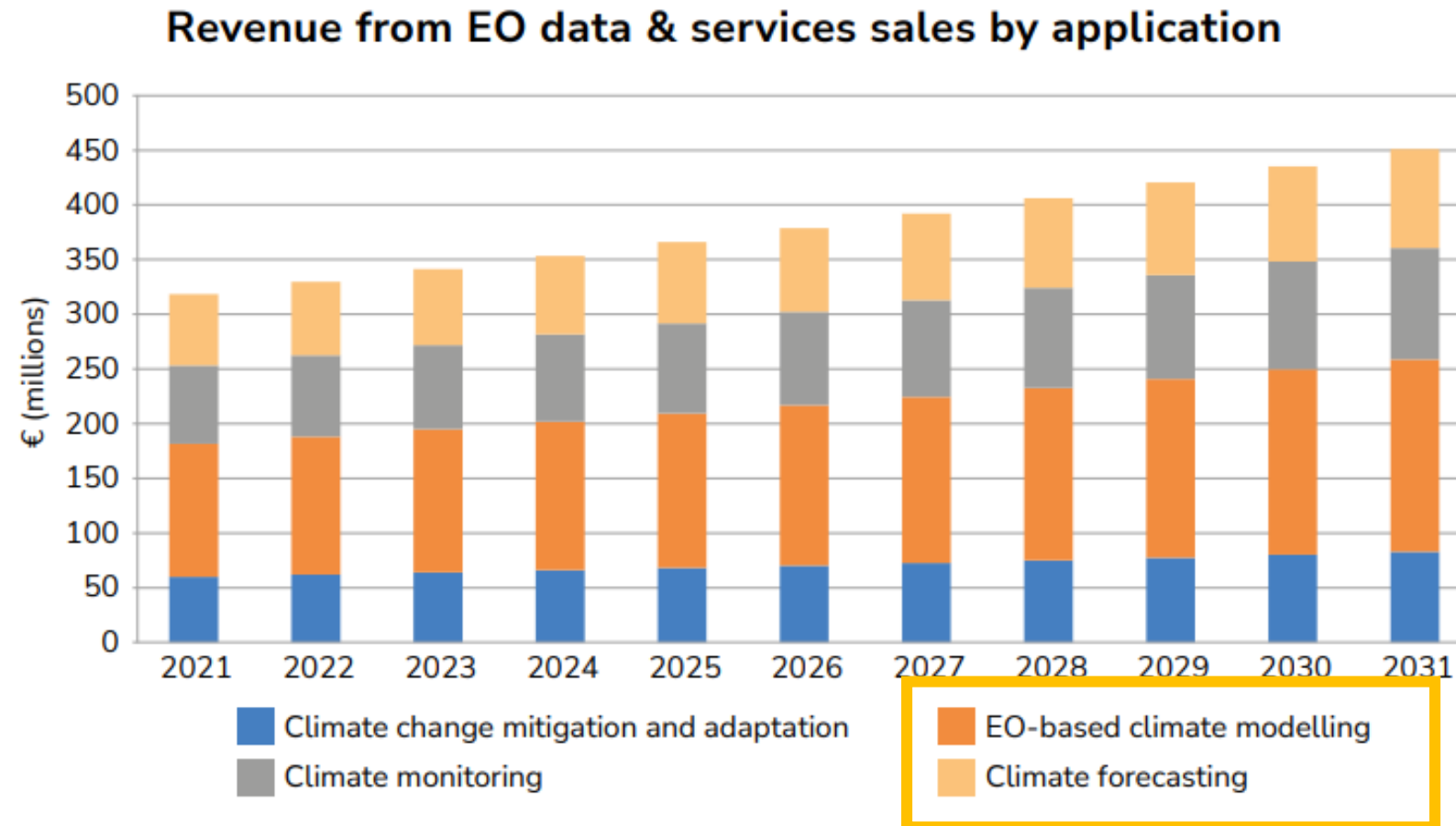
*Other segments includes Space, Forestry, Insurance and Finance, Energy and Raw Materials

The shipment of sports & wearables saw an annual increase of 30% between 2015 and 2020

Shipment of GNSS devices by type



EO-based climate modelling holds by far the largest market share in the segment, with the other applications



EUSPA funding tools stimulating innovation and fostering EU aerospace ecosystem, incl. start-ups & SMEs

CASSINI and Entrepreneurship

Foster EU's innovative spirit to deliver **applications and services**

Stimulate **innovation and entrepreneurship** in the aerospace ecosystem



Horizon Europe

Foster adoption of Galileo, EGNOS and Copernicus via **application development**

Support the integration of services into devices and their **commercialisation**



Galileo/EGNOS research (Fundamental Elements)

Foster the development of innovative Galileo and EGNOS-enabled **receivers, antennas and chipsets**

Increase **EU industry competitiveness**



Adoption grants

Foster **EGNOS operational implementation** for civil aviation

Maximise EGNOS adoption all over EU



Support for start-ups under Cassini – the EU programme



www.cassini.eu

Develop your solution

- Hackathons
- Competitions
- Development Programme
- Connection to accelerators/incubators

Get advice

- Technical advice
- Business advice

Get funding

- Very early stage – EBAN, crowdfunding
- Venture capitals
- EIC Accelerator
- Horizon Europe, Fundamental Elements
- European Investment Bank
- Investor matchmaking

Get connected

- Contacts with industry
- Networking events
- Dedicated promotion

New myEUspace competition just launched as part of CASSINI



Do you have...



a **theoretical idea** with a high market potential?



