



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

INTERNATIONAL SUMMER SCHOOL

NATURE-BASED SOLUTIONS FOR HYDRO-METEO HAZARDS AND CLIMATE CHANGE ADAPTATION

29 AUGUST - 01 SEPTEMBER 2022



GeoIKP

Platform for Nature-based Solutions

Find and share knowledge on nature-based solutions

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This work is carried out under the framework of OPERANDUM (OPEn-air laborATORies for Nature baseD solutions to Manage hydro-meteo risks) project, which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776848.

The publication reflects only the authors' views and the European Union is not liable for any use that may be made of the information contained therein.



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CEO at KAJO s.r.o.

Freelance consultant at European Commission

Disaster Risk Management Expert focusing on early warning systems and innovative technologies.



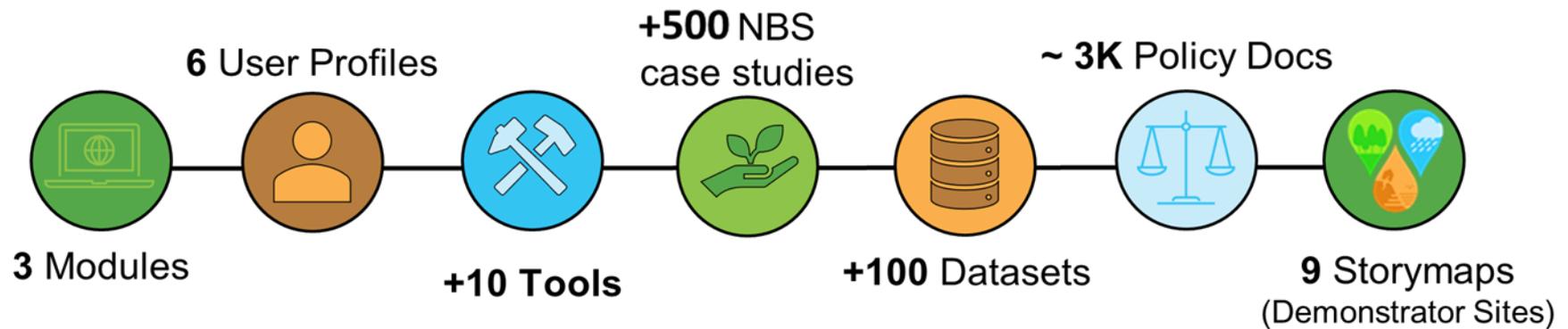
- Open and user-friendly web-platform
- Designed, implemented and deployed within OPERANDUM project
- **Goal:** Share knowledge, data and tools on NBS for hydro-meteorological risk mitigation and climate change adaptation
- ***GeoIKP*** stands for ***Geospatial Information Knowledge Platform***
 - ↳ ***Key feature:*** enabling the multiple and diverse actors involved in the NBS co-creation process (policymakers, citizens, scientists, etc.) to visualize and query geo-referenced data for the specific area of interest



1. Overview of GeoIKP
2. Virtual tour of GeoIKP
 - Focus on selected functionalities
3. Self-exploration
(if time allows)



GeoIKP in Numbers





3



Modules

GeoIKP

WebGIS

Add your NBS

Data Catalogue

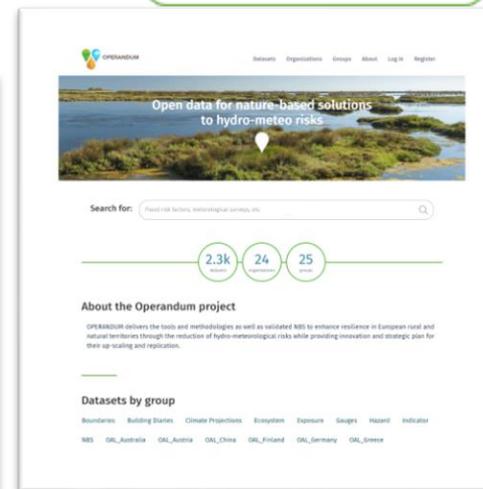
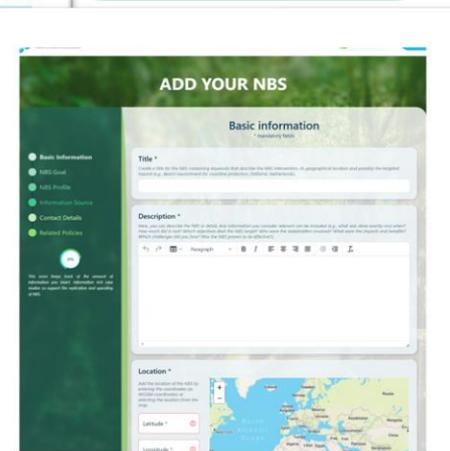
This is the main interface of the GeoIKP linking to all pages including the crowdsourcing application and the data management portal.

This is the crowdsourcing application for collecting Nature-based Solution examples around the world.

This is the portal for managing NBS related spatial and non-spatial data.



WebGIS module (main entry point)





- Open-source cutting-edge technologies/libraries
- Data stored in a PostgreSQL database
- Spatial data served via standardized web services (GeoServer)
- Non-spatial data served via Python API (Application programming interface)
 - Services/API could be used by external users and/or systems





- GeoIKP follows ISO/OGC standards
 - INSPIRE Directive
 - It increases the interoperability of the system
 - It allows easier integration with other systems
- Data is described with a standardized set of metadata
 - It puts data into a context
 - It makes it easier to understand the data





[Explainer video GeoIKP Platform](#)



