

WEED

WORLD ECOSYSTEM EXTENT DYNAMICS



User Collaboration Descriptions (D1.1)

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Glossary of Concepts and Terminology

Table 1. Used abbreviations and their expansions

Abbreviation	Concept/Term
ARIES	Artificial Intelligence for Environment & Sustainability
CBD	Convention on Biological Diversity
CU	Champion User
DEM	Digital Elevation Model
EFG	Ecosystem Functional Group
EO	Earth observation
ET	Ecosystem Type
EU	End User
EUNIS	European University Information System
GBF	Kunming-Montreal Global Biodiversity Framework
GIS	GeoInformation System
IUCN GET	International Union for Conservation of Nature Global Ecosystem Typology
LL	Living Lab
PEOPLE-EA	Pioneering Earth Observation Applications for the Environment – Ecosystem Accounting
Ramsar	Convention on Wetlands (Ramsar)
RS	Remote sensing
SDG	Sustainable Development Goal
SEEA EA	System of Environmental-Economic Accounting – Ecosystem Accounting
UN	United Nations
UNSD	United Nations Statistical Division
UNFCCC	United Nations Framework Convention on Climate Change
WEED	World Ecosystem Extent Dynamics

Table 2. Important concepts and their definitions (with abbreviations where applicable).

Concept	Definition	Abbreviation
Basic spatial unit	Geometrical construct representing a small spatial area	BSU
Biome	A large ecological region on Earth, characterized by a unique set of species and ecological processes. Biomes are typically classified based on their predominant vegetation types, which are shaped by environmental factors such as temperature, precipitation, soil type, and disturbance regimes. Examples of biomes include tropical rainforests, temperate forests, grasslands, deserts, tundra, and aquatic ecosystems, such as coral reefs and estuaries. Biomes can span multiple continents and can be found in various climatic zones.	
Champion user	Country engaged during the co-creation phase of the WEED project	CU
Ecosystem	A community of living organisms (biotic components including plants, animals, and microorganisms) in a particular area, interacting with each another and with their physical environment (abiotic components made of non-living elements such as air, water, soil, sunlight, temperature, mineral), and functioning as a dynamic and interconnected ecological unit	
Ecosystem classification	A standard process that organises and categorises ecosystems based on their distinct ecological attributes, including physical, biological, and functional characteristics. The classification aims to identify and group ecosystems into discrete and meaningful ecosystem types that share similar ecological structures, functions, and interactions, allowing for efficient comparison, analysis, and understanding of ecological patterns and processes	
Ecosystem extent	Size of an ecosystem asset (contiguous space of a specific ecosystem type characterised by a distinct set of biotic and abiotic components and their interactions). The extent of a certain ecosystem type corresponds to the aggregate area of all ecosystem assets of that type.	EE

Ecosystem functional groups	Functionally distinctive groups of ecosystems within a biome that are defined in a manner consistent with the definition of ecosystems under the Convention on Biological Diversity	EFGs
Ecosystem integrity	The ecosystems' capacity to maintain their composition, structure and functioning within the range of their natural variability. Ecosystem integrity is central to the CBD but also to other Multilateral Environmental Agreements (MEA).	
Ecosystem map	A visual representation of the spatial distribution of distinct ecosystem types, based on a specified ecosystem typology. Ecosystem maps help illustrate the geographical extent and arrangement of different ecosystem types within a given region (e.g., a country), facilitating ecological analysis and land management efforts.	
Ecosystem type	Represent a category of ecosystems that share similar physical, biological, and functional attributes (i.e., with similar characteristics in terms of structure, function, composition, and interactions between organisms and with their physical environment), and are characterised by similar assemblages of biota and abiotic components, and ecological processes (e.g., ecological characteristics, dominant vegetation, environmental conditions)	ET
European Petroleum Survey Group	A geodetic parameter dataset with coordinate reference systems which may be applicable at global, regional, national or local scale	EPSG
European Nature information System	A comprehensive pan-European habitat classification system	EUNIS
Habitat	A location (area) in which a particular organism is able to conduct activities which contribute to survival and/or reproduction	
Land cover	Observed physical and biological cover of the Earth's surface, including natural vegetation and abiotic (non-living) surfaces	

Living Lab	Collaboration meetings of the WEED project with the champion users and other early adopters	LL
Managed ecosystems	Ecosystems predominantly influenced by human activities where a stable natural ecological state is unobtainable and where socio-economic interventions are required to maintain a new stable state. Examples are urban green spaces, agricultural lands, artificial waterbodies, and anthropogenic marine systems	
Minimum mapping unit	Smallest object size that is represented on a map (smaller objects being either 'lost' or subsumed into a larger unit)	MMU
Natural Capital	Refers to the Earth's natural resources that provide valuable services to humans and other species. These natural resources include air, water, soil, ecosystems and their biodiversity. This stock underpins our economy and society by producing value for people, both directly and indirectly. Goods and services provided to humans by sustainably managed natural capital include a range of social and environmental benefits including clean air and water, climate change mitigation and adaptation, food, energy, places to live, materials for products, recreation and protection from hazards.	
Natural Capital Accounting	A comprehensive system for valuing the natural resources and the ecosystem services these natural assets provide to human well-being and economic activities. This is done by measuring the changes in stock and condition of natural assets and the flow of ecosystem services, and integrating these into accounting and reporting systems in a standard way.	
Natural ecosystems	Self-regulating systems that have evolved over time without significant human intervention or management, in response to natural environmental conditions, such as climate, soil, water, and biotic factors, including other species and their interactions. They are predominantly influenced by natural ecological processes characterised by a stable ecological state that sustains ecosystem integrity, and maintains ecosystem conditions within the inherent range of natural variability. Examples are primary and old growth forests, natural	

	grasslands and savannahs, natural rivers and wetlands.	
OpenEO	An application programming interface that allows users to connect to Earth observation cloud back-ends in a unified way.	
Realm	One of five major components of the biosphere that differ fundamentally in ecosystem organisation and function: terrestrial, freshwater, marine, subterranean, atmospheric and combinations of these (transitional realms).	
Red List of Ecosystems	A global framework developed by IUCN to map the ecosystems that are at risk of collapse due to loss of biodiversity and degradation of ecological processes and functions, classified in terms of critically endangered, endangered, vulnerable, near threatened and of least concern.	

1. Executive Summary

The World Ecosystem Extent Dynamics (WEED) project targets the development of a globally applicable open-source toolbox to enable countries or regions to generate comprehensive maps of the extents of terrestrial, freshwater and coastal ecosystem types and their temporal variations. The toolbox will leverage existing datasets and tools in combination with novel methods for analyzing Earth Observation (EO) data and is co-developed with national authorities to ensure alignment with national needs and priorities, and with international policies, and strengthening their capacities to use and integrate EO methodologies in their operational practices and systems on ecosystem mapping and monitoring. The toolbox will be provided as an EO-integrated solution end-to-end processing system, hosted on cloud computing infrastructures and following the FAIR principles, ensuring compliance with interoperable standards, and adhering to best practices on the reproducibility of the mapping results. The robustness and transferability of the methods will be demonstrated by executing large-scale demonstrations in selected countries, within and outside Europe, producing and validating national ecosystem extent maps following international ecosystem typologies, and showcasing the utility across different policy applications (e.g. Environmental Economic ecosystem accounts (SEEA EA), biodiversity indicators (GBF A.2), etc.).

The aim of this report is to describe the collaboration with the users during the development (user co-creation phase) and demonstration (user uptake phase) of the World Ecosystem Extent Dynamics (WEED) toolbox.

Based on interviews with the Champion Users (the countries involved in the user co-creation phase), their current practices to perform ecosystem mapping, their expectations and their available national datasets were gathered and documented. Thereafter a set of test-areas were discussed with them to be used during the co-design (co-creation phase). These areas will be primarily used to quantify the accuracy of the mapping and change mapping results, improve the quality through algorithm benchmarking as well as ingestion of national data (also named the context-awareness of the toolbox).

Chapter 3 describes the **current practices of the Champion Users**. Despite these users have already experience in habitat and/or ecosystem mapping, they are currently limited to providing frequent and recent updates of the maps, lacking some detail to be used as robust and useful information for decision making. Furthermore, the quality of the maps, hence its uncertainties, is currently not known and should be quantified. Practice from the additional users to be involved for the demonstrations (user uptake phase) will be added in due time.

The collected **user requirements** are synthesized in Chapter 4. The requirements are described from the 'use' and 'technical' perspective, as well as the most important change processes to be captured in the dynamics. High spatial resolution (10 to 30m), frequent updates (1 to 2 years) and thematic details beyond the IUCN Global Ecosystem Typology Level 3 (Ecosystem Function Groups) are key.

Chapter 5 provides an **overview of data availability at national scale** and how to ingest them into the toolbox. The datasets are described in ten themes: administrative, land cover, land use, vegetation or flora information, climate, soil and geology, geomorphology, hydrology, coastal and other datasets.

The toolbox solution will be developed in co-design with the Champion Users. During this **agile iterative development**, a **set of test-areas** were agreed upon and described in Chapter 6. About 150 thousand square kilometers of areas are defined, split over 50 areas.

The areas were intersected with the IUCN GET indicative maps and show that they cover 80% (60 out of 75¹) ecosystem functional groups. Additional test areas to cover the remaining groups will be added during the testing phase.

Finally, their **tasks, contributions and timeline** are described in Chapters 7 and 8. Special care is given to the validation process.

2. Introduction

This document presents the terms of involvement and collaboration with the users engaged within the WEED project. The project follows a user-centric approach that puts users at the center of the EO-integrated solution through an active involvement of committed organizations throughout the entire lifecycle of the project. Furthermore, the project aims to facilitate the adoption of the solution by and beyond the users involved in the project through a continuous user consultation process and an important capacity building component. The latter component is required to develop skills within the target community, which facilitates the uptake of the solution into users' operational practices.

The project recognizes three types of users:

1. **Champion Users (CU)** refer to organizations with interest and commitment to engage in the project during the **co-creation** phase. They participate in the design and development of the WEED solution with committed resources and support the research and innovation activities of the project. They will act as ambassadors within the target user community and act as relays for the adoption of the solution by other stakeholders, and they foresee a clearly defined use of the EO-integrated solution in their operational practices.
2. **End Users (EU)** refer to organizations with an interest in showcasing the adequacy and robustness of the WEED solution for integration into operational processes of the target user group. They will be actively involved in the second phase, called **user uptake** phase.
3. **Target community (TC)** refers to organizations that show an interest in following the developments and experiences from organizations using the WEED solution. They will be inactively involved in the second phase through participating in webinars or other public events. These organizations will not be further described in this collaboration document but will be encouraged to register to the project website for (newsletter) updates and as such the project gets an overview of this community.

The project has engaged with six champion users covering Europe from north to south and outside Europe from west to east to cover a broad range of ecosystem types, as shown in Figure 1.

¹ There are 110 ecosystems functional groups but excluding marine and sub-terrain we come to 75 groups.

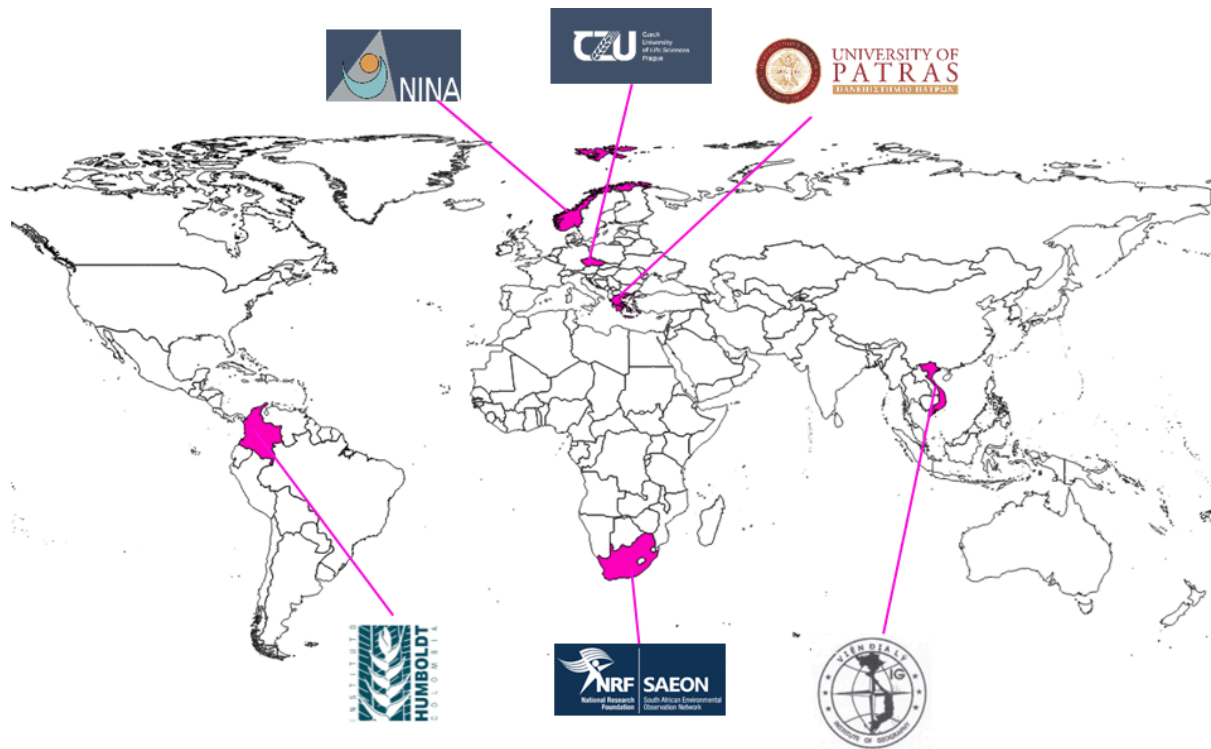


Figure 1. Champion Users within WEED project

Note all Champion Users (CU) are also considered End Users (EU) in phase 2.

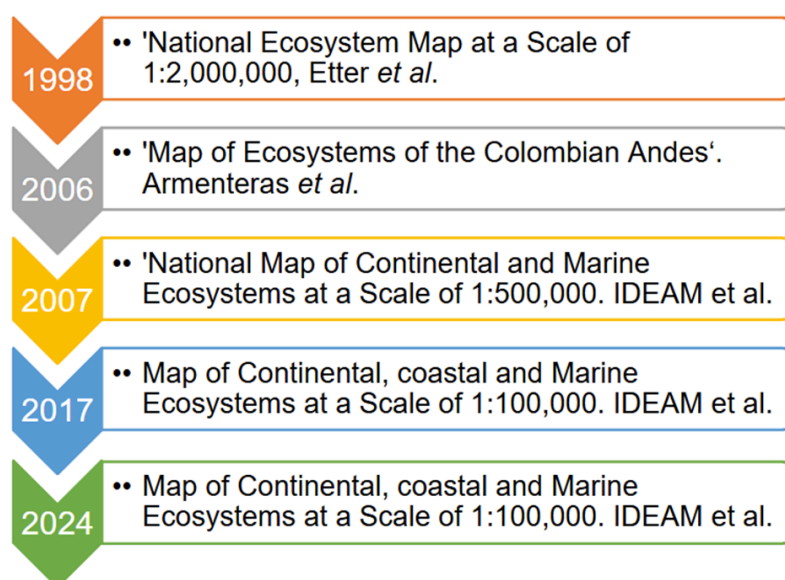
The engagement of five additional countries as End Users for User Uptake (phase 2) is ongoing. The eleven countries are selected based on their diversity in terms of geography (latitudes and altitudes), environment (climate zones, landforms), biomes and types of ecosystems, data availability, as well as countries' technical capacities.