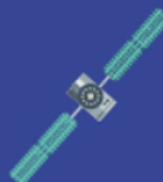
a **prototype** that you want to bring in the market?



a **product** and you want to scale-up your business?

Are you...

an **entrepreneur, start-up, scale-up** or **university student** coming from **EU Member States**, Norway, Switzerland or Iceland?



Apply now!

We are looking for **the best commercial solutions** (mobile apps, wearables, robotics etc.) using **EU space data** and their synergies



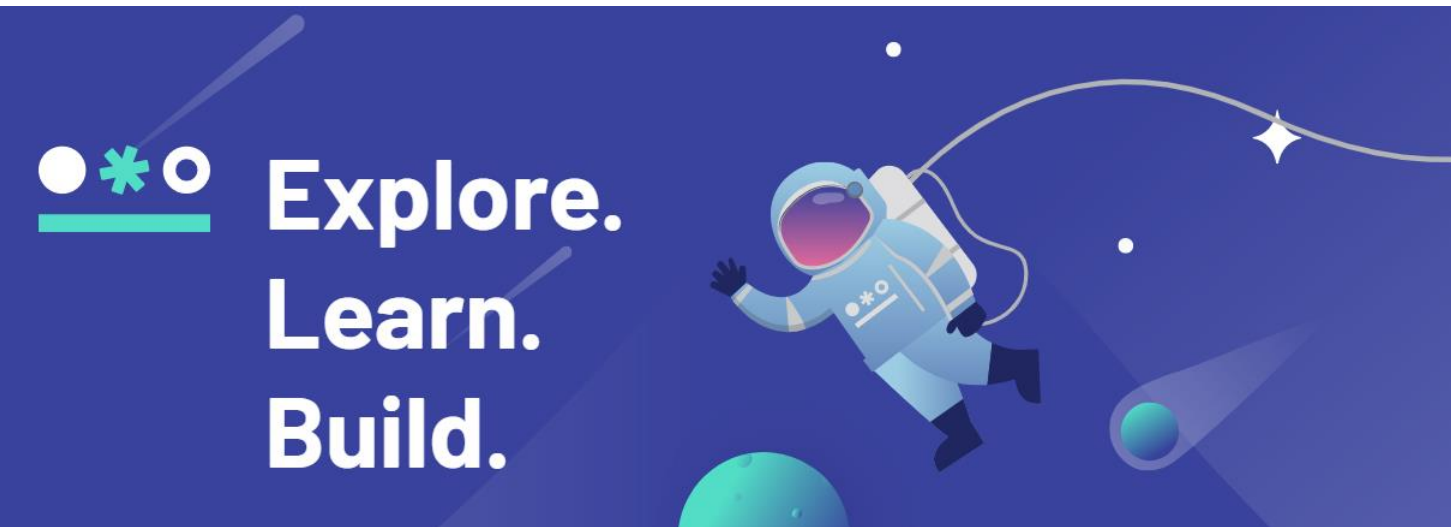
€ 1.000.000
PRIZE POOL



30
AWARDS

Learn more about the competition and the timeline here:
<https://www.euspa.europa.eu/myeuspacecompetition>

EUSPA Space Academy: Lift off to a successful space business



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<https://www.euspa.europa.eu/spaceacademy/>



Trainings



Workshops



1-to-1 mentoring



Office Hours



EU space
data and signals



Team &
resources



Customer
& sales



Legal



Product



Business



Finance



EUSPA Horizon Europe call of 2022 (HORIZON-EUSPA-2022-SPACE)



**To be opened soon with the
deadline: 16 February 2023**

Type of Action	Topic	Indicative budget (EUR mln)	Funding rate
IA	EGNSS applications for Smart mobility	9.5	70% (except for non-profit legal entities, where a rate of 100% applies)
PCP	Public sector as Galileo and/or Copernicus user	5.2	100 %
IA	Copernicus downstream applications and the European Data Economy	9.6	70% (except for non-profit legal entities, where a rate of 100% applies)
RIA	Large-scale Copernicus data uptake with AI and HPC	9.6	100%
RIA	Designing space-based downstream applications with international partners	5,1	100%
RIA	GOVSATCOM Service developments and demonstrations	9,1	100%
TOTAL budget:		48,1	



Activities to produce plans and arrangements or **designs for new**, altered or **improved products**, processes or services.



Activities to **establish new knowledge** or to **explore the feasibility** of a new or improved technology, product, process, service or solution.



Activities that aim to help a buyers' group to strengthen the public procurement of research, development, validation and, possibly, the first deployment of new solutions

* dates are tentative and subject to change

User Consultation Platform 2022

The UCP is engaging with **other user communities**, industries, service providers and R&D, bringing together **expertise** and **insights** from different applications, sharing experiences, and strengthening an EU network of **innovators** by encouraging **cooperation** across broad disciplines



Time for discussion and Q&A





Linking space to user needs

Get in touch with us

www.euspa.europa.eu



The European Union Agency for the Space Programme is hiring!

Apply today and help shape the future of #EUSpace!