TOWARDS EO-INTEGRATED OPERATIONAL SERVICES IN SUPPORT OF STANDARDIZED GHG PUBLIC REPORTING AND FOREST CARBON TRADING

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Issue

“The overwhelming majority of the carbon credits or ‘REDD+ results’ so far generated do not represent genuine, additional and verifiable reductions in carbon emissions”

Simon Counsell, Rainforest Foundation, UK

Strategic innovation path

What is the link of Earth observation to the Carbon Market?

Climate Change

Climate Change Mitigation | **Climate Change Adaptation**

EO products and services supporting both, compliance markets & voluntary carbon markets

Mapping and monitoring of carbon footprints

Provision of independent and transparent data information

Support field data collection

Estimation, monitoring and verification of reforestation or carbon sequestering projects

Support the verification of carbon storage

Transparency in the institutional and financial infrastructure for carbon market transactions

Environmental safeguards to mitigate against any adverse project impacts

Many more…

Strategic innovation path

Status of relevant EO products and services supporting both, compliance markets & voluntary carbon markets development activities

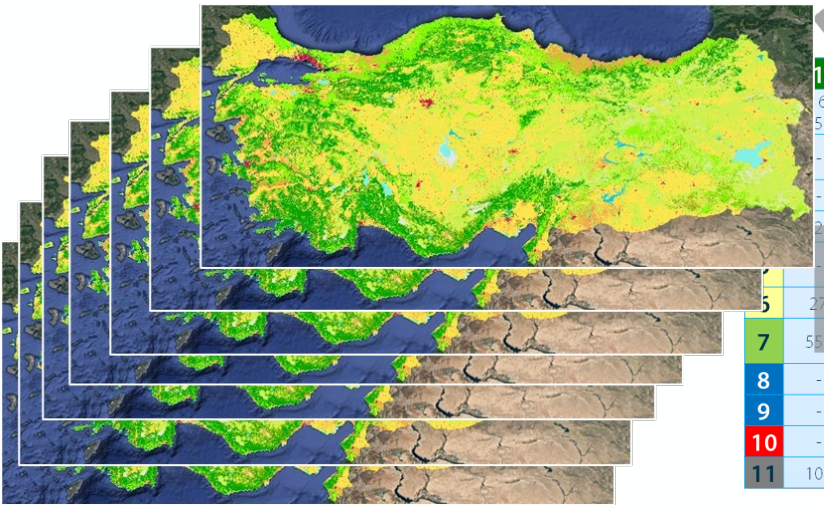
GHG Monitoring and ReportinG System Of Türkiye
A best practice example

