



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



GeolKP

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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Field Deployment Manager for several atmospheric field campaign.



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PhD in Hydrology and Water Management

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

- **GeolKP** stands for *Geospatial Information Knowledge Platform*

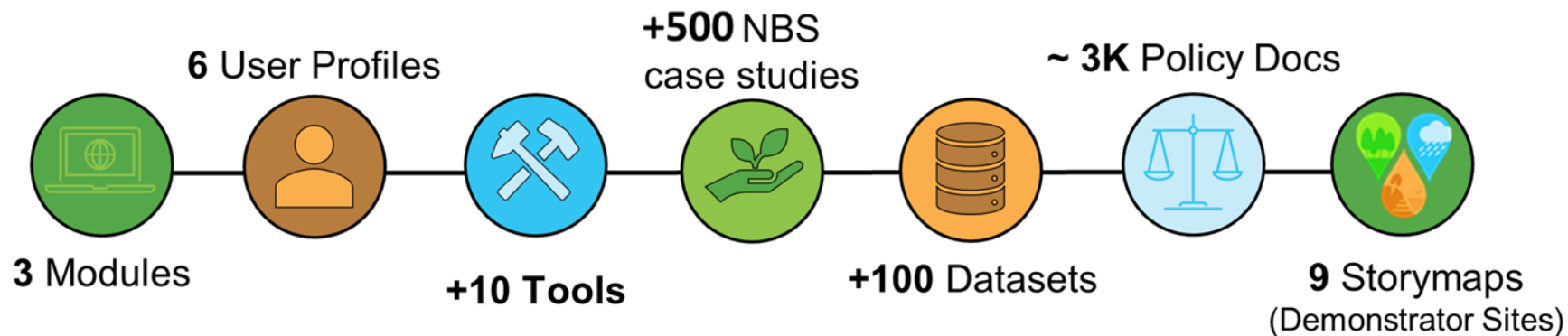
↳ **Key feature:** enabling the multiple and diverse actors involved in the NBS co-creation process (policymakers, citizens, scientists, etc.) to visualize and query geo-referenced data for the specific area of interest



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



GeolKP in Numbers





3



Modules

GeoIKP

WebGIS

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

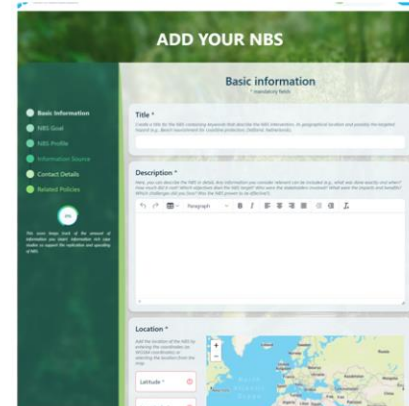
Add your NBS

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

Data Catalogue

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

WebGIS module
(main entry point)



About the Operandum project

OPERANDUM delivers the tools and methodologies as well as validated NBS to enhance resilience in European rural and natural territories through the reduction of hydro-meteorological risks while providing innovation and strategic plan for their up-scaling and replication.

Datasets by group

Boundaries Building Barriers Climate Projections Ecosystem Exposure Gauges Hazard Indicator
NBS OAL_Australia OAL_Austria OAL_China OAL_Finland OAL_Germany OAL_Sweden



- 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



- GeolKP 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 GeolKP Platform](#)



OPERANDUM

GeolKP – An Overview



GeolKP



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EU funded project
GA no. 776848





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

- Where can I find raw data?
- How effective are NBS?
- Etc.

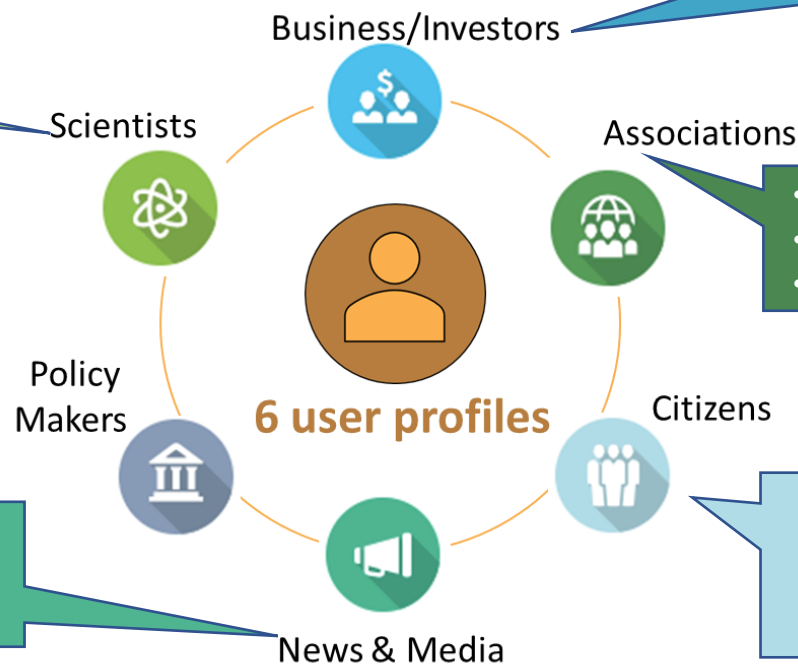
- Legislations
- Global Environm. frameworks
- Etc.

- Where are NBS implemented ?
- Can I download maps/statistics?
- Etc.

- How to analyse the area of an NBS project?
- How to find partners & opportunities?
- Etc.

- How to increase public engagement?
- Which legal frameworks are relevant ?
- Etc.

