

Eo4multihazards Web Application

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Project Description

The **EO4MULTIHAZARDS** project is a **European Space Agency** funded project aiming to explore the EO technology potential to advance the scientific understanding of high impact multi-hazard events to better identify, characterise and assess their associated risk, vulnerability and impacts on society and ecosystems. This project will finish in September 2025.

The aim of the development of the web application is to create the multi-hazard event database and provide access to it through a web portal and API.

Our initial challenge in this project is the spread of data across different repositories and the harmonization of these datasets.



Project Roadmap

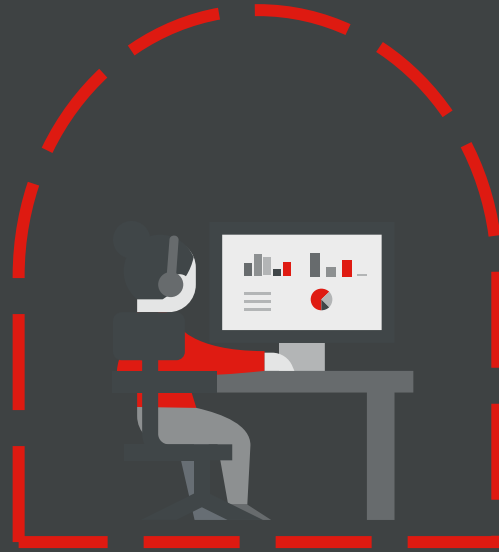


Input data

- Selection of the available and accessible hazard data sources
- Process automation

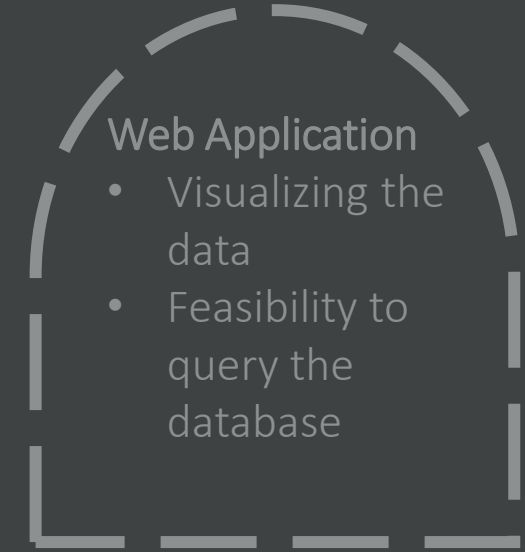
Database

- Architecture and technologies
- Relational Database
- Integrate the geometries



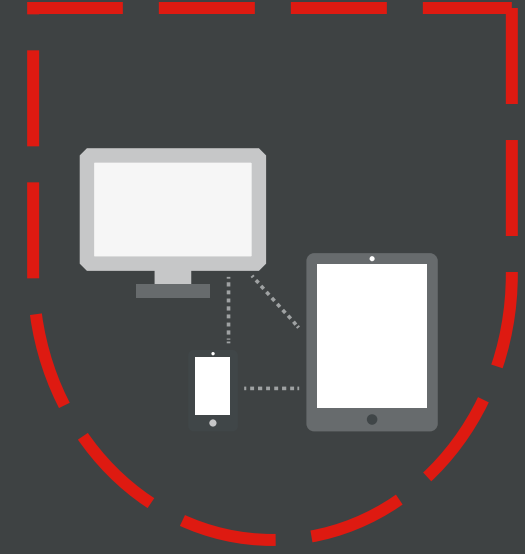
Development

- Packages and Technologies
- Feasibility to use map



Web Application

- Visualizing the data
- Feasibility to query the database



Input Data



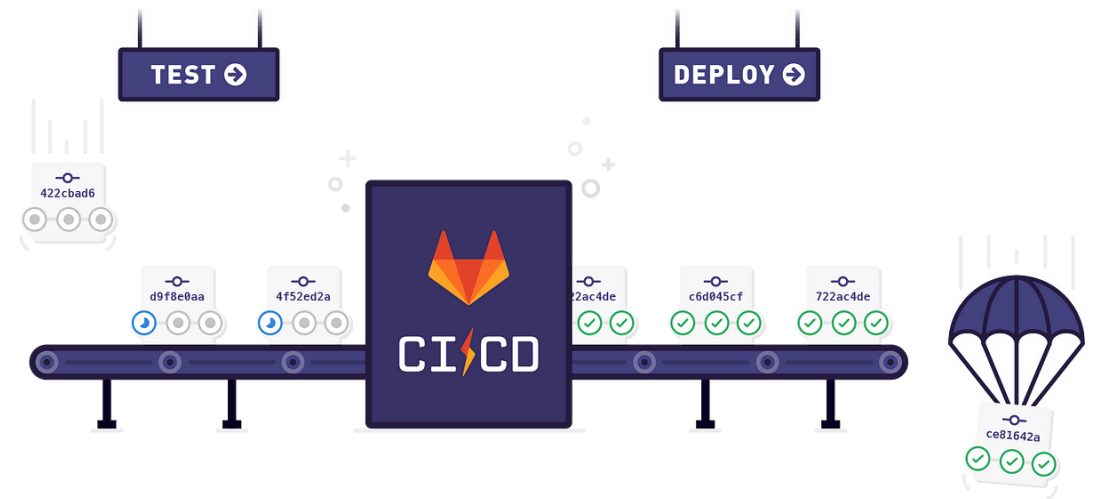
Input Data – Dataset selection

- International Disaster Database(API accessibility)
 - All Hazard Types
- European Forest Fire Information System dataset (Openly available) – Forest Fire
- British Geological Survey (Available upon request)
- Data Harvesting/ Data FAIR principles (Findable, Accessible, Interoperable, Reusable)
- API, web services