REPUBLIC OF TÜRKİYE
MINISTRY OF TREASURY AND FINANCE

EUROPEAID

LULUCF-TR
GHG Monitoring and Reporting System

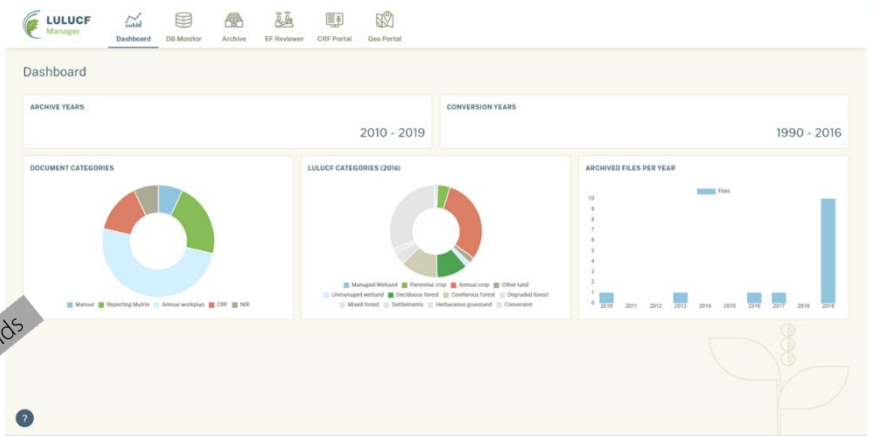
FROM SATELLITE OBSERVATIONS TO STANDARDIZED REPORTING

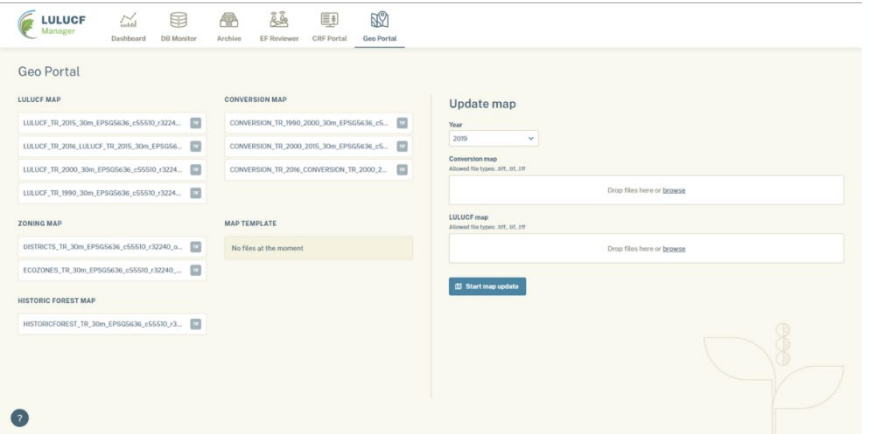


Forest | Cropland | Grassland | Wetlands | Settlements | Other lands

	1	2	3	4	5	6	7	8	9	10	11
1	6.675	-	-	113	145	14	99	17	39	24	19
2	-	10.373.940	-	549	323	76	231	67	37	81	77
3	-	-	728.208	1	1	-	2	0	0	0	0
4	28	1.006	19	3.256.445	122	50	142	29	28	12	61
5	-	-	-	-	23.727.151	664	-	923	348	982	483
6	27	23	0	18	1	0	0	12	6	87	30
7	551	2.136	146	569	572	226	24.227.393	284	78	113	274
8	-	-	-	-	30	-	11	287.798	-	1	6
9	-	-	-	-	505	-	311	-	1.348.149	47	260
10	-	-	-	-	-	-	-	1	1	815.398	7
11	107	329	1	124	436	45	219	66	542	38	1.702.887

26 annual LULUCF matrices





Funded by EuropeAid | Contract#: EuropeAid/136031/ICH/SER/TR

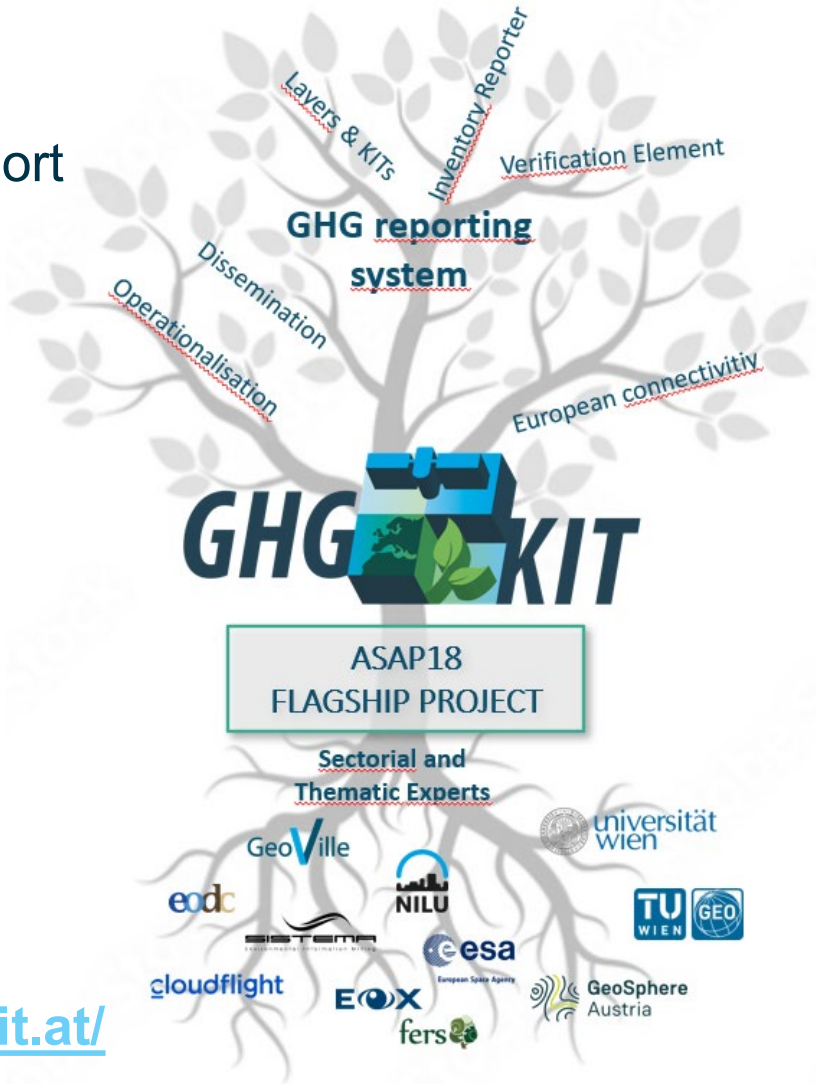
GHG-KIT - Prototyping an EO-enabled kit supporting greenhouse gas reporting