GeoIKP



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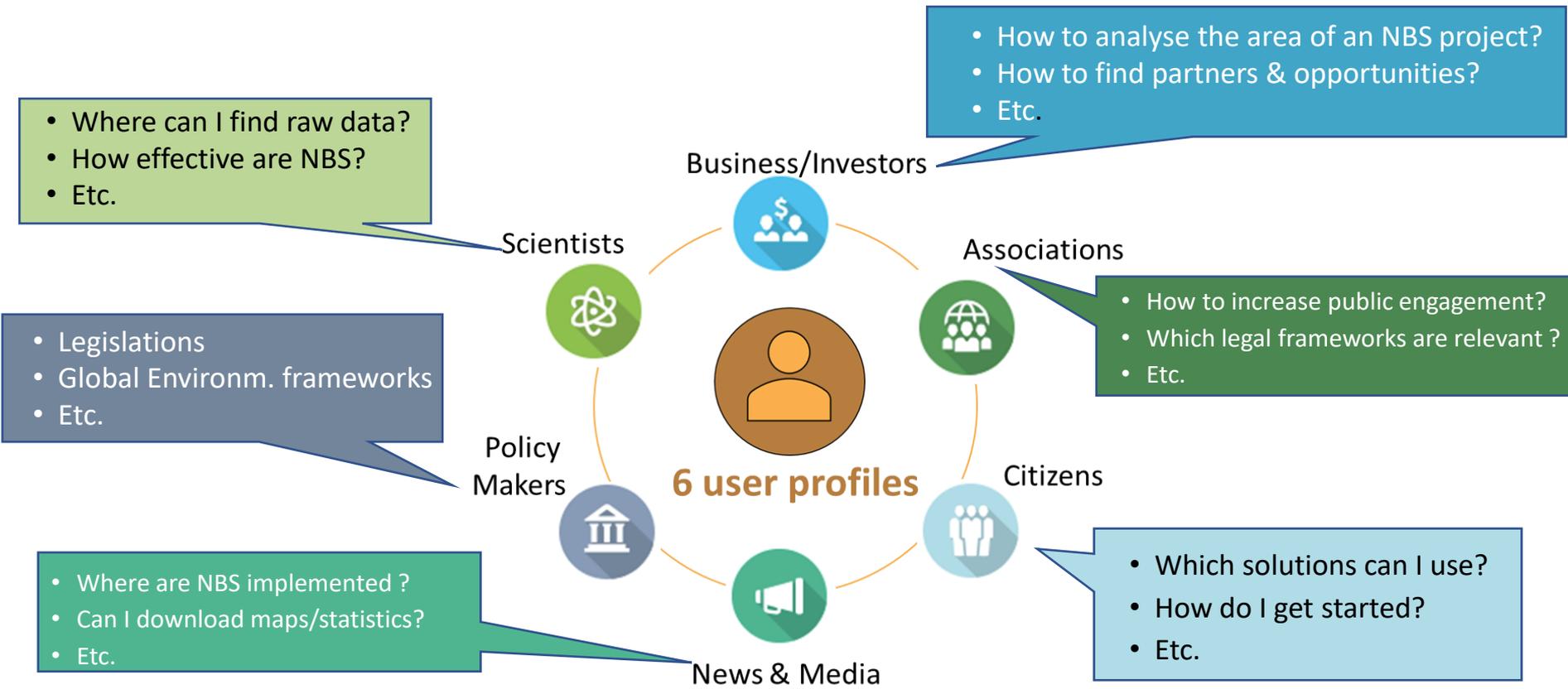






Key Attribute: User-driven platform with advanced user interface customization developed through a co-creation approach

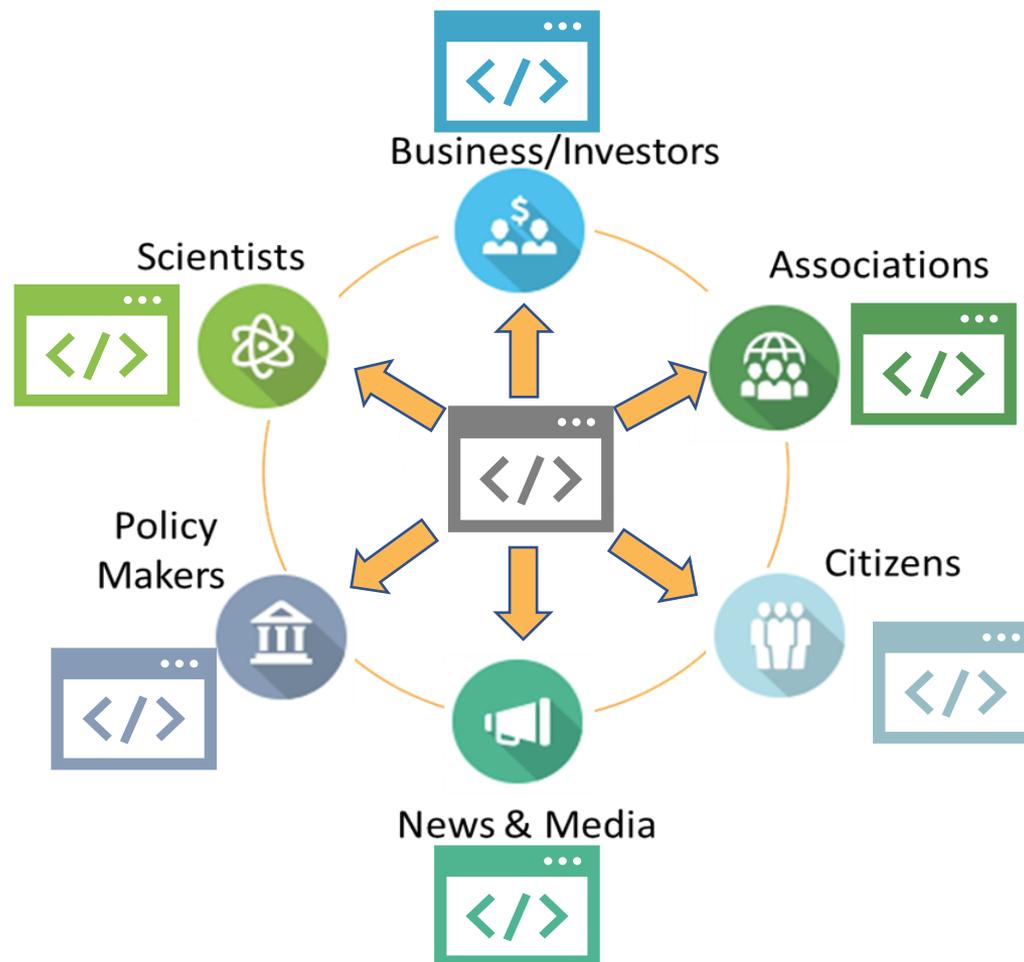
Co-creation approach: Consultations with OPERANDUM partners and stakeholders in order to: 1) Identify user categories; 2) Assess needs per each user category





Key Attribute: User-driven platform with advanced user interface customization developed through a co-creation approach

Common functionalities with graphic interfaces and contents customized per user type





Key Attribute: User-driven platform with advanced user interface customization developed through a co-creation approach

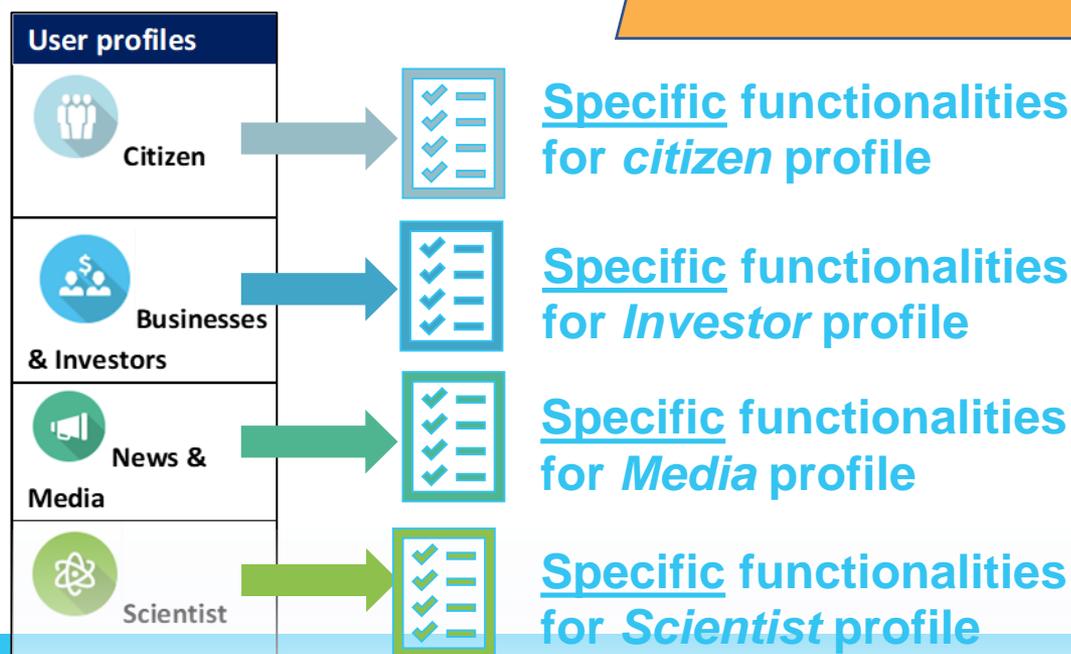
OUTCOMES

- Specific functionalities developed ad-hoc for specific user categories

A couple of Examples

Business Networking

Citizens' stories





Key Attribute: GeoIKP as central hub for **sharing** knowledge on NBS and much more...



- ❑ Individual functionalities to offer multiple entry points to the “data provider”
- ❑ but interconnected to each other to provide the end user with a single access point to information

- [Add your NBS](#)
- Add Datasets
- Add Legislations
- Share your story (on NBS challenges & success)
- Promote your business

Functionalities



OPERANDUM Data METHODOLOGY

Collect / Process

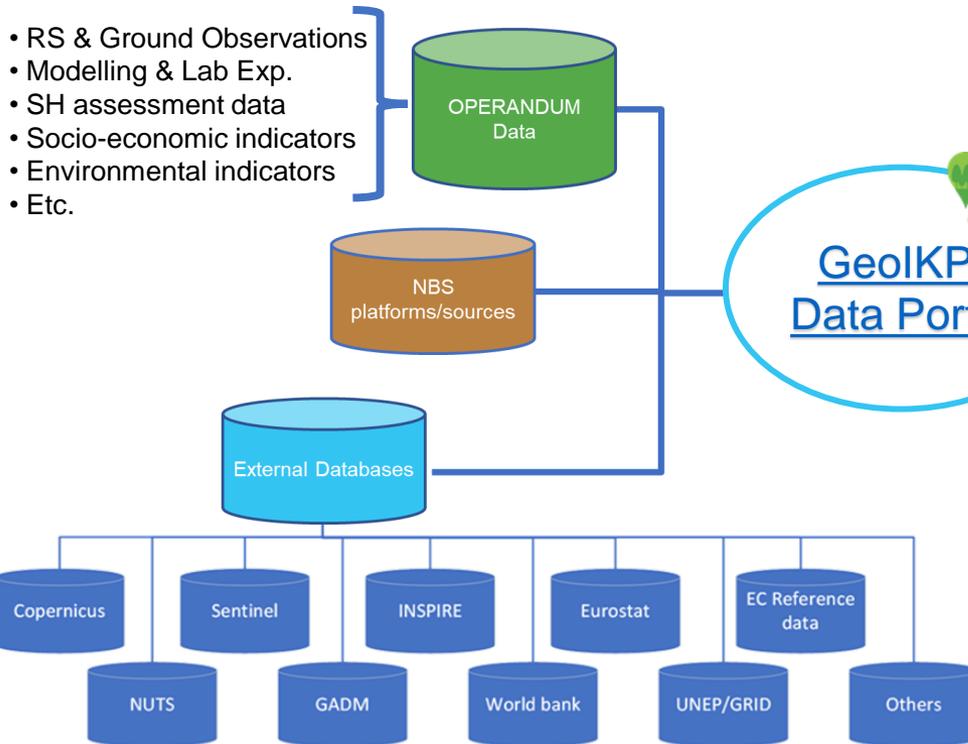
Quality Check

Harmonize

Standardize

Publish

- RS & Ground Observations
- Modelling & Lab Exp.
- SH assessment data
- Socio-economic indicators
- Environmental indicators
- Etc.



METADATA creation for each NBS case study collected from external sources (NBS catalogue)

LINKED TOGETHER

METADATA creation for datasets (ISO standard compliant, including OGC and INSPIRE for spatial datasets)



Findable 
Accessible 
Interoperable 
Reusable 

Fulfil

FAIR principles





OPERANDUM Geo-catalogue of NBS



NBS METADATA

Translated into a set of metadata fields

ADD YOUR NBS

NBS METADATA

- Basic Information
- NBS Goal**
- NBS Profile
- Information Source
- Contact Details
- Related Policies



NBS Goal

* mandatory fields

Goal of the NBS *

What is the main goal of the NBS?

- Tick this box if the goal of this NBS is to reduce natural hazards
- Tick this box if this NBS does NOT target natural hazards

Select the main goal. Other addressed challenges can be selected in the Societal challenges section.

-- Other goal: Please select one option --

Societal challenges *

Specify which societal challenges the NBS targets or can help addressing the list. If you don't know, you can select "Unknown" item.

-- select at least one option --

Location *

Add the location of the NBS by entering the coordinates (as WGS84 coordinates) or selecting the location from the map.



Latitude *

Longitude *

Tick this field if the location entered is only approximate (e.g. coordinates of the closest city).

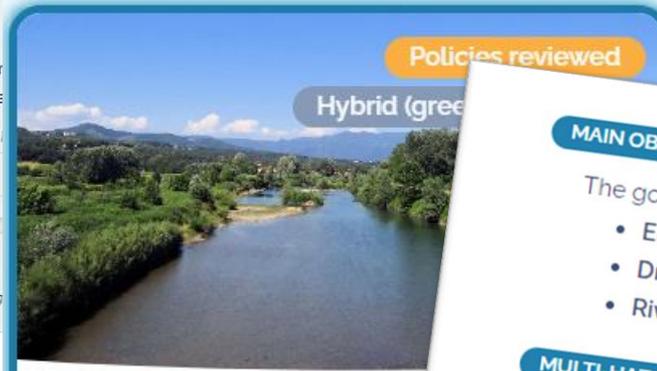
Area *

Select the area which the NBS covers from the list.

Enter the area in

-- select one option --

Exact km²



Riparian buffer zones and basin to reduce flood and enhance water quality Massaciucoli Lake, Italy

Hazard

- Eutrophication
- Drought
- Riverine (fluvial) Flood

MAIN OBJECTIVE OF THE NBS

The goal of this NBS is to manage natural hazards

- Eutrophication
- Drought
- Riverine (fluvial) Flood

MULTI-HAZARD

This NBS (project) reduces multiple hazards.

NBS TYPE

Hybrid (green-blue-grey)

POTENTIAL CO-BENEFITS

- Vegetational Cover
- Well-being (humidex & recreational area)

INTERVENTION TYPE

- Submerged dams or weirs
- Ponds and basins
- Riparian buffer zones

ECOSYSTEM

Rivers and Lakes

APPROACH

<https://geoikp.operandum-project.eu/nbs/crowdsourcing>





DATA CATALOGUE

<https://data-catalogue.operandum-project.eu/>

- Storing different types of data
- Describing data with metadata
- Metadata fields following international standards ([ISO/OGC](#), [INSPIRE Directive](#))



Search for:

Flood risk factors, meteorological surveys, etc.



2.3k

datasets

24

organizations

25

groups





DATA CATALOGUE

<https://data-catalogue.operandum-project.eu/>

Data Catalogue([video](#))



Search for:

Flood risk factors, meteorological surveys, etc.



2.3k

datasets

24

organizations

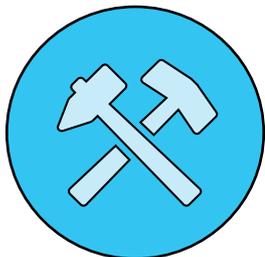
25

groups





+10



Tools

Learn about the **concept of NBS**, the **permitting paths** and **best practices** leading to a successful NBS project, and how **co-creation** can be integrated in the NBS life cycle



Learn

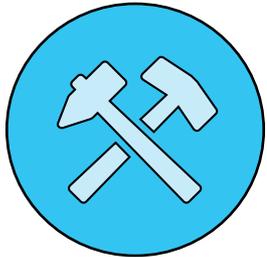




OPERANDUM

GeoIKP Overview

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Tools

Get inspired by exploring the interactive story-maps of the OPERANDUM OALs and by reading citizens' stories shared by the GeoIKP community.

Learn



Get inspired

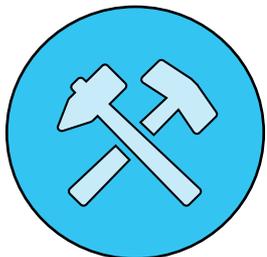


GeoIKP





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Tools

Discover how NBS have been employed around the globe for hydro-meteorological risk reduction and climate change

Get inspired



Discover



- Browse existing NBS projects
- Search for relevant legislation
- Find partners & funding opportunities

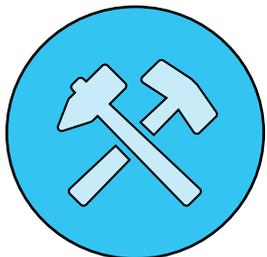




OPERANDUM

GeoIKP Overview

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Tools

GeoIKP



Analyse the area of an NBS project

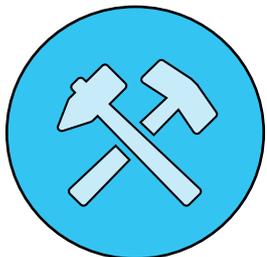
Data, maps, statistics on several thematic areas (Multi-sourced risk data, Climate & land cover/use characteristics, Earth and ground observations, etc.)



OPERANDUM

GeoIKP Overview

+10



Tools

Get inspired
Discover
Analyse

Learn



Select



Select the optimal NBS for your area
(**interactive pre-assessment tool**
– *under development*)

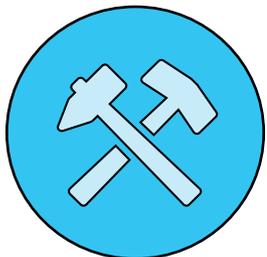




OPERANDUM

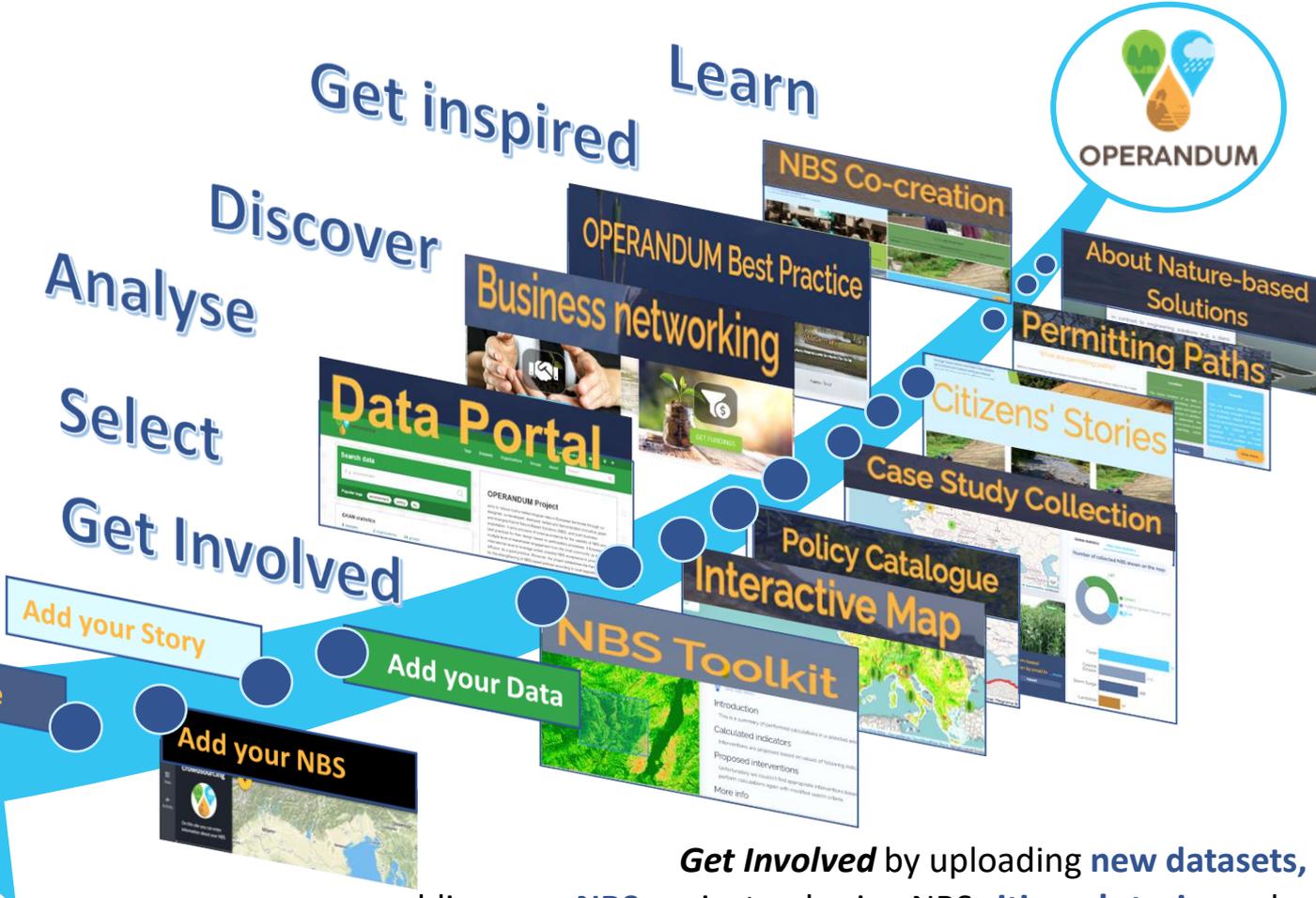
GeoIKP Overview

+10



Tools

GeoIKP



Get Involved by uploading new datasets, adding new NBS projects, sharing NBS citizens' stories or by registering your company/institution