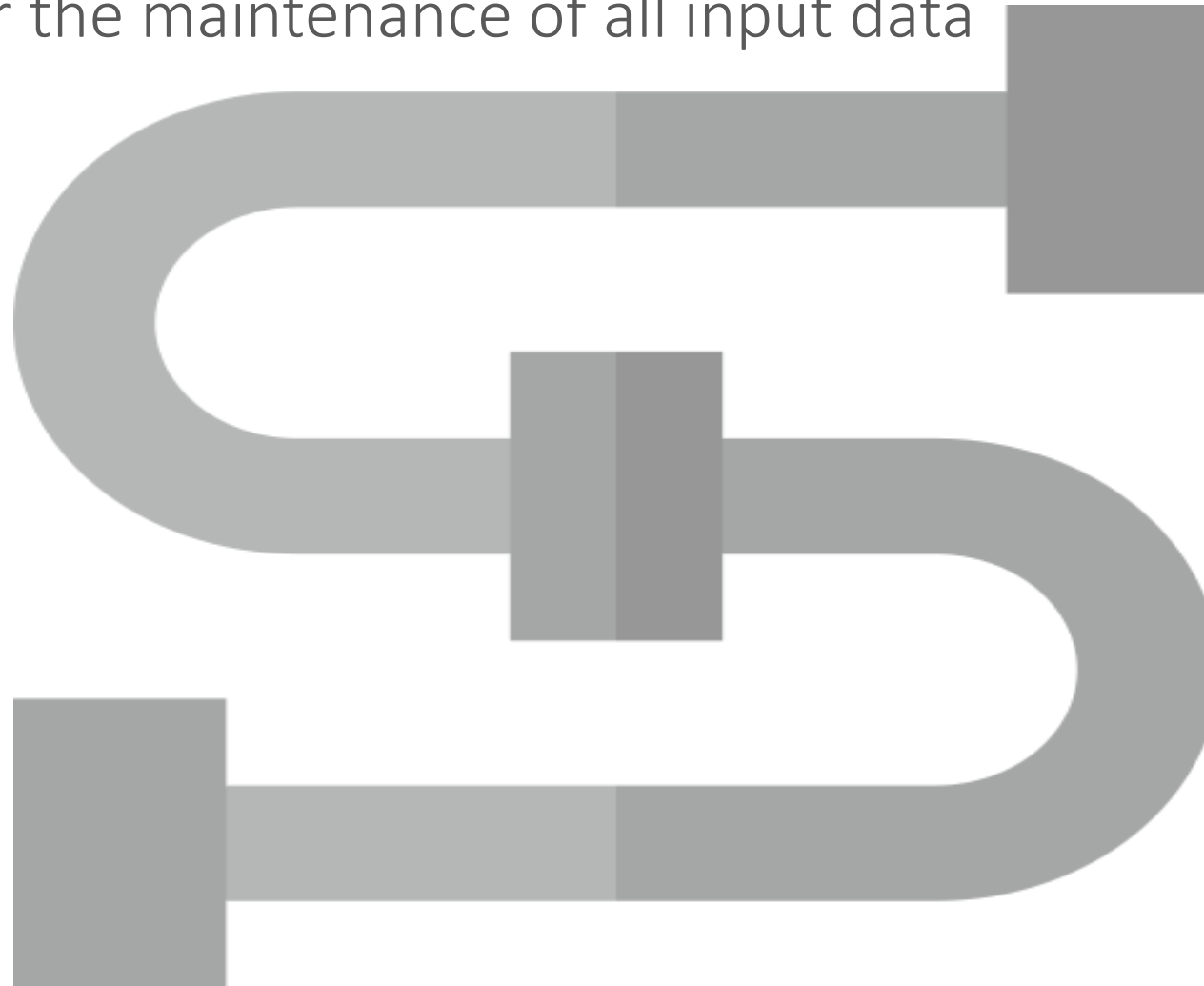
Input Data - Automation

- CI/CD pipeline for the maintenance of all input data
- Scheduled at a precise time of the day
- Download new data
- Harmonization of the database
- Uploading to the Database
- Separate Job for each Data sources



Input Data – CI/CD

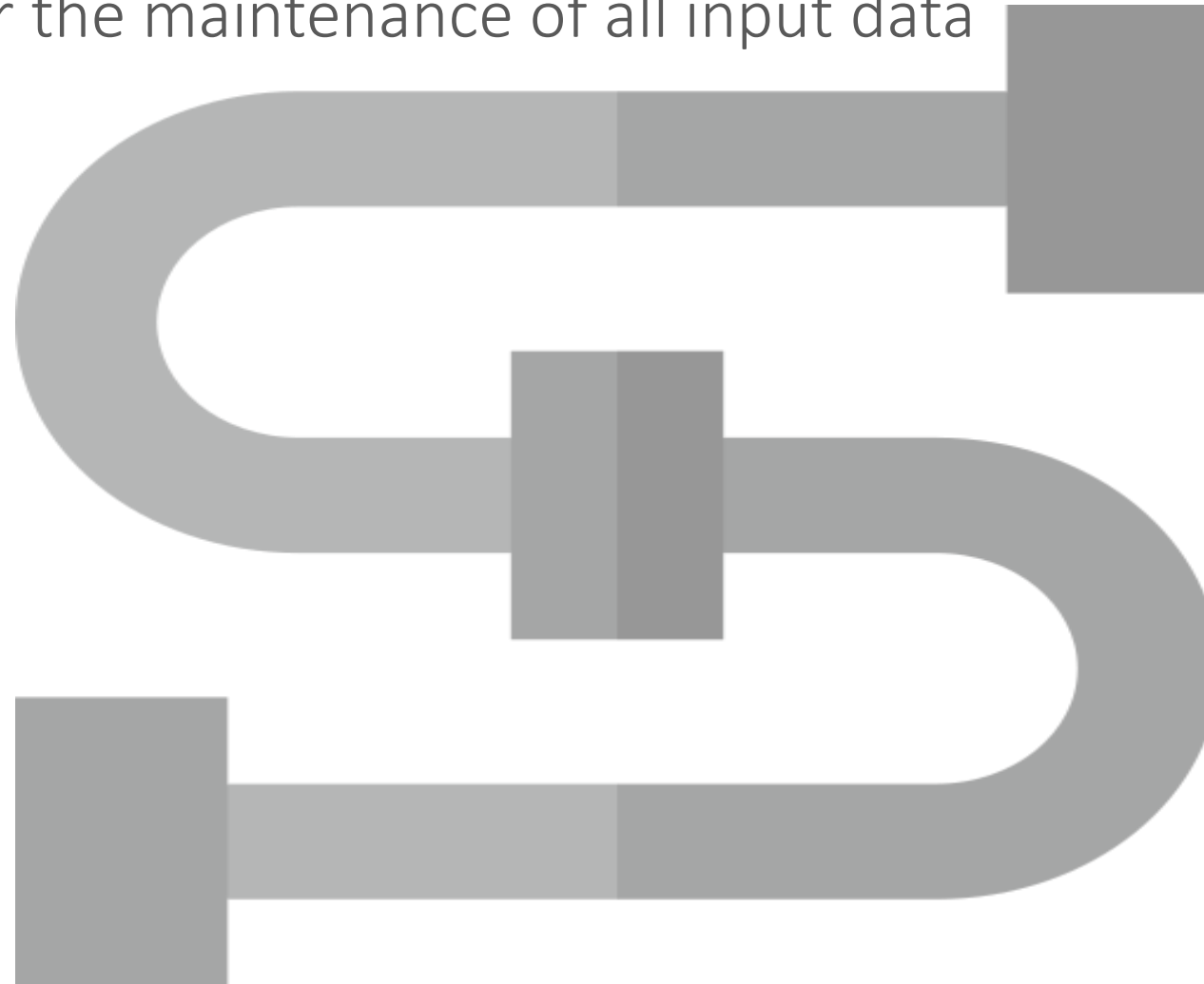
CI/CD pipeline for the maintenance of all input data