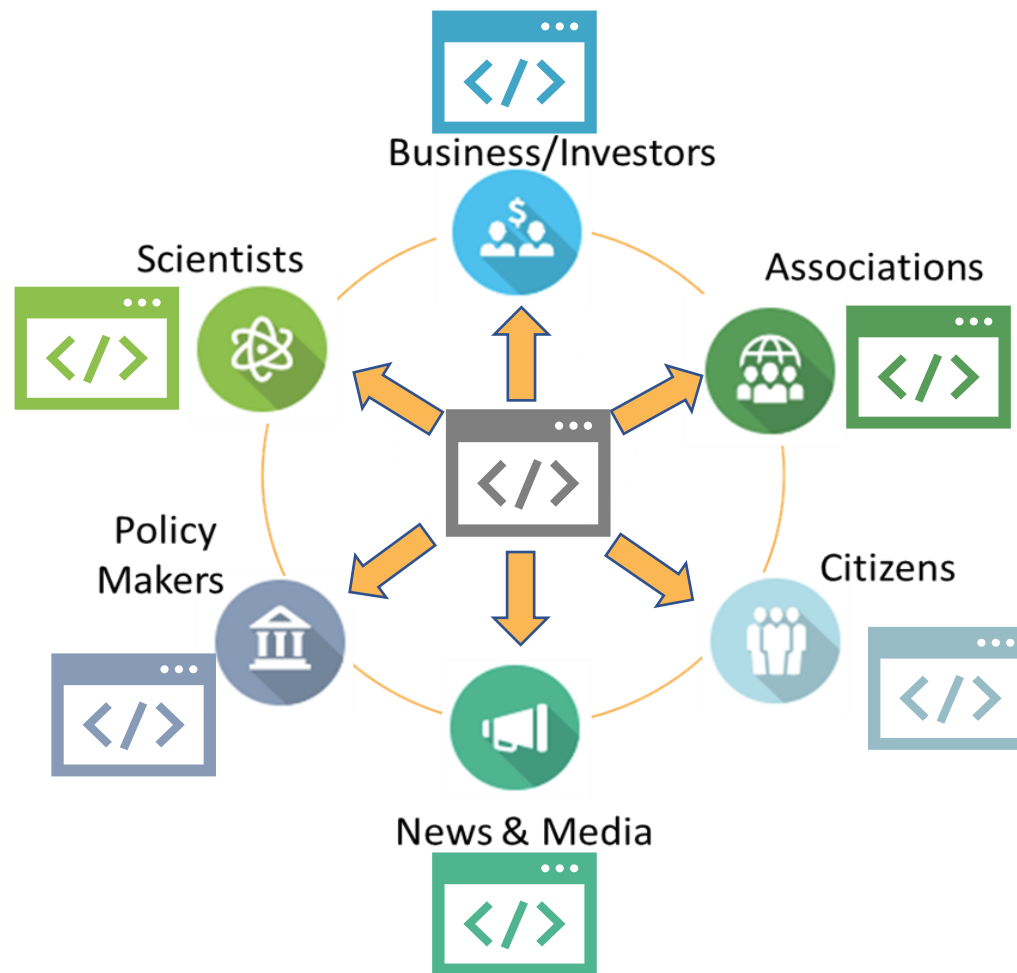
- Which solutions can I use?
- How do I get started?
- Etc.