3. Countries' current experiences

This chapter provides an overview of the current practices, both technical and organizational, in the different countries to create ecosystem extent maps. The descriptions are provided per country in alphabetical order.

3.1. Champion User Colombia

The tradition of ecosystem mapping in Colombia has its origins in the 1990s when the pioneering work of Andrés Etter titled 'National Ecosystem Map at a Scale of 1:2,000,000' was published (Etter, 1998). Throughout the first decade of the 21st century, additional ecosystem mapping projects were carried out, among which stands out the 'Map of Ecosystems of the Colombian Andes' (Armenteras, Rodriguez, Morales, & Romero, 2006) and the 'National Map of Continental and Marine Ecosystems at a Scale of 1:500,000' (IDEAM et al., 2007), developed through collaboration among various entities within the National Environmental System.



The most recent national map of ecosystems, published in 2024 (IDEAM, IAVH, INVEMAR, & IGAC, 2024), was created at a scale of 1:100,000 and adopted a systems-based approach following a hierarchical structure. The levels of this structure are defined according to spatial patterns generated by state factors such as climate, geology, water, soil, and biota. As a basis for this classification, the system proposed by Bailey in 2009 was employed. This system encompasses the study of vertical structures (how components are integrated on a site with dependency relationships) and horizontal structures (the spatial interaction of the ecosystem with adjacent ones through the exchange of matter and energy).

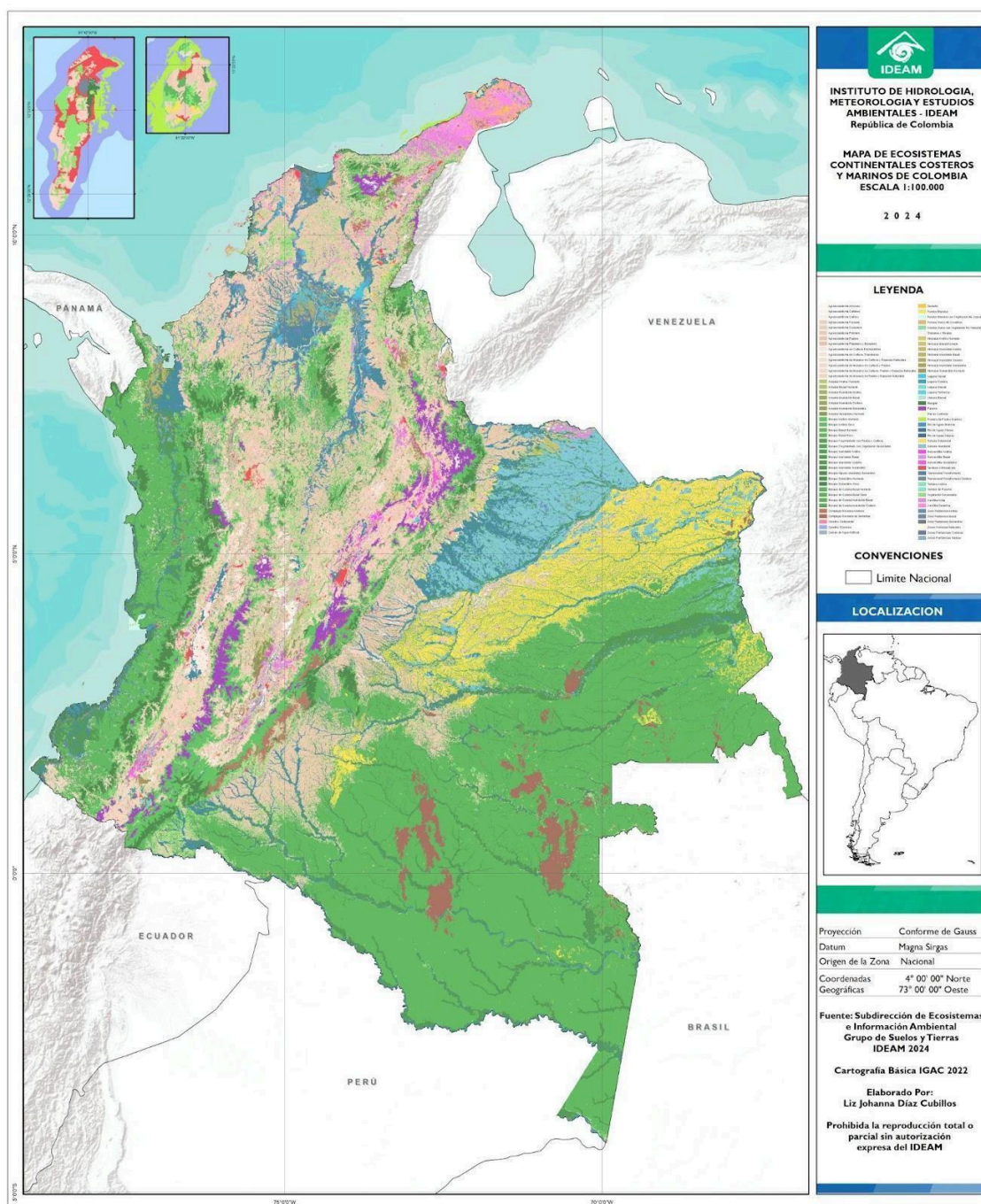


Figure 2. Ecosystem map of Colombia (IDEAM et al., 2024).

The characteristics of the ecosystem map are further detailed in the table below.

Table 3. Characteristics of current ecosystem extent maps from Colombia

Attributes	MEC v2.1
spatial coverage	National

temporal coverage	2018
spatial resolution	1:100,000 (MMU 25 ha)
temporal resolution	Aprox. 8 years
spatial type	vector
typology	national
classes	20 mapped (there are 90 ETs mapped in MEC V2.1)
accuracy mapping	not known
accuracy change	n.a.
methodology mapping	Overlay of 8 different layers in GIS (Cobertura de tierra = 191 (2018), land cover classes, 35 climatic regions, 12 biome regions, UNI_BIOTIC = biotic information based on fauna species distribution for 67 regions, AMB_EDAFOG = 100 soil types through a combination of geomorphology and soil information, TIPO_AGUA = three water types to present high, intermediate and low land rivers, GRADO_TRAN = a boolean mask containing natural versus transformed land, INVEMAR = 7 marine and 12 ecosystem types (2014))
methodology change	re-assessment of some variables
URL	https://www.andi.com.co/Uploads/MapaEcosistemas2017.pdf
Layers	Ecosystem types All input data layers (biome:12, biotic: 87)
Language	ES
license	CC-BY

Organizationally, different institutes collaborate to create ecosystem maps such as INVEMAR for coastal, marine and insular; IDEAM for land cover, soil and hydrology; SINCHI for the Amazon area; IAVH for biodiversity (mostly flora and fauna); IGAC for high resolution orthophotography; and DANE for statistical soundness.

The main *focus areas for success* expected to be provided by the WEED project are:

- More frequent updates of ecosystem maps, based on period information on various co-variables,
- Generate more robust and useful information for decision making, through access to state-of-the-art concepts and methods.
- Enable comparison of the state of the country's ecosystems with those of other nations,
- Ability to use the results from national to local scales,
- Applicable in various fields, such as measuring the conservation status of ecosystems and mapping of ecosystem services.

3.2. Champion User Czech Republic

Czech Republic has two current practices on ecosystem extent mapping:

1. *Biotopes mapping layer*. A process based on field data collection for reporting to the Habitats Directive; extended Natura 2000 mapping.
2. *Consolidated Layer of Ecosystems (CLE)*. A process using habitat maps in combination with several other data sources, typically vector layers, using Geographic Information System (GIS) tools.

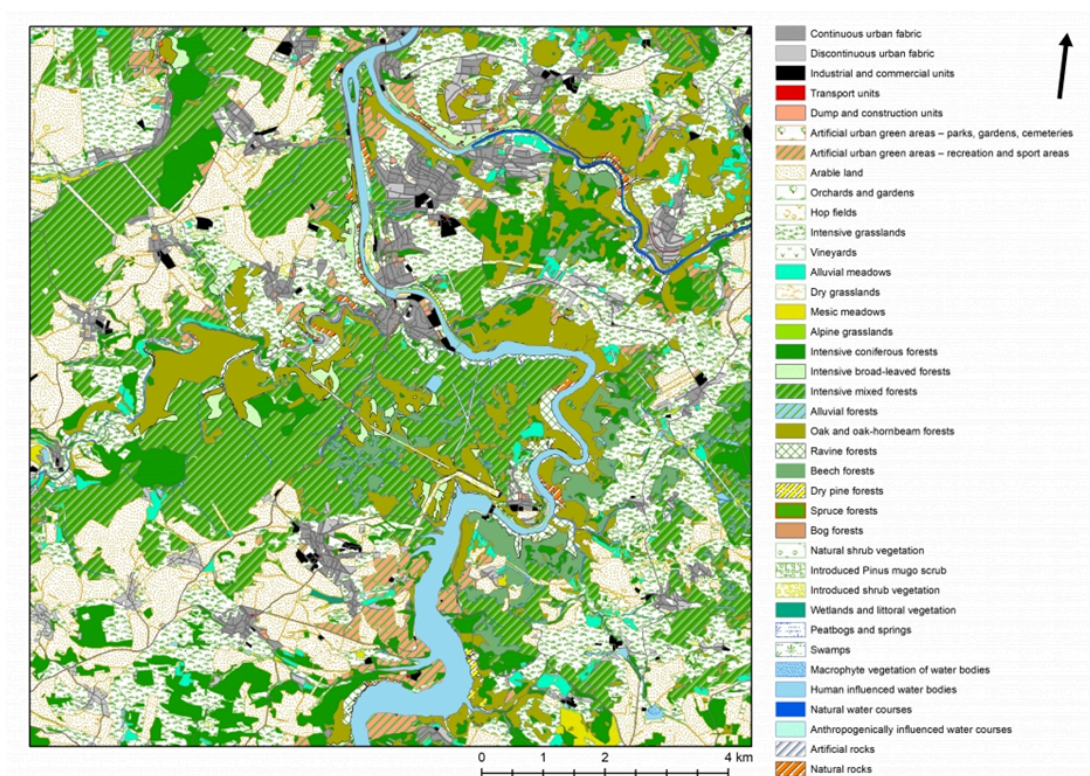


Figure 3. Consolidated Layer of Ecosystems (CLE)

The characteristics of the ecosystem map are further detailed in the table below.

Table 4. Characteristics of current ecosystem extent maps from the Czech Republic

Attributes	Biotopes mapping layer	CLE (Consolidated Layer Ecosystems)
spatial coverage	national, mostly limited to N2K sites	national
temporal coverage	2000-2005, 2017-2022	base is N2K map, updates for certain areas dep. on databases 2013, 2021 (2022, 2023)
spatial resolution	1:10,000 MMU precise incl. small patches	1:10,000 MMU dep. on data layer
temporal resolution	2 timesteps	yearly on limited areas
spatial type	vector	vector
typology	Habitat with crosswalk EUNIS2012, national typology (1)	trade-off for mosaic landscapes (2)
classes	156 natural classes	39-41 classes
accuracy mapping	not known, potential some spatial shift and polygon boundary issues	not known, potential sliver polygons
accuracy change	not known, complete re-assessment per cycle	not known
methodology mapping	field data collection survey	GIS layer combinations (Corine, LPIS, Urban Atlas, Topographic maps, biotopes, water & forest management)
methodology change	full re-assessment	dep. on data input layers
URL	https://geoportal.gov.cz/php/micka/record/basic/4b31eb64-6e50-4222-91d4-500b0a02080a?dlang=en	https://metadata.nature.cz/en/?Bbox=&Text=consolidated&wtxt=0&sort=title&sd=A
Language	CZ	CZ, EN
Layers		ZABAGED, Land Cover (Corine, Urban Atlas), LPIS, biotopes, Woody

Attributes	Biomes mapping layer	CLE (Consolidated Layer Ecosystems)
		vegetation cover and vegetation groups
license	Creative Commons BY4.0	Creative Commons BY 4.0

Organizationally, the Nature Conservation Agency of the Czech Republic (AOPK) is responsible for collecting the field data and producing the Natura 2000 layers. These layers will be combined with topographic maps (ZABAGED, Fundamental Base of Geographic Data of the Czech Republic), provided by the State administration of land survey and cadaster (CUZK), Land Parcel Information System (LPIS), provided by the Ministry of Agriculture, forest management, provided by the Czech Forestry Institute (CFI), Corine Land Cover and Urban Atlas layers both provided by the European Environment Agency. The GIS processing to combine all layers into the CLE map is done by AOPK. CZU is a user of all data layers and provides feedback to the different entities.

The main *focus areas for success* expected to be provided by the WEED project are:

- shorten the update period of habitat mapping through introducing remote sensing
- fill gaps in ecosystem extent mapping and derived indicators
- reduce the spatial misalignments of Natura 2000 habitats
- explore the usability and usefulness of lidar imagery
- provide information on uncertainties of the maps

3.3. Champion User Greece

Greece is actively involved in the Mapping and Assessment of Ecosystems (MAES), and hence has two reference practices:

1. Greece ecosystem type map (LIFE-IP 4 NATURA), a MAES Level 3 ecosystem type map over the entire country.
2. PEOPLE-EA extent map, exploration process on using Earth Observation conducted by the ESA project over the Peloponnese island.

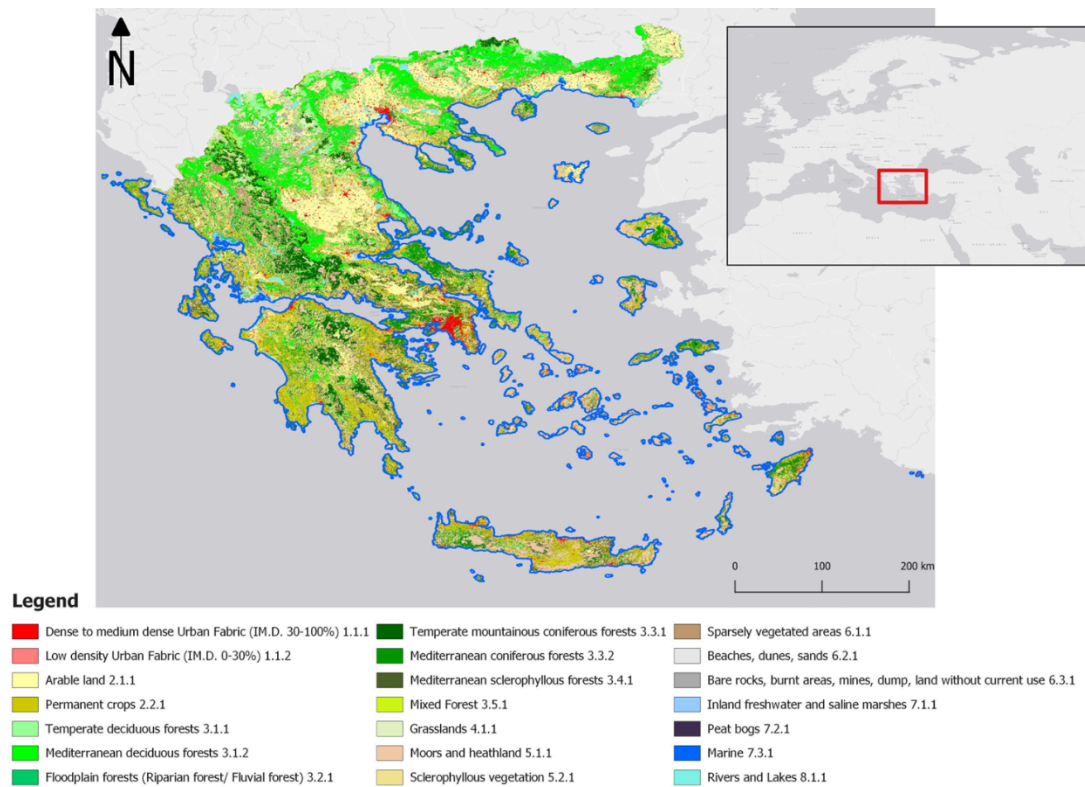


Figure 4. LIFE-IP MAES L3 map (Verde et al. 2020).