- EMDAT Data Retrieval via API
- EFFIS Data Retrieval from WFS (Web Feature Services)

Input Data – CI/CD

CI/CD pipeline for the maintenance of all input data



- EMDAT Data Retrieval via API
- EFFIS Data Retrieval from WFS (Web Feature Services)

Data is downloaded and saved in the Eo4multihazard database in different tables
Following the specific conditions from each data source

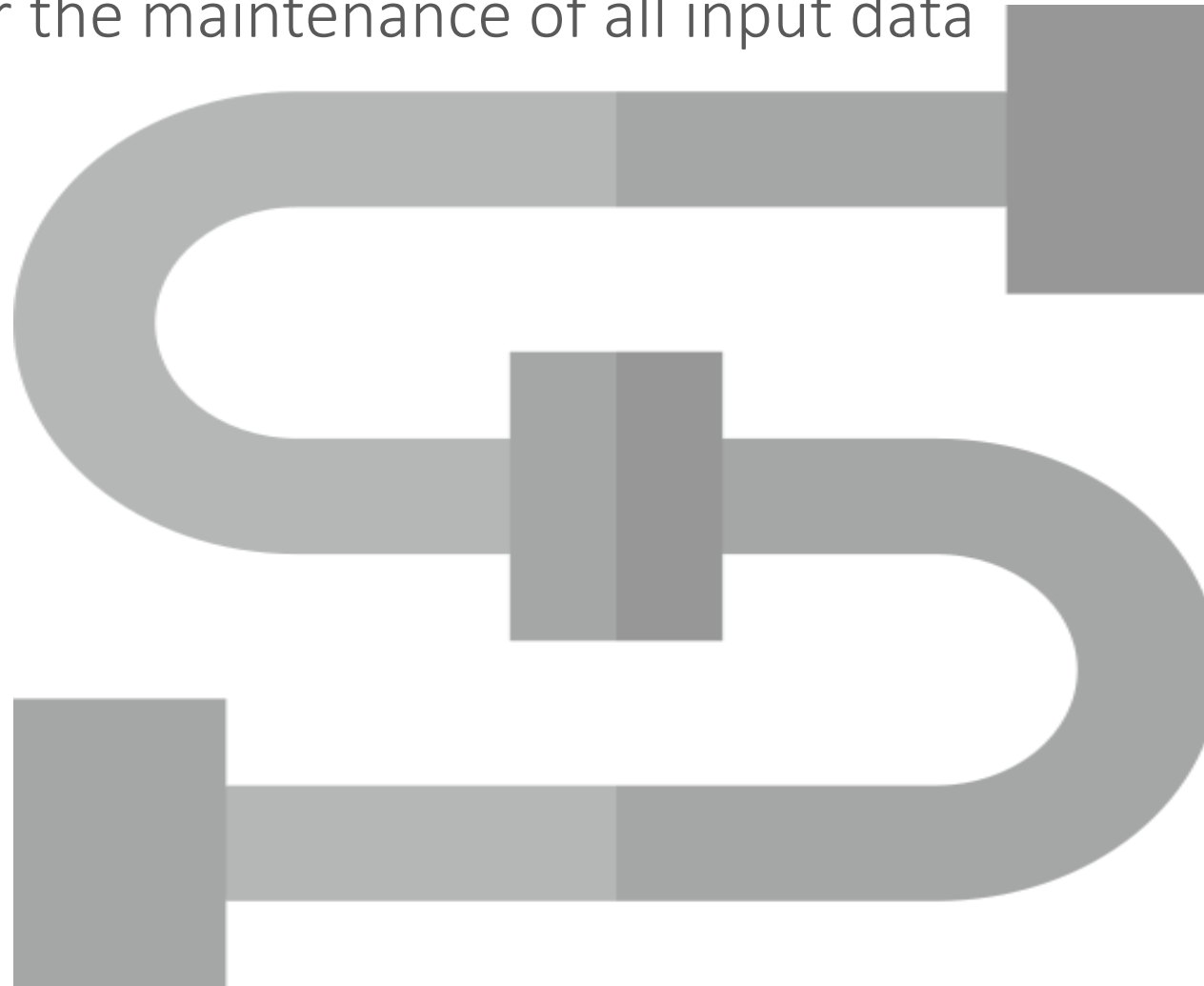
Input Data – CI/CD

CI/CD pipeline for the maintenance of all input data

Database Harmonization

- UK-BGS events dataset harmonization and upload
- EMDAT and EFFIS harmonization

- EMDAT Data Retrieval via API
- EFFIS Data Retrieval from WFS (Web Feature Services)



Data is downloaded and saved in the Eo4multihazard database in different tables following the specific conditions from each data source