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

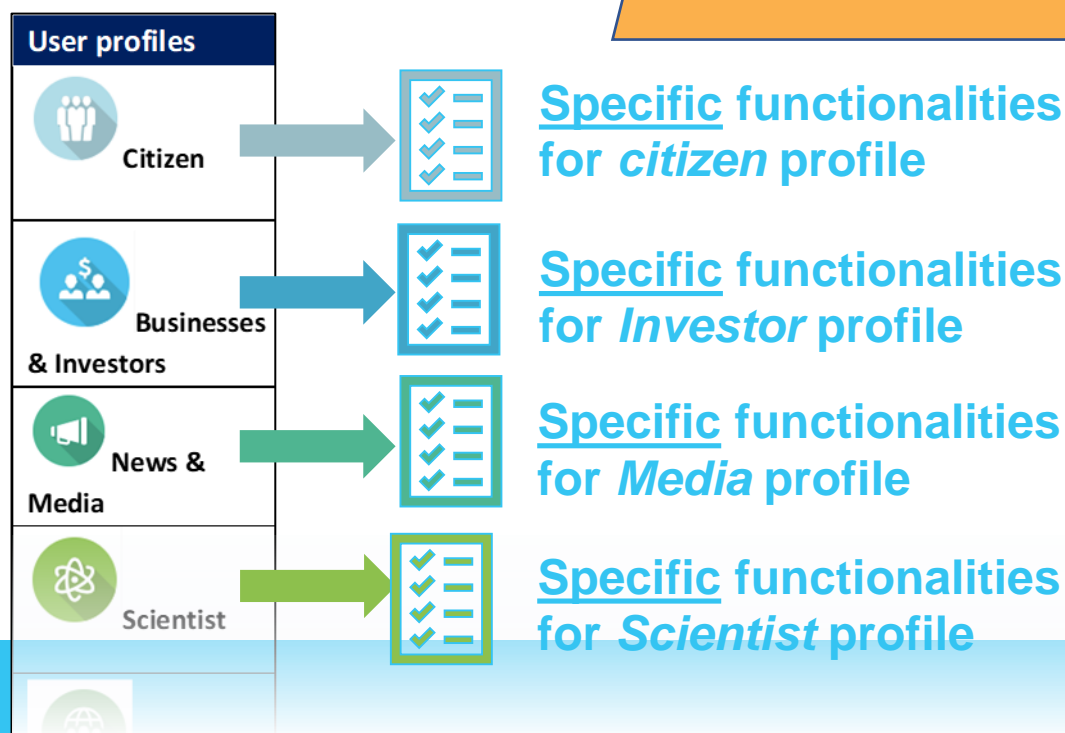
OUTCOMES

- Specific functionalities developed ad-hoc for specific user categories

A couple of Examples

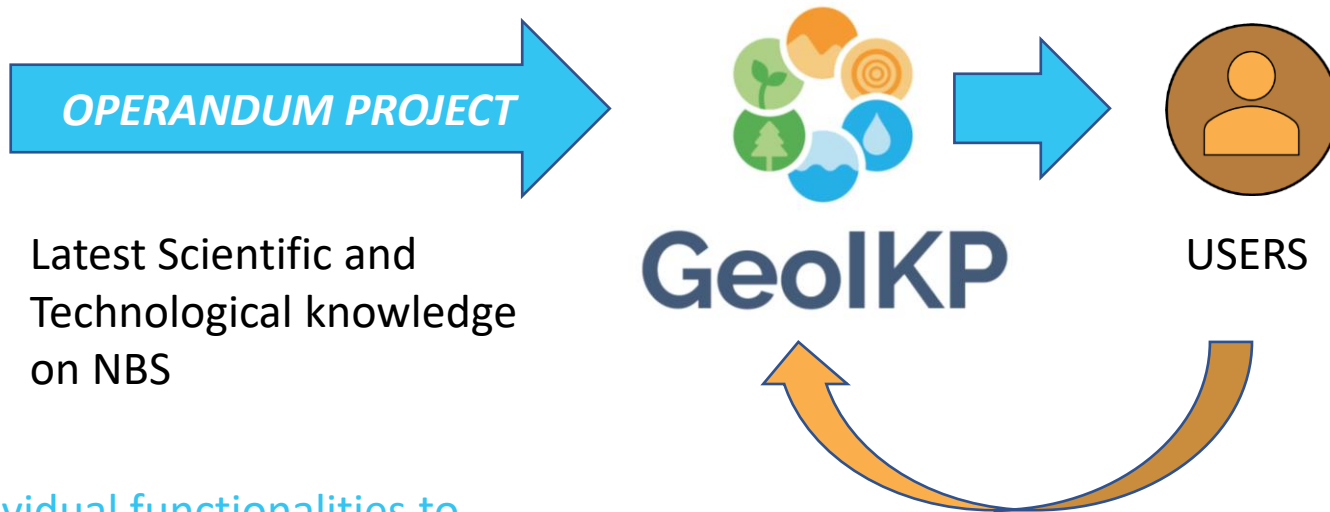
Business Networking

Citizens' stories





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



Latest Scientific and
Technological knowledge
on NBS

GeolKP

USERS

- ❑ 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

GeolKP Overview

OPERANDUM Data METHODOLOGY

Collect / Process

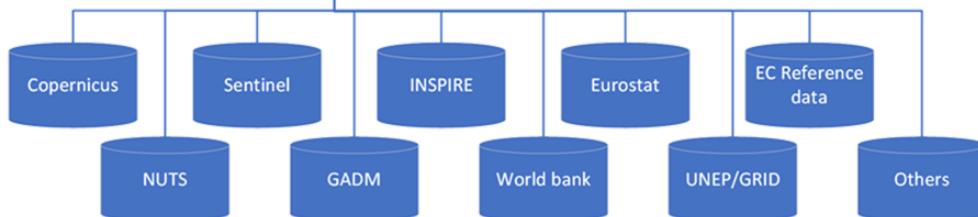
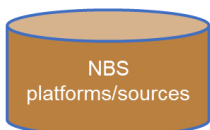
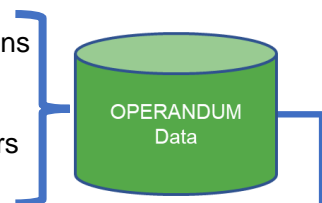
Quality
Check

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)

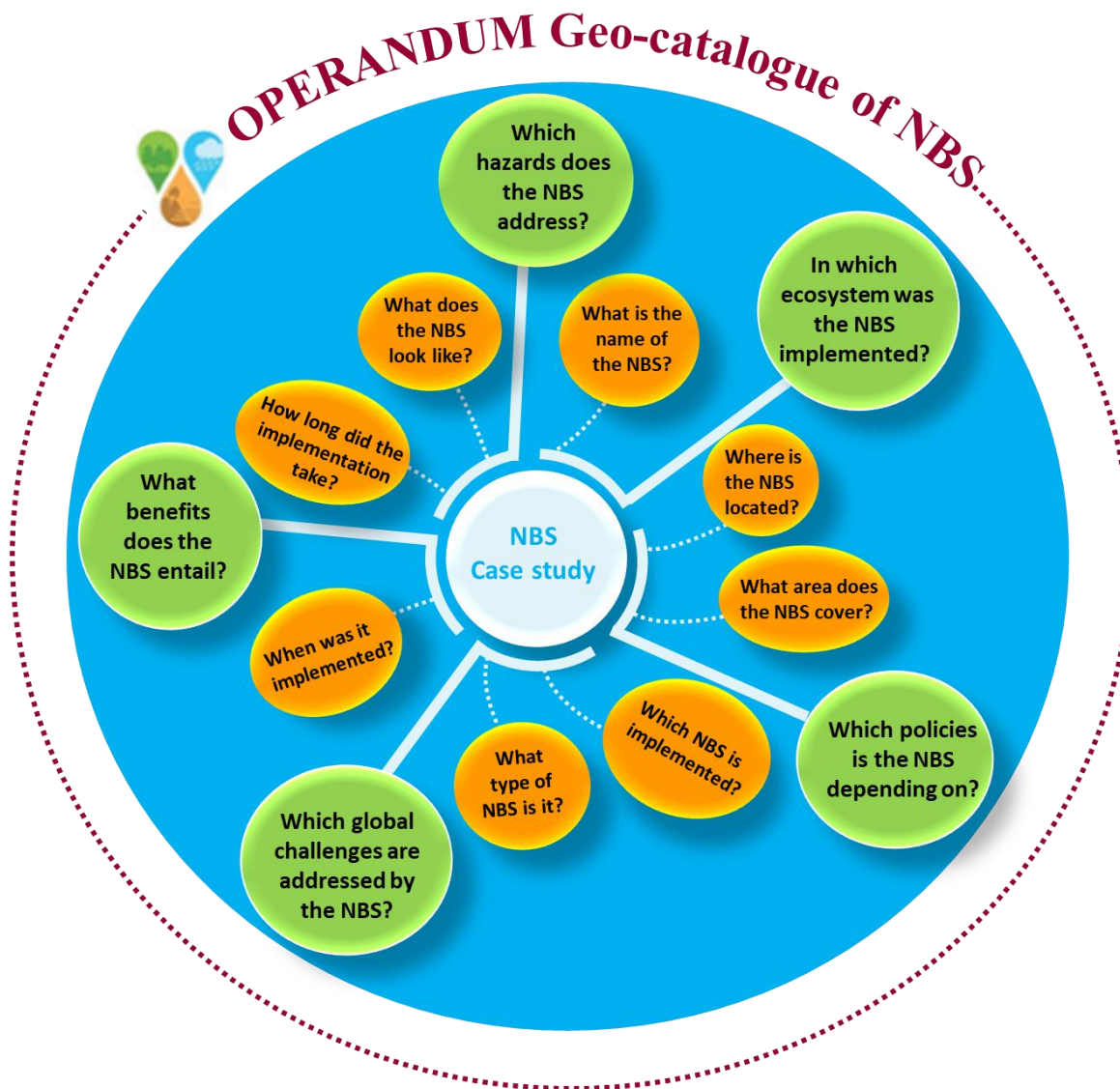


Findable
Accessible
Interoperable
Reusable

Fulfil
FAIR principles



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GA no. 776848



NBS METADATA

Translated into a set of metadata fields

ADD YOUR NBS

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

5%

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.

-- select one option --

Enter the area in

Exact km²

NBS METADATA

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

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

Hazard

Eutrophication
Drought
Riverine (fluvial) Flood

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



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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

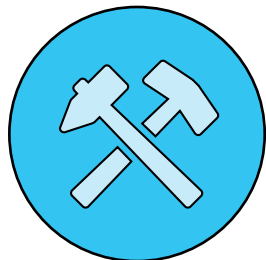
organizations

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



GeolKP

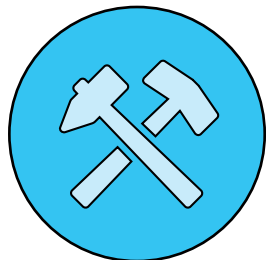




OPERANDUM

GeolKP 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 GeolKP community.

Learn



About Nature-based Solutions



Get inspired



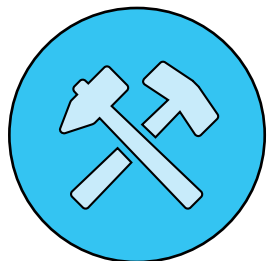
GeolKP



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+10



Tools

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

Get inspired



OPERANDUM

NBS Co-creation

OPERANDUM Best Practice

About Nature-based Solutions

Permitting Paths

Citizens' Stories

Discover

Case Study Collection

Business networking

Policy Catalogue

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

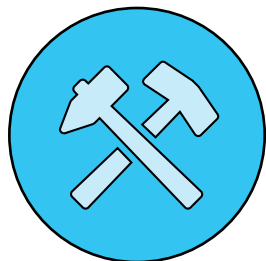




OPERANDUM

GeoIKP Overview

+10



Tools

GeoIKP



Get inspired
Discover

Learn



Analyse



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.)



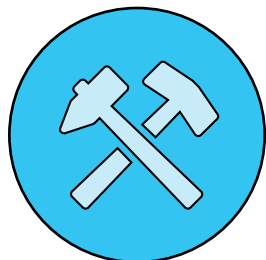
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GeolKP Overview

+10



Tools

Get inspired
Discover
Analyse
Learn
Select



OPERANDUM

NBS Co-creation

OPERANDUM Best Practice

Business networking

Data Portal

About Nature-based Solutions

Permitting Paths

Citizens' Stories

Case Study Collection

Policy Catalogue

Interactive Map

NBS Toolkit

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



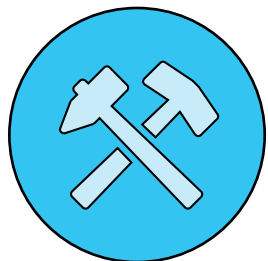
EU funded project
GA no. 776848



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GeoIKP Overview

+10



Tools

Get inspired
Discover
Analyse
Select
Get Involved

Learn



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Interactive Map

NBS Toolkit

Add your Story

Add your Data

Add your NBS

Add your Enterprise



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



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GA no. 776848

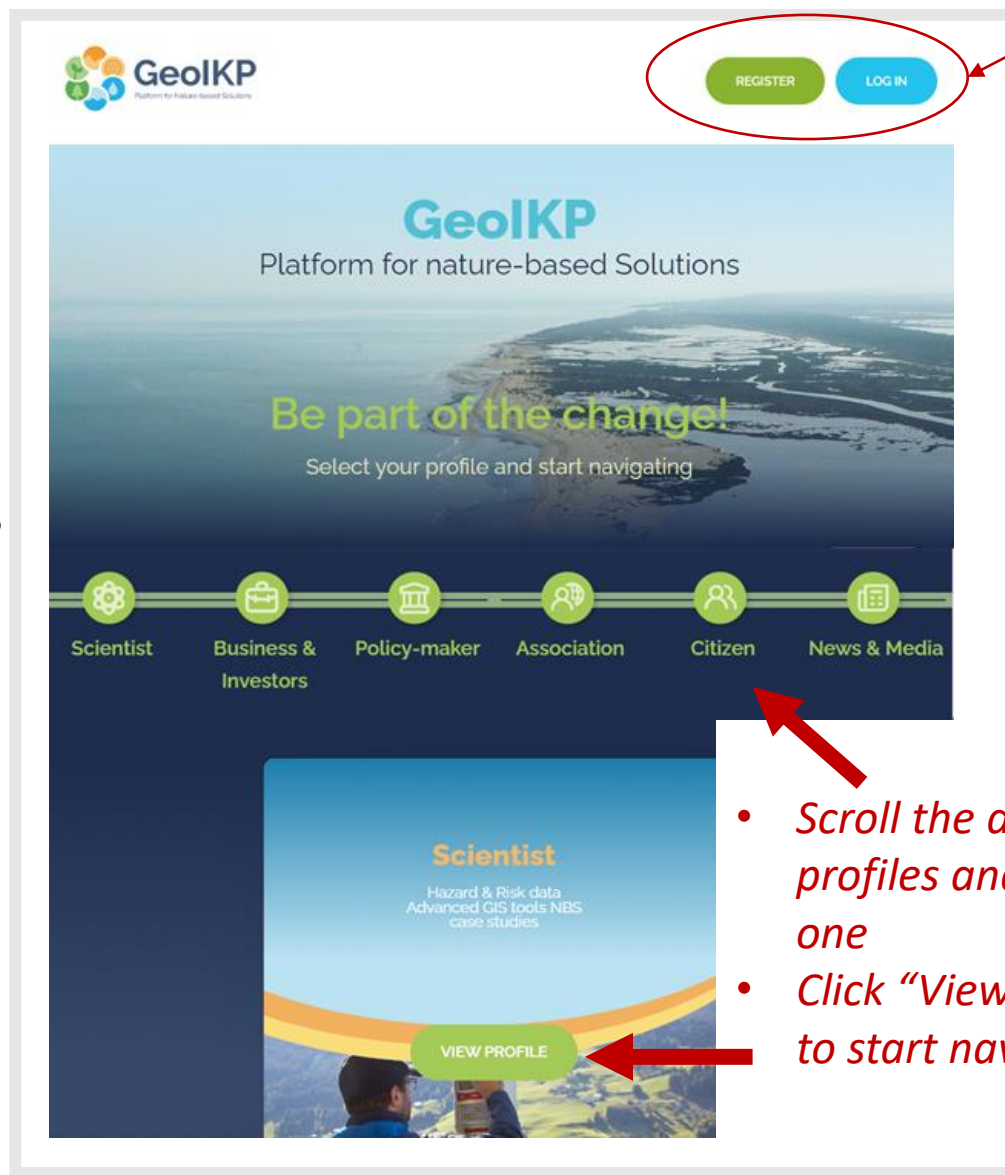


GeoIKP *Virtual tour*





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

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

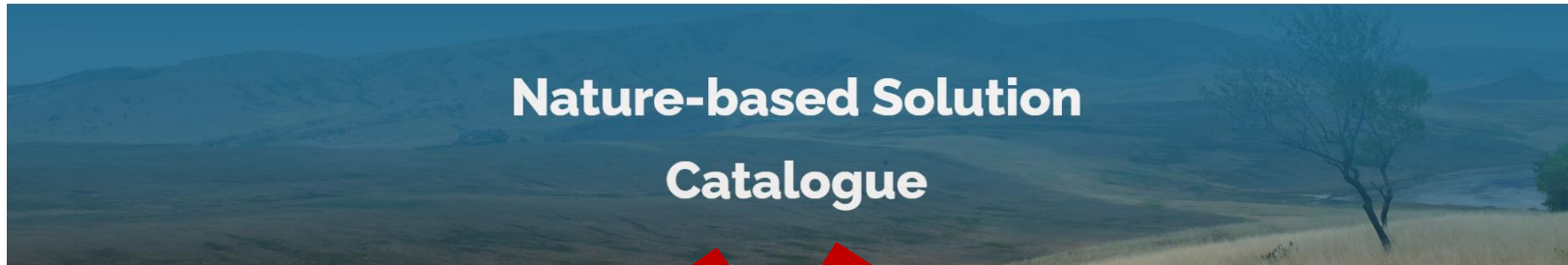
NBS Co-creation Pathway
Explore the NBS co-creation process step by step
EXPLORE

GeolKP User Guide

Scientist homepage



<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

<input type="text" value="Search NBS..."/>	Hazard	Intervention type (e.g. green roofs)
Ecosystem	Approach (e.g. protection of natural forests)	Target (SDG etc.)
Policy level		

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



Click "search" to display the results

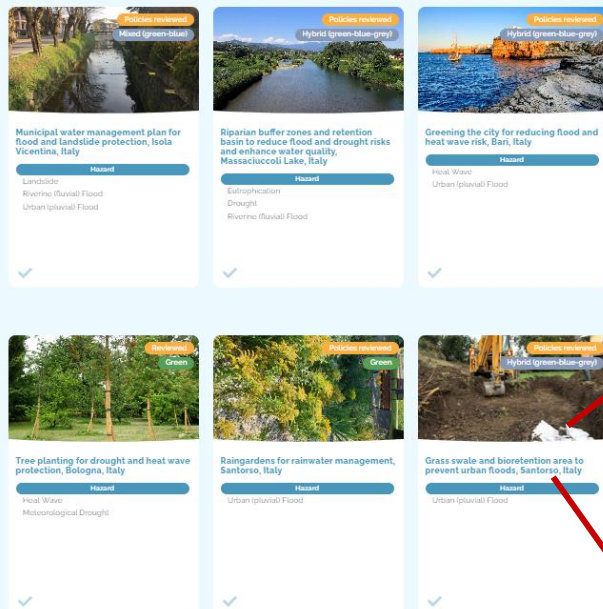
Click "X" to clear all filters



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

Nature-based Solution Catalogue

Showing 6 of 28 NBS case studies



LOAD MORE

View Individual Results

• On the map: click on the icon



• From the list: click on the individual NBS factsheet

Grass swale and bioretention area to prevent urban floods, Santorso, Italy

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

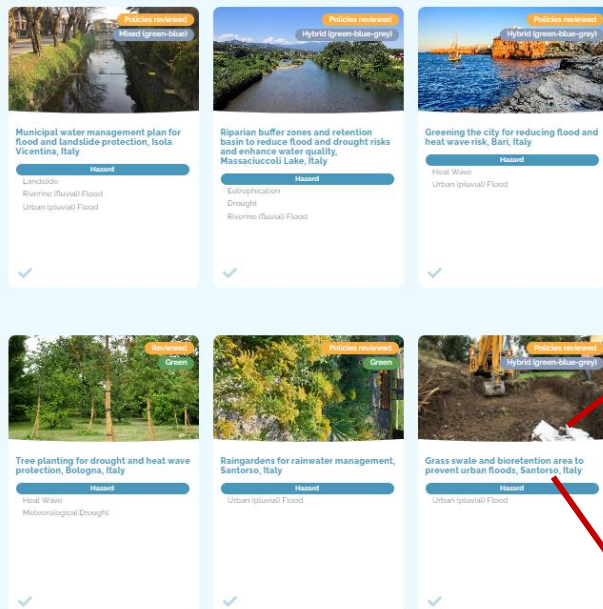




<https://geoikp.operandum-project.eu/nbs/explorer>

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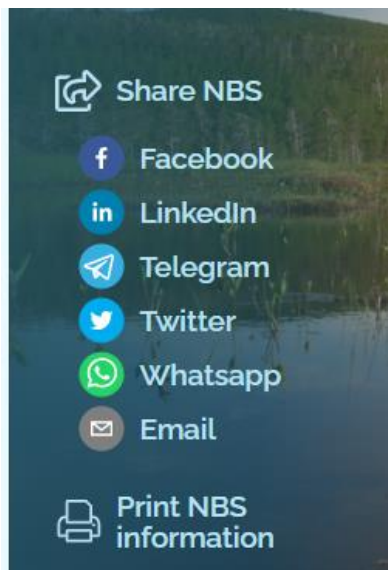
GeoIKP Virtual tour

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

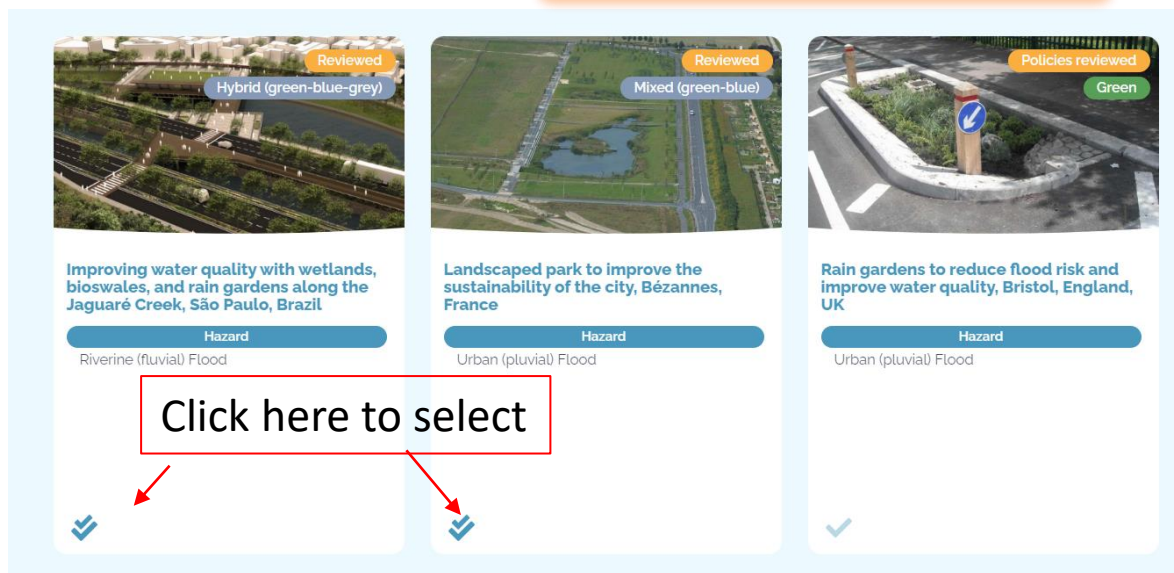
Nature-based Solution Catalogue

Additional functionalities:

1. SHARE/ PRINT
NBS case study



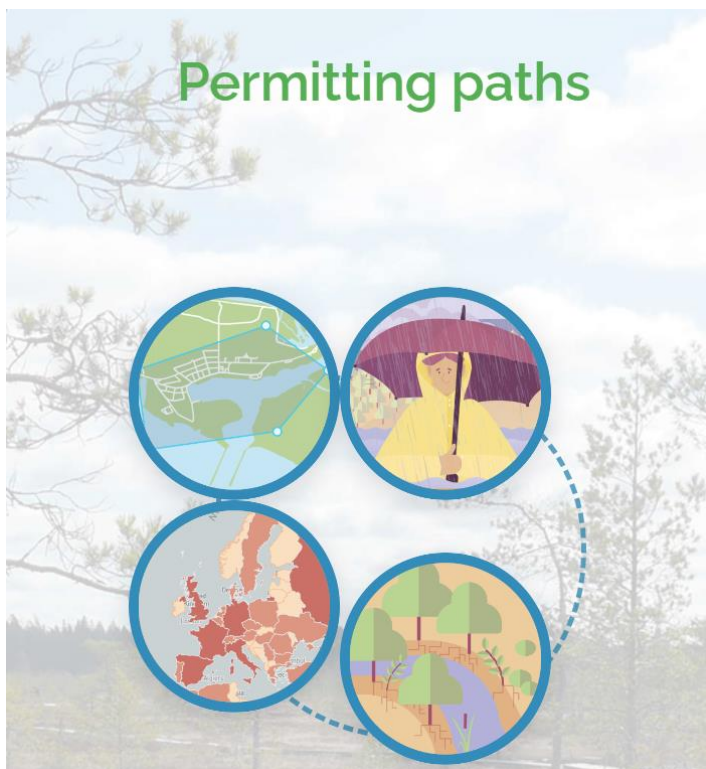
2. COMPARE
NBS case studies



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<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

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



SEARCH

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 (Capitolina Junta n.151/2018)

⌚ Local
🔗 Go to the policy

Civil protection and natural disasters

⌚ Regional
🔗 Go to the policy





OPERANDUM

GeoIKP Virtual tour

<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 - Vögtelsberg

Hazards: Landslide

EXPLORE

OAL Hong Kong

The Hong Kong New Territories

Hazards: Flood, Storm surge, Landslide

EXPLORE

OAL China

Shijiang River Watershed

Hazards: Land degradation

EXPLORE

OAL Finland

Lake Puruvesi

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

Belluccia Beach

Hazards: Storm Surge, Seawater Intrusion, Coastal Erosion

EXPLORE

OAL Italy

Panaro River

Hazards: Flood, Soil Erosion

EXPLORE

OAL Italy

Po di Goro

Hazards: Drought, Seawater Intrusion

EXPLORE

OAL UK

Catlin's Bay

Hazards: Coastal Erosion, Storm Surge, Flood, Landslide

EXPLORE



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GA no. 776848



<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

LAYERS MANAGER

- Organize, Hide, etc layers
- Read metadata
- Show legend

SEARCH LAYERS

- Search & upload additional layers

BOUNDARIES

RISK

NBS

ADD LOCAL FILE TO THE MAP

Default layers organized by thematic area

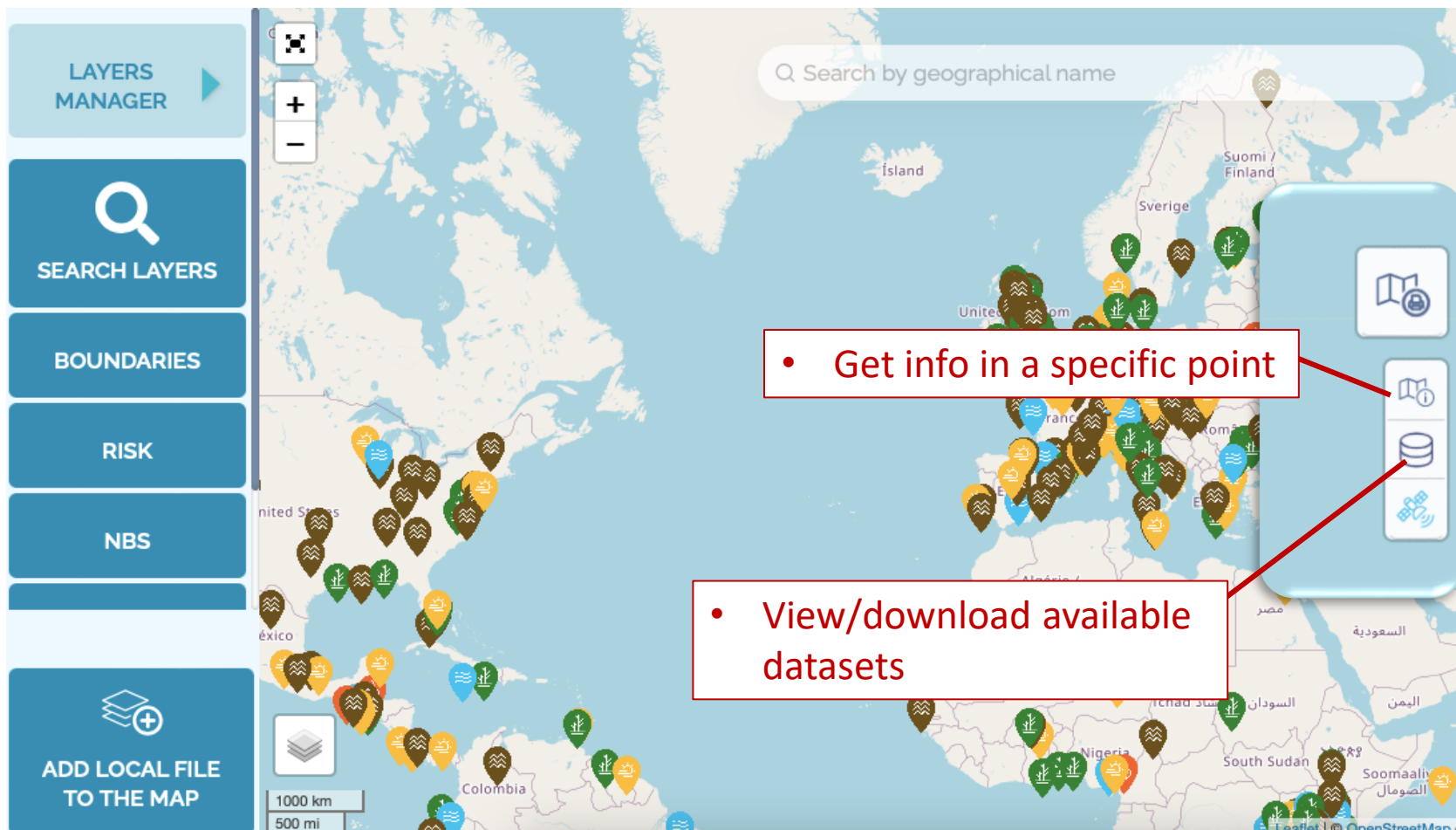


OPERANDUM

GeoIKP Virtual tour

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

INTERACTIVE MAP



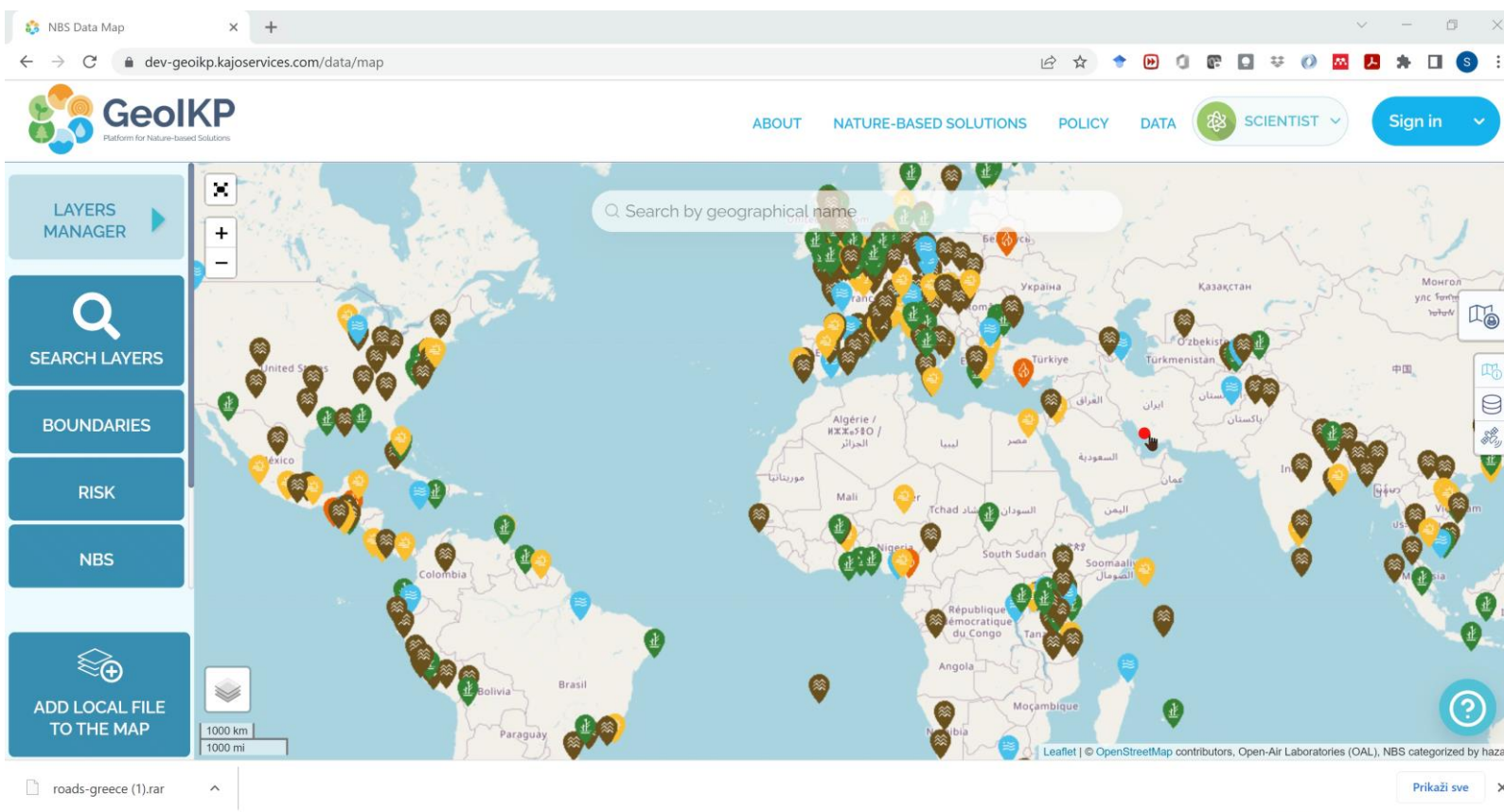
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GA no. 776848



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

INTERACTIVE MAP

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





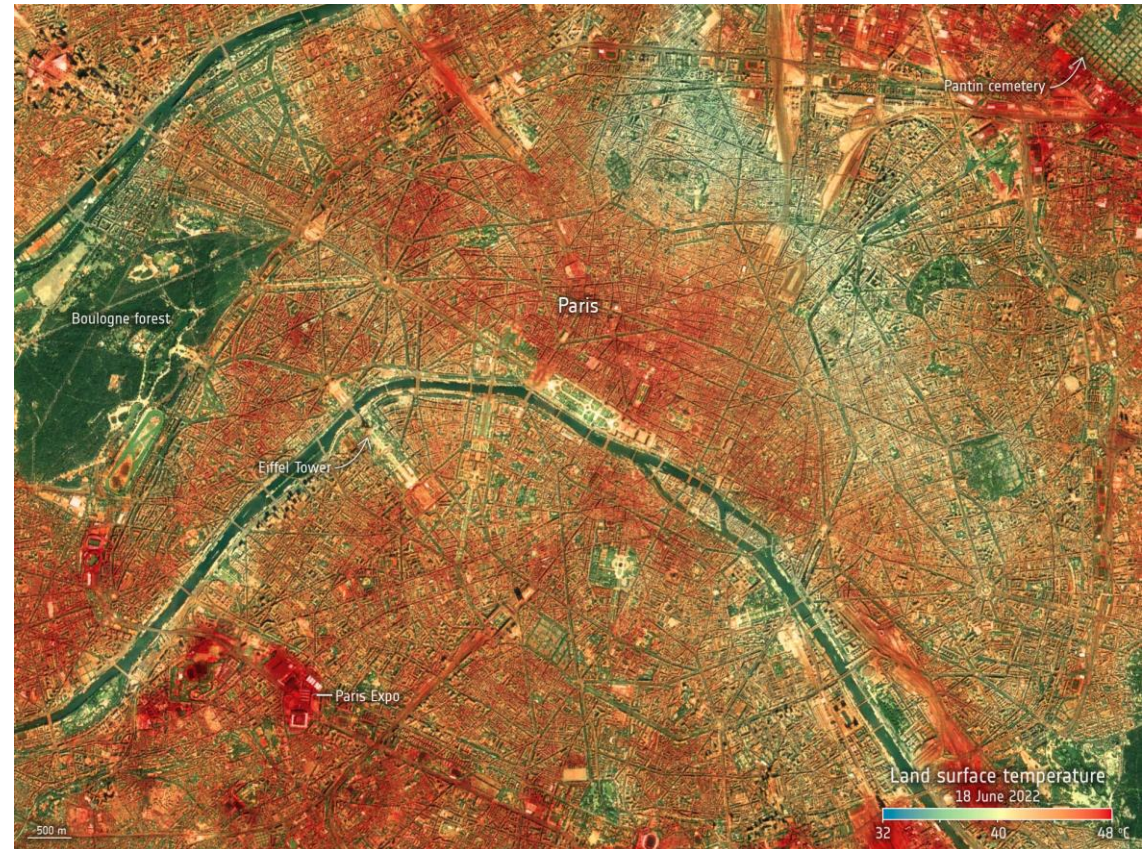
Case study example

- 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



Use Case – Problem to Solution

- 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

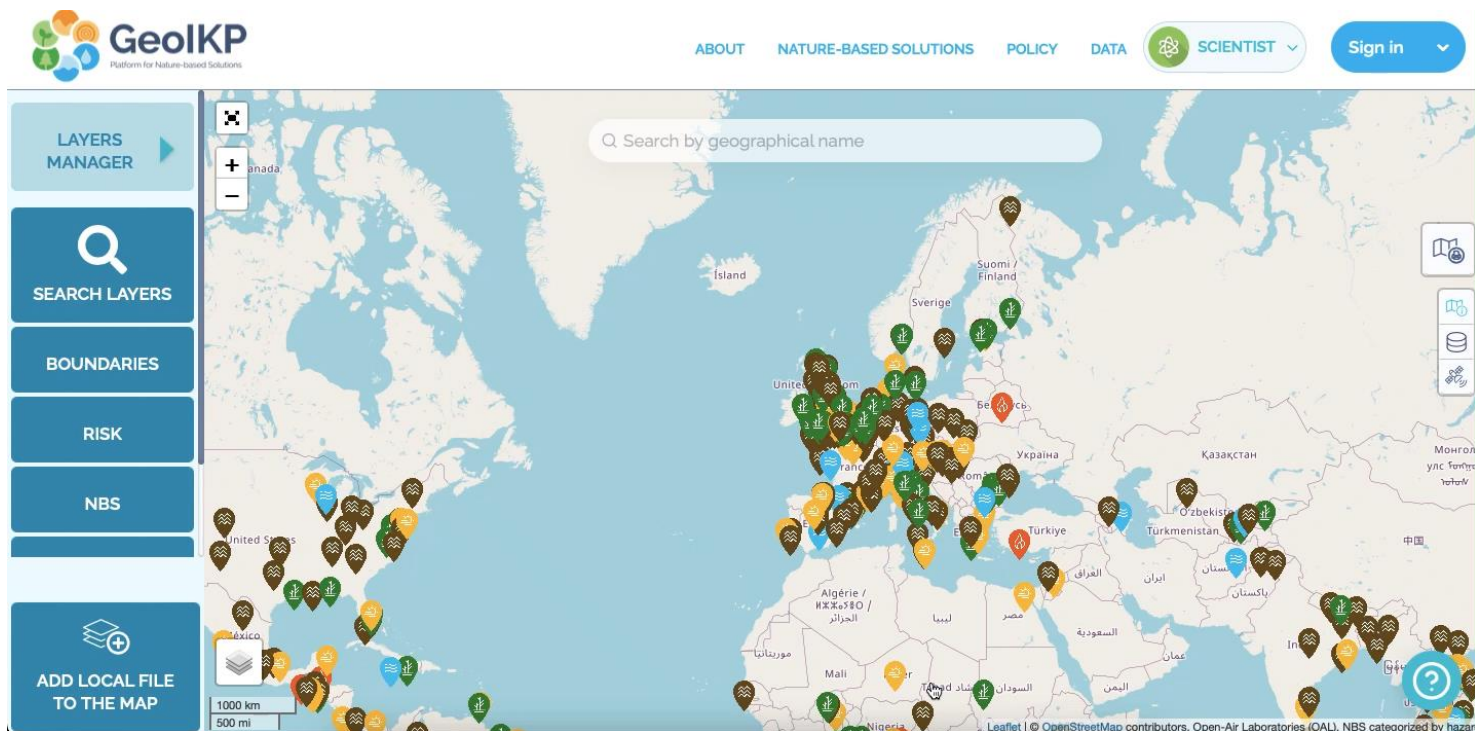
Heat Wave

Riverine (fluvial) Flood

Urban (pluvial) Flood



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





Use Case – Assess and Replicate

- 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*)



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





Thank you!



Questions?