GeoIKP *Virtual tour*





GeoIKP *Welcome Page*



Optional

- *Scroll the different profiles and choose one*
- *Click "View Profile" to start navigating*



GeoIKP
Homepage

Menu

Change profile

GeoIKP Platform for Nature-based Solutions

ABOUT NATURE-BASED SOLUTIONS POLICY DATA SCIENTIST Sign in

Scientist homepage

Nature-based Solutions Hub

- Explore**
Explore successful NBS, their effectiveness, co-benefits and possible negative
- NBS Catalogue**
Browse successful Nature-based Solutions
BROWSE
- Policies for NBS**
Find legal frameworks for NBS
FIND
- NBS Co-creation Pathway**
Explore the NBS co-creation process step by step
EXPLORE

GeoIKP User Guide



<https://geoikp.operandum-project.eu/nbs/explorer>



Nature-based Solution Catalogue

Option 1: Search NBS in a geographic area (Zoom in/out)



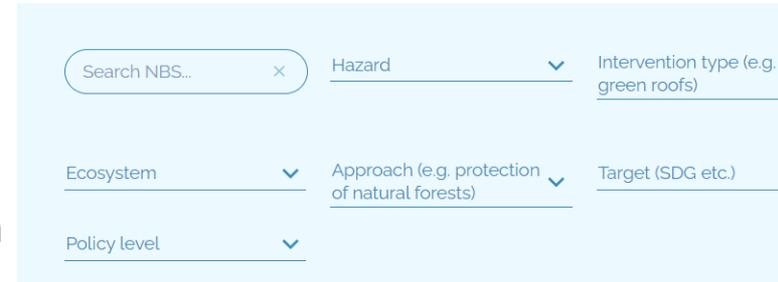
LEGENDS

NBS categorized by hazard (in WGS84)

- NBS related to fire hazards
- NBS related to Meteorological/Climatological hazards
- NBS related to Geological/Hydrological hazards
- NBS related to environmental hazards
- NBS related to other hazard categories



Option 2: Use filters to find specific types of NBS



Option 3: you can use filters and map also in combination

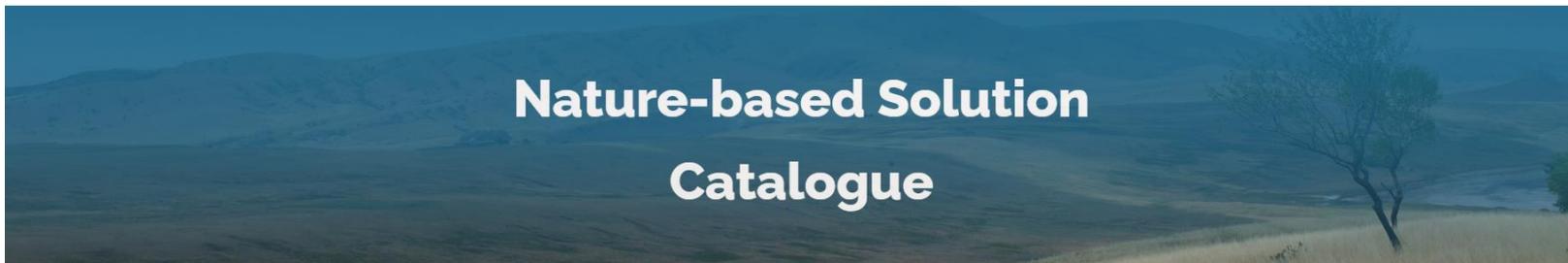


Click "X" to clear all filters

Click "search" to display the results



<https://geoikp.operandum-project.eu/nbs/explorer>



Nature-based Solution Catalogue

Showing 6 of 28 NBS case studies

- Municipal water management plan for flood and landslide protection, Isola Vicentina, Italy**
Hazard: Landslide, Riverine (fluvial) Flood, Urban (pluvial) Flood
- Riparian buffer zones and retention basin to reduce flood and drought risks and enhance water quality, Massaciuccoli Lake, Italy**
Hazard: Eutrophication, Drought, Riverine (fluvial) Flood
- Greening the city for reducing flood and heat wave risk, Bari, Italy**
Hazard: Flood Wave, Urban (pluvial) Flood
- Tree planting for drought and heat wave protection, Bologna, Italy**
Hazard: Heat Wave, Meteorological Drought
- Raingardens for rainwater management, Santorso, Italy**
Hazard: Urban (pluvial) Flood
- Grass swale and bioretention area to prevent urban floods, Santorso, Italy**
Hazard: Urban (pluvial) Flood

LOAD MORE

View Individual Results

- On the map: click on the icon 
- From the list: click on the individual NBS factsheet

Overview

Images

Source

Related NBS

Related Policies

Related Datasets

Share NBS

- Facebook
- LinkedIn
- Telegram
- Twitter
- Whatsapp
- Email

Print NBS information

Explore this NBS

OVERVIEW

Challenges
The Altovicentino area was affected by different flood events in recent years, including both localized floods in urban areas due to high intensity rainfalls, and river overflows. Among the latter, the most catastrophic episodes occurred in

MAIN OBJECTIVE OF THE NBS
The goal of this NBS is to manage natural hazards

- Urban (pluvial) Flood

NBS TYPE
Hybrid (green-blue-grey)

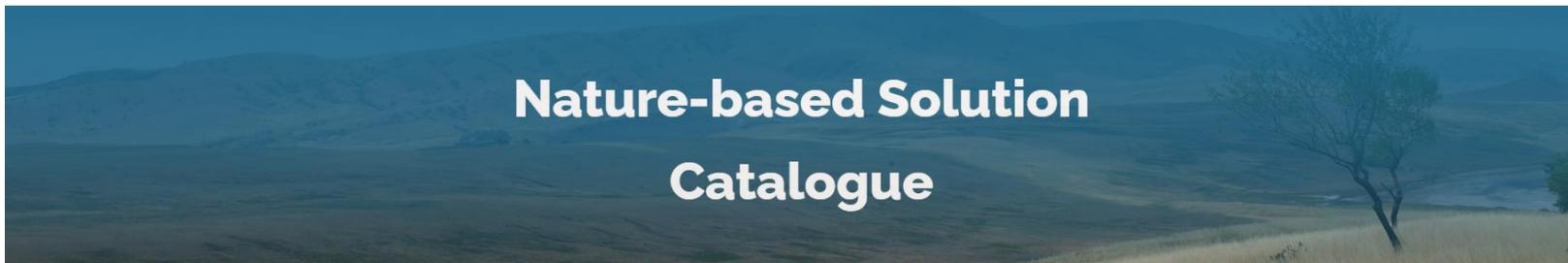
POTENTIAL CO-BENEFITS
Vegetational Cover
Water Quality

INTERVENTION TYPE





<https://geoikp.operandum-project.eu/nbs/explorer>



Nature-based Solution Catalogue

Showing 6 of 28 NBS case studies

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LOAD MORE

View Individual Results

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Overview

Images

Source

Related NBS

Related Policies

Related Datasets

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NBS TYPE

Hybrid (green-blue-grey)

POTENTIAL CO-BENEFITS

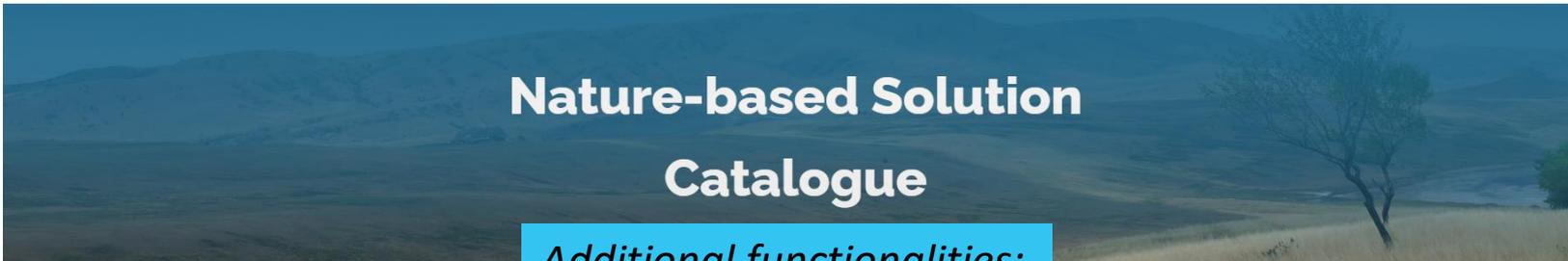
- Vegetational Cover
- Water Quality

INTERVENTION TYPE





<https://geoikp.operandum-project.eu/nbs/explorer>



Nature-based Solution Catalogue

Additional functionalities:

1. SHARE/ PRINT NBS case study

Share NBS

- Facebook
- LinkedIn
- Telegram
- Twitter
- Whatsapp
- Email

Print NBS information

2. COMPARE NBS case studies



Hybrid (green-blue-grey)
Reviewed

Improving water quality with wetlands, bioswales, and rain gardens along the Jaguaré Creek, São Paulo, Brazil

Hazard
Riverine (fluvial) Flood

Mixed (green-blue)
Reviewed

Landscaped park to improve the sustainability of the city, Bézannes, France

Hazard
Urban (pluvial) Flood

Policies reviewed
Green

Rain gardens to reduce flood risk and improve water quality, Bristol, England, UK

Hazard
Urban (pluvial) Flood

Click here to select



<https://geoikp.operandum-project.eu/policy/path>



- Almost every NBS needs to go through a path to be permitted
- The path varies greatly depending on the local characteristics, the hazard and much more
- Here you can browse through a more general permitting path which presents legislation that might apply for your case
- You can also check out some permitting paths of OPERANDUM OALs



<https://geoikp.operandum-project.eu/policy/catalogue>

Policies for NBS

Are you looking for policies? Find relevant policy and legislation documents that can be important for your NBS.



Option 1: Select a country on the map

Search policy... x

Flood X ▾ Habitat ▾

Policy ▾ Target ▾

Intervention ▾ Approach ▾

NBS Type ▾

Option 2: Use filters to find specific types of legislation

Option 3: you can use filters and map also in combination



<https://geoikp.operandum-project.eu/policy/catalogue>

Policies for NBS

Are you looking for policies? Find relevant policy and legislation documents that can be important for your NBS.

Click "X" to clear all filters



Click "search" to display the results



Showing 6 of 36 policies

Civil protection and natural disasters

Regional
Go to the policy

SIMILAR POLICIES RELATED NBS RELATED DATA

7th Environment Action Programme (EAP) (Decision 1386/2013/EU)

EU

A Blueprint to Safeguard Europe's Water Resources

Erosion
EU

Act No. 38 Provisions regarding the agricultural sector

National
Go to the policy

Approval of sustainable urban afforestation guidelines for Rome Capital (Capitolino Junta n.151/2018)

Local
Go to the policy

Civil protection and natural disasters

Regional
Go to the policy





<https://geoikp.operandum-project.eu/oal/explorer>

OPERANDUM Best Practice

Open-air laboratories (OALs) are a new concept that expands Living Labs to a wider vision for natural and rural areas to address specific risks and to assess the effectiveness of Nature-based Solutions through innovative monitoring systems and cutting-edge numerical modelling approaches. Explore OPERANDUM's OALs in more detail and find out more about their approaches, results, impacts, and effectiveness!

OAL Austria
Wattental - Vögelberg

Hazards: Landslides

EXPLORE

OAL Hong Kong
The Hong Kong New Territories

Hazards: Flood, Storm surge, Heatwave

EXPLORE

OAL China
Shijiang River Watershed

Hazards: Land degradation

EXPLORE

OAL Finland
Lake Puruwei

Hazards: Eutrophication

EXPLORE

OAL Germany
Biosphere Reserve Lower Saxonian Elbe Valley

Hazards: Flood

EXPLORE

OAL Greece
Spercheios River

Hazards: Drought, Flood

EXPLORE

OAL Ireland
Dublin, Dodder River

Hazards: Flood

EXPLORE

OAL Italy
Bellucchio Beach

Hazards: Storm Surge, Sewerage Infiltration, Coastal Erosion

EXPLORE

OAL Italy
Panaro River

Hazards: Flood, Soil Erosion

EXPLORE

OAL Italy
Po di Goro

Hazards: Drought, Seawater Infiltration

EXPLORE

OAL UK
Cattaline Bay

Hazards: Coastal Erosion, Storm Surge, Flood, Landslide

EXPLORE





<https://geoikp.operandum-project.eu/nbs/lifecycle>

NBS Co-creation pathway

A bottom-up approach throughout the entire NBS cycle will ensure multiple benefits including empowerment of citizens and social cohesion, co-production of knowledge, environmental awareness, greening economy and business cooperation. Explore step by step how co - creation can be integrated in the NBS life cycle.

- This page introduces the idea of a co-creation pathway to actively engage the public and other stakeholders
- You can explore different ways to engage people in every step of the NBS creation process





<https://geoikp.operandum-project.eu/data/map>

INTERACTIVE MAP

The screenshot displays the GeoIKP interactive map interface. On the left, a sidebar contains several buttons: 'LAYERS MANAGER', 'SEARCH LAYERS', 'BOUNDARIES', 'RISK', 'NBS', and 'ADD LOCAL FILE TO THE MAP'. The main map area shows a world map with numerous colored pins (green, yellow, blue, red) representing data points. A search bar at the top right contains the text 'graphical name'. A scale bar at the bottom left indicates 1000 km and 500 mi. The map is overlaid with various data layers, and a search bar is visible at the top right.

- Organize, Hide, etc layers
- Read metadata
- Show legend
- Search & upload additional layers
- Default layers organized by thematic area



<https://geoikp.operandum-project.eu/data/map>

INTERACTIVE MAP

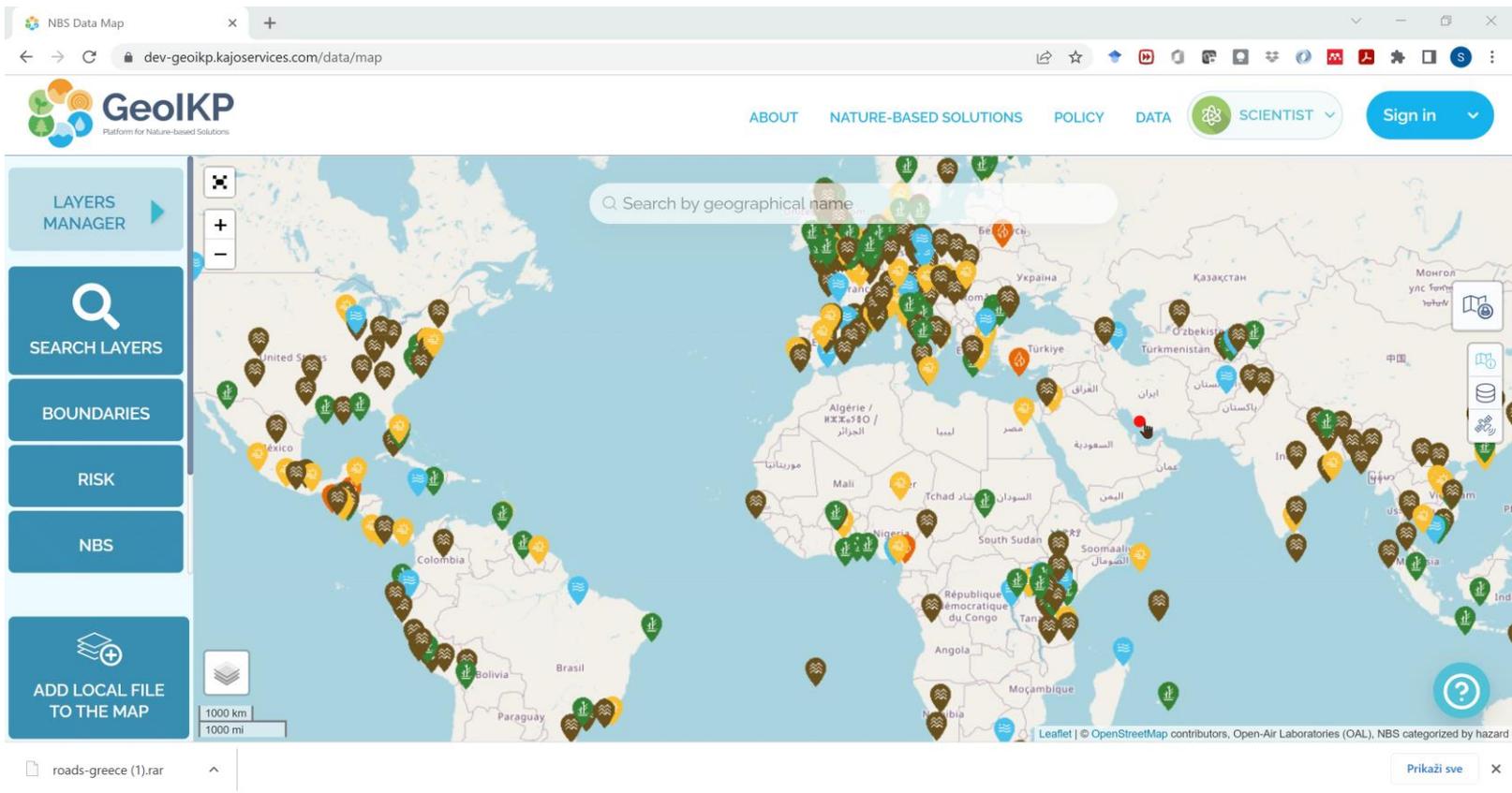
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<https://geoikp.operandum-project.eu/data/map>

INTERACTIVE MAP

How to export data to your QGIS interface ([video](#))





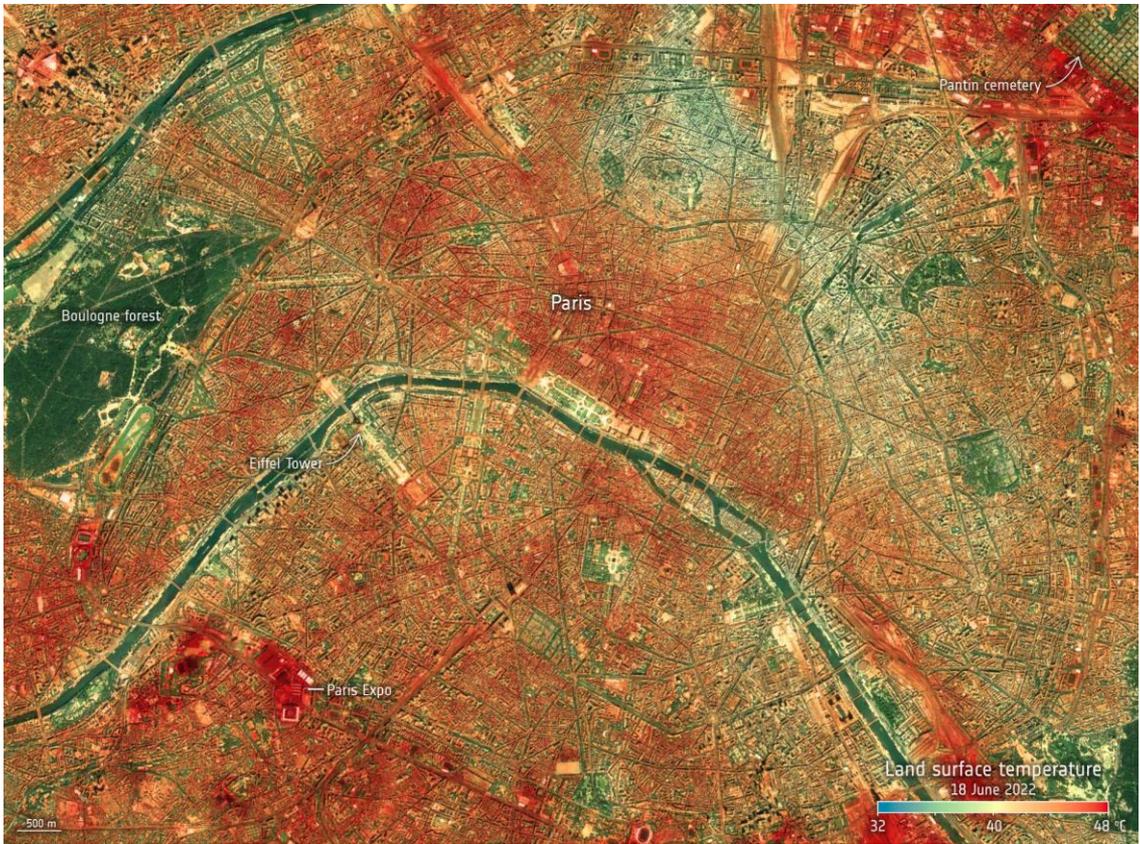
Case study example

- Location: Paris
- Hazard: Heatwaves





- Heatwaves are forecasted to become more intense and frequent with 10-25 days of heatwaves per year by 2100
- Surface temperatures during this year's heatwave indicate areas of that could be focused on
- Elderly people are primarily vulnerable to heatwaves and the share of over-60s is constantly increasing



Paris Surface Temperature on 18th June 2022



Use Case – Problem identification



Paris: 5.8 m² green space per capita



- Schoolyards cover 73 hectares of asphalted and impervious surfaces which greatly contribute to the heat island effect
- Solutions for 10 selected schoolyards:
 - Increase the number of trees, school gardens, green walls and roofs
 - Permeable and light-colored surfaces
 - Rainwater harvesting systems
- Co-benefits:
 - Health & Well-being
 - Social cohesion
 - Urban biodiversity
- Multi-hazard context
 - Reducing urban flooding



Greening schoolyards to face heat waves and floods, Paris, France

Hazard

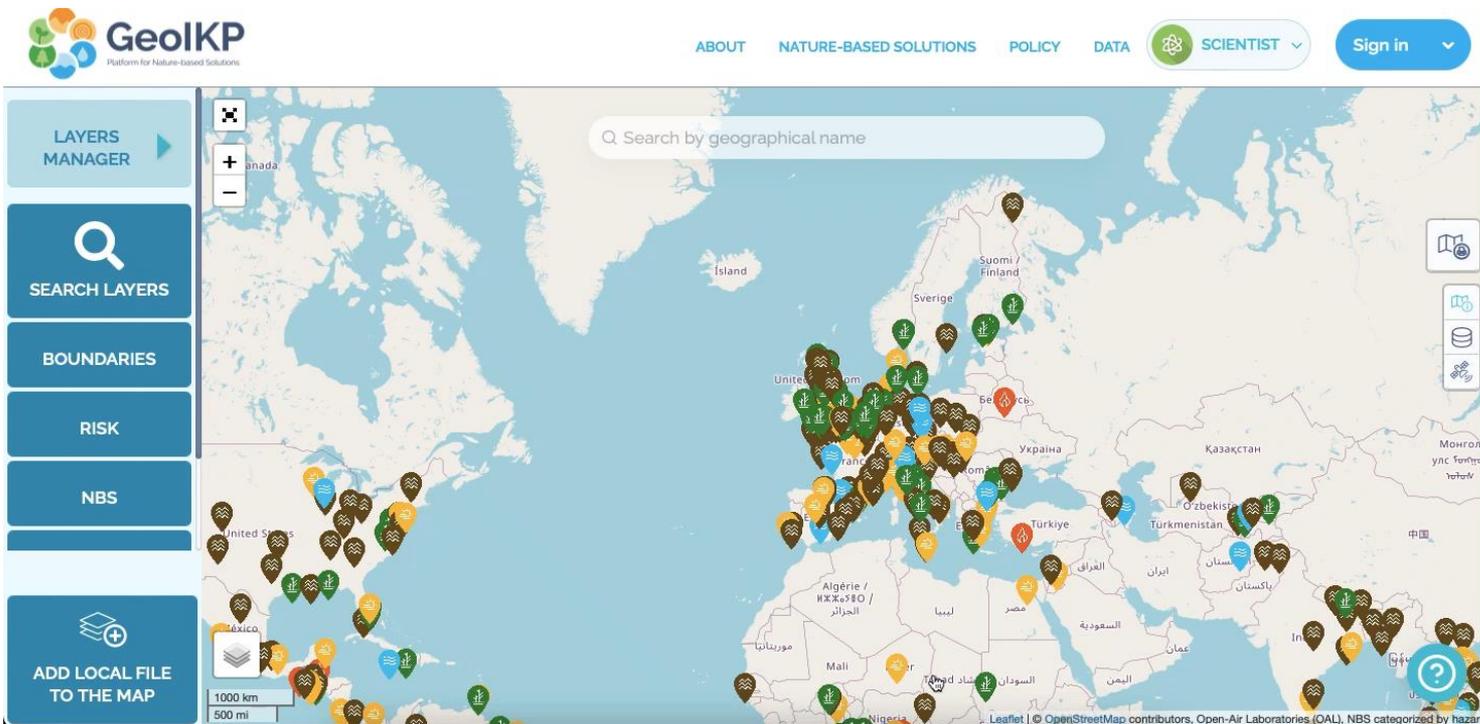
Heat Wave

Riverine (fluvial) Flood

Urban (pluvial) Flood



1. Explore the local characteristics (e.g., demography, green areas, Imperviousness) in the *Interactive Map* ([video](#))





- Location: Paris
- Hazard: Heatwaves
- Steps:
 1. Explore the hazard and local characteristics (e.g., demography, green areas) in the *Interactive Map*
 2. Preselect several possible solutions from the *NBS Catalogue*
 3. Prioritize one Nature-based Solution (*NBS Catalogue – compare*)
 4. Identify potential regulating policies for the NBS (*Policy Catalogue & Permitting Paths*)
 5. Plan the co-creation with the general public (*Co-creation Pathway & OPERANDUM Best Practice*)



OPERANDUM

GeoIKP *Self-exploration*



<https://geoikp.operandum-project.eu/>



EU funded project
GA no. 776848



Thank you!



Questions?

