

# Rapid Action for Citizens with EO

Space4Critical Infrastructures Webinar 2023

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# Rapid Action Initiative

- International cooperation on EO, started in 2020, triggered by Covid-19 crisis
- Open-Source Dashboards enabled by Euro Data Cube, and interoperable inter-Agency Technologies. Two instances deployed:

<https://eodashboard.org>



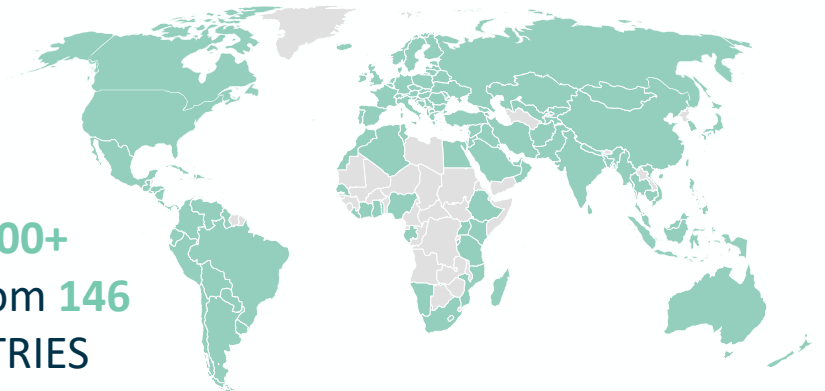
<https://race.esa.int>



- Rapid Innovation transferrable to applications
- Showcases the value of EO to inform on societal relevant topics: economy, agriculture, environment
- Serves as testbed for Open Innovation, with participation of European Industry and citizens
- Achieved global presence (reached 180.000+ people in 145 countries)



186.500+  
VISITS from 146  
COUNTRIES





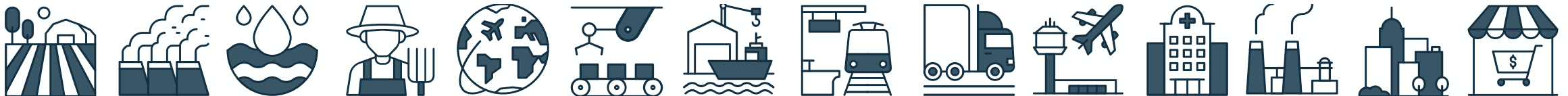
RACE is the place where people **discover the value of Earth Observation data for society**, unlocked by innovative methods; it is where where curious people **get inspired to explore and use EO data**, and are **offered the right instruments** in their hands and the freedom to be creative and **try out generating new value from EO**.