The characteristics of the ecosystem map are further detailed in the table below.

Table 5. Characteristics of current ecosystem extent maps for Greece

Attributes	Greece ecosystem map (LIFE-IP)	PEOPLE-EA (EUNIS/extent map)
spatial coverage	National	Peloponnese
temporal coverage	2019	2020
spatial resolution	100m	10m
temporal resolution	2018-2019	2020
spatial type	raster	raster
typology	MAES L3	EUNIS L3
classes	21	42
accuracy mapping	79.55%	not known
accuracy change	one shot	one shot
methodology mapping	Random forest based on Sentinel-2A 2018-2019 + EU-DEM See https://doi.org/10.3390/rs12203303	Catboost ML based on Sentinel-1, Sentinel-2 2020, DEM, climate + soil See https://esa-people-ea.org/sites/esapeopleea/files/downloads/PEOPLE-EA_D7_ATBD_EcosystemExtent_v1_2.pdf
methodology change	not available	not available
URL	on request	on request
Language	GR, EN	EN
Layers	Level-3	Level-1, Level-2 and Level-3
license		None

Organizationally, the LIFE-IP map was developed under the LIFE IP 4 NATURA Project (<https://edozoume.gr/en/>), a cooperation between coordinated by the Natural Environment Agency and Climate Change Agency (NECCA), both part of the Ministry of Environment. Both agencies cooperate in collecting data for areas of interest (mostly protected areas). The national statistical agency follows this approach, complemented by some local and regional authorities (e.g. Forest Service) Data collection derived from in situ MAES surveys for the

LIFE IP 4 NATURA Project, as well as from recent Article 17 (Dir. 92/43/EEC) monitoring field work. University of Patras (UPATRAS), the lead partner of the MAES LIFE IP 4 NATURA Action, now provides technical support and training to the agencies. They are doing UPATRAS conducting continuous data collection from of surveys on ecosystems, habitats, conditions and services from local and regional authorities. UPATRAS also leads the ongoing Article 17 monitoring survey in Greece. These datasets are not yet integrated into a single platform.

The main *focus areas for success* expected to be provided by the WEED project are:

- Produce a frequently updated operational ecosystem type map (with scale < 10,000) according to a standardized approach.
- Improve the accuracy of ecosystems with a similar spectral response, e.g. where possible to integrate ecological modelling.
- Fine-tune the impervious area covers classification.
- Conduct field surveys inside and outside the Natura 2000 network areas.
- Standardize a validation approach.

3.4. Champion User Norway

Norway has a long history on land use monitoring, more particularly on forestry and agriculture mapping. Recently they have been developing extent maps according to the Eurostat Ecosystem typology (level 1 and level 2). There are two important common practices:

1. Nature in Norway habitat map (NIN), is a long-term project with the aim of documenting and further developing knowledge about Norwegian natural variation, mainly based on field-based mapping in combination with drone and aerial photos. Version 2 has mapped 111 selected habitat types.
2. Grunnkart for arealregnskap, is a base map for use in land use accounting and is composed of existing information of land cover, land use and ecosystems. The first test version was released in 2024, with a second test version planned for release in early 2025.

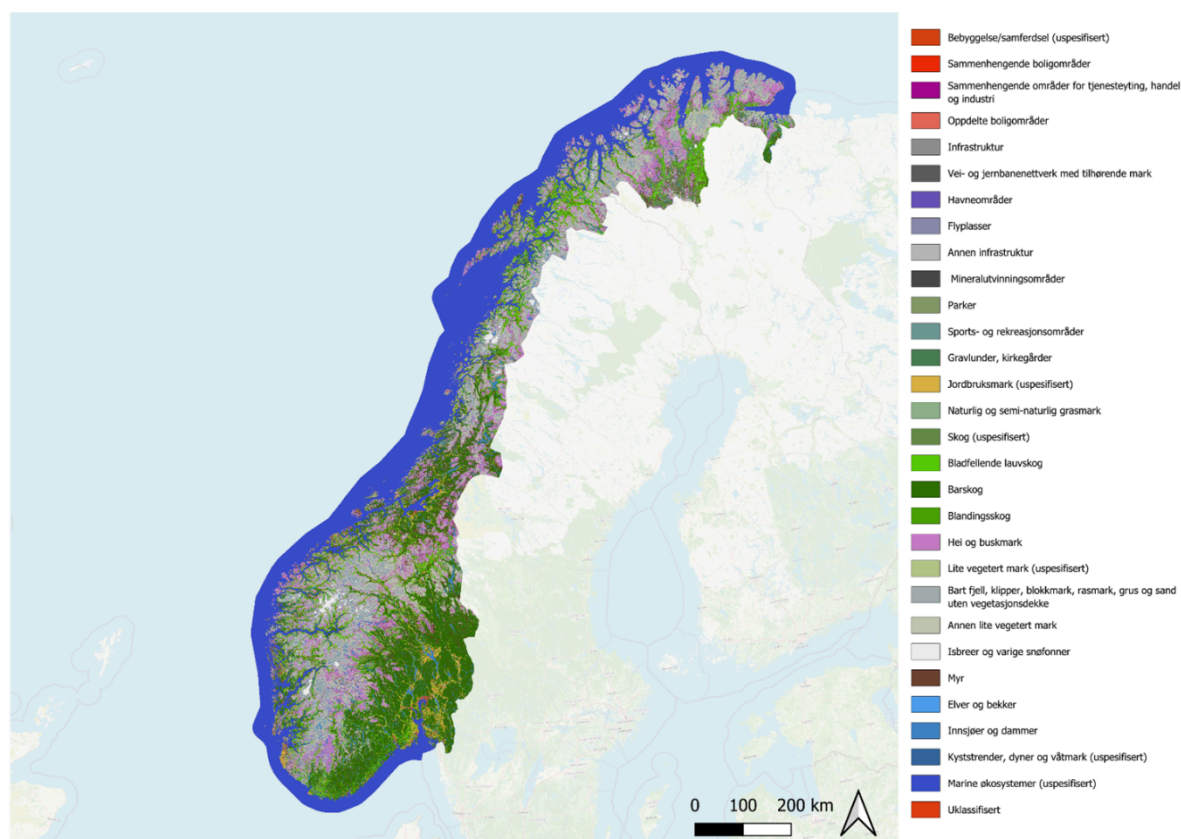


Figure 5. Grunnkart for arealregnskap

The characteristics of the ecosystem map are further detailed in the table below.

Table 6. Characteristics of current ecosystem extent maps for Norway

Attributes	Grunnkart for arealregnskap	Habitat map (Nature in Norway = NIN3)
spatial coverage	Nation (except Svalbard)	National, only priority areas
temporal coverage	Not clearly defined, different coverage per area due to municipality (likely closest to 2021)	2023
spatial resolution	not found	1:5000
temporal resolution	beta in 2023, beta rev 2024 target 3 yearly updates	not found
spatial type	vector	vector

Attributes	Grunnkart for arealregnskap	Habitat map (Nature in Norway = NIN3)
typology	EU typology	National -> EUNIS2021
classes	L2 (not all classes)	Hierarchical 3 x 3 main types, and 73 subtypes for terrestrial (https://naturinorge.artsdatabanken.no/Natursystem , https://artsdatabanken.no/NiN/Natursystem)
accuracy mapping	not known	unknown
accuracy change	no change available	no change available
methodology mapping	The NIBIO's Grunnkart for arealregnskap is a combination of data from NIBIO, Env Agency, SSB and Mapping authority NIBIO Brage: Grunnkart for bruk i arealregnskap https://brage.nina.no/nina-xmlui/handle/11250/2834619?locale-attribute=en (report)	field surveys
methodology change	not known	not known
URL	https://kilden.nibio.no/?topic=arealinformasjon&x=6631718.18&y=266906.19&zoom=10.5&bgLayer=graaatone&layers=arealregnskap_okosystemtype&layers_opacity=0.75&layers_visibility=true	https://nin.artsdatabanken.no/Natur i Norge
Layers	https://wms.nibio.no/cgi-bin/arealregnskap_grunnkart?service=WMS&request=GetCapabilitiesAR50:https://wms.nibio.no/cgi-bin/ar502?SERVICE=WMS&VERSION=1.3.0&REQUEST=GetCapabilities https://kilden.nibio.no/?topic=arealinformasjon&zoom=0&x=7219344&y=284337.75&bgLayer=graaatone (viewer)	https://geocortex02.miljodirektoratet.no/Html5Viewer/?viewer=naturbase
Language	NO	NO

Attributes	Grunnkart for arealregnskap	Habitat map (Nature in Norway = NIN3)
license	None	None

Organizationally, Norway's land management and spatial planning is a decentralized process and as such most (sometimes non-uniform) information comes from the municipalities. In 2021, the government committed to developing ecosystem accounts where the Statistical Bureau (SSB) is responsible for the production. This production is supported by the Norwegian Environment agency, collecting data to monitor nature, the Norwegian Mapping Authority, responsible for cadastral and topographic non-nature data through aerial photography, Norwegian Institute of Bioeconomy Research (NIBIO), responsible to product the Grunnkart, and Norwegian Institute for Nature Research (NINA), supporting the production of the NINM cardmap through field data collection.

The main *focus areas for success* expected to be provided by the WEED project are:

- Improve coherency of the extent map: adding agriculture land sub-classes, natural grasslands.
- Improve the mapping of mountainous areas (including wetlands).
- If possible, subdivide the marine ecosystems.
- Harmonize the temporal resolution.

3.5. Champion User South-Africa

South-Africa is one of the first countries on the globe who has been working on ecosystem maps according to the IUCN GET typology. Its history started already by creating the first vegetation maps around 2000. To improve ecosystem mapping, the National Ecosystems Classification System (Dayaram et al. 2021) describes four realms, namely terrestrial, freshwater, marine and estuarine. Each realm has its own classification system and description and is presented in a national realm map managed in one harmonized spatial layer. The terrestrial realm derives its information from the national vegetation map which provides a historic extent of vegetation types. A separate process to map land cover and land cover change has resulted in the National Land Cover map which can be used to quantify the extent of conversion of natural ecosystems to anthropogenic features.

Two main products are used to determine the remaining extent of terrestrial ecosystems in South Africa, namely,

1. the South African national vegetation map (Dayaram et al., 2019) and
2. a national land cover map (DFFE, 2021).

By combining the two products in a GIS, it is possible to assess the extent of remaining natural habitat. These products were also used during the process of developing an ecosystem account for South Africa (Statistics South Africa, 2020, see https://www.statssa.gov.za/?page_id=14717). An analysis of land use change found that on

average 22% of South Africa has been converted across all biomes however rates of biome loss ranges between 2-64% (Skowno et al., 2021). Other important features can be extracted from the SA-NECS suchs habitat types for rivers, wetlands, estuaries and marine features.

The characteristics of the ecosystem map are further detailed in the table below.

Table 7. Characteristics of current ecosystem extent maps for South-Africa

Attributes	NVM (VEGMAP project)	SA-National Land Cover
spatial coverage	National terrestrial, incl. Eswatini and Lesotho	national
temporal coverage	1936, 1953, 1996 (more agriculture focus) 2006, 2012, 2018 (more floristic)	1996, early 200 2014 , revised 2018 2020, 2022 (every 2 years)
spatial resolution		30m, based landsat 20m from 2020 onwards geometric consistency is not known
temporal resolution	every 6 years, or earlier of sufficient areas are changed - partly updates	every 2 years
spatial type	geodatabase, shapefile, cmf	raster
typology	Vegetation types, see https://www.sanbi.org/biodiversity/foundations/national-vegetation-map/	National
classes	4 hierarchical levels, namely, Biomes (9), Bioregions (41), Vegetation types (458) and Subtypes (23).	https://www.sanbi.org/wp-content/uploads/2024/06/2021_NECS-Handbook.pdf
accuracy mapping		70-80%

Attributes	NVM (VEGMAP project)	SA-National Land Cover
accuracy temporal change	N/A, a historical map	
methodology mapping		SANLC 2020 and 2022: Sentinel 2 Multispectral Imagery • Computer Automated Land Cover (CALC) • 12 Geographic Masks
methodology change		Previous maps have used landsat, sentinel images
URL	https://bgis.sanbi.org/SpatialDataSet/Detail/1674 (download) Vegmap 2024: https://bgis.sanbi.org/Projects/Detail/2258	https://egis.environment.gov.za/sa-national-land-cover-datasets NLC 2022 presentation: https://www.statssa.gov.za/wp-content/uploads/2024/07/3.-NATIONAL-NCA-FORUM-LAND-COVER-2024-08-07-1.pdf
Language	EN	EN
Layers	attribute table for polygons	1 file with color palette
license		

The vegetation map has four hierarchical levels, namely, Biomes (9), Bioregions (41), Vegetation types (458) and Subtypes (23); as shown in figure below.

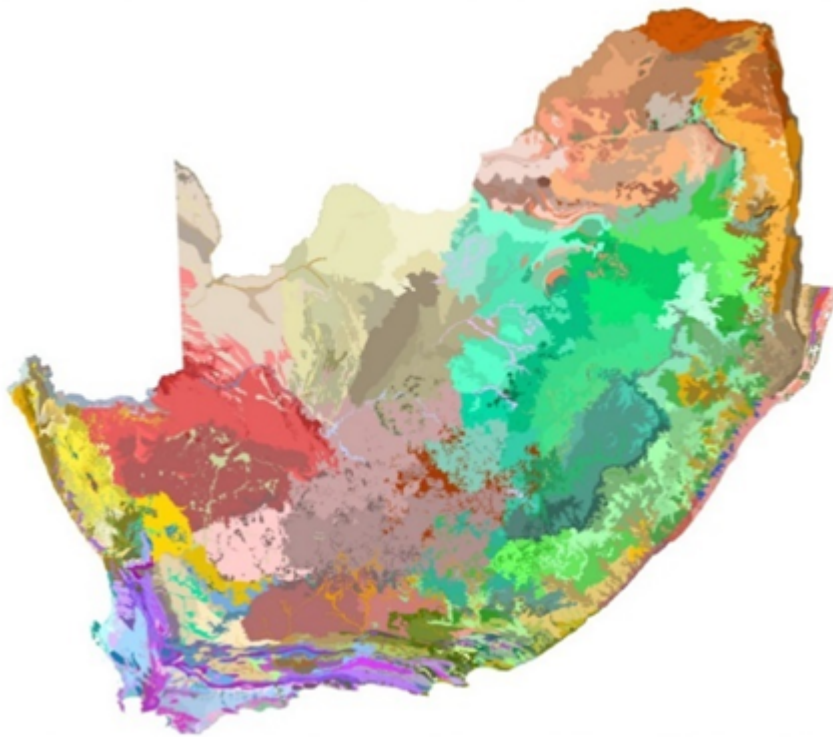


Figure 6. The South African national vegetation map depicting 466 vegetation types across 9 Biomes (Dayaram et al 2019).

The South African National land cover map has had multiple versions starting 1990, 2013/14 and 2018. The CALC datasets are from 20 meter multi-seasonal Sentinel 2 satellite imagery and forms part a new automated landcover process (See <https://egis.environment.gov.za/sa-national-land-cover-datasets>). The latest version of 2022 is available. There are 73 classes of information and is comparable, with the previous 1990 and 2013-14 South African National Land-Cover (SANLC) datasets, however these products are produced at 30m resolution. The South African National Land-Cover 2018 dataset is available on an open licence agreement.