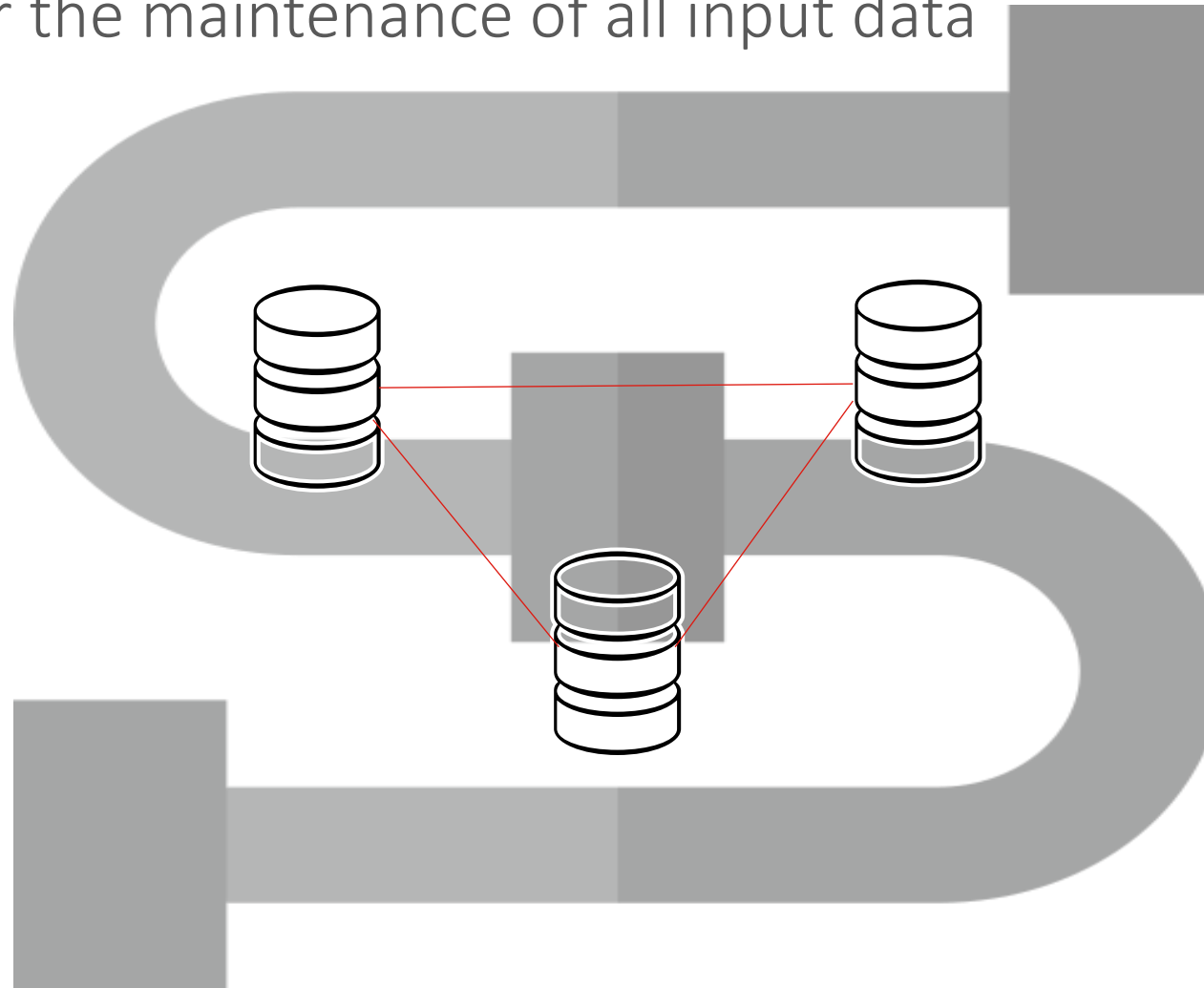
Input Data – CI/CD

CI/CD pipeline for the maintenance of all input data

Database Harmonization

- UK-BGS events dataset harmonization and upload
- EMDAT and EFFIS harmonization

- EMDAT Data Retrieval via API
- EFFIS Data Retrieval from WFS (Web Feature Services)



Eo4multihazard
Database – events table

- All the data sources are included
- final indices are accumulated based on the number of the record in the database

Data is downloaded and saved in the Eo4multihazard database in different tables
Following the specific conditions from each data source