Data & Information  
Discovery Tools

Innovative use of  
EO for society

EO Cloud Platform  
Technologies

Community  
Contributed

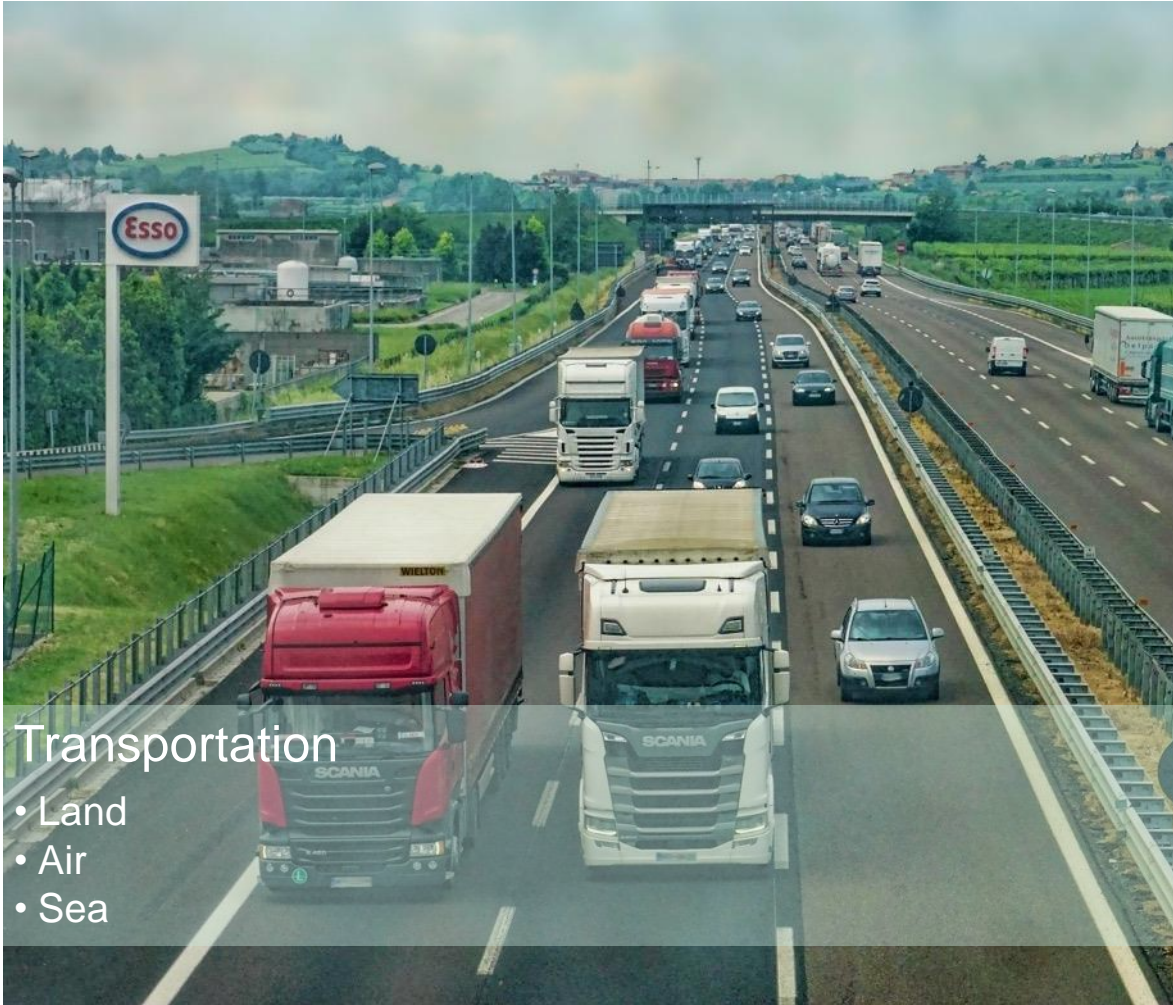


## Supply chain indicators



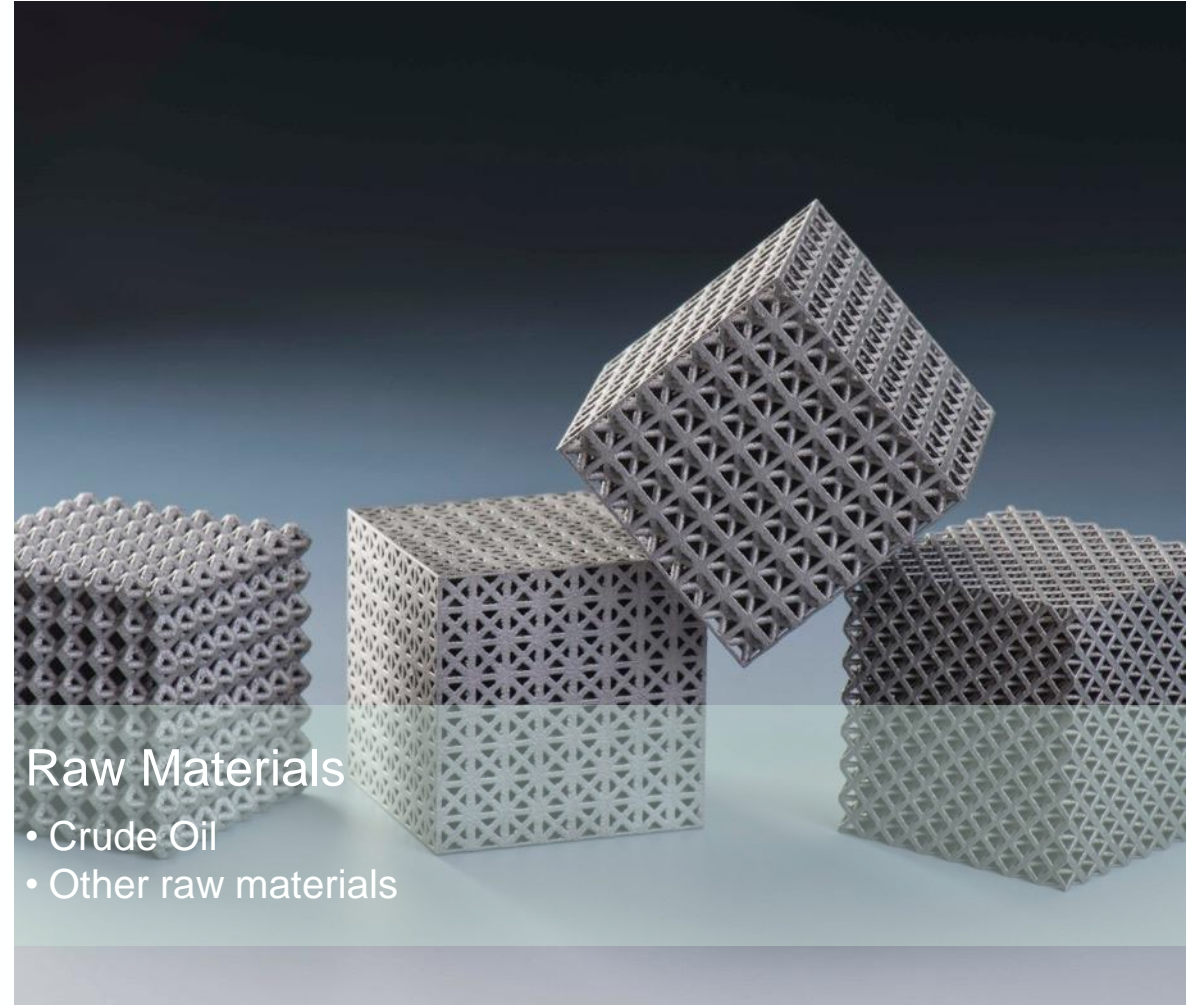
## Environmental and climatic indicators