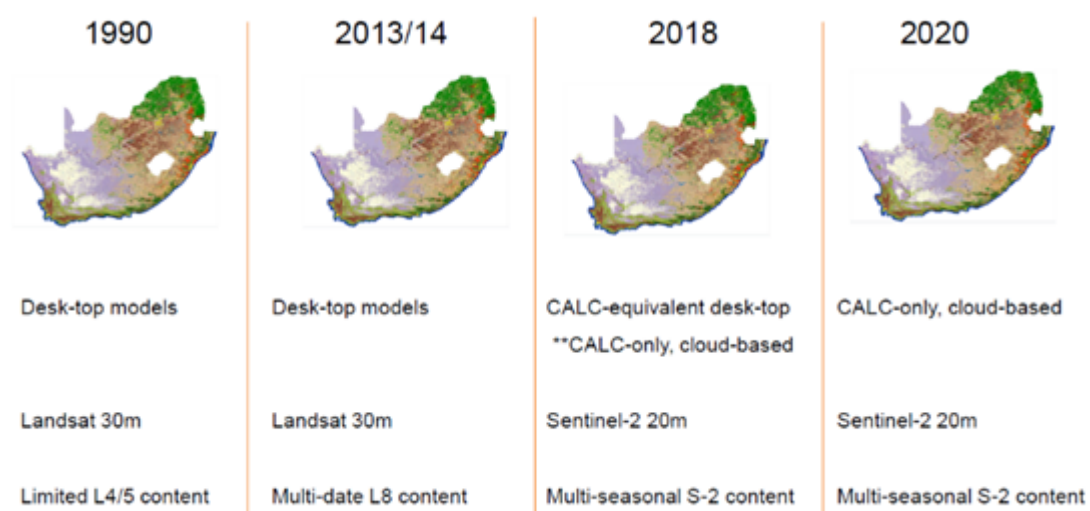


Figure 7. Summary South African Land Cover Products between 1990 and 2020. Computer Automated Land Cover (CALC) methods were adopted for the 2018 and 2020 periods to ensure more regular land cover updates.

Organizationally, The South African National Biodiversity Institute (SANBI) curate vegetation (and other ecosystem) maps. The Department of Forestry Fisheries and the Environment (DFFI + CSRI) produces the National land cover products. A large network of NGO's and other organizations (e.g. CSIR) are involved in validating and contributing to the two products through data sharing agreements, and reference data. Statistics South Africa (StatSA) has performed some GIS operations to combine the maps into a SEEA ecosystem extent map, while SANBI (Andrew Skowno) has cross walked it to the IUCN GET typology. SAEON is a project partner with SANBI, with a focus on in-situ networks and providing science expertise on biodiversity assessments (e.g. fire mapping, invasive plant mapping, wetlands, carbon sequestration, etc. SAEN will be the contact organisation for phase1 and will work in coordination with SANBI while the latter will be further involved in the testing in phase2.

The main *focus areas for success* expected to be provided by the WEED project are:

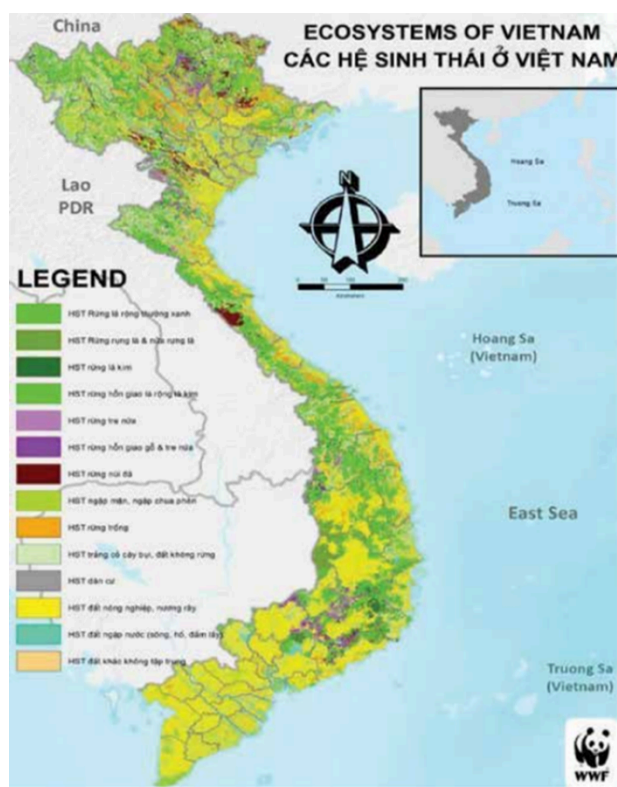
- extend the geographical extent and access for poorly studied vegetation types
- better map and characterize terrestrial ecosystem condition metrics to improve the ability to assess the Red List of Ecosystems in the future
- increase the diverse sources of information and models to improve accuracy
- harmonize local mapping typologies and global approaches

3.6. **Champion User Vietnam**

A single ecosystems map for the entire Vietnam country has been developed by WWF (on behalf of the Ministry of Natural Resources and Environment, MONRE) for 2013, as part of the Strategy to mainstreaming Ecosystem-Based Adaptation (EBA), as shown in Figure 7.

Another more recent map was developed for the Cu Lao Cham Islands but limited to the coastal and marine classes not mapping the terrestrial ecosystems. The islands are a group of 8 small islands of Quang Nam province (Vietnam), that form a part of the Cu Lao Cham Marine Park, a world Biosphere Reserve recognized by UNESCO. The islands are also recognized as Vietnam's national scenic site. The map of the ecosystem, as shown in Figure 8, along the shoreline of Cu La Cham, was established based on the data from the field survey in 2018, carried out by the Institute of Geography and Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology.

A third map was mentioned related to natural parks within Vietnam. However, this map did not reveal any ecosystem mapping, but merely attributed some properties (fauna, flora, conservation state, etc.) to every natural parc polygon. Also, a very detailed forest map was discussed, however being very valuable input data (for training or validation), it was not further considered as it only prevailed information on one theme (forest). These inputs, however, are further considered as national datasets to be analyzed as input data layers.



Hình 3. Các hệ sinh thái trên đất liền ở Việt Nam

Nguồn: WWF Việt Nam, 2013

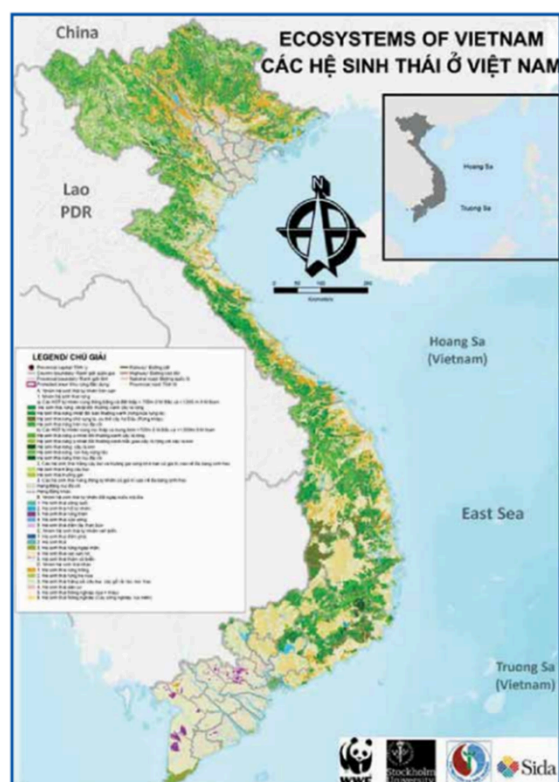


Figure 3. Map of terrestrial ecosystems of Vietnam based on types of forest vegetation
(Source: BCA, WWF and Stockholm University, 2013)

Figure 8. Ecosystems of Vietnam for 2013 (source WWF)

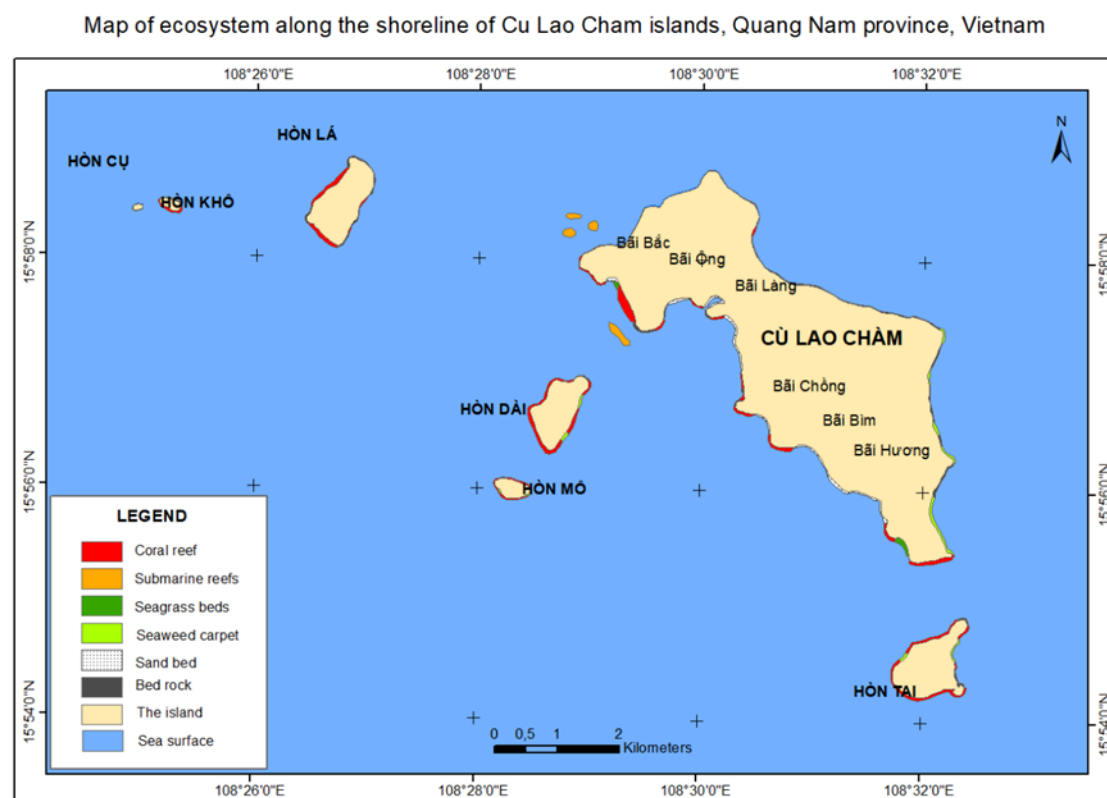


Figure 9. Map of ecosystems along the shoreline of Cu Lao Cham islands [Source: Institute of Geography, Vietnam Academy of Science and Technology]

The characteristics of the ecosystem map are further detailed in the table below.

Table 8. Characteristics of current ecosystem extent maps for Vietnam

Attributes	Ecosystems of Vietnam	Cu Lao Cham Islands
spatial coverage	National	8 small islands of Quang Nam province
temporal coverage	2013	2018
spatial resolution		1:10,000
temporal resolution	2020	
spatial type	vector	vector
typology	national	
classes		coastal, intertidal only
accuracy mapping	not known	not known
accuracy change	no change mapped	no change mapped
methodology mapping	https://www.cbd.int/doc/world/vn/vn-nbsap-v3-en.pdf	
methodology change	not available	not available
URL	through 3rd party	on request
Language		
Layers		Island boundary Ecosystem boundary Sea and land areas

Attributes	Ecosystems of Vietnam	Cu Lao Cham Islands
license		

Organizationally, MONRE is responsible for reporting and biodiversity. VAST is supporting three ministries (environmental, rural, and technology) with its own scientific task to create ecosystem maps including collecting reference data.

The main *focus areas for success* expected to be provided by the WEED project are:

- produce a frequently updated operational ecosystem type map according to a standardized approach
- able to track important changes in forest, wetland and coastal ecosystems

3.7. Phase-2 countries

This chapter will be filled in later.

3.8. Summary success criteria

Based on the current practices from the users and their identified prime success criteria for the WEED toolbox, Table 9 provides the criteria turned into a toolbox requirement.

Table 9. Summary of identified success criteria

Identifier	Requirement	Source
SUC-1	Enable more frequent updates, harmonize temporal resolution	COL, CZE, GRC, NOR, VNM
SUC-2	Harmonized typology to enable cross-country comparison	COL, ZFA, VNM
SUC-3	Ability to scale from national to local	COL, GRC, ZFA
SUC-4	Wall-2-wall mapping (no gaps)	CZE, GRC, ZFA
Not supported	Including marine ecosystems	NOR
SUC-5	Reduce spatial misalignments	CZE
SUC-6	Improve coherency and accuracy for specific ecosystems (imperviousness, mountainous, cropland, wetland)	GRC, NOR

SUC-7	Inclusion of state-of-the-art datasets (e.g. LIDAR)	CZE, ZFA
SUC-8	Use of state-of-the-art technologies (e.g. Machine Learning)	COL, ZFA
SUC-9	Reliable detection of changes	VNM
SUC-10	Provision of uncertainties	CZE
SUC-11	Robust and useful information for policy use	COL
Not supported *	Characterize condition metrics	ZFA
SUC-12	Applicability in various fields	COL
SUC-13	Standardized validation approach	GRC

(*) condition metrics will not be provided as output of the toolbox, however inter-annual changes in conditions will be accounted for that not necessarily lead to ecosystem changes.

4. User Requirements

This section describes the requirements from the champion users collected during the structured online interviews. A summary table across the different champion users is included in the Requirements Baseline deliverable (D1.2). However, before describing the requirements from both the 'use' perspective and the 'technical' perspective, first the typologies are introduced.

4.1 Ecosystem typologies

The IUCN Global Ecosystem Typology (GET) is internationally recognized as the standard for several policy reporting (e.g. CBD, SEEA EA). The typology is comprised of six hierarchical levels, as shown in Figure 10. The typology allows navigation from global to local scales. The three upper levels classify ecosystem based on their functional characteristics (such as structural roles of foundation species, water regime, climatic regime or food web structure), rather than based on which species live in them. The three lower levels typically incorporate more detailed information for use in national or regional policies. As an example, Level 4 regional subgroups are proxies for compositionally distinctive geographic variants that occupy different areas within the distribution of a functional group at Level 3, composed out of 110 groups. More details can be found at <https://global-ecosystems.org/>.