Database



Database

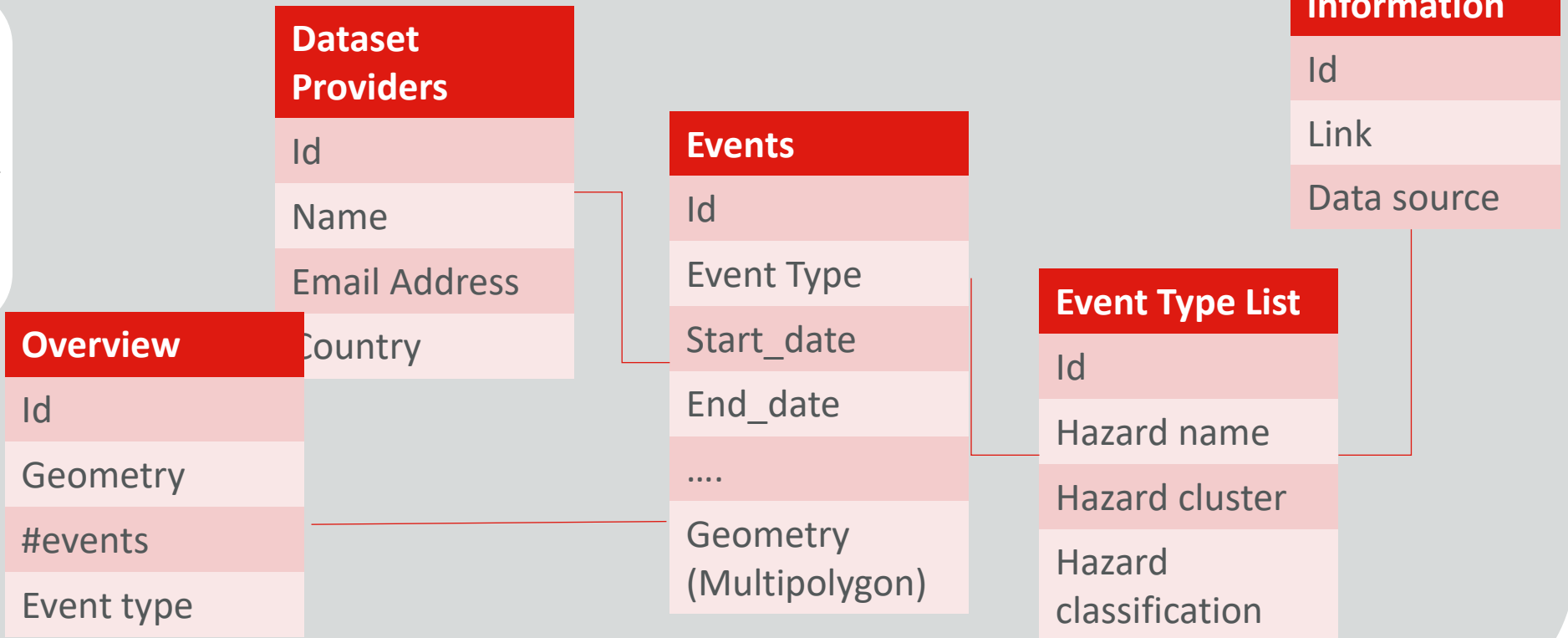


PostgreSQL: Relational Database to manage the storage of records
Collects and exposes events and datasets metadata for further analysis



PostGIS

- Plugin for PostgreSQL
- Store the Geometry data type

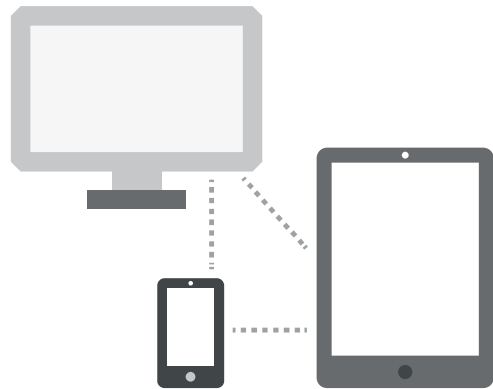


Development

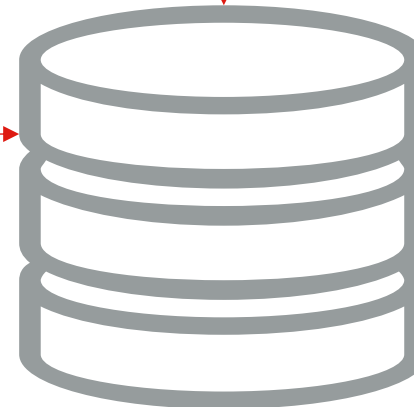


Development - Overview

Final Users (Researchers, Risk Managers,..)
Accessing the Eo4multihazard Application



Eo4multihazard Web Application



Eo4multihazard Database

EFFIS Dataset
EMDAT Dataset
BGS-UK Dataset

Development - Technologies

- Application development in **Django** framework
- Standard containerization of the application in **Docker**
- Showing the geometry of the event in **Folium** map
- Folium map is based on **Leaflet** map
- List of Countries with their ISO codes in **Py-country**
- Converting the geometry of the events with **Shapely**



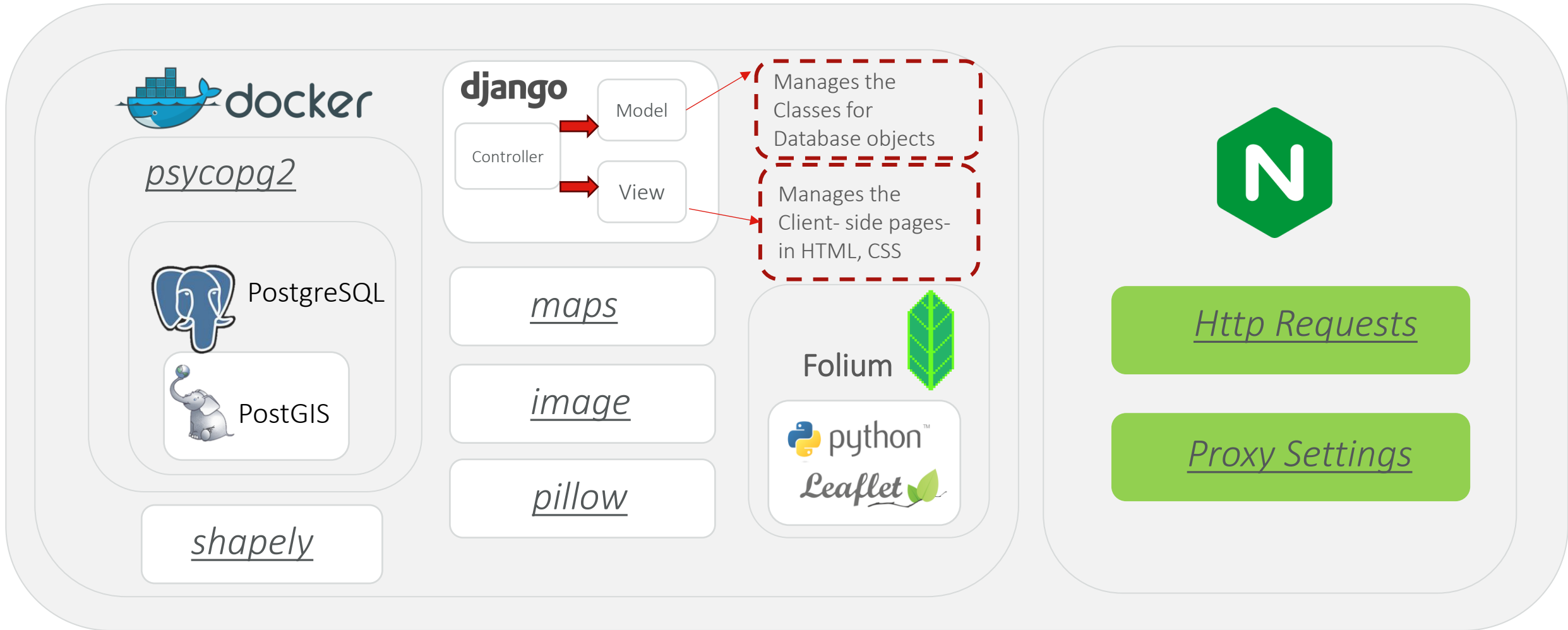
django



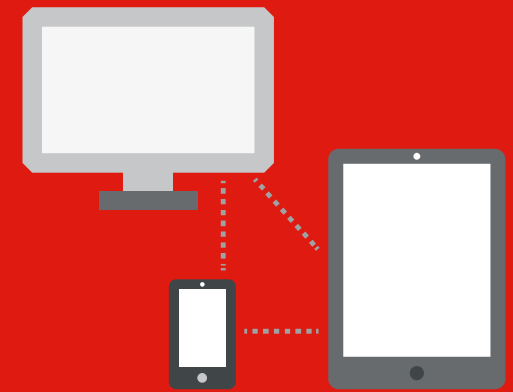
Leaflet 



Development - Packages



Web Application



Web Application

Functionalities are to support researcher and first responders to identify relation between events

- Event overview - GAUL Admin-0 level, implemented by the Food and Agriculture Organization (FAO)

E04MULTHAZARDS beta version Project Dataset Contact

Filtering Tools: Use it to query event records

Start Date: gg/mm/aaaa End Date: gg/mm/aaaa

Select the Event Type

- Acid rain
- Air pollution (outdoor / chronic) - poor air quality
- Air pollution (outdoor - result of product combustion and other hazards)
- Aquifer recharge (systems failure/ outages)

Select the Event Country

- Austria
- Belgium
- Bulgaria
- Cyprus

Recorded Events

	Event Type	Country	Location	Id	Date	Start	End	Provider
●	Wildfire	ES	Pobla, Sa	49512	Oct. 16, 2024	Oct. 16, 2024	Oct. 16, 2024	EFFIS
●	Wildfire	TR	N.A.	57641	Oct. 15, 2024	Oct. 15, 2024	Oct. 15, 2024	EFFIS
●	Wildfire	TR	N.A.	57727	Oct. 15, 2024	Oct. 15, 2024	Oct. 15, 2024	EFFIS
●	Wildfire	RO	Brezni?a-Ocol	57725	Oct. 15, 2024	Oct. 15, 2024	Oct. 15, 2024	EFFIS
●	Wildfire	TR	N.A.	57614	Oct. 15, 2024	Oct. 15, 2024	Oct. 15, 2024	EFFIS
●	Wildfire	RO	Brezni?a-Ocol	57607	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	RO	Brezni?a-Ocol	57724	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	DZ	N.A.	43575	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	IT	Villaplana	49097	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	DZ	N.A.	43555	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS

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Web Application

Functionalities are to support researcher and first responders to identify relation between events

- Event overview - GAUL Admin-0 level, implemented by the Food and Agriculture Organization (FAO)
- Features filtering by polygon on the map

E04MULTHAZARDS beta version Project Dataset Contact

Filtering Tools: Use it to query event records

Start Date: gg/mm/aaaa End Date: gg/mm/aaaa search reset

Select the Event Type
Acid rain
Air pollution (outdoor / chronic) - poor air quality
Air pollution (outdoor - result of product combustion and other hazards)
Aquifer recharge (systems failure/ outages)

Select the Event Country
Austria
Belgium
Bulgaria
Cyprus

Recorded Events

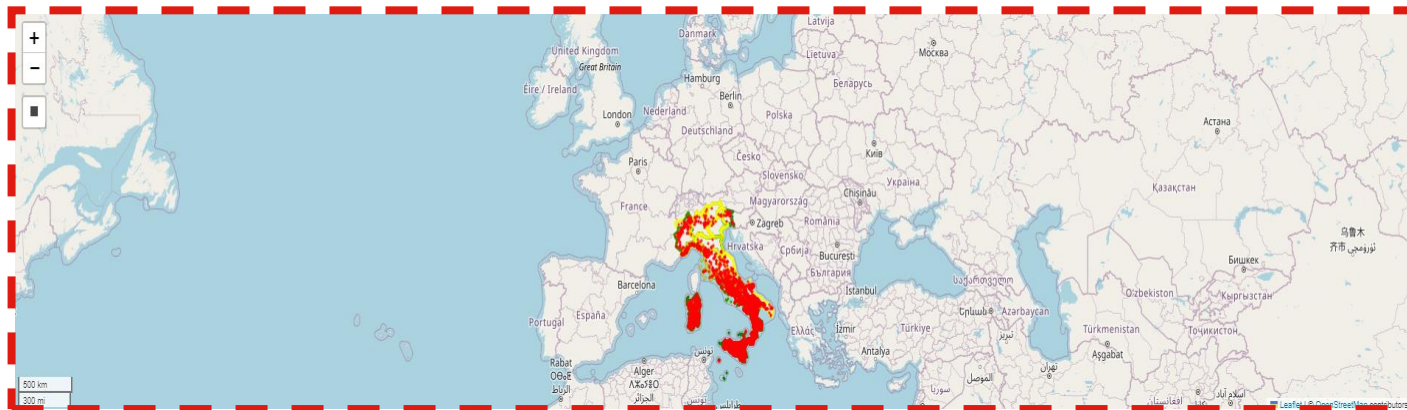
	Event Type	Country	Location	Id	Date	Start	End	Provider
●	Wildfire	ES	Pobla, Sa	49512	Oct. 16, 2024	Oct. 16, 2024	Oct. 16, 2024	EFFIS
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●	Wildfire	TR	N.A.	57727	Oct. 15, 2024	Oct. 15, 2024	Oct. 15, 2024	EFFIS
●	Wildfire	RO	Brezni?a-Ocol	57725	Oct. 15, 2024	Oct. 15, 2024	Oct. 15, 2024	EFFIS
●	Wildfire	TR	N.A.	57614	Oct. 15, 2024	Oct. 15, 2024	Oct. 15, 2024	EFFIS
●	Wildfire	RO	Brezni?a-Ocol	57607	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	RO	Brezni?a-Ocol	57724	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	DZ	N.A.	43575	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	IT	Villaplana	49097	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS
●	Wildfire	DZ	N.A.	43555	Oct. 14, 2024	Oct. 14, 2024	Oct. 14, 2024	EFFIS

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Web Application

Functionalities are to support researcher and first responders to identify relation between events

- Event overview - GAUL Admin-0 level, implemented by the Food and Agriculture Organization (FAO)
- Features filtering by polygon on the map
- Features filtering by country, event type, start/end date



A screenshot of the E04MULTIHAZARDS web application interface. The interface includes a header with the project name and navigation links, a map of Europe, and a filtering panel. The filtering panel has fields for Start Date and End Date, a dropdown for Event Type, and a dropdown for Event Country. Below the filtering panel is a table of recorded events with columns for Event Type, Country, Location, Id, Date, Start, End, and Provider. The table shows several wildfire events in Spain, Turkey, Romania, and Algeria. A red dashed box highlights the filtering panel and the table, with a red arrow pointing from the highlighted area on the map to the table.

Web Application

➤ Download result of related events list

The screenshot displays the Eo4MULTHAZARDS web application interface. At the top, there is a navigation bar with the project name 'E04MULTHAZARDS draft version' and links for 'Project', 'Dataset', and 'Contact'. The main content area is divided into several sections:

- Event Information:** A form displaying details for a wildfire event. The event name is 'Wildfire', ID is '2343', and it occurred on 'May 5, 2024' in 'Kirklees, UK'. The hazard type is 'METEOROLOGICAL and HYDROLOGICAL'.
- Map:** A map of Great Britain with a red circle indicating the location of the event in Kirklees.
- Related Datasets:** A table with columns for Id, Category, Title, Link to dataset, Provider, Data Repository, and Documentation.
- Related Events:** A section with filters for Start Date (05/01/2022), End Date (05/05/2024), and Radius (200000). A 'Download CSV' button is highlighted with a red dashed box. Below the filters is a table of related events.
- Related Publications:** A section with a table for Id and Information.

Id	Event Type	Start Date
77871	Heatwave	Aug. 16, 2022
77866	Heatwave	July 27, 2022
77939	Drought	Sept. 12, 2022
77944	Landslide	June 28, 2022
77937	Drought	Sept. 12, 2022
77863	Heatwave	July 20, 2022
77850	Heatwave	July 18, 2022
77851	Heatwave	July 18, 2022
77835	Heatwave	Aug. 13, 2022
77890	Wildfire	July 19, 2022
77886	Wildfire	July 19, 2022
77899	Wildfire	Aug. 14, 2022
77943	Drought	Sept. 12, 2022
77876	Heatwave	July 11, 2022
77884	Wildfire	July 17, 2022
77873	Heatwave	Aug. 16, 2022
77857	Heatwave	July 19, 2022
77885	Wildfire	July 19, 2022
77847	Heatwave	July 22, 2022
77942	Drought	Sept. 12, 2022
77874	Heatwave	July 11, 2022
77862	Heatwave	July 20, 2022
77846	Heatwave	July 16, 2022
77875	Heatwave	July 11, 2022
77883	Wildfire	July 16, 2022

Web Application

- Download result of related events list
- Query to display related events: filter by time and radius

The screenshot displays the Eo4MULTHAZARDS web application interface. At the top, there is a navigation bar with the title "E04MULTHAZARDS draft version" and links for "Project", "Dataset", and "Contact".

Event Information:

- Hazard Name: Wildfire
- Id: 2343
- Insert Date: May 5, 2024
- Start Date: May 5, 2024
- End Date: May 5, 2024
- Country: UK
- Location: Kirklees
- Description:
- Hazard Cluster: None
- Hazard Type: METEOROLOGICAL and HYDROLOGICAL
- Data Provider: EFFIS
- Reference Number: Reference Id

A map of Great Britain is shown on the right, with a red circle indicating the location of Kirklees in the north of England.

Related Datasets:

Id	Category	Title	Link to dataset	Provider	Data Repository	Documentation
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Related Events:

Start Date: 05/01/2022 | End Date: 05/05/2024 | Radius: 200000 | Show Data | Download CSV

Id	Event type	Start Date
77871	Heatwave	Aug. 16, 2022
77866	Heatwave	July 27, 2022
77939	Drought	Sept. 12, 2022
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77885	Wildfire	July 19, 2022
77847	Heatwave	July 22, 2022
77942	Drought	Sept. 12, 2022
77874	Heatwave	July 11, 2022
77862	Heatwave	July 20, 2022
77846	Heatwave	July 16, 2022
77875	Heatwave	July 11, 2022
77883	Heatwave	July 16, 2022

Related Publications:

Id	Information
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Web Application

- Download result of related events list
- Query to display related events: filter by time and radius
- Map overview of selected event and related ones

The screenshot displays the Eo4MULTHAZARDS web application interface. At the top, there is a navigation bar with the logo, the text "E04MULTHAZARDS draft version", and links for "Project", "Dataset", and "Contact".

The main content area is divided into several sections:

- Event Information:** A list of key-value pairs for a wildfire event:
 - Hazard Name: Wildfire
 - Id: 2343
 - Insert Date: May 5, 2024
 - Start Date: May 5, 2024
 - End Date: May 5, 2024
 - Country: UK
 - Location: Kirklees
 - Description:
 - Hazard Cluster: None
 - Hazard Type: METEOROLOGICAL and HYDROLOGICAL
 - Data Provider: EFFIS
 - Reference Number: Reference Id
- Map:** A map of Great Britain with a red dashed box highlighting the region around Leeds and Kirklees. A red arrow points from the "Location" field in the event information to this map.
- Related Datasets:** A table with columns: Id, Category, Title, Link to dataset, Provider, Data Repository, Documentation.
- Related Events:** A section with filters for Start Date (05/01/2022), End Date (05/05/2024), and Radius (200000). Below the filters is a table of related events:

Id	Event Type	Start Date
77871	Heatwave	Aug. 16, 2022
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77862	Heatwave	July 20, 2022
77846	Heatwave	July 16, 2022
77875	Heatwave	July 11, 2022
77883	Wildfire	July 16, 2022
- Related Publications:** A table with columns: Id, Information.

Web Application

- Download result of related events list
- Query to display related events: filter by time and radius
- Map overview of selected event and related ones
- View the Related Publication

The screenshot displays the Eo4MULTHAZARDS web application interface. At the top, there is a navigation bar with the title "E04MULTHAZARDS draft version" and links for "Project", "Dataset", and "Contact".