## Transportation

- Land
- Air
- Sea

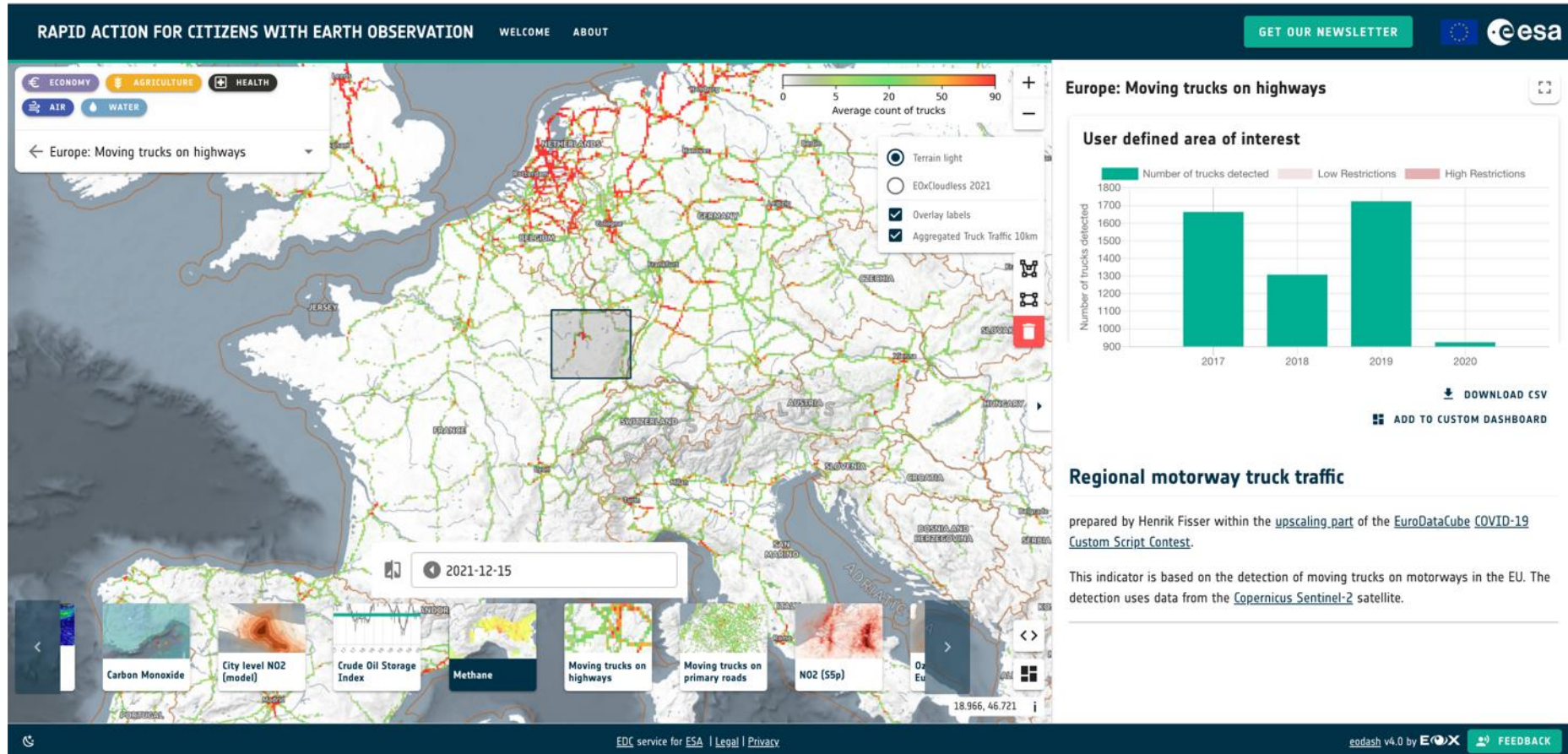


## Raw Materials

- Crude Oil
- Other raw materials

# Supply Chain Indicators (1/4)

## Anomalies in Land Transport trends

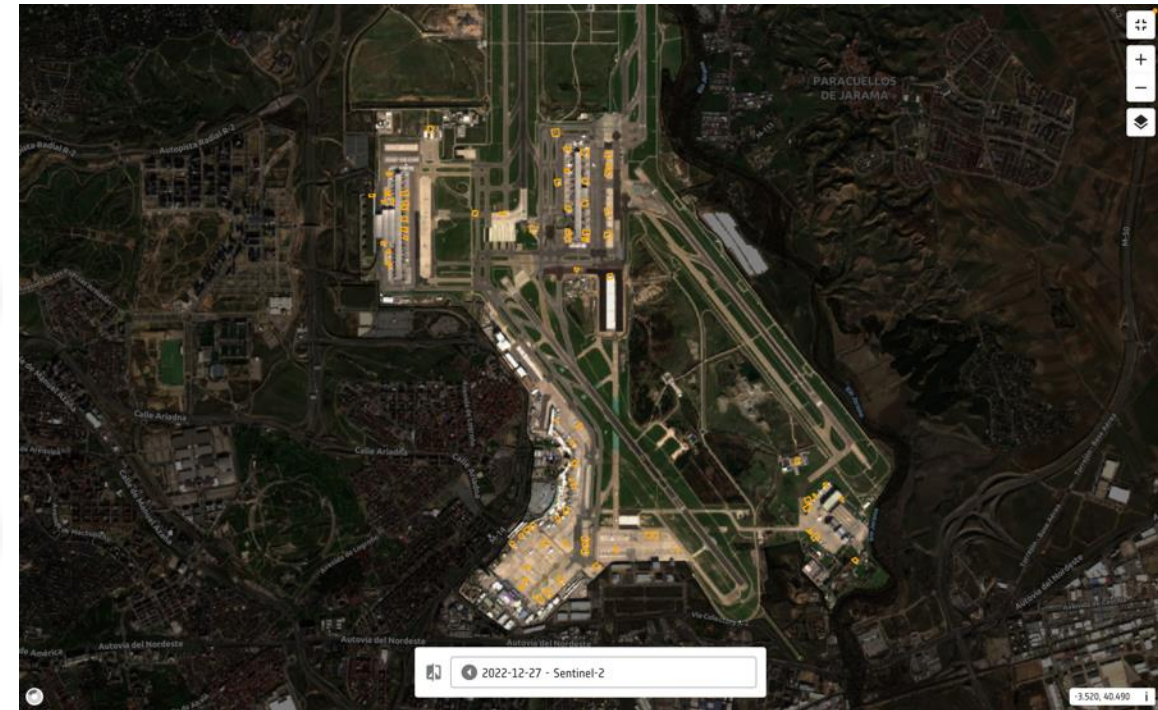
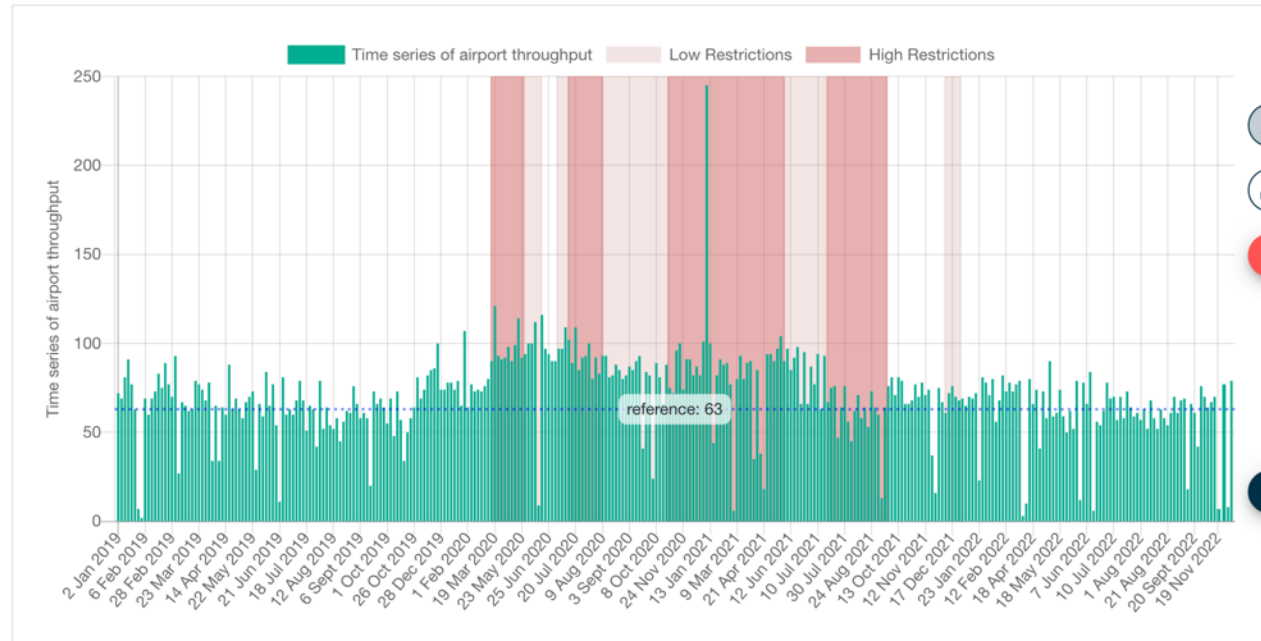


Analytics of long-term trends in land transportation. Example: detected moving trucks in Sentinel-2 imagery, on motorways and national roads.

# Supply Chain Indicators (2/4)

## Anomalies in Transportation Hubs - Airports

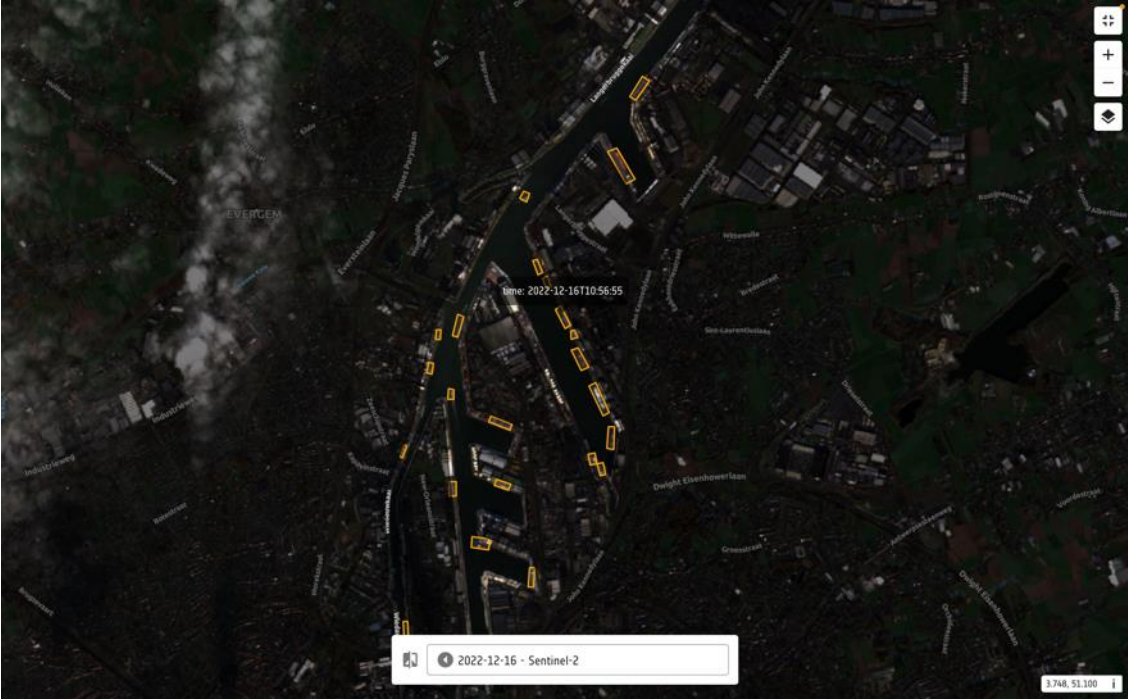
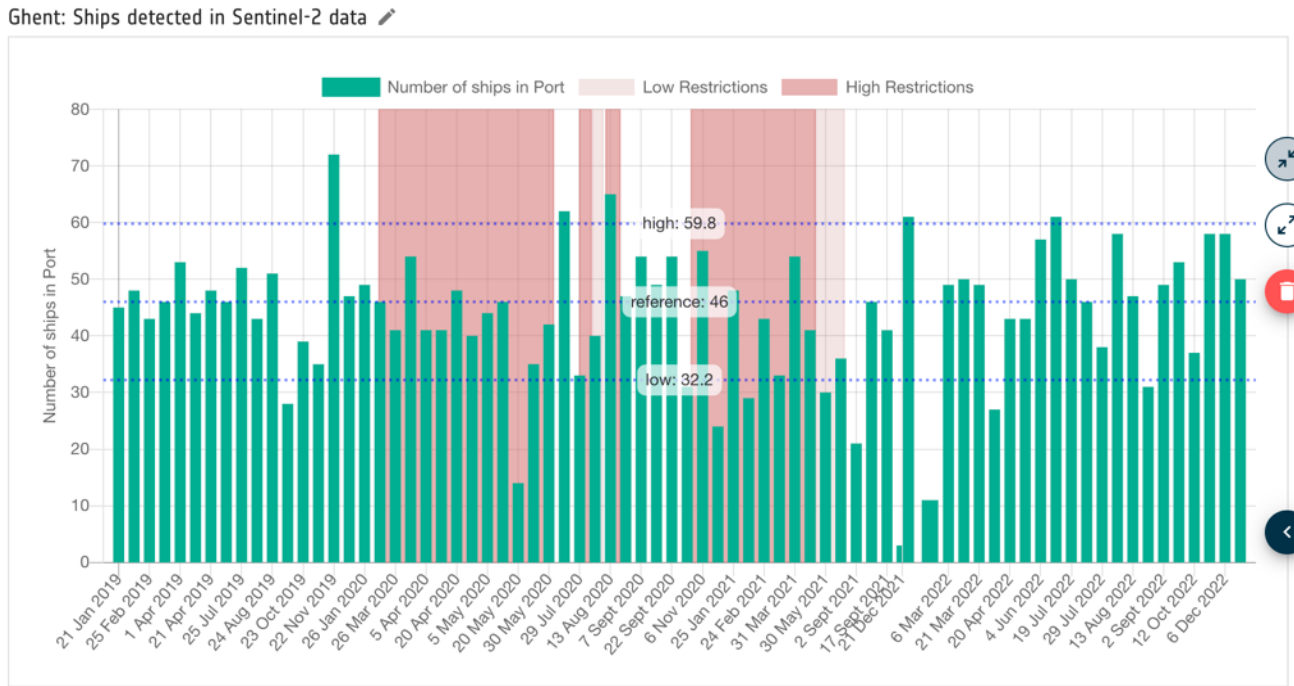
Madrid: Parked planes detected on Sentinel-2 data



Detections of anomalies in activities at international transport hubs. Example: detected parked planes in Sentinel-2 imagery using Artificial Intelligence. Analytics over long-term data to point out anomalies, e.g. larger number of parked planes during Covid-19 restrictions.

# Supply Chain Indicators (3/4)

## Anomalies at logistic Hubs - Ports

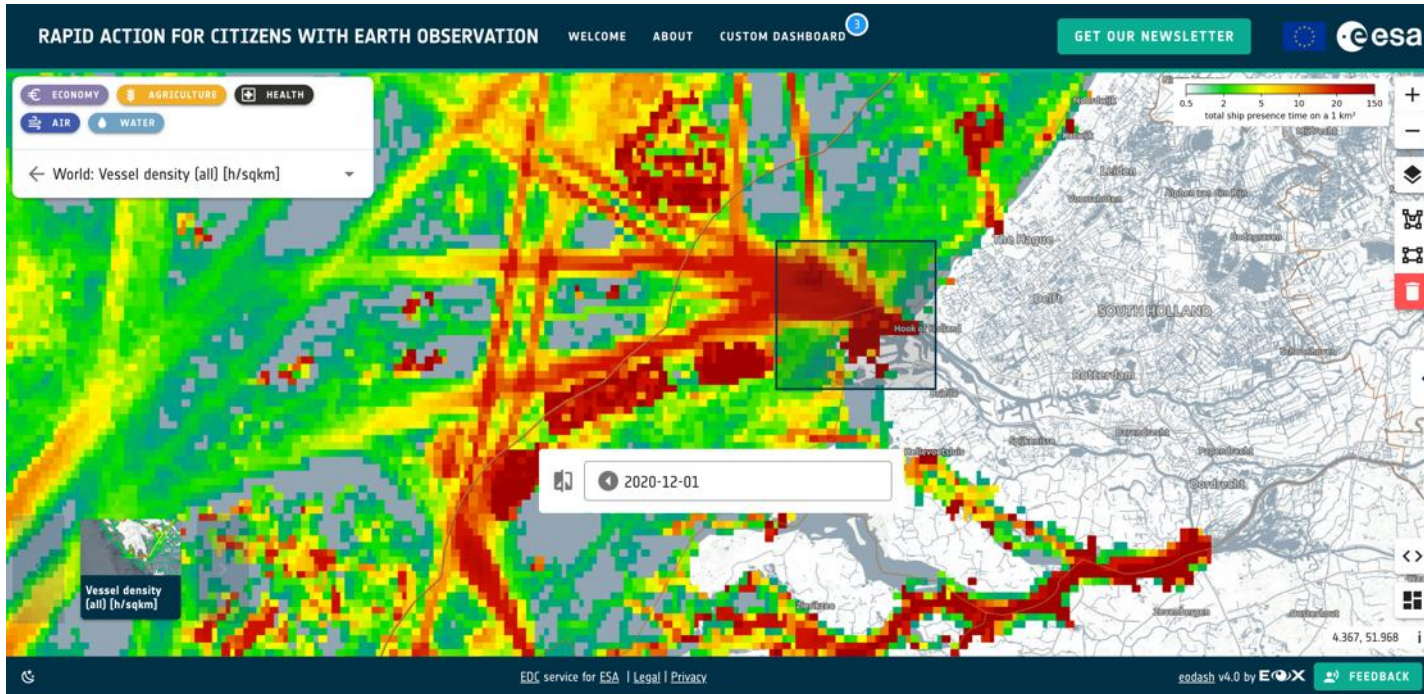


Detections of anomalies in levels of activity at logistic hubs such as international ports. Example: detected ships in Sentinel-2 imagery using Artificial Intelligence. Analytics over long-term data are performed to point out anomalies

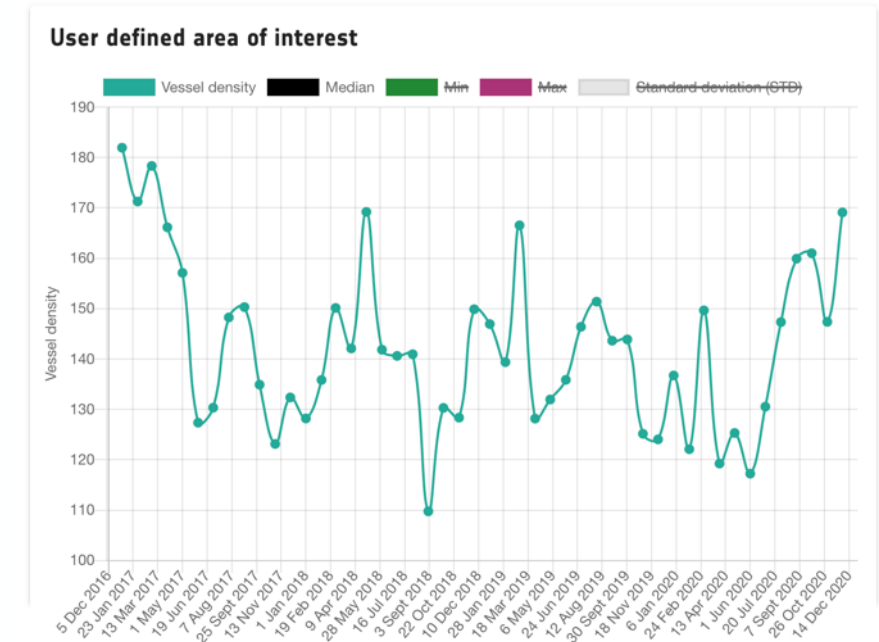


# Supply Chain Indicators (3/4)

## Anomalies at logistic Hubs – Ports (continued)



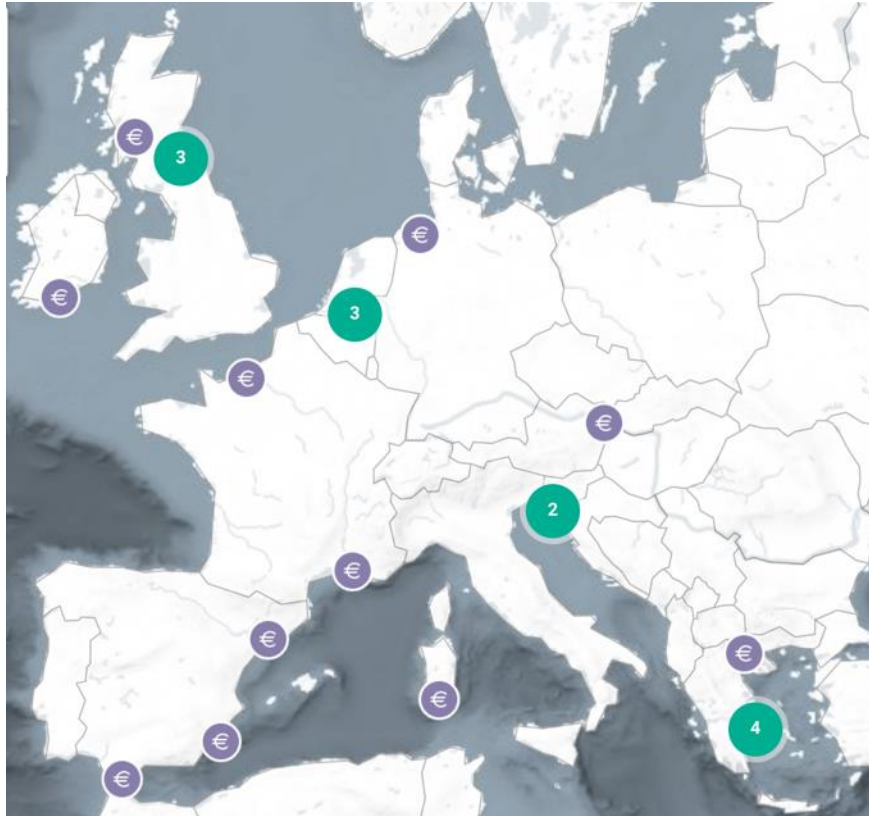
World: Vessel density (all) [h/sqkm]



EO data is complemented by other sources, such as AIS. Here on-the-fly analytics are computed over an user-defined area of interest from vessel density maps provided by EMODNET.