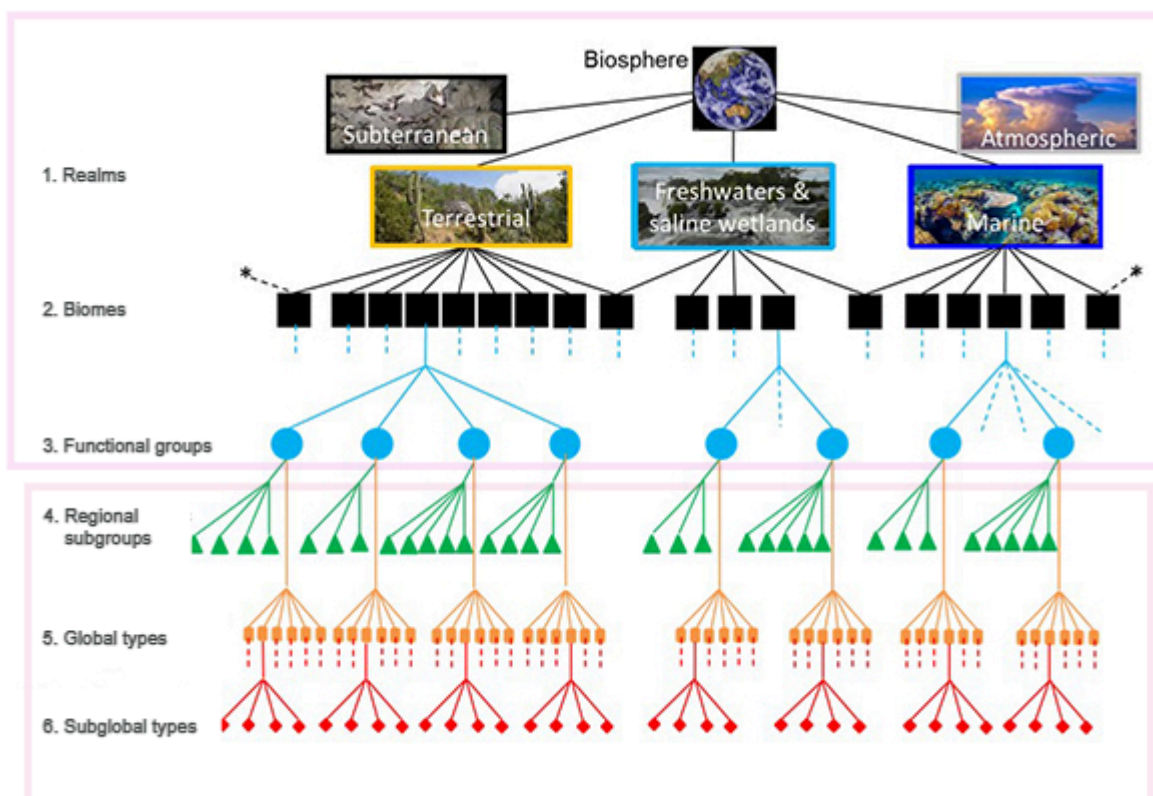


Figure 10. IUCN Global Ecosystem Typology (credits IUCN)

The European Union has endorsed a common EU ecosystem typology as a common classification to harmonize the reporting on ecosystem accounts (ETA), based on the most important existing EU-wide ecosystem classifications: the MAES ecosystem typology and

the EUNIS habitat classification, while the IUCN GET typology provides important context. The ETA uses three levels of increasing ecological details to classify all European ecosystems. A crosswalk between ETA L1/L2 and the IUCN GET is provided for international comparisons. The toolbox will support 126 classes (excluded the 12 marine ecosystem classes) defined at ETA L3, including crosswalk to IUCN GET. More information can be found at https://ec.europa.eu/eurostat/statistics-explained/index.php?oldid=534864#Developing_ecosystem_accounts_in_the_EU.

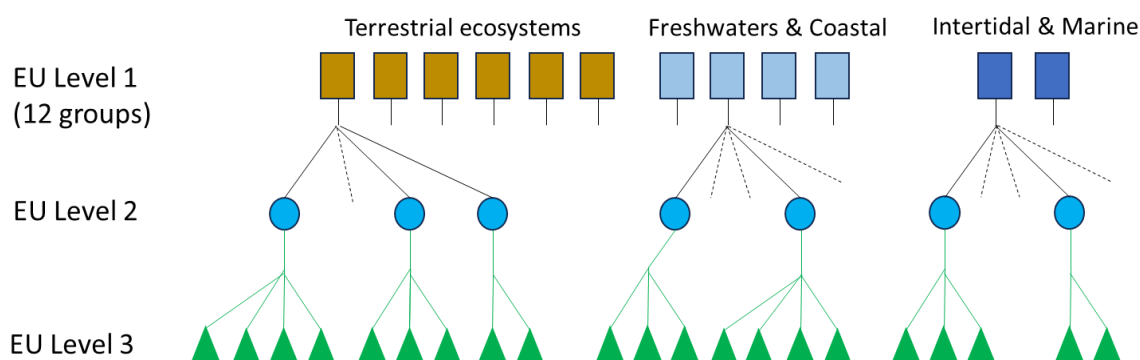


Figure 11. European Ecosystem Typology Accounting (ETA)

The EUNIS habitat classification is a comprehensive pan-European system to facilitate the harmonized description and collection across Europe using criteria for habitat identification. It is hierarchical and covers all types of habitats from natural to artificial, from terrestrial to freshwater and marine. The classification was initiated in 2012, and a revision started in 2021, including a new element for indicator species for level 3 habitats. There are 270 level 3 identified terrestrial, freshwater and coastal habitats. The toolbox will support level 3 as far as possible. More information is available at

<https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification-1/documentation>

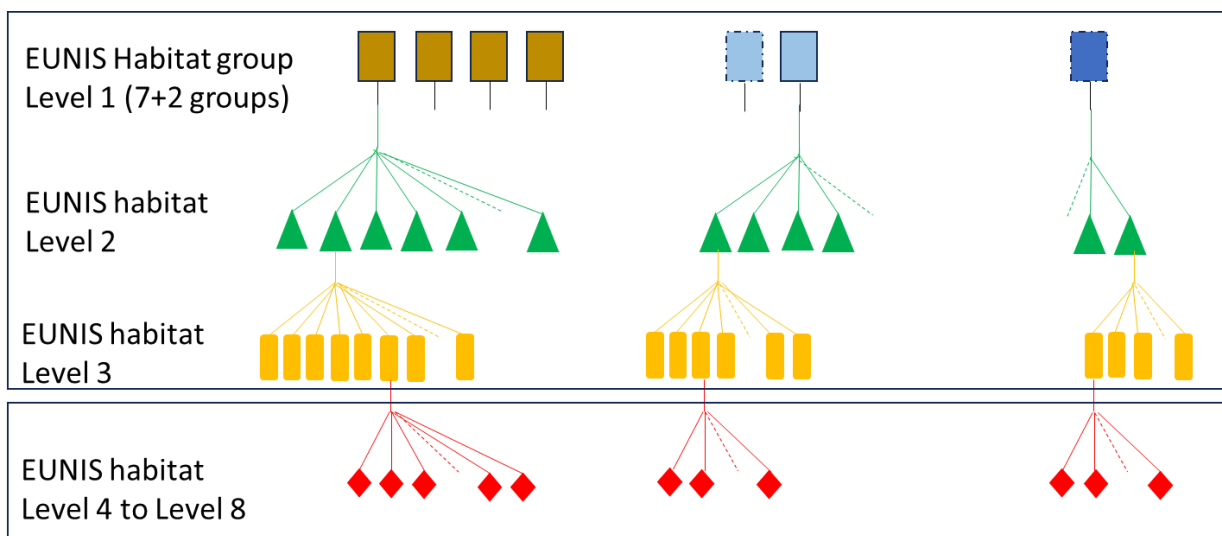


Figure 12. European EUNIS habitat typology

Despite the EU ecosystem extent typology (ETA) is partly based on the EUNIS habitat typology, at its highest level (Level 3) it aggregates several classes of the EUNIS Level 3 classes. Hence, to enable countries to use the EUNIS habitat information in its highest level of detail (up to Level 3) for national or local policy decisions, the toolbox will support both ETA and EUNIS typologies.

4.1. User requirements, use perspective

Table 10. Champion User requirements, Use perspective

		Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
Use information							
Requirement ID	Typology						
[REQ-USE-TYPO1]	IUCN GET	X (level-4 where possible)				X (level-4 where possible)	X (level-4 where possible)
[REQ-USE-TYPO2]	EU extent typology		X (level-3)	X (level-3)	X (level-3)		
[REQ-USE-TYPO3]	EUNIS typology		X (level-4 where possible)	X (level-4 where possible)	X (level-4 where possible)		
[REQ-USE-TYPO4]	Annex-I typology		X				
[REQ-USE-TYPO5]	RAMSAR typology	X	X				X
	Prime use of products (*)						

		Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
[REQ-USE-CASE1]	Ecosystem Accounts - national	X	X	X	X	X	X
[REQ-USE-CASE2]	Ecosystem Accounts - subnational	X	X	X	county-level	X	X
[REQ-USE-CASE3]	Biodiversity reporting (GBF/IPBES)	X	X (Habitat Directive)	X	X	X	X
[REQ-USE-CASE4]	SDG reporting			X		X	X
[REQ-USE-CASE5]	RAMSAR reporting	X					X
[REQ-USE-CASE6]	UNFCCC reporting						X
[REQ-USE-CASE7]	Other						Land management, Education 2 yearly national reporting
	Prime use of data layers						
[REQ-USE-LAYER1]	Ecosystem characteristics data cube	X	X	X	X	X (to be confirmed)	X
[REQ-USE-LAYER2]	Ecosystem extent base map	X	X	X	X	X	X
[REQ-USE-LAYER3]	Ecosystem dynamics	X	X	X	X	X	X

		Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
[REQ-USE-LAYER4]	Indicators	X	X	X	X	X	X
	Prime users						
[REQ-USE-USER1]	Ecosystem/Biodiversity analysts	X	X	X	X		X
[REQ-USE-USER2]	Statisticians	X		X	X		X
[REQ-USE-USER3]	Remote sensing experts			X			X
[REQ-USE-USER4]	Economists			X	X		X
[REQ-USE-USER5]	Data scientists		X	X			X
[REQ-USE-USER6]	Other						planner, manager
	Capacity building						
[REQ-USE-CAPACITY1]	Self-learning			X			X
[REQ-USE-CAPACITY2]	Webinar	X		X			X
[REQ-USE-CAPACITY3]	Remote hands-on	X		X			X
[REQ-USE-CAPACITY4]	Local hands-on	X		X			X

(*) note that the national focal points from different policies (e.g. CBD NFP, UNFCCC NFP, CEPA NFP, etc.) were not contacted separately, so this is solely the view of the Champion User's perspective.

4.3 User requirements, technical perspective

Table 11. Champion User requirements, technical perspective

Requirement ID	Requirement	Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
Technical requirements							
[REQ-TECH1]	Map type	vector/raster	vector	raster	raster	raster	vector
[REQ-TECH2]	Map format	cloud optimized geotiff	vector	cloud optimized geotiff	cloud optimized geotiff		cloud optimized geotiff
[REQ-TECH3]	Metadata format	As simple as possible		Any type			Any type
[REQ-TECH4]	Minimum Mapping Unit (MMU)	<5 ha and below (resolution 30m and below)	30m and below	30m and below	100m and below (10-30m)	20 - 30m (align with BSU of land cover maps)	10m - 30m forest 0.3 ha land use < 0.1 ha
[REQ-TECH5]	Minimum Mapping Width (MMW) for linear features	10 m	4m and below	4m and below (small forest roads)			
[REQ-TECH6]	Ecosystem with highest spatial detail	Wetlands, Remnant dry forest	Streams, wetland and lines of trees	wetlands, dunes, riparian	urban, wetlands		
[REQ-TECH7]	Projection	EPSG:9377		EPSG:3035,	EPSG:3035		UTM84, VN2000

Requirement ID	Requirement	Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
				transition to CGRS87			
[REQ-TECH8]	Update frequency	2 years	3 years	1 to 3 years	3 years	2 years	half yearly
[REQ-TECH9]	Update latency	3 to 6 months	3 to 6 months	half year	one year	3 to 6 months	3 to 6 months
[REQ-TECH10]	Ecosystem dynamics generic	2 years ²	X	EU Level-1 (all)	X	X	X
[REQ-TECH11]	Ecosystem dynamics detailed	1 year, except for fires (daily - post-fire season), water system (biannual), and climate change (every five years).	Most detailed scale possible	EU Level-2 or 3 (some*)	Crops and sparse vegetation	wetlands	Most detailed scale possible
	Accuracy						
[REQ-TECH12]	Base map	>85%	85%	80%	85%	80%	80%
[REQ-TECH13]	Dynamics	>85%	>85%	80%	>85%		>90%
	Uncertainty metrics						
[REQ-TECH4]	Omission/commission trade-off	commission		omission	commission		commission

²¹. This data can be highly variable due to the country's diverse ecosystems. The most pronounced changes are likely to occur because of climate change and the loss of natural areas, but there may be interannual and intra-annual variations for many ecosystems.

Requirement ID	Requirement	Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
[REQ-TECH15]	Class-confusion metrics	User class matrix	X	X	X	X	X
[REQ-TECH16]	Spatiotemporal probabilities dominant class			if possible			
[REQ-TECH17]	Per-pixel probabilities each class						
[REQ-TECH18]	Area-correction statistics			X			
[REQ-TECH19]	Certainty of time and direction of change						
	Ability to ingest reference data			Yes			
[REQ-TECH20]	Type (point, polygon)	Point, polygon	polygon	point	point		Point, polygon
[REQ-TECH21]	Habitat or ecosystems	Optional		X		X	x
[REQ-TECH22]	Species information	X (at 1km - pixel)		Optional		Optional	x
	Ability to ingest national geospatial layers			Yes			

Requirement ID	Requirement	Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
[REQ-TECH23]	Vegetation data	X	X				x
[REQ-TECH24]	Land cover/use data	X		X (forest cadaster)	X		X
[REQ-TECH25]	Soil data	X					x
[REQ-TECH26]	Fauna and biodiversity	X			X		X
[REQ-TECH27]	Climate data	X		X		X	X
[REQ-TECH28]	Hydrological data					X	
[REQ-TECH29]	Human impact data	X					
[REQ-TECH30]	Legal or Policy considerations	X		X, conservation status		X, conservation status	
	Data Access						
[REQ-TECH31]	Download	X	X				x
[REQ-TECH32]	Web service	X	X	X	X		X
[REQ-TECH33]	Programming interface (API)	X					x
[REQ-TECH34]	Notebook samples					X	x
[REQ-TECH35]	Data Policy	Free, public	Free, public	free, public (on request)			

4.4 User requirements, change detection perspective

The ecosystem change will be mapped primarily in the period 2018 to 2024, hence the Sentinel era. The primary change processes to monitor are identified in the table below.

Table 12. Champion User requirements, Change detection perspective

Requirement ID	Requirement	Colombia	Czech Republic	Greece	Norway	South Africa	Vietnam
Primary change processes							
[REQ-CHANGE1]	Deforestation	X	X				X
[REQ-CHANGE2]	Urban expansion	X	X		X (crop L3 types)	X (encroachment settlements)	x
[REQ-CHANGE3]	Agriculture expansion	X	X	X (from riparian zones)			x
[REQ-CHANGE4]	Agriculture abandonment	X		X	X (sparse vegetation)	avoided degradation (protect, mining)	x
[REQ-CHANGE5]	Climate Change	X		X (alpine grassland)			x
[REQ-CHANGE6]	Invasive species		X			X (pine to fynbos)	x
[REQ-CHANGE7]	Fires	X					x
[REQ-CHANGE8]	Alteration of water system	X				X wetland transition (agriculture, abandon, rangeland, natural)	X (wetland in coastal zone)

As shown in the tables above, the users request to explore the option to map more details than the default extent level for international reporting. The focus should be set to explore the following classes:

Colombia:

- T1.3 Tropical/Subtropical Montane Rainforests
 - Páramos (has unique characteristics that give them a functionality distinct from that of T1.3)
- F2.3 Seasonal freshwater lakes or TF1.4 Seasonal floodplain marshes (wetlands depend on their biotic composition and require more than distinction on flow, seasonality and temperature)
 - Flooded grassland
 - Flooded shrublands

Czech Republic:

- More than specific ecosystems at level 4, the main interest is in detecting ecosystem change at the most detailed scale.