Prototype EO-integrated GHG Monitoring Reporting and Verification (MRV) system supporting the Austrian inventory report

- Verification Element: GHG flux estimates (top-down)
- LULUCF Inventory Reporter (bottom-up)

Main users/beneficiaries:

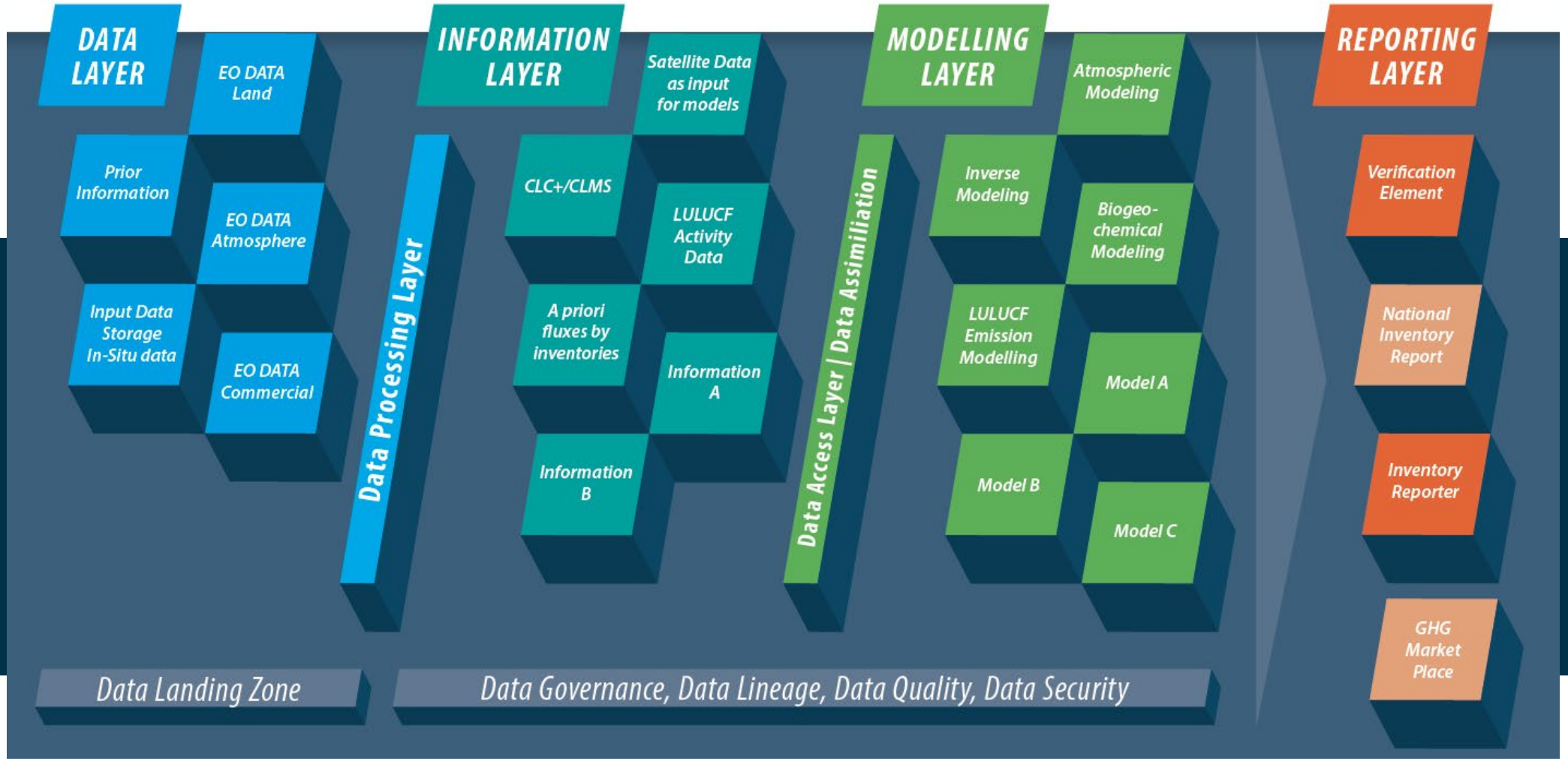
- The Environment Agency Austria (Umweltbundesamt, UBA)
- The Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology



Funded by the Austrian Space Application Programme (Austrian Research Promotion Agency)
Contract #FO999893432

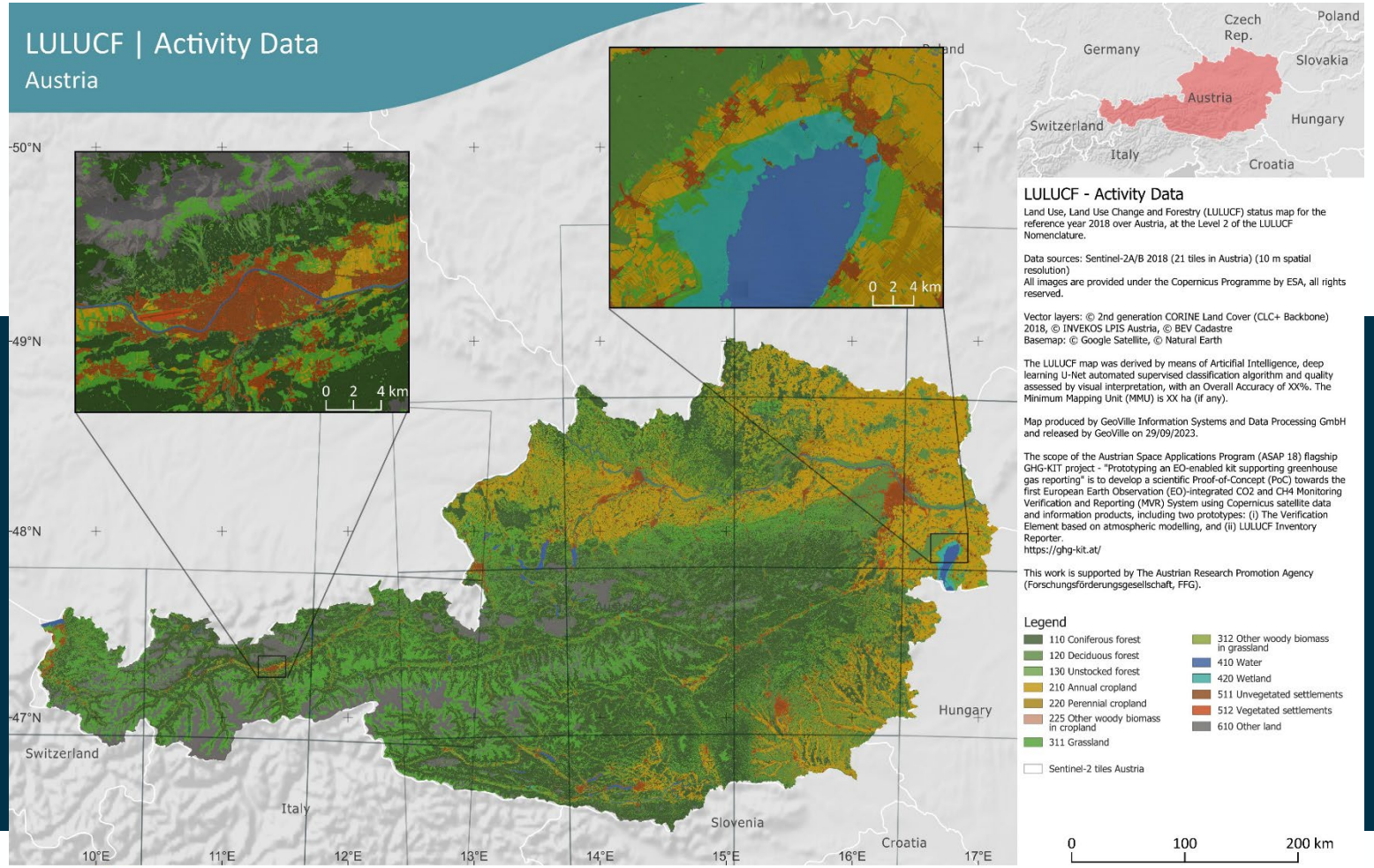
https://ghg-kit.at/

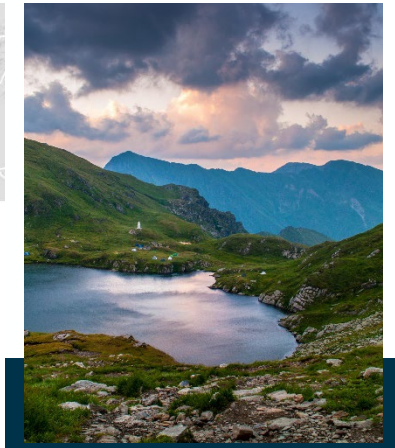
THE GHG-KIT OVERALL CONCEPT



Tool-Kit System supporting various aspects of reporting

GHG-KIT - Prototyping an EO-enabled kit supporting greenhouse gas reporting

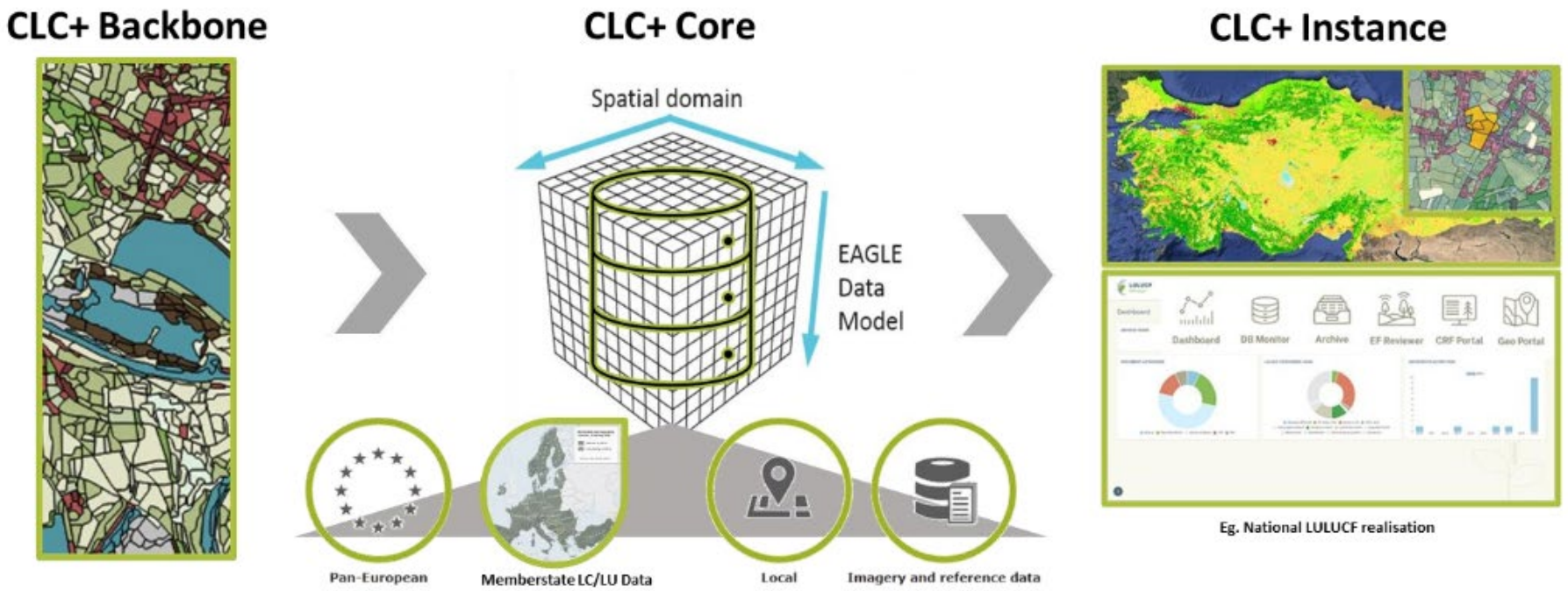




- LULUCF activity data prototype implementation
- 9-years time series for 2015 – 2023
- 95% Overall Accuracy
- S-1, S-2, Landsat time series analysis based on AI Deep Learning U-Net trained classification algorithm and application of rulesets

Copernicus CLC+ Product Suite

- **CLC+ Core** second stage of CLC+ → consistent multi-use grid-based Land Cover/Land Use (LC/LU) hybrid data repository
- **CLC+ Instances** → newly-composed tailored information layer extracted out of the CLC+ Core system



- ✓ LULUCF instance
- ✓ CLC legacy instance
- ✓ Biodiversity strategy
- ✓ CAP monitoring
- ✓ Europe's Urban Agenda
- ✓ Climate Change mitigation and the Energy Union

Land Monitoring

Copernicus
Europe's eyes on Earth

Copernicus CLC+ Product Suite

Exploring the potential downstream use of CLMS geospatial data in the LULUCF process

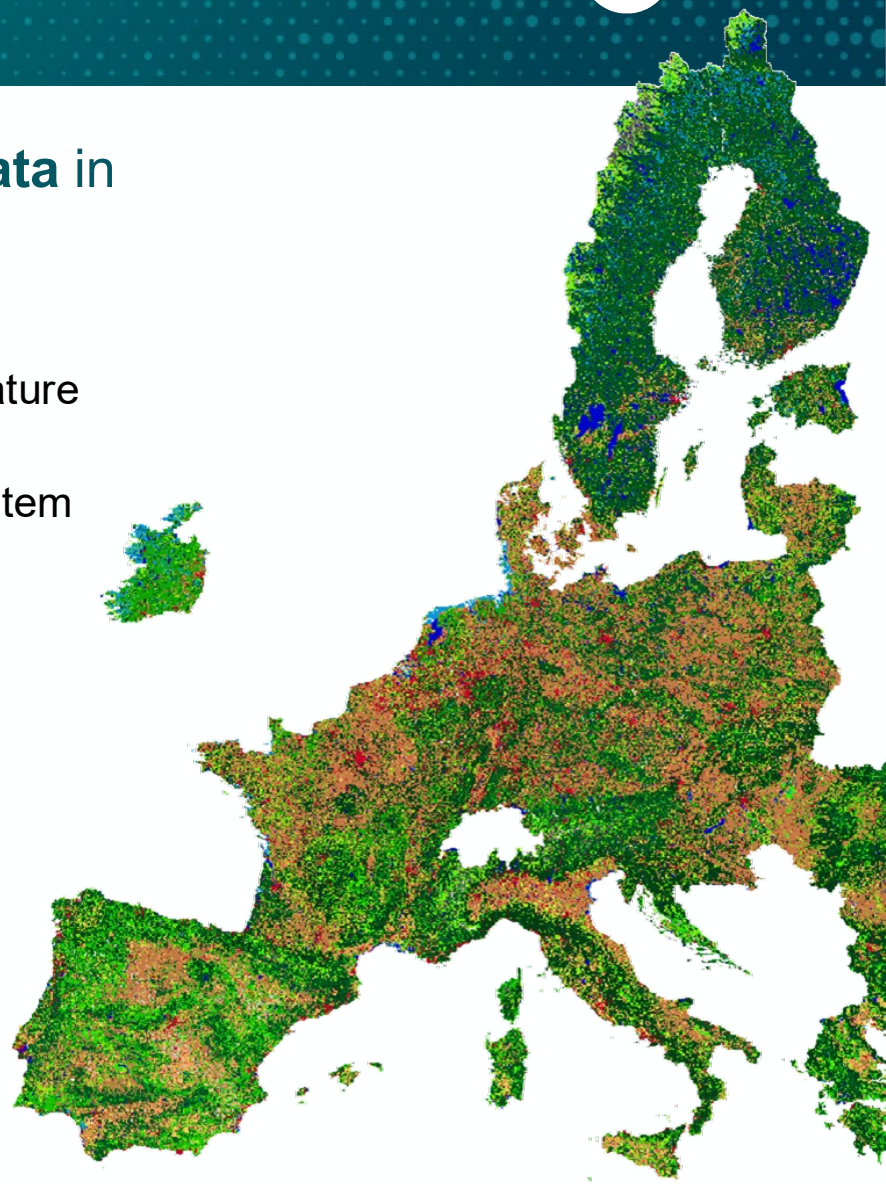
Flexible database solution (CLC+ Core) that can