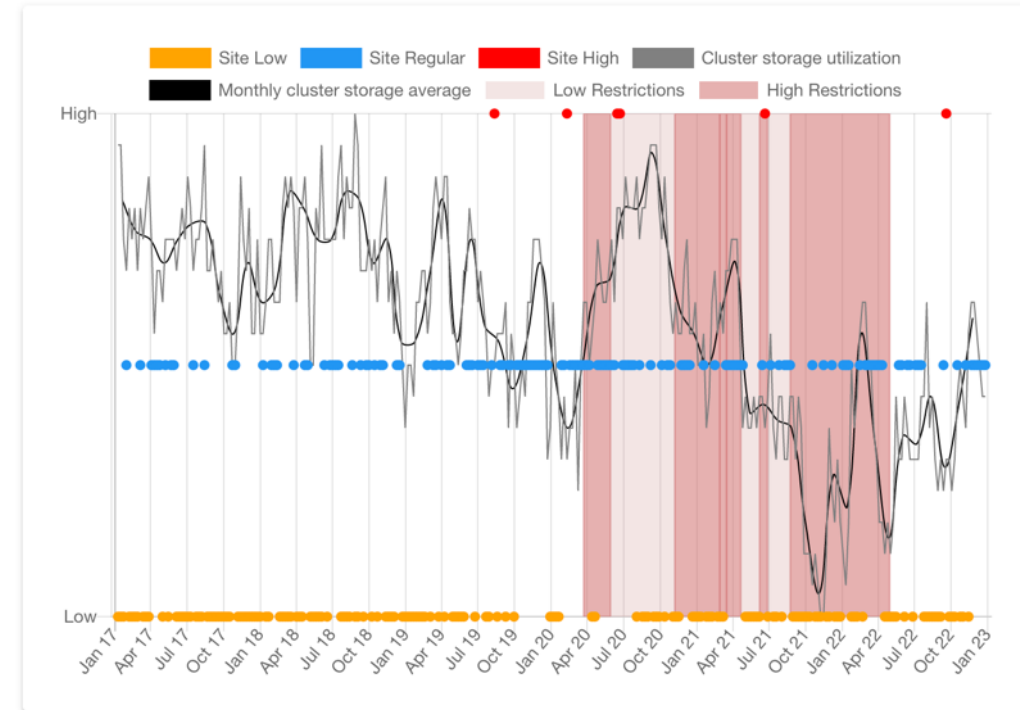
# Supply Chain Indicators (4/4)

## Anomalies at hubs for storage and distribution of raw materials



### Pachi: Crude Oil Storage Index

Level of oil in tanks based on SAR and optical data



Crude oil stock variation based on floating-roof tanks observed in Synthetic Aperture Radar and Optical data, provided by OILX. Four main European Hubs are monitored. In this example we show the reduction in crude oil availability observed for South Europe Cluster and the Low level of oil in tanks at Pachi during 2021- 2022.



Extreme Precipitation



Wildfires



Water Quality



Air Pollution



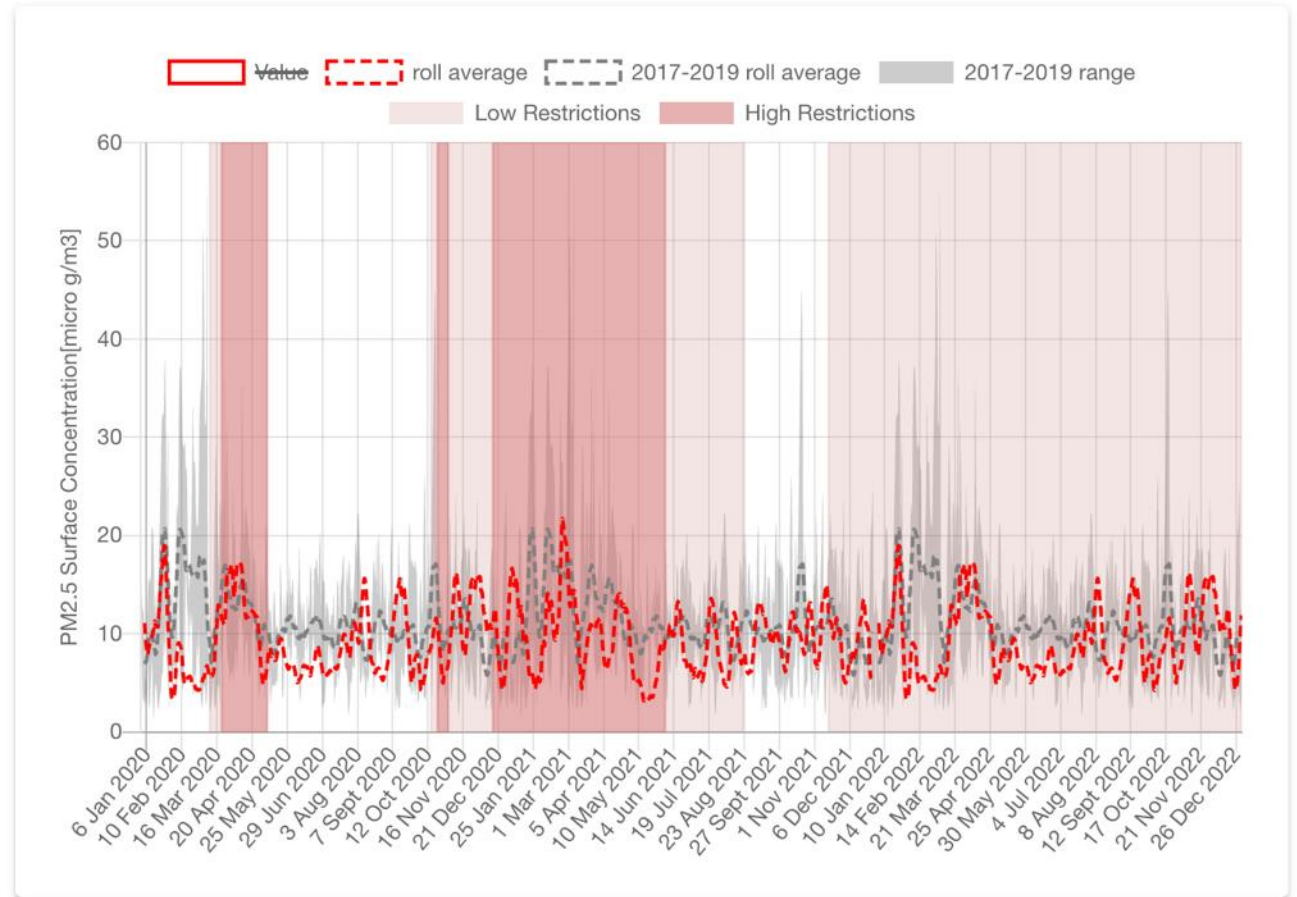
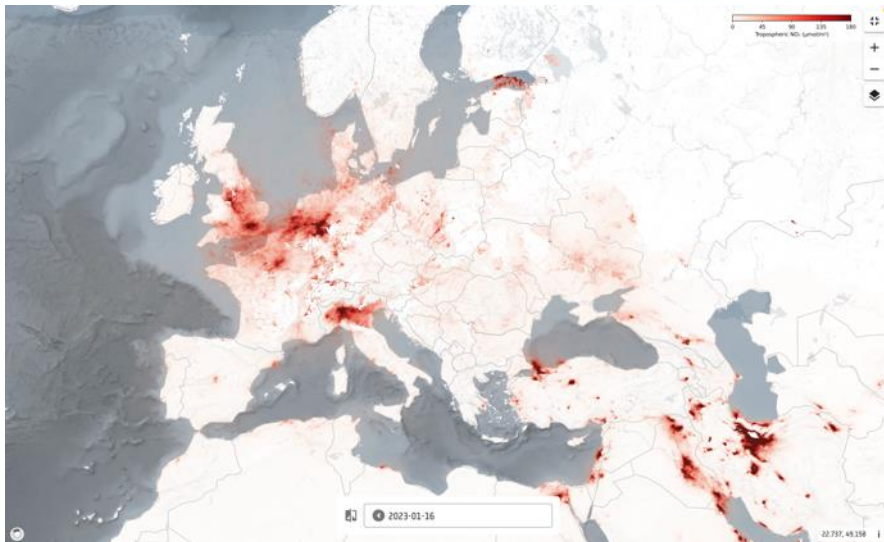
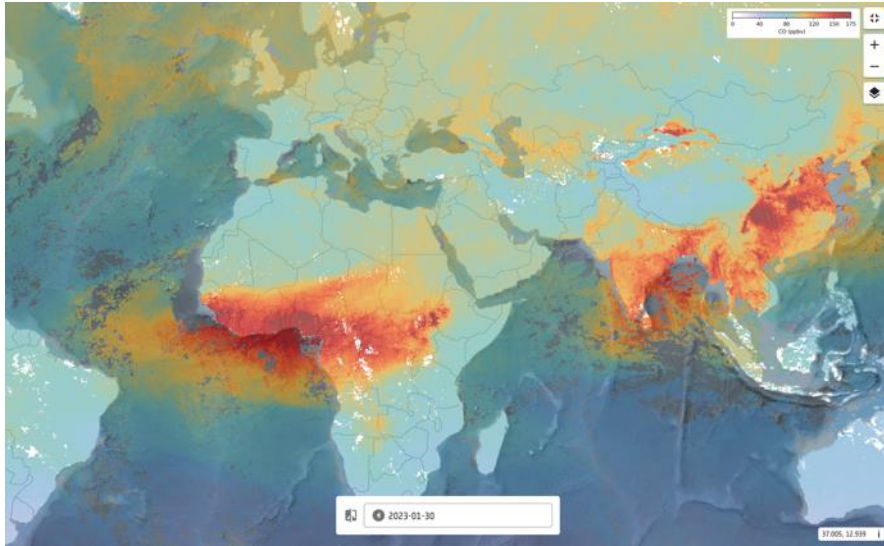
## Checklists to assess vulnerabilities in health care facilities in the context of climate change

The WHO publication *Checklists to Assess vulnerabilities in Health Care Facilities in the Context of Climate Change*, along with other checklists, is available on the WHO website at [www.who.int/publications/i/item/checklists-vulnerabilities-health-care-facilities-climate-change](http://www.who.int/publications/i/item/checklists-vulnerabilities-health-care-facilities-climate-change).

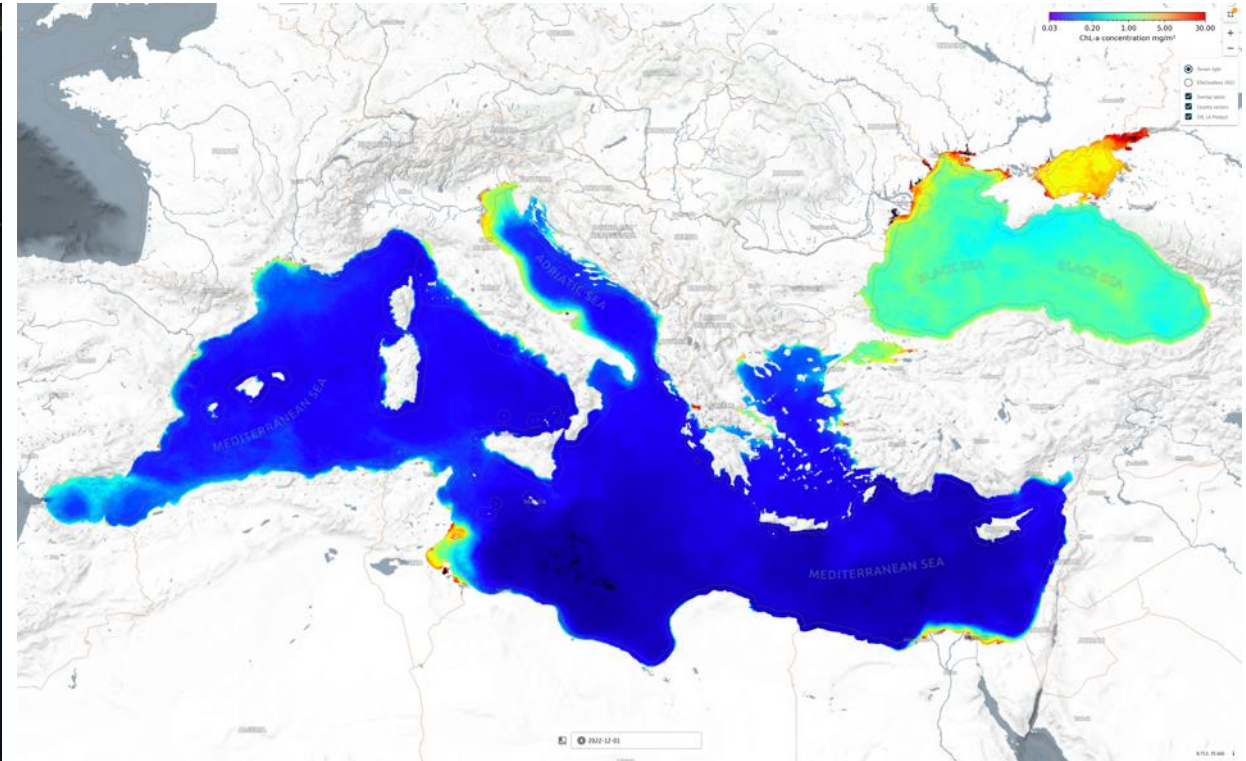
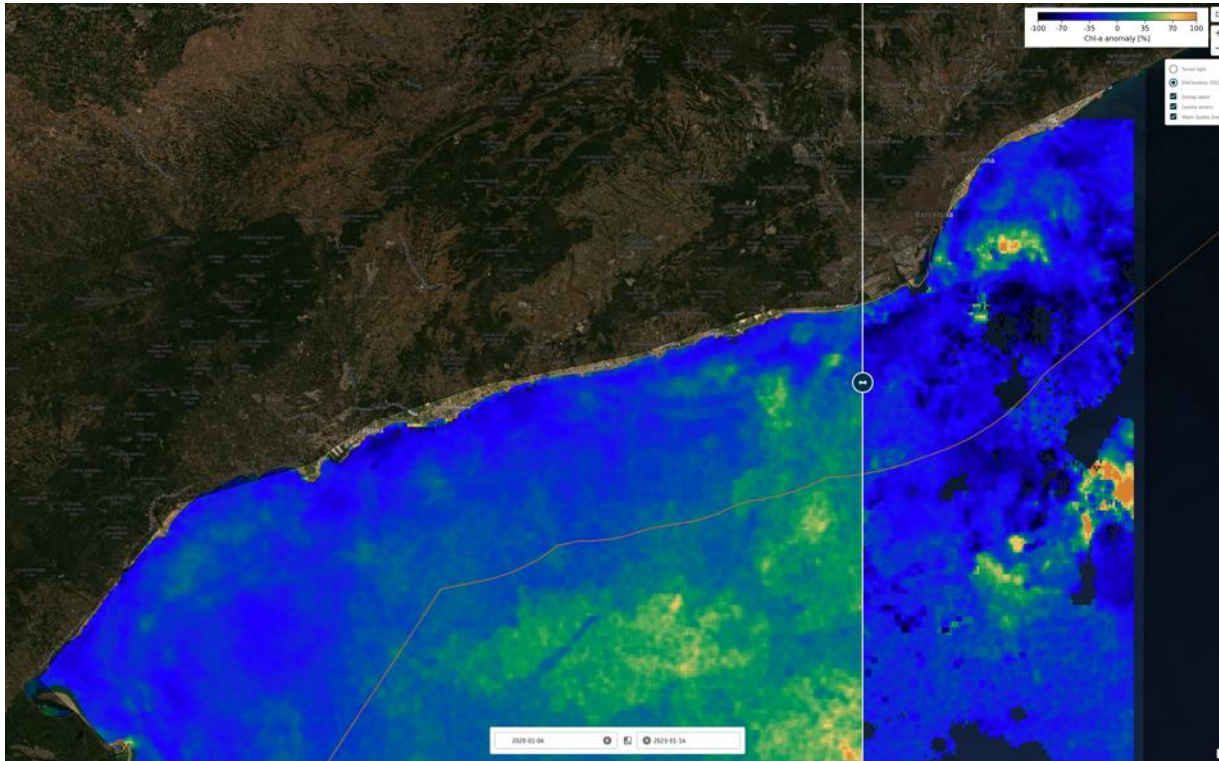
### Checklist for assessing climate hazards

CLIMATE HAZARD TYPE	IS HAZARD OR EXPOSURE PRESENT? Yes/No	ARE THESE AREAS IMPACTED?			
		Health workforce	WASH and health care waste	Energy services	Infrastructure, technologies, products, processes
Flood		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storm		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sea-level rise		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heatwave		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cold wave		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Environmental and Climate Indicators (1/2)



Greenhouse gases and air pollutants at global scale, with on-the-fly analytics (e.g. NO<sub>2</sub>, SO<sub>2</sub>, CH<sub>4</sub>, CO) from Sentinel-5p, complemented by data from Copernicus Services (CAMS)



Water quality indicators like chlorophyll-a and total suspended matter at 250m resolution from Sentinel-2 and Sentinel-3 (2020-2023), complemented by 1km resolution multi-sensor data from CMEMS (1997-2021)

# RACE Open Innovation Process

- EODASH open-source library
  - Open Jupyter Notebooks



- Access to Euro Data Cube via the Network of Resources  
<https://nor-discover.cloudeo.group/>

Open-Source Project

Free and Open Data

- Copernicus Sentinels
- Copernicus Services
- Indicators free to download from RACE, STAC API in development

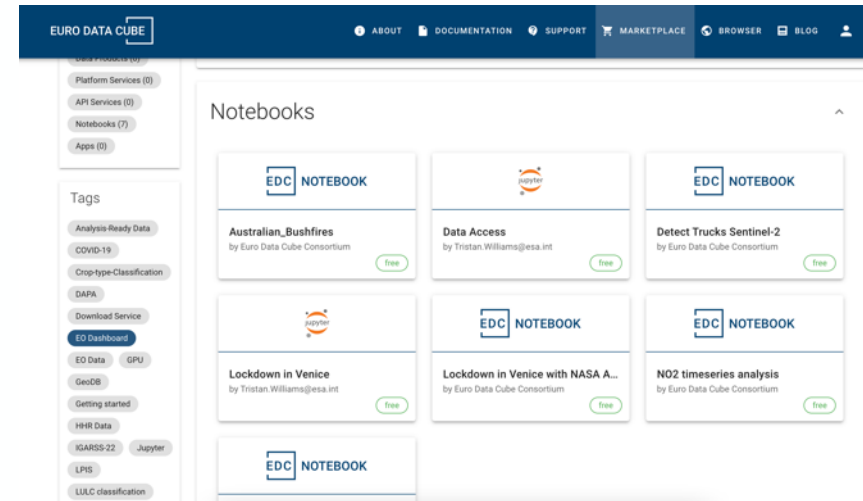
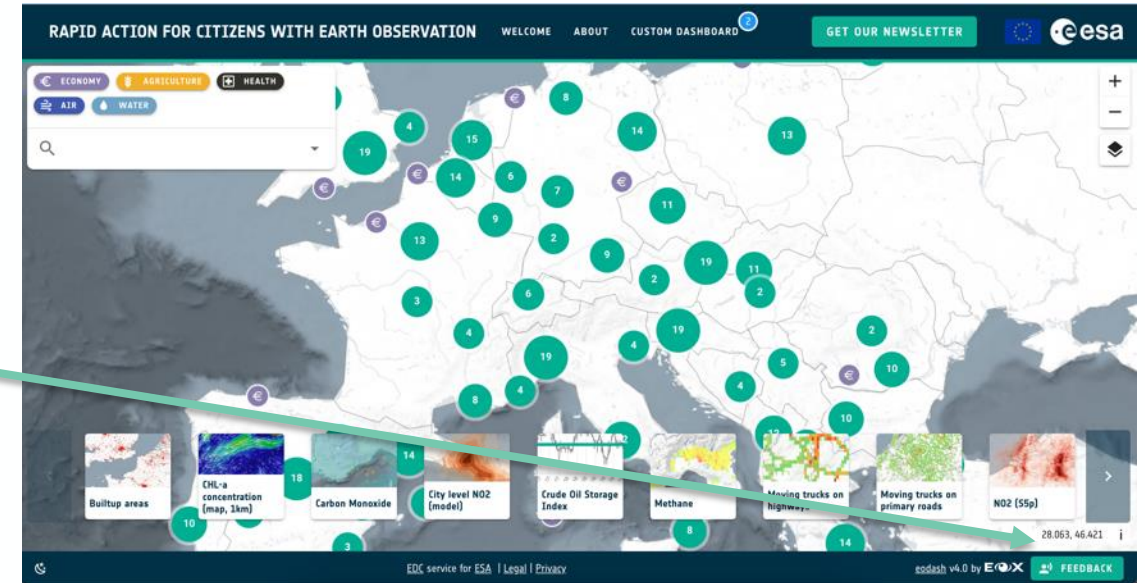
Sponsored Access to Infrastructure

Community Contributed

- ESA Open Call Innovation
- RACE Challenges
- Free tutorials and training (IGARSS 2023, FOSS4G 2023)

# Opportunities to participate to RACE

- Request a feature/data, report a bug:
  - <https://github.com/eurodatacube/eodash>
  - Feedback form
- Participate to trainings / workshops:
  - IGARSS 2023, FOSS4G 2023
- Try out the Jupyter Notebooks: <https://eurodatacube.com>



# From R&D towards decision support

- RACE & EODASH open-source library enabled the development of the Green Transition Information Factories
- GTIF-AT public “beta release” completed 14 February 2023: <https://gtif.esa.int>

## Energy Transition Tools



## Sustainable Cities Tools