Greece:

- Boreal and temperate high montane forests and woodlands
- Deciduous temperate forests
- Temperate alpine grasslands and shrublands
- Sown pastures and fields
- Plantations
- Derived semi-natural pastures and old fields
- Small permanent freshwater lakes
- Seasonal freshwater lakes

Norway:

- Boreal and temperate high montane forests and woodlands
- Polar tundra and desserts
- Temperate alpine grasslands and shrublands
- Annual croplands
- Plantations
- Urban and industrial ecosystems

South Africa:

- Classes of the National Vegetation Map

Vietnam:

- L2 Tropical/Subtropical Forest
 - L3 Tropical/Subtropical lowland rainforests (important landscape and quite distributed)
 - L4 Low Mountain limestone karst broad leaved tropical seasonal rainforest
 - L4 High Mountain limestone karst coniferous tree

- L3 Tropical/Subtropical dry forests and thickets
 - L3 Tropical/Subtropical montane rainforests
- L2 Temperate-boreal forests and woodlands biome
 - L3 Deciduous temperate forests
- L2 Intensive land-use biome
 - L3 Annual croplands
 - L3 Plantations
 - L3 Urban and industrial ecosystems
- L2 Artificial wetlands biome
 - L3 Rice paddies
- L2 Brackish tidal biome
 - L3 Intertidal forests and shrublands

5. National data availability and sharing

During the interviews with the champion users, an initial inventory was made on potentially interesting national (or sub-national) datasets to produce the ecosystem extent maps or the validation thereof.

In the former case (production), the WEED platform solution will provide the necessary tools and guidelines for the users to ingest their datasets into the platform. In the latter case, the datasets will remain at the users' side and be used for validating the output of the WEED platform solution.

During the co-design phase (phase 1), the necessary tools and guidelines may not be yet fully available for the users from the start. As a temporary means the required datasets will be uploaded by the development team into the platform.

The results of the WEED platform solution will be available in real-time through the user interface (ARIES-derived web browser application) and can be downloaded thereof. The results will be cached such that re-running the same context (space, time, typology) does not require to fully recreate the maps from start. During the co-design phase, the champion users will also be able to access specific layers from the object storage.

A set of national potential datasets were identified to be explored and analyzed during the co-design phase within the following categories:

- Administrative boundaries
- Land cover
- Land use
- Vegetation / flora information
- Climate
- Soil / geology
- Geomorphology / elevation
- Hydrology / freshwater
- Marine / coastal
- Other

6. Test sites for co-creation

This section describes the test sites provided by the Champion Users to be used during the co-design phase (phase 1). Their selection is based on the diversity of the area related to ecosystem types in combination with the availability of ground-truth data to quantify the quality during validations. A size of around 6% per country was budgeted for test sites.

For each Champion User, first a description of the selected test-regions is given. Thereafter they are summarized in a table with their size, their intersecting with Ecosystem Functional Groups (EFG) and their intersecting with processing Tiles. Vector files are available per champion user and contain the following columns: fid, Name, WEED site, Priority.

6.1. Test-sites Colombia

The champion user has defined 17 regions during co-design testing. The total area of the priority test regions is 48 thousand km² (4.2% of the country). From these 17 regions, Colombia has prioritized 8 regions, marked with **(P)**.

- **CO1: Mojana (P):** It is situated in the northern region of the country and is classified as an inland delta, where significant fluvial systems, including the Cauca, Magdalena, Nechí, and San Jorge rivers, converge.

The area is characterized by extensive wetland ecosystems and seasonally inundated forested landscapes, supporting distinctive vegetation assemblages such as Zapales—flooded forests dominated by low-canopy trees and shrub formations—as well as a diversity of marshes, lagoons, and other hydrological features.

The delineated polygon encompasses a jurisdiction of 11 municipalities, spanning approximately 11,500 km², which were severely impacted by extreme hydrometeorological events associated with the La Niña phenomenon in 2010 and 2011. The region has undergone significant alterations in land cover, including the degradation of forested and wetland habitats due to pasture expansion. Additionally, anthropogenic pressures, particularly mining activities concentrated in the elevated southern zones, have contributed to hydrological disturbances and contamination, further modifying the area's ecological and environmental dynamics.

- **CO2: San Andrés:** It is an island located in the Colombian Caribbean, spans approximately 2,670 hectares and is predominantly composed of mangrove and tropical dry forest ecosystems.

Its geomorphological development occurred over an atoll system, resulting in a calcareous substrate and a topography characterized by flat to gently undulating terrain. The highest elevations are concentrated in the central sector, where hills reach a maximum altitude of 87 meters above sea level.

The island exhibits a high degree of anthropogenic transformation, particularly in the northern region, where intensive tourism activities are prevalent. Various ecosystems have been subjected to degradation due to pollution, the deposition of construction debris, and additional anthropogenic pressures such as overfishing. Furthermore, the island is projected to be highly susceptible to the impacts of climate change, including sea-level rise and shifts in ecosystem dynamics.

- **CO3: Providencia (P):** Providencia and Santa Catalina are two islands located in the northwestern Colombian Caribbean, exhibiting significant similarities to San Andrés,

particularly in terms of surface area (2,200 hectares, with Providencia accounting for 90%).

However, in contrast to San Andrés, these islands have a volcanic origin, which has resulted in distinct lithological properties, primarily composed of andesitic rocks. Their geomorphology is more rugged, characterized by pronounced topographic variations, with elevations reaching up to 360 meters, as well as steeper slopes and incised valleys.

The islands are subject to environmental pressures comparable to those observed in San Andrés; however, the intensity of tourism activity is notably lower. Additionally, it is crucial to highlight that these islands sustained severe damage from Hurricane Iota in November 2020. This extreme meteorological event catalyzed extensive data collection and analytical initiatives, facilitated through scientific expeditions such as Black Crab and Seaflower.

- **CO4: Ciénaga grande de Santa Marta (P):** This area has been designated as a priority due to its high density of mangrove ecosystems, which are systematically monitored through high-resolution remote sensing technologies by the national institution responsible for marine and coastal ecosystem research (Invemar).

Spanning an area of 404 km², it is situated within the lowland plains between the western flank of the Sierra Nevada de Santa Marta and the Magdalena River. The confluence of freshwater and brackish water in this region creates optimal conditions for the development and persistence of mangrove ecosystems.

Despite its designation as a Ramsar wetland and its overlap with legally protected National Parks (Isla Salamanca and Ciénaga Grande de Santa Marta), the CGS is subject to substantial anthropogenic pressures. Key stressors include the expansion of the Barranquilla metropolitan area (currently home to approximately 2.4 million residents), intensive agricultural practices (primarily for palm, plantain, and cotton cultivation), extensive livestock grazing, and long-term hydrological modifications. These interventions have been implemented to enhance navigability and mitigate the adverse impacts of recurrent flooding on local communities, yet they have also significantly altered the region's ecological dynamics.

- **CO5: Delta del Sinú:** This region is also part of the mangrove ecosystems monitored by Invemar through high-resolution remote sensing technologies. It is situated in the northwestern sector of the Colombian Caribbean coast, along the margins of the Sinú River estuary.

The area is near multiple wetland systems, most notably the Bajo Sinú wetland complex and the mangrove ecosystems of the Gulf of Morrosquillo.

Its conservation status is comparatively higher than that of the CGS, despite experiencing anthropogenic pressures such as tourism development, extensive cattle ranching along wetland peripheries and riverbanks, and hydrocarbon extraction. Notably, 100% of its approximately 9,100-hectare expanse falls within the Manglar de la Bahía de Cispata Regional Integrated Management District (DRMI), a designation established in 2006. Although this protection category does not entirely prohibit productive activities, it imposes regulated usage constraints that contribute to the long-term preservation and ecological integrity of the mangrove ecosystem.

- **CO6: Buenaventura (P):** This region also comprises mangrove ecosystems monitored by Invemar through high-resolution remote sensing technologies. However, in contrast to the previously mentioned areas, it is located along the Pacific

coast, a geographic distinction that drives substantial variations in key environmental parameters.

These include geomorphological characteristics, more extensive tidal regimes, and elevated humidity and precipitation levels compared to the Caribbean. In conjunction with a distinct biogeographic and evolutionary history, these factors result in pronounced differences in the structural composition, ecological functioning, and dynamic processes of the mangrove ecosystems in this area.

The area of interest extends southward from Buenaventura, Colombia's primary Pacific port city, which has an estimated population of approximately 320,000 inhabitants. Consequently, mangrove ecosystems in the vicinity of the port are subject to significant anthropogenic pressures and land-use transformations.

- **CO7: Delta del Patía:** Like Buenaventura, this region comprises mangrove ecosystems monitored by Invemar through high-resolution remote sensing technologies and is situated along the Pacific coast, specifically at the Patía River estuary.

This area demonstrates a higher conservation status than Buenaventura, largely due to its near-complete inclusion within Sanquianga National Natural Park, a legally protected area established in 1977.

- **CO8: Páramo de Pisba (P):** Between 2010 and 2020, Colombia made significant strides in establishing legal frameworks for the delineation of páramos as strategic ecosystems, recognizing their critical role in providing essential ecosystem services such as carbon sequestration, hydrological regulation and supply, and the support of high biodiversity.

Pisba, one of the officially designated páramos in Colombia, is situated within the Eastern Cordillera and spans approximately 107,000 hectares, with elevations ranging from 2,700 to 4,000 meters above sea level. This altitudinal gradient results in distinct vegetation strata, including high-canopy arboreal formations, shrublands characteristic of the lower páramo zone, and herbaceous grasslands dominating the uppermost elevations. The eastern slope of the páramo exhibits significantly higher humidity levels compared to the western slope. In contrast, anthropogenic pressures have been more pronounced on the western flank, where land-use activities such as potato cultivation and coal mining are widespread. A portion of this ecosystem falls within the boundaries of Pisba National Natural Park, a protected area established in 1977 to safeguard its ecological integrity.

- **CO9: Páramo de Santurbán:** Santurbán is also encompassed within the páramo delimitation project and is situated in the Eastern Cordillera, at elevations ranging from 2,600 to 4,300 meters above sea level.

Covering approximately 138,000 hectares, the region includes well-conserved natural areas, particularly within the six Regional Natural Parks, which collectively account for more than 50% of the designated territory. Nevertheless, considerable land-use transformations are evident, particularly along the primary transportation axis linking Bucaramanga and Cúcuta, with pronounced impacts in the Berlin sector. On the eastern slope, within the municipalities of Vetás and California, mining operations are prevalent, generating socio-environmental conflicts between local communities and organizations based in Bucaramanga. This city, home to approximately 600,000 inhabitants, depends on one of the principal watersheds originating near these municipalities for its potable water supply.

- **CO10: Páramo de Chingaza:** A designated segment of this páramo, also situated within the Eastern Cordillera, has been incorporated into the evaluation. This area exhibits a high density of wetland ecosystems, encompassing both natural water bodies, such as *Laguna de Chingaza*, and artificial reservoirs, including the *Chuza Reservoir*.

These wetlands serve as critical hydrological assets, providing a major source of water for Bogotá and its adjacent municipalities. Their role is particularly vital given the city's population of over 8 million inhabitants and its economic significance, contributing approximately 30% of the national GDP. Owing to its ecological and hydrological importance, this páramo has been formally delineated and is predominantly safeguarded under the protection status of Chingaza National Natural Park, established in 1977. This designation ensures a high degree of conservation. The defined assessment polygon encompasses slightly more than 24,000 hectares, with elevations ranging from approximately 2,500 to 4,000 meters above sea level.

- **CO11: Cuenca Alta río Bogotá:** This area spans approximately 590,000 hectares and features a substantial altitudinal gradient, ranging from approximately 300 to 4,000 meters above sea level.

Consequently, it encompasses a highly diverse spectrum of ecosystems, including páramos, Andean forests, wetlands, and tropical dry forests, among others. The territory includes the city of Bogotá, along with other major urban centers such as Soacha, Chía, Zipaquirá, Fusagasugá, and Girardot, among others. As a result, the total population within the area surpasses 10 million inhabitants.

- **CO12: Drummont/Becerril-Cesar (P):** This area is situated in northern Colombia, along the banks of the Cesar River, which is hydrologically sustained by multiple tributaries originating from the slopes of the Serranía del Perijá and the Sierra Nevada de Santa Marta.

The terrain is predominantly flat to gently undulating, with an average elevation of approximately 50 meters above sea level. Given its relatively arid climatic conditions, the area predominantly supports xerophytic vegetation, particularly in its northern sector. Towards the south, the Cesar River Valley expands, merging into a flood plain that constitutes the wetland complex of the Ciénaga de Zapatosa. A portion of this region has been subject to open-pit coal mining operations, granted as a concession to the Drummond company in the mid-1990s. Additionally, the area comprises extensive pasturelands, African oil palm plantations, and cultivated zones dedicated to crops such as plantain.

- **CO13: AP_Plata/Simiti-Cesar:** This area spans 98,000 hectares along the eastern margin of the lower Magdalena River, with an average elevation of 42 meters above sea level.

It is predominantly composed of floodplain environments, where wetlands, particularly ciénagas (marshes), constitute the dominant landscape feature. These ecosystems are associated with seasonally inundated forests, whereas in areas with lower ecological integrity, primarily along the easternmost sector, the land cover transitions to pasturelands and African oil palm plantations.

- **CO14: AP_Guane/Barrancabermeja:** This area spans approximately 179,000 hectares, situated south of the AP_Plata/Simiti-Cesar area, with a slightly elevated mean altitude of 70 meters above sea level. It lies within the influence zone of the Magdalena River and the lower course of the Sogamoso River.

The topography is predominantly low-gradient, characteristic of the floodplain environments associated with both rivers, where wetlands—particularly ciénagas (marshes) are the prevailing feature. The landscape also comprises pasturelands and extensive African oil palm (*Elaeis guineensis*) plantations. The southern boundary of the delineated area extends to encompass a sector of the city of Barrancabermeja, which has an estimated population of 200,000 and an economy primarily driven by hydrocarbon extraction and processing.

- **CO15: Piedemonte Casanare (P):** This area spans approximately 178,500 hectares and comprises both mountainous and lowland terrains. The mountainous sector reaches elevations of nearly 1,300 meters above sea level, while the lower-lying areas exhibit a flat to undulating relief, with elevations around 250 meters above sea level.

The highland zone is predominantly covered by dense forests, whereas the lowland areas are traversed by multiple west-to-east flowing rivers originating from the mountain range, fostering the development of gallery forests along their courses.