Event Information

Hazard Name:	Wildfire
Id:	2343
Insert Date:	May 5, 2024
Start Date:	May 5, 2024
End Date:	May 5, 2024
Country:	UK
Location:	Kirklees
Description:	
Hazard Cluster:	None
Hazard Type:	METEOROLOGICAL and HYDROLOGICAL
Data Provider:	EFFIS
Reference Number:	Reference Id

Related Datasets

Id	Category	Title	Link to dataset	Provider	Data Repository	Documentation
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Related Events

Start Date: End Date: Radius: [Show Data](#) [Download CSV](#)

Id	Event Type	Start Date
77871	Heatwave	Aug. 16, 2022
77866	Heatwave	July 27, 2022
77939	Drought	Sept. 12, 2022
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77874	Heatwave	July 11, 2022
77862	Heatwave	July 20, 2022
77846	Heatwave	July 16, 2022
77875	Heatwave	July 11, 2022
77883	Wildfire	July 16, 2022


Related Publications

Id	Information
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A red dashed box highlights the "Related Publications" section, and a red arrow points from the text "View the Related Publication" in the list to this section.

Web Application

➤ List of Available Datasets


EO4MULTHAZARDS beta version
Project Dataset Contact

List of Available Datasets

Id	Category	Title	Link to dataset	Provider	Data Repository	Documentation
10	None	None	None		None	
5	METEOROLOGICAL and HYDROLOGICAL, Wildfire	Copernicus Surface Soil Moisture - 1km	https://edp-portal.eurac.edu/discovery/5101aaf8-7964-11ee-9a8e-47abc4958022	EURAC RESEARCH	REST API (2.0)	
7	Cold wave, Heatwave, Wildfire	ERAS-Land Temperature era5-single-levels?tab=overview	https://cds.climate.copernicus.eu/cdsapp#/dataset/reanalysis-era5-single-levels?tab=overview	EURAC RESEARCH	GRIB/NetCDF	
8	METEOROLOGICAL and HYDROLOGICAL, Wildfire	ERAS-Land precipitation era5-single-levels?tab=overview	https://cds.climate.copernicus.eu/cdsapp#/dataset/reanalysis-era5-single-levels?tab=overview	EURAC RESEARCH	GRIB/NetCDF	
9	Cold wave, Heatwave, Wildfire	Temperature from ADO	https://ado.eurac.edu/	EURAC RESEARCH	API	
6	METEOROLOGICAL and HYDROLOGICAL, Wildfire	Meteo stations information	https://edp-portal.eurac.edu/discovery/c80d970c-adbf-4381-bfae-98d87ba59f9b	EURAC RESEARCH	WMS/WFS	
4	Cold wave, Heatwave, Wildfire	Daily temperature and precipitation values - Climate Data Base	https://edp-portal.eurac.edu/discovery/de6e883c-b9b9-4787-94a7-66517f9f06b8	EURAC RESEARCH	REST API (2.0)	

List of Available Data Providers

Id	Name	Country	Email	Website
1	EMDAT	Belgium	contact@cred.be	https://www.emdat.be
3	EURAC RESEARCH	Italy	info@eurac.edu	https://www.eurac.edu/
4	Euro-Mediterranean Centre on Climate Change (CMCC)	Italy	info@cmcc.it	https://www.cmcc.it/
5	Open Data Provincia di Bolzano	Italy	opendata@retectivica.bz.it	https://data.civis.bz.it/info
6	EFFIS	None	jrc-effis@ec.europa.eu	https://forest-fire.emergency.copernicus.eu/
7	BGS	United Kingdom	emills@bgs.ac.uk	None

Web Application

➤ List of Available Datasets

➤ List of Available Data Providers

EO4MULTHAZARDS beta version [Project](#) [Dataset](#) [Contact](#)

List of Available Datasets

Id	Category	Title	Link to dataset	Provider	Data Repository	Documentation
10	None	None	None		None	
5	METEOROLOGICAL Copernicus and HYDROLOGICAL, Wildfire	Surface Soil Moisture - 1km	https://edp-portal.eurac.edu/discovery/5101aaf8-7964-11ee-9a8e-47abc4958022	EURAC RESEARCH	REST API (2.0)	
7	Cold wave, Heatwave, Wildfire	ERAS-Land Temperature era5-single-levels?tab=overview	https://cds.climate.copernicus.eu/cdsapp#/dataset/reanalysis-eras5-single-levels?tab=overview	EURAC RESEARCH	GRIB/NetCDF	
8	METEOROLOGICAL Copernicus and HYDROLOGICAL, Wildfire	ERAS-Land precipitation era5-single-levels?tab=overview	https://cds.climate.copernicus.eu/cdsapp#/dataset/reanalysis-eras5-single-levels?tab=overview	EURAC RESEARCH	GRIB/NetCDF	
9	Cold wave, Heatwave, Wildfire	Temperature from ADO	https://ado.eurac.edu/	EURAC RESEARCH	API	
6	METEOROLOGICAL Copernicus and HYDROLOGICAL, Wildfire	Meteo stations information	https://edp-portal.eurac.edu/discovery/c80d970c-adbf-4381-bfae-98d87ba59f9b	EURAC RESEARCH	WMS/WFS	
4	Cold wave, Heatwave, Wildfire	Daily temperature and precipitation values - Climate Data Base	https://edp-portal.eurac.edu/discovery/de6e883c-b9b9-4787-94a7-66517f9f06b8	EURAC RESEARCH	REST API (2.0)	

List of Available Data Providers

Id	Name	Country	Email	Website
1	EMDAT	Belgium	contact@cred.be	https://www.emdat.be
3	EURAC RESEARCH	Italy	info@eurac.edu	https://www.eurac.edu/
4	Euro-Mediterranean Centre on Climate Change (CMCC)	Italy	info@cmcc.it	https://www.cmcc.it/
5	Open Data Provincia di Bolzano	Italy	opendata@retectivica.bz.it	https://data.civis.bz.it/info
6	EFFIS	None	jrc-effis@ec.europa.eu	https://forest-fire.emergency.copernicus.eu/
7	BGS	United Kingdom	emills@bgs.ac.uk	None

Future Work

- **Improvement**
Improve dataset page of the web application, webapp usability, and fill table of useful datasets
- **Creation**
new pipelines to update datasets, Geostories to describe case studies, testing, and bug fixing
- **Finalizing**
final URL and Host of web application

Thanks For Your Time!



eurac
research

Contact us

Center For Sensing Solutions

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Kathrin.Renner@eurac.edu