



Land Monitoring

Environment Information System (prototype)

AI and Earth Observation Workshop, Brussels
Matteo Mattiuzzi – European Environment
Agency

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Copernicus and GEO Data

The current landscape:

- 6 Copernicus Services, 500+ products
- Multiple data backends and frontends
- Different catalogs and data access services
- **Extracting information from EO and EO-derived products requires highly trained expertise.**



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EIS - Environment Information System





Imagine...

A conversational AI platform that makes **all Copernicus data and analytical capabilities** accessible through natural language.

- *“Show me vegetation health in southern Spain last summer”*
- *“What data exists for coastal erosion monitoring?”*
- *“Compare snow cover in the Alps - 2020 vs 2025”*
- *“What is the flooding risk in my current location?”*

EIS - Environment Information System

EIS does:

-  Understands the user's intent
-  Helps clarifying the question if needed
-  Connects to data, and runs applications to deliver the reply
-  Cites sources & documentation



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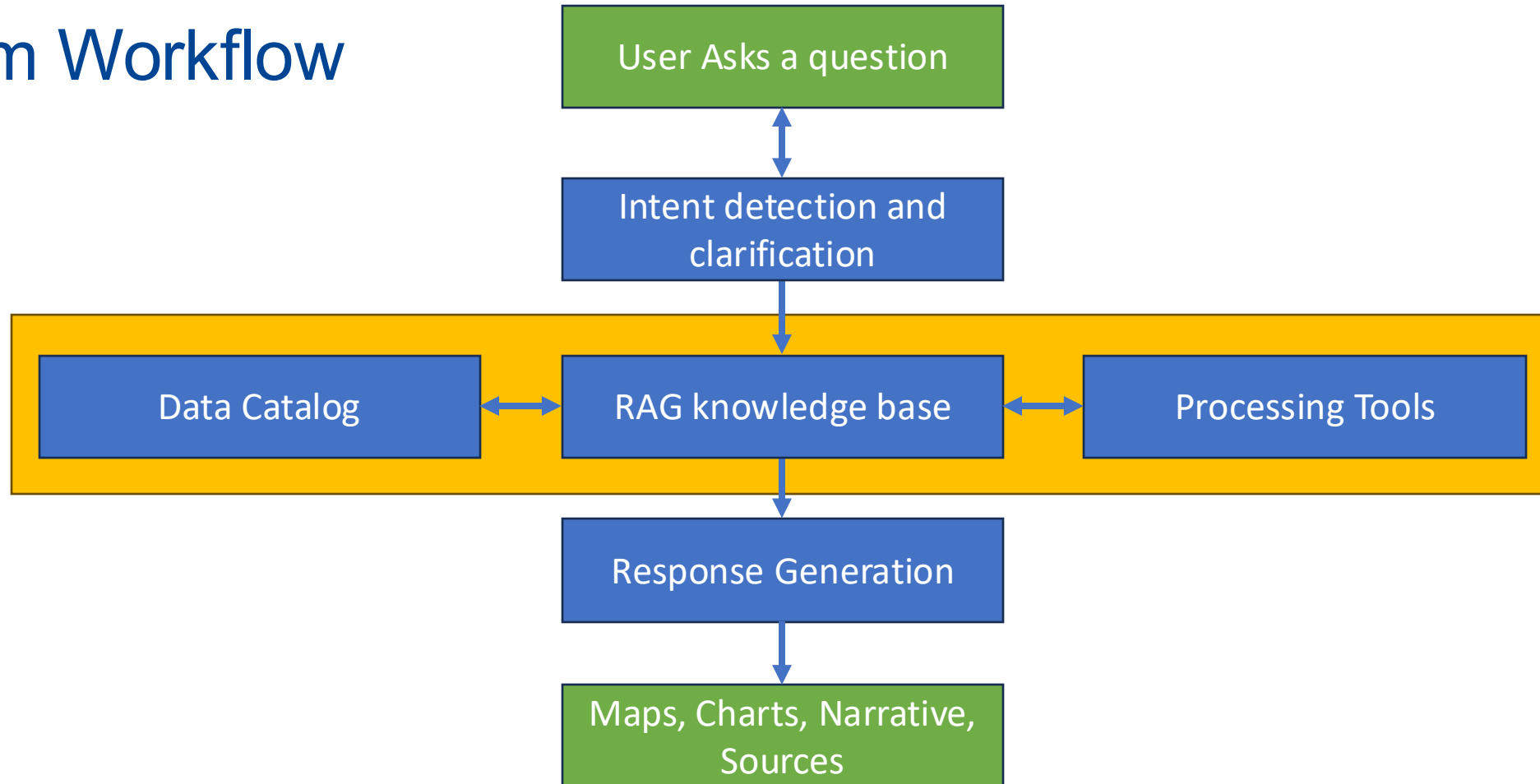
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EIS - Environment Information System