- **Harmonize** existing (dissimilar) LC/LU input data by using a common nomenclature (**EAGLE**)
- **Combine** existing data (mainly CLMS) by developing extraction rules in the system

→ **Output:** LULUCF Instances as **100m grid**

Specific **LULUCF products** (Instances):

- Is currently still under development to create a proxy for LULUCF categories of national GHG reporting
- Are being produced for EEA, to provide EEA with (country) independent activity data proxies
- Can be produced by countries to support their own spatially explicit monitoring/reporting



CLC+ LULUCF Instances Beta Version - EU-27

BREATHE - EO-based enhancement and verification of LULUCF inventories for forest & biomass

Prototype for the 1st European EO-integrated MRV System of greenhouse gas (GHG) emissions from Above-Ground-Biomass (AGB) changes in Austria and wildfires in Türkiye

BREATHE's specific aims:

- processing of multisource GHG satellite missions
- detailed information on the Earth's surface - including LULUCF, CLMS and newly developed information about forest and biomass
- Integration of independent field biomass measurements
- atmospheric transport modelling of GHG fluxes resulting from forest fires
- integration of all these different data sources and methods on a cloud-based IT system, compliant with the UNFCCC reporting standards.

Main users/beneficiaries:

- The Environment Agency Austria (Umweltbundesamt, UBA)
- The Directorate General of Forestry of Türkiye (*Orman Genel Müdürlüğü*, OGM)

BREATHE

https://breathe-project.eu/

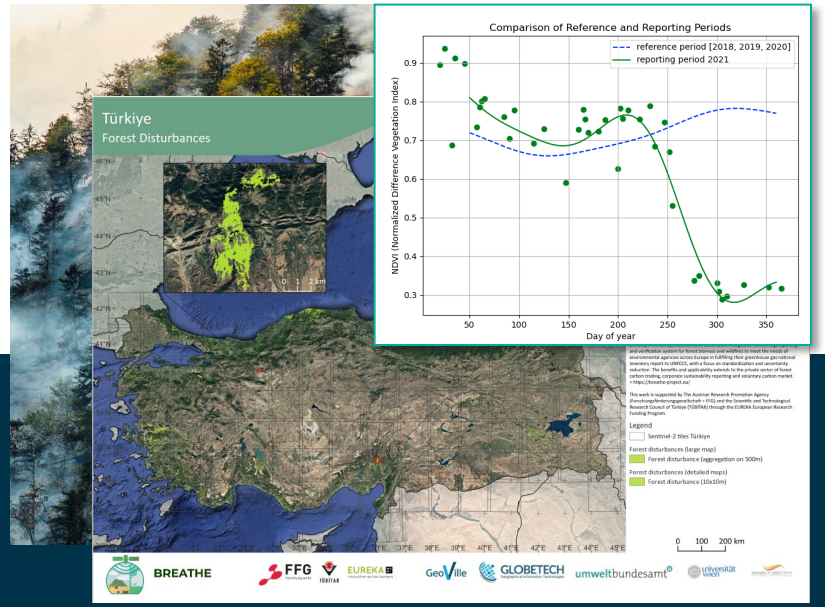
eureka innovation beyond borders

FFG Forschung wirkt.

TÜBİTAK

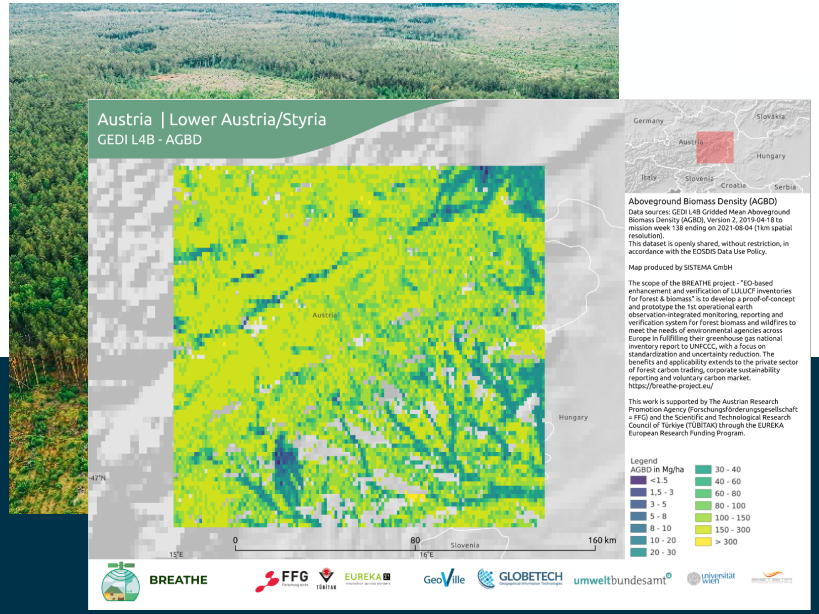
Austrian Research Promotion Agency, Contract #FO999893872

BREATHE - EO-based enhancement and verification of LULUCF inventories for forest & biomass



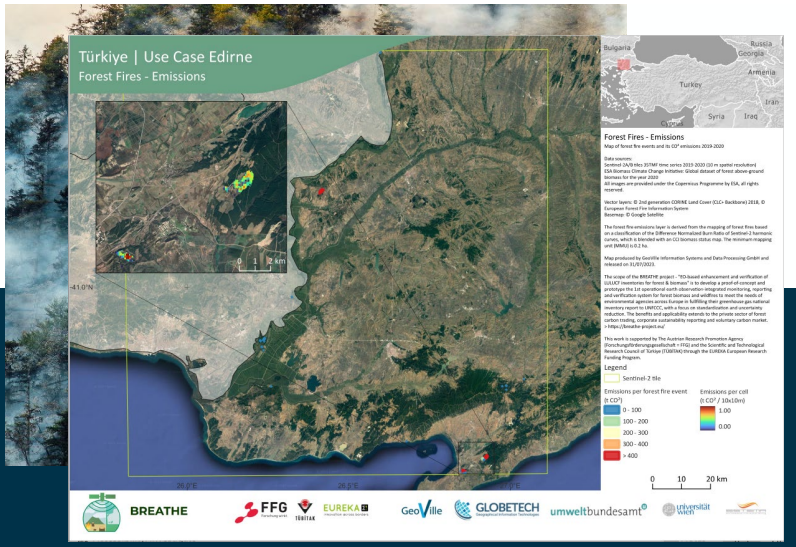
Forest disturbances

Use Case Overall
Accuracy of 99.84%



Above ground Biomass density (AGBD)

$$L_{fire} = A \cdot M_B \cdot C_f \cdot G_{ef} \cdot 10^{-3}$$



CO2 emissions from biomass burning

https://breathe-project.eu/results/

« Take-Home Messages »

Key components available in support of carbon market regulations

- ∨ **Cloud based monitoring and reporting systems** for inventorying and controlling of major carbon pools
- ∨ Technologies for identifying and quantifying **Forest Above-Ground-Biomass** (AGB) changes on forest carbon **SINKS** are already established
- ∨ Operationalization for estimating changes in **SOURCES** (clear-cuts, sustainable selective logging, wildfires, pest outbreaks, other extreme climatic events…) are in development

✓ ***Satellite EO technologies already play a key role in monitoring, reporting and verifying international/national carbon policy and financial framework***

Outlook and seed questions for panel discussion

- *How can we best employ established methods for GHG and LULUCF monitoring to support transparency of a carbon market ?*

- *How can we seize the opportunity to standardize an EO-supported carbon market monitoring scheme through a more holistic approach of the carbon cycle (as opposed to the dualistic scheme “bottom-up/top-down”)*

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