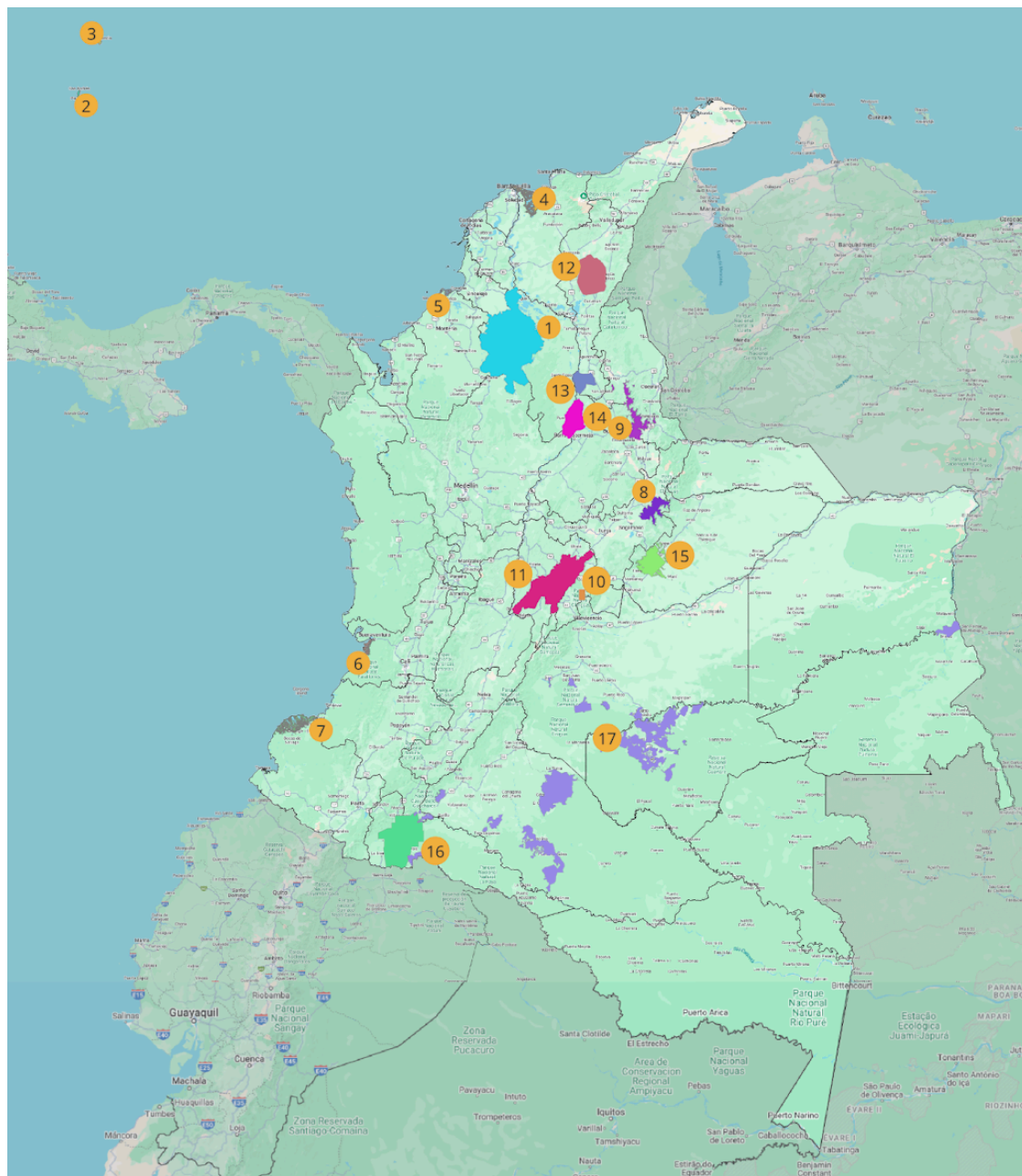
The landscape has undergone substantial anthropogenic transformation, particularly in the flatter regions, due to extensive livestock grazing, rice cultivation, and large-scale African oil palm (*Elaeis guineensis*) plantations. The area also includes urban settlements, with key municipal centers such as Tauramena and Aguazul, which together host approximately 50,000 inhabitants. Additionally, the city of Yopal, though not entirely encompassed within the delineated area, has a population exceeding 190,000 and an economy primarily centered on hydrocarbon extraction and processing.

- **CO16: Putumayo:** This area encompasses approximately 500,000 hectares, with elevations ranging from 300 to 1,000 meters above sea level. It represents an ecotonal zone between the Andes and the Amazon, predominantly characterized by tropical humid forest ecosystems, interspersed with diverse wetland systems associated with major fluvial networks, including the Putumayo and Mecaya Rivers.

The area is undergoing significant deforestation processes, primarily driven by extensive cattle ranching and, in certain sectors, by illicit coca cultivation. Additionally, it contains urbanized areas within municipalities such as Villagarzón, Orito, Puerto Asís, and Puerto Guzmán, where substantial land areas are allocated for hydrocarbon extraction and processing activities.

- **CO17: Arco de deforestación Amazonia (P):** This evaluation area comprises approximately 45 polygons, encompassing a total of 1,400,000 hectares distributed across multiple sectors of the Amazon, where substantial deforestation processes have been documented.

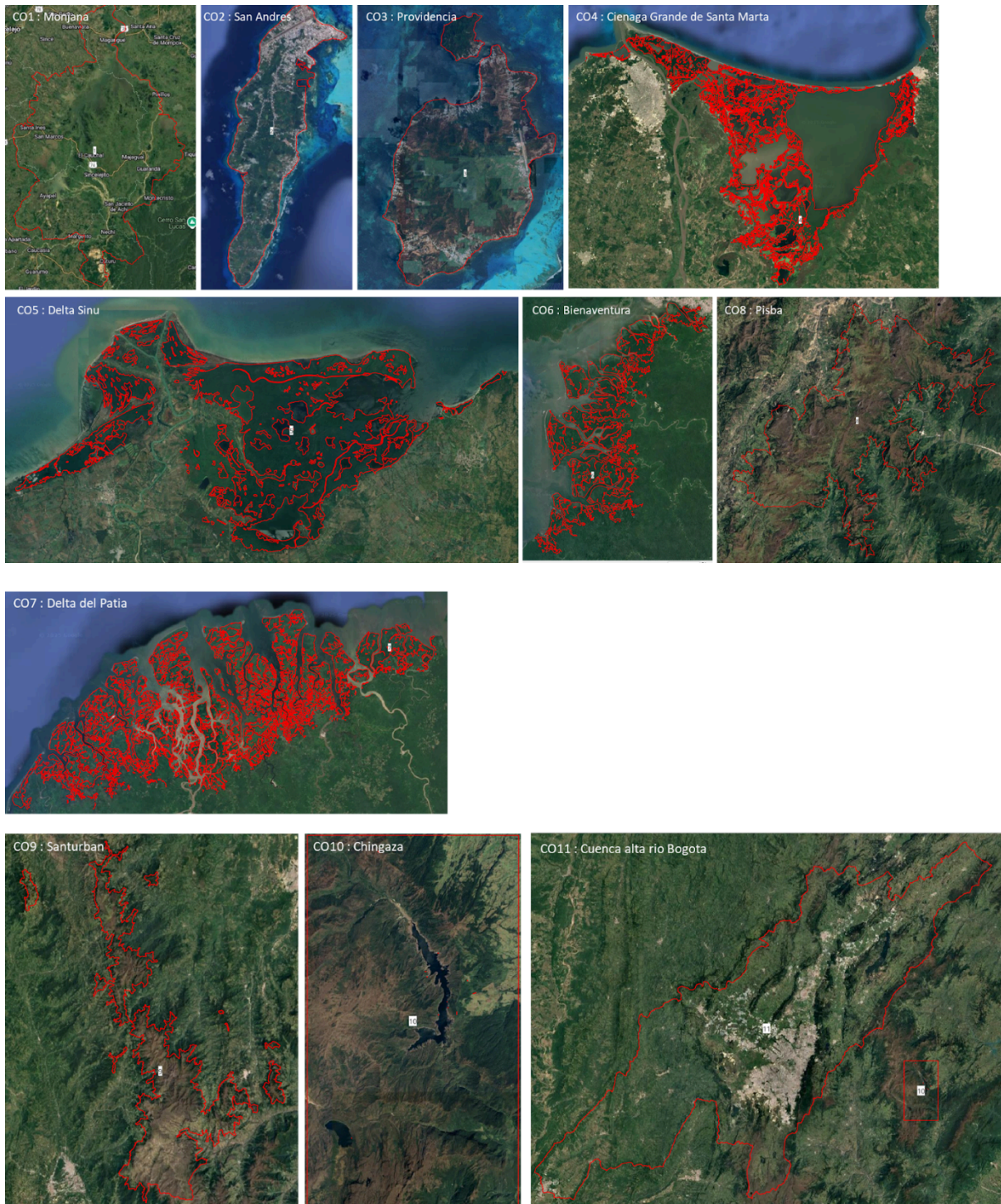
These areas are systematically monitored by the Amazonian Institute of Scientific Research (SINCHI) through the MOSCAL program (*Módulo de seguimiento al cumplimiento de los acuerdos locales de conservación del bosque*). This initiative facilitates the surveillance and assessment of adherence to forest conservation agreements established between the government and local smallholder producers, aiming to curb deforestation dynamics within this region of the country.



Test regions

- | | |
|----------------------------------|------------------------------------|
| 1. Mojana | 9. Santurbán |
| 2. San Andrés | 10. Chingaza |
| 3. Providencia | 11. Cuenca alta río Bogotá |
| 4. Cienaga Grande de Santa Marta | 12. AP_Drummont/Becerril-Cesar |
| 5. Delta Sinú | 13. AP_Plata/Simiti-Cesar |
| 6. Buenaventura | 14. AP_Guane/Barrancabermeja |
| 7. Delta del Patía | 15. Piedemonte Casanare |
| 8. Pisba | 16. Putumayo |
| | 17. Arco de deforestación Amazonia |

Figure 13. Location of test-areas for Colombia



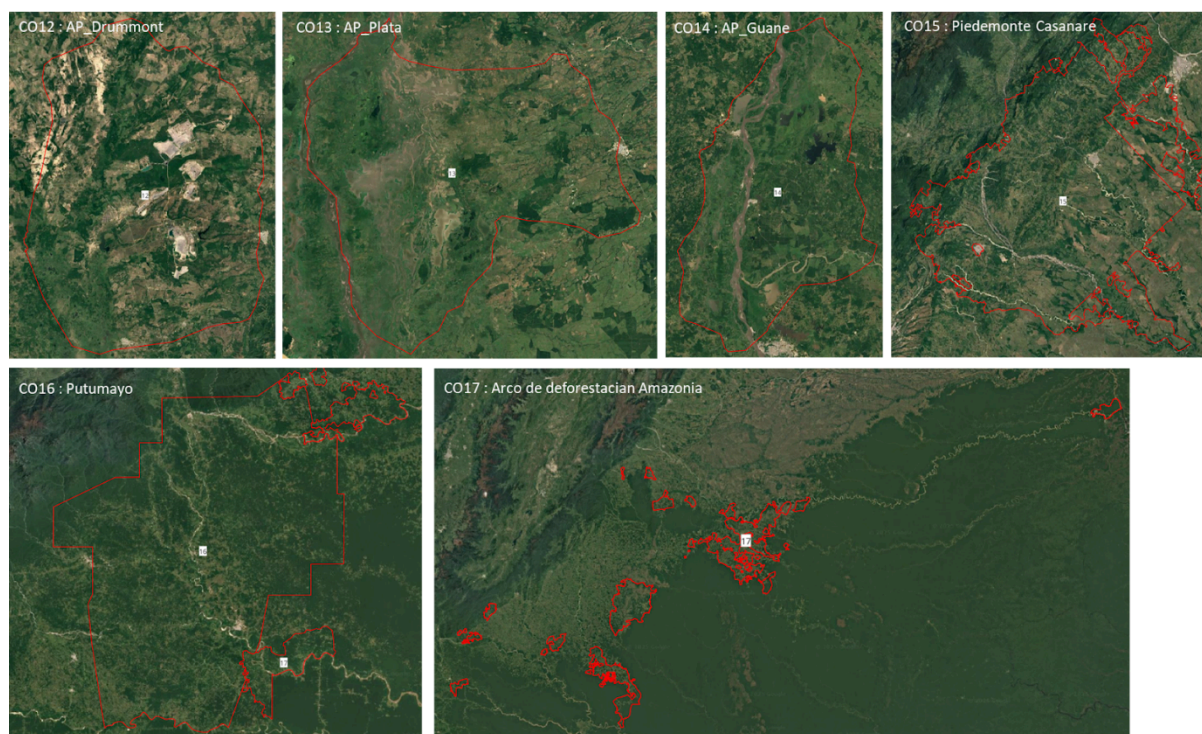


Figure 14. Location of test areas for Colombia

Table 13. Mapping of Colombian test areas to Ecosystem Functional Groups (EFG).

Name	Area in size (km2)	EFG types
CO1: Mojana (PNUD-IAVH) (P)	11,597	'F1_1', 'F1_2', 'F1_4', 'F2_2', 'F2_3', 'F3_2', 'F3_3', 'F3_4', 'F3_5', 'T1_1', 'T1_2', 'T1_3', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_4'
CO2: San Andres (Seaflower expedition)	28	'MT1_1', 'MT1_3', 'MT2_1', 'MT3_1', 'T1_2', 'T7_3', 'T7_4'
CO3: Providencia (Seaflower expedition) (P)	23	'MT1_1', 'MT2_1', 'MT3_1', 'T1_2', 'T7_1', 'T7_3', 'T7_4'
CO4: Cienaga Grande de santa Marta (Monitoreo Manglares) (P)	404	'F1_1', 'F1_2', 'F1_4', 'F2_2', 'F2_3', 'F3_2', 'F3_4', 'F3_5', 'MFT1_1', 'MFT1_2', 'MT1_1', 'MT1_2', 'MT2_1', 'MT3_1', 'T1_2', 'T1_3', 'T5_2', 'T7_2', 'T7_3', 'T7_4', 'T7_5'
CO5: Delta Sinú (Monitoreo Manglares)	90	'F1_1', 'F1_2', 'F1_4', 'F2_3', 'F3_2', 'F3_4', 'F3_5', 'MFT1_2', 'MT1_1', 'MT2_1', 'MT3_1', 'T1_1', 'T1_2', 'T5_2', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_4'

CO6: Buenaventura (Monitoreo Manglares) (P)	153	'F1_1', 'F1_2', 'F1_4', 'F3_2', 'F3_4', 'F3_5', 'T1_3', 'T6_5', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_6'
CO7: Delta del Patía (Monitoreo Manglares)	644	'F1_1', 'F1_4', 'F3_2', 'F3_3', 'F3_4', 'F3_5', 'T1_3', 'T6_5', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_6'
CO8: Pisba (Delimitación de paramos) (P)	1096	'F1_1', 'F3_1', 'F3_3', 'T1_3', 'T6_5', 'T7_1', 'T7_3', 'T7_5', 'TF1_6'
CO9: Santurban (Delimitación de páramos)	1419	'F1_1', 'F1_4', 'F3_3', 'T1_1', 'T1_3', 'T1_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_1'
CO10: Chingaza (Delimitación de páramos)	210	'F1_1', 'F1_2', 'F1_4', 'F2_1', 'F2_2', 'F2_3', 'F3_2', 'F3_3', 'F3_4', 'F3_5', 'T1_1', 'T1_2', 'T1_3', 'T5_2', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_4'
CO11: Cuenca alta rio Bogota (Pomca Cundinamarca)	5975	'F1_1', 'F1_2', 'F1_4', 'F2_2', 'F2_3', 'F3_2', 'F3_4', 'F3_5', 'T1_1', 'T1_2', 'T1_3', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_4'
CO12: AP_Drummont/Becerril_Cesar (ANH) (P)	2928	'F1_1', 'F1_2', 'F1_4', 'F2_2', 'F2_3', 'F3_2', 'F3_4', 'F3_5', 'T1_1', 'T1_2', 'T1_3', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_4'
CO13: AP_Plata/Simiti-Cesar (ANH)	1006	'F1_1', 'F1_4', 'F2_3', 'F3_2', 'F3_3', 'F3_5', 'T1_2', 'T1_3', 'T4_2', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_1', 'TF1_4'
CO14: AP_Guane/Barrancabermeja (ANH)	1831	'F1_1', 'F1_2', 'F1_4', 'F2_2', 'F2_3', 'F3_1', 'F3_2', 'F3_3', 'F3_4', 'F3_5', 'T1_2', 'T1_3', 'T6_5', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_6'
CO15: Piedemonte Casanare (Fibras) (P)	1810	'F1_1', 'F1_2', 'F1_4', 'F1_5', 'F1_7', 'F2_2', 'F2_3', 'F3_2', 'F3_3', 'F3_5', 'T1_1', 'T1_2', 'T1_3', 'T1_4', 'T3_1', 'T4_2', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_1', 'TF1_4'
CO16: Putumayo (Grantierra-Consga)	4960	'F1_1', 'F1_4', 'F3_2', 'F3_3', 'F3_4', 'F3_5', 'MFT1_2', 'MT1_1', 'MT1_2', 'MT2_1', 'T1_1', 'T7_3', 'T7_4'
CO17: Arco de deforestacion Amazonia (Fondo para la vida) (P)	14089	'F1_1', 'F1_4', 'F3_2', 'F3_3', 'F3_4', 'F3_5', 'MFT1_2', 'MT1_1', 'MT1_2', 'MT2_1', 'T1_1', 'T7_3', 'T7_4'

The total processing area is 339 tiles (20x20km), as highlighted in yellow in figure below. If only the priority areas are selected, the total processing area is 107 tiles.