System Workflow



EIS - Environment Information System

User space, also storing user credentials to Copernicus data and processing infrastructures

RAG – ingested knowledge chunks

Ask – Main user interface

Tools – trusted tools and data connectors that EIS is allowed to use

Projects – Established recurrent workflows

Seed questions/examples

User question input



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EIS – Ask examples

EXAMPLES

<p>Discover</p> <ul style="list-style-type: none"> – Which Copernicus service monitors ocean temperature? – What CLMS products are available for forest monitoring? – How does the Atmosphere Monitoring Service track air quality? – Which product shows crop types in my region? – What climate reanalysis datasets does C3S provide? – What Copernicus data is available for flood risk mapping? 	<p>Visualize</p> <ul style="list-style-type: none"> – Show me the latest Sentinel-2 image over Turin – Display land cover map for Barcelona – Show snow cover in the Alps from last week – Visualize sea surface temperature in the Mediterranean 	<p>Algorithms & Models</p> <ul style="list-style-type: none"> – What methods are available for flood detection? – Which foundation models support Sentinel-2 data? – How can I classify land cover using deep learning? – What algorithms detect burned areas from satellite imagery? – Which SAR processing methods are available? – Recommend a model for vegetation monitoring 	<p>In the Cloud</p> <ul style="list-style-type: none"> – I want to monitor vegetation health in my area – Create a cloud-free satellite composite of my area – How has land temperature changed recently? – Help me detect flooding from satellite data 	<p>Code Examples</p> <ul style="list-style-type: none"> – Python script to download Sentinel-2 time series – R example for accessing CDSE STAC API – How do I calculate vegetation indices with Python? – Radar data processing for change detection
<p>Time Series</p> <ul style="list-style-type: none"> – NDVI vegetation trend for my location – Water index time series for coastal areas – Snow cover changes over the past year – Compare vegetation health across seasons 	<p>Statistics</p> <ul style="list-style-type: none"> – Unemployment rate in Spain vs Italy since 2015 – GDP per capita trends in the EU – Compare life expectancy across European countries 	<p>Climate & Environment</p> <ul style="list-style-type: none"> – How have European temperatures changed since 1990? – What are the main findings of C3S climate reports? – How does CAMS monitor atmospheric composition? – Sea level rise trends in the Mediterranean 	<p>Health & SDGs</p> <ul style="list-style-type: none"> – How does Copernicus contribute to the UN SDGs? – Air quality trends in European capitals – Life expectancy trends in EU countries 	

Example seed questions (not all are working)



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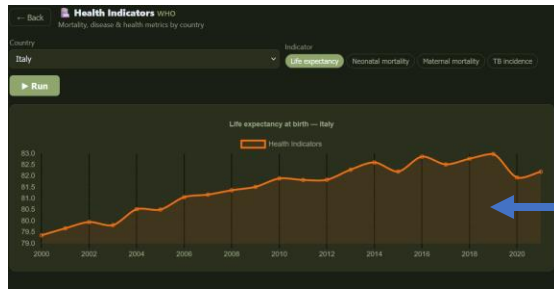
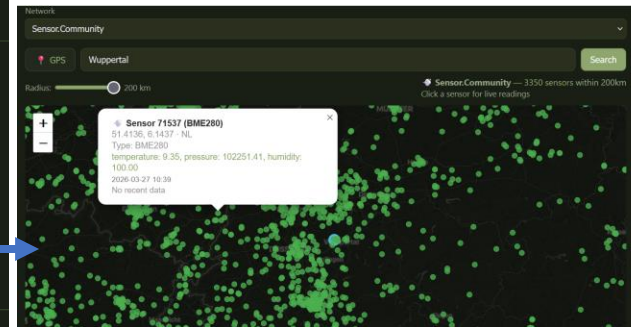


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EIS – Tools (few examples)

‘Tools’ is a pool of data, data access and algorithms enabled in the system.

All ‘Tools’ are indexed in the RAG.


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EIS – Algorithms (part of tools)

Ask Tools Projects

What methods are available for flood detection?

EIS offers several flood detection methods, each with specific strengths:

SAR Flood Change Detection
 Compares SAR backscatter between dry baseline and flood event
 Data: Sentinel-1 GRD (VH) Method: Pre/post difference + Otsu thresholding Recipe: sar_flood_change
 ▶ Run Sar Flood Change Details

MNDWI Water Extent Change
 Optical-based water detection using green and SWIR bands
 Data: Sentinel-2 L2A Method: $MNDWI = (Green - SWIR)/(Green + SWIR)$ Recipe: mndwi_flood_change
 ▶ Run Mndwi Flood Details

Water & Wetness Mapping
 Combined optical-radar approach for all-weather detection
 Data: Sentinel-2 L2A + Sentinel-1 GRD Method: MNDWI + SAR VV threshold (-18dB) Recipe: water_wetness
 ▶ Run Water Wetness Details

GFM Ensemble Algorithm
 Robust flood detection using three complementary methods:
 Data: Sentinel-1 GRD Method: Ensemble voting (minimum 2 algorithms must agree) The GFM ensemble approach helps minimize false positives from:
 ▶ Use Details

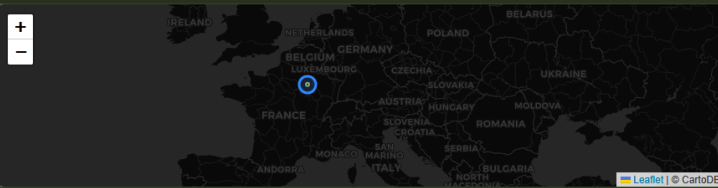
6 sources

Execute mndwi_flood processing for my area of interest

To run mndwi_flood_change, please select your area of interest on the map. Default period: last 3 months (2025-12-26 to 2026-03-26).

8 sources

Coole (48.7605, 4.3945)



Radius: 15 km

Confirm location

I'll help you analyze potential flood areas around Coole, France using the Modified Normalized Difference Water Index (MNDWI) from Sentinel-2 data.

MNDWI provides an overall accuracy of 81% for water detection, and is particularly effective for mapping open water bodies. However, note that it may underestimate areas with dense emergent vegetation.

The analysis will: 1. Calculate MNDWI using Sentinel-2 bands (Green and SWIR) 2. Apply appropriate thresholding to identify water features 3. Generate a water extent map for the 15km radius area around Coole

For flood mapping in vegetated areas, consider complementing this with SAR-based analysis using Sentinel-1 data, which can better penetrate vegetation cover.

6 sources

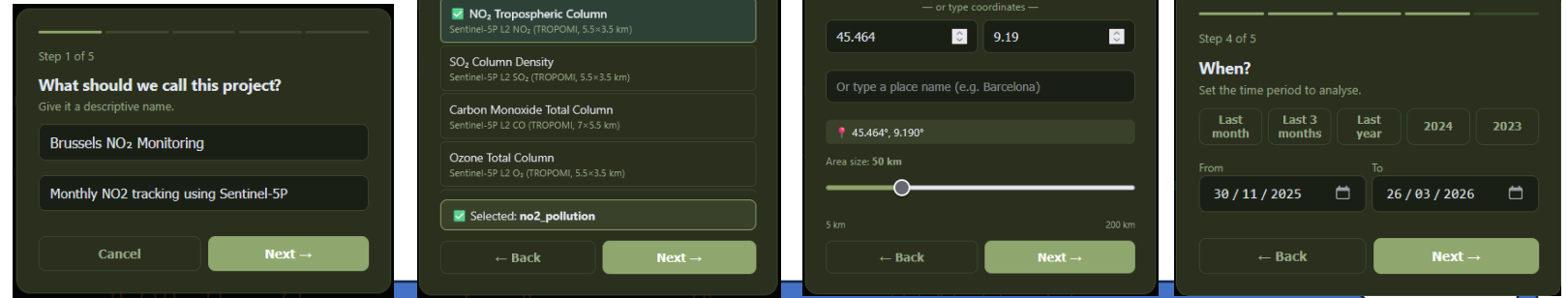
Standard MNDWI Threshold (Recommended)

Dynamic Thresholding

Machine Learning Classification (Advanced)

4 literature sources

EIS – Projects




'Projects' are recurrent and defines workflow. (early stage)



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EIS - What Next

- The access to EIS is not public yet
- We are currently consolidating the code base.
- We are looking forward to release a basis for collaboration under EUPL 1.2+ soon.
- For any question, please contact matteo.mattiuzzi@eea.europa.eu



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