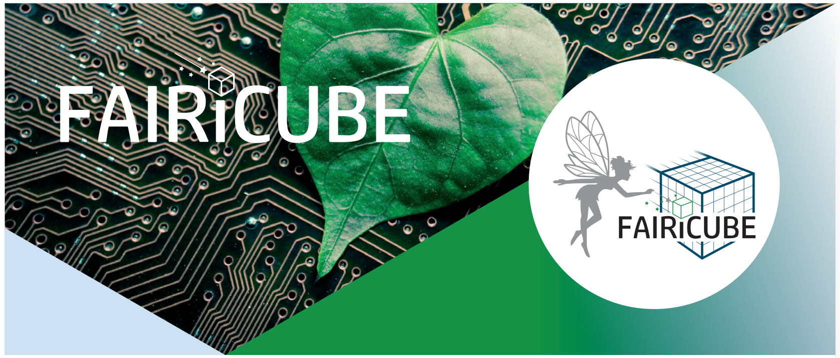
Flyer FAIRiCUBE

General flyer



Deliver the power of data cubes and machine learning (ML) to decision/policy makers and data scientists.

Why FAIRiCUBE?

There is an ever-increasing amount of earth observation data available, largely in the form of data cubes. The relevant data formats are quite mature, data is (at least partially) freely available, various data processing libraries as well as visualization and data storage tools have been developed. Additionally, compute platforms can be used, they scale well and are becoming affordable.

Despite these relevant evolvements, non-EO experts who would greatly profit by integrating these resources into their work are still struggling to make full use of the available data as well as relevant analysis and processing tools. Diverse aspects continue to confound potential users, such as:

- How to connect different data sources with storage & compute resources? What if you bring your own data?
- What computational aspects must be considered when dealing with gridded spatiotemporal data?
- How can we share tooling such as (trained) machine learning models?
- How do we visualize and share the results with the relevant stakeholders?
- How can we properly document what processing has been applied to the data? How can we include this essential provenance information?

Objective

The objective of the FAIRiCUBE project is to enable players from beyond classic Earth Observation (EO) domains to provide, access, process, and share gridded data and algorithms in a FAIR and TRUSTable manner.

Our vision

Within FAIRiCUBE, we demonstrate a harmonized data space, the FAIRiCUBE Hub, where we connect all the pieces required for a data science pipeline into a user-friendly framework, where everything is FAIR (Findable, Accessible, Interoperable, Reusable) and TRUSTable (Transparency, Responsibility, User focus, Sustainability, and Technology). In this manner, we illustrate how the Green Deal Data Space (GDDS) could be formed pertaining to gridded data and the analysis thereof.

FAIRiCUBE

FAIRiCUBE HUB

The FAIRiCUBE Hub is a crosscutting platform and framework for data ingestion, provision, analysis, processing and dissemination, tightly integrated to the common European data spaces. As such, the FAIRiCUBE Hub is intended to support domain experts and data scientists to access and analyze pre-processed data without being burdened by technical issues.
It aims to provide an overview of data and processing modules readily available to unleash the potential of environmental, biodiversity and climate data. Potentially, every scientist or decision maker that works with regular discretized spatiotemporal data can benefit from FAIRiCUBE Hub. This way, the power of data cubes and ML can be unlocked for a wider community.
All the elements of the FAIRiCUBE Hub already exist, for example as part of community tools like GitHub or commercial solutions provided through our data cube collaborators rasdaman and EuroDataCube/EOX. We nevertheless need to make sure these elements are interoperable. Like puzzle pieces fitting together, each piece much seamlessly slot into the next piece; where this is currently not possible, we develop shims to enable such seamless integration. Our vision is to define, standardize and if required create these connections.

Use cases

Five Use Cases have been designed to illustrate how data-driven projects can benefit from cube formats, infrastructure, and computational benefits. The requirements from these Use Cases will drive the development of the FAIRiCUBE Hub.
The use cases address different aspects such as:

- EU green deal action items
- different scales (urban / regional)
- pilot cities (Barcelona, Vienna, Oslo, Luxembourg)
- using different objectives and technical platforms

The five use cases are

Urban adaptation to climate change (urban focus)

Biodiversity and agriculture nexus (regional focus)

Validation of Phytosociological Methods through Occurrence Cubes (urban/regional focus)

Analysis of genetic drift in Drosophila melanogaster (regional focus)

Spatial and temporal assessment of neighborhood building stock (urban focus)

This project has received funding from the Horizon Europe program of the EU under grant agreement No 101059238
Duration of the project: 2022 - 2025 (36 months).
Partners: NILU - The climate and environmental research institute (Coordinator), Epsilon Italia, Natural History Museum Vienna, EOX IT Services, Constructor University Bremen, Wageningen University and Research, 4sfera Innova, space4environment.

Flyers FAIRiCUBE

Use case flyer 1

FAIRiCUBE Use Case 1

Urban adaptation to climate change

A FAIRiCUBE use case by Wageningen Research

Use case objective

Climate change poses several challenges to cities, such as droughts, urban heat waves, changing precipitation patterns, floods and (peri-)urban biodiversity loss. These impacts are interrelated with factors like land use activities around cities and the socio-economic setting. Datasets on these factors are available, but they are complex to integrate and analyze due to their heterogeneity, format and quality. The goal of UC1 is to harmonize the diverse datasets into structured data cubes and provide a comprehensive "toolkit" for their analysis.

Potential applications

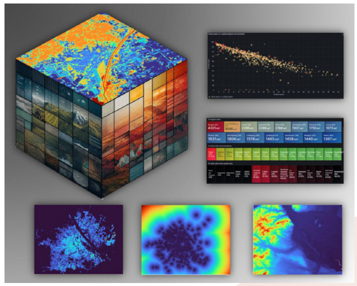
The data analysis toolkit should support European institutions, local policy makers and scientists to make well-informed decisions when addressing climate change's multifaceted impacts. One European data cube collects indicators from different domains for many cities. It can be used to identify cities with similar characteristics, assess climate change impacts across the continent and the influence of different factors on cities adaptation capacity.

On the local scale, we work closely with city municipalities to create city cubes and define specific goals. For example, study the effects of various environmental variables on perceived temperature. Where possible, solutions developed for one city will be scaled to other cities.

The data cubes

The European data cube contains data from the climate, land and socio-economic domains. Clustering analysis has been employed to discover cities that are similar with respect to the impact of climate change and their adaptation strategies. This dataset is available here.

To understand the effect of covariates on perceived temperature, the first step is to have an accurate measure. We aim at achieving it by integrating in the city cube weather station data. Where no station is available, the values will be predicted based on land surface temperature, DEM and other variables.



FAIRiCUBE

General information - About Fairicube

The five use cases are

- Urban adaptation to climate change (urban focus)
- Biodiversity and agriculture nexus (regional focus)
- Validation of Phytosociological Methods through Occurrence Cubes (urban/regional focus)
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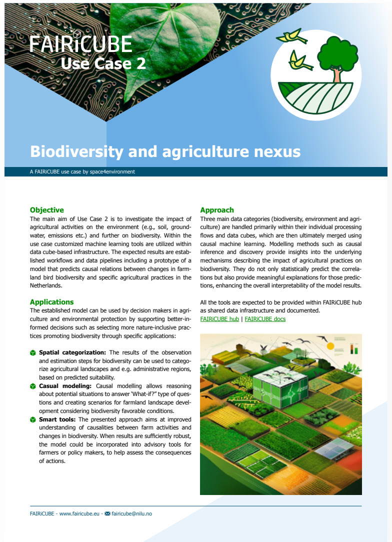
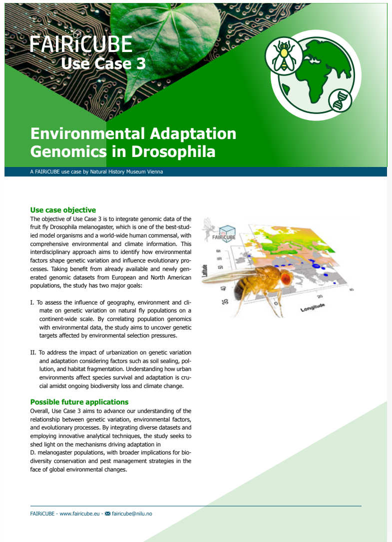
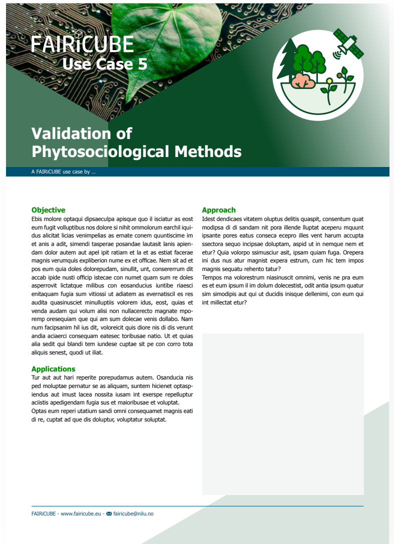
Flyers FAIRiCUBE

Use case flyer serie







Use Case rock

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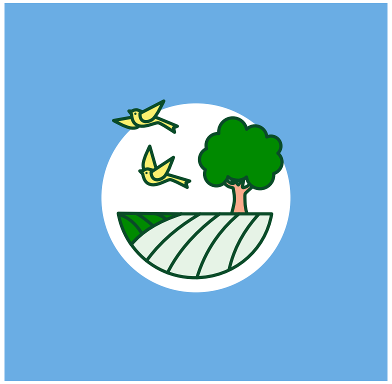

Use Case sky

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Use Case green

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Use Case blue

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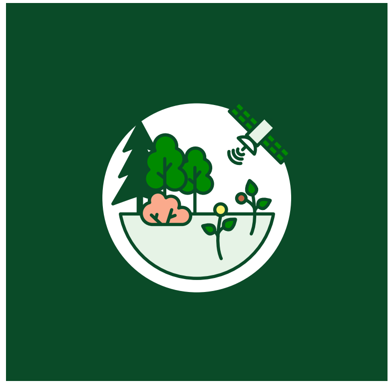

Use Case forest

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