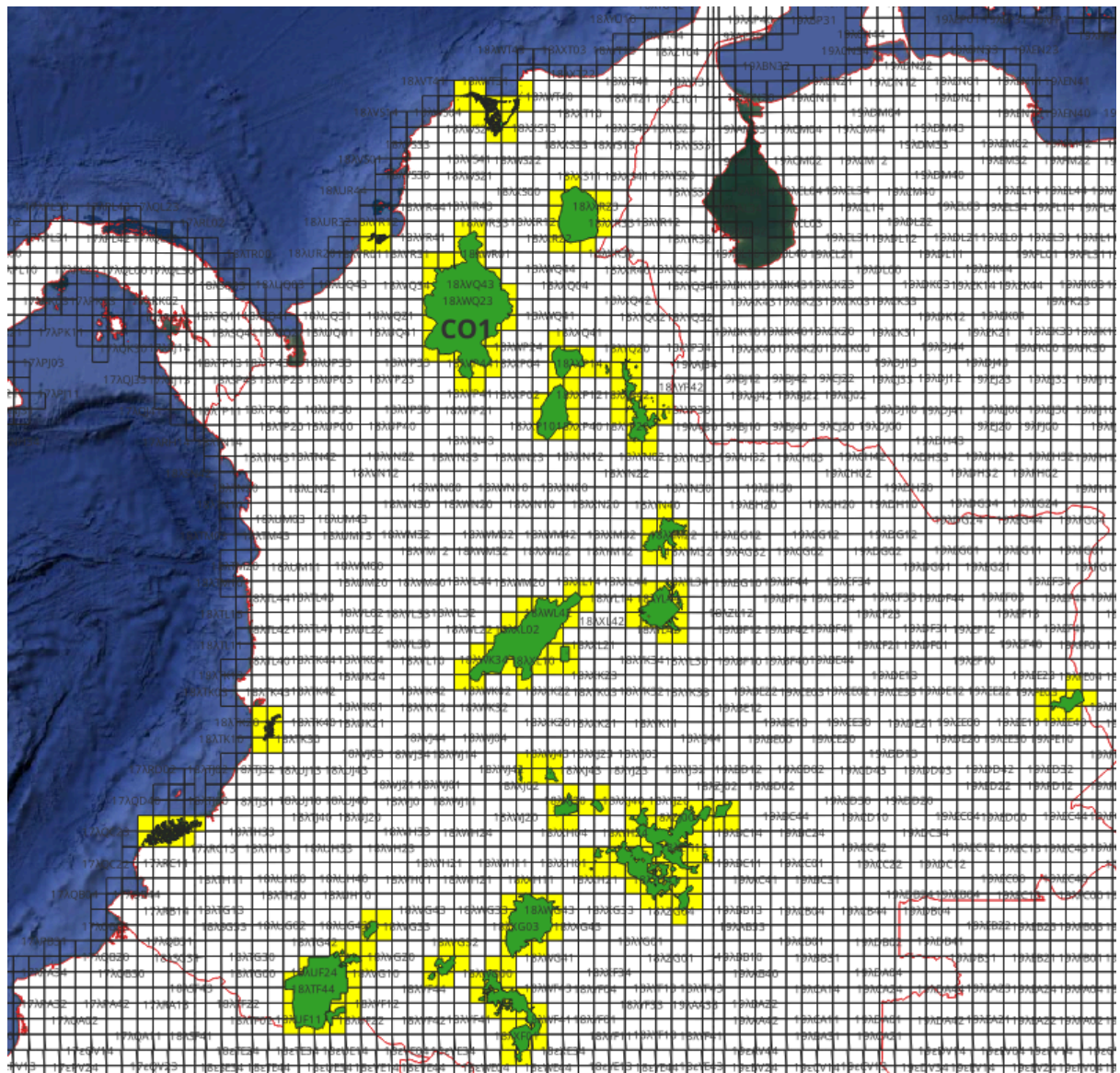


Figure 15. Processing tiles for Colombian test sites.

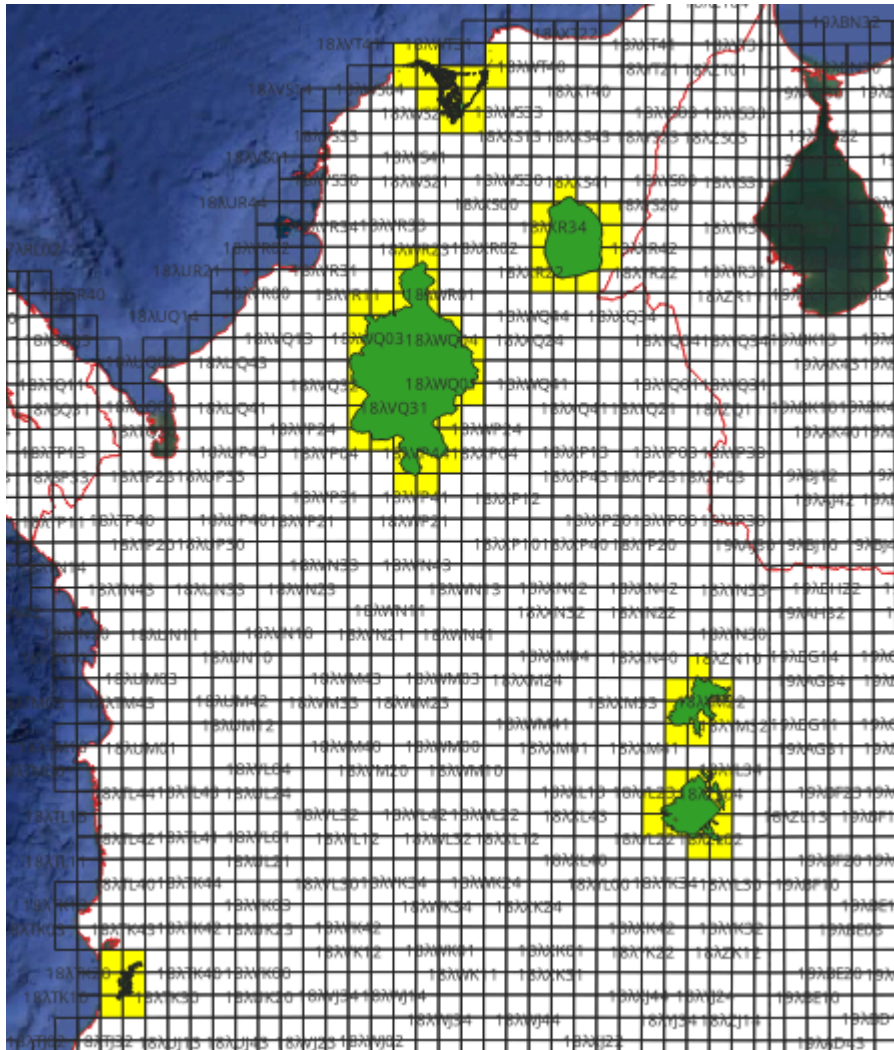


Figure 16. Processing tiles for Colombian priority test sites.

6.2. Test-sites Czech Republic

The Czech Republic has selected eight test sites for the co-design phase, covering 20% of the country.

- **CZ1, Bílé Karpaty**

A protected landscape area in the White Carpathians located in the North-East. A flysch mountain range with a predominance of sandstones, conglomerates and claystones with peaks up to 970 meters. The landscape is primarily dominated by deciduous forests, mainly beeches. On the southern slopes, at altitudes above 500m, some oak-hornbeam forests are seen with the proportion of conifers increasing from northwest.

- **CZ2, Krkonoše National Park**

A protected landscape area in the mid North (connected to Poland). It is a UNESCO biosphere reserve and is known of its four vegetation belts: (i) sub-mountain (400-800m) with deciduous and mixed forest, (ii) mountain (800-1200m) with coniferous forest, (iii) sub-alpine (1200-1450m) with pastures and ice, (iv) alpine (1450-1600m) with stone and tundra.

- **CZ3, Podyji National Park**

A protected landscape area in the mid-South (connected to Austria). The area is 84% forest with oak, beech with many protected plant species and fauna species.

- **CZ4, Bohemian Switzerland National Park**

Established in 2000 and covers an area of nearly 80 km², is the youngest national park in the Czech Republic; Natura 2000 area. The park on its northern side borders and is linked to the Saxon Switzerland National Park in Germany. The focal point of the area protection is a unique sandstone rock town with the occurrence of rare plant and animal species and islands of well-preserved woods.

- **CZ5, Transect Bohemian N-S**

A transect starting at Bohemian Park (CZ4) and crossing the Czech Republic to the South.

- **CZ6, Transect Khronose N-S**

A transect starting at Khronose National Park (CZ1) and crossing the Czech Republic to the South.

- **CZ7, Transect Podji W-E**

A transect starting at the Podji National Park (CZ3) and covering the South-East of Czech Republic.

- **CZ8, Transect Mid W-E**

A transect starting at the mid latitude in West of Czech Republic and crossing to the East.

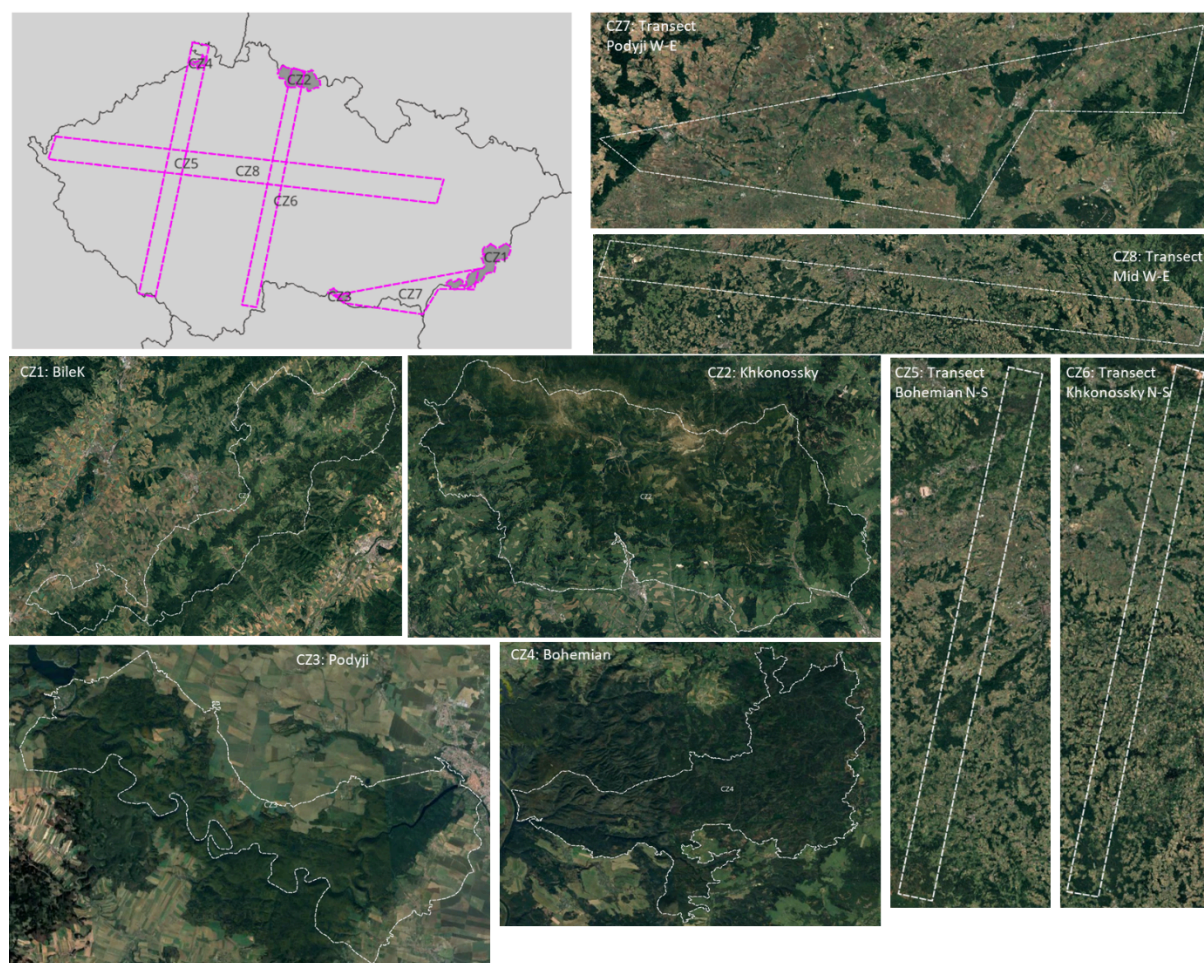


Figure 17. Location of test areas for Czech Republic

Table 14. Mapping of Czech Republic test areas to Ecosystem Functional Groups (EFG).

Name	Area in size (km ²)	EFG types
CZ1: Bílék	747	F1_3, F1_4, F2_4, F3_2, F3_5, T2_2, T4_4, T4_5, T6_4, T7_1, T7_2, T7_3, T7_4, T7_5; TF1_2
CZ2: Krkonosé	549	F1_3, F1_4, F3_1, F3_2, F3_4, F3_5; T2_2, T7_1, T7_3, T7_4, T7_5; TF1_2
CZ3: Podyjí	91	F1_2, F1_3, F1_4, F2_4, F3_1, F3_2, F3_5; T2_2, T4_4, T4_5, T6_4, T7_1, T7_2, T7_3, T7_4, T7_5; TF1_2
CZ4: Bohemian	79	F1_2, F1_3, F1_4, F3_2, F3_4, F3_5, T2_2, T7_1, T7_3, T7_4, T7_5, TF1_2
CZ5: Transect Bohemian N-S	3688	F1_1, F1_2, F1_3, F1_4, F2_2, F2_4, F3_1, F3_2, F3_4, F3_5, T2_2, T7_1, T7_2, T7_3, T7_4, T7_5, TF1_2

CZ6: Transect Khronose N-S	2863	F1_2, F1_3, F1_4, F2_2, F2_4, F3_1, F3_2, F3_4, F3_5, T2_2, T7_1, T7_2, T7_3, T7_4, T7_5, TF1_2, TF1_4
CZ7: Transect Podyji W-E	2400	F1_1, F1_2, F1_3, F1_4, F1_5, F2_2, F2_4, F3_1, F3_2, F3_5, T2_2, T4_4, T4_5, T6_4, T7_1, T7_2, T7_3, T7_4, T7_5, TF1_2
CZ8: Transect Mid W-E	7978	F1_2, F1_3, F1_4, F2_2, F2_4, F3_1, F3_2, F3_4, F3_5, T2_2, T4_4, T4_5, T6_4, T7_1, T7_2, T7_3, T7_4, T7_5, TF1_2

The total processing area is 103 tiles (20x20km), as highlighted in yellow in figure below.



Figure 18. Processing tiles for Czech Republic test sites.

6.3. Test-sites Greece

The champion user has defined 11 zones for testing during the co-design phase. The total area of the priority test regions is 47 thousand km² (35.7% of the country, including the full island of Crete).

- **EL1, Mt Chelmos, Mt Killini, Xylokaastro:** This area includes two of the highest mountains in Peloponnese, Chelmos (2,355 m) and Killini (2,376 m) as well as the artificial lake of Feneos and part of the lake and wetland system of Stymfalia, all being part of the Natura 2000 network. It extends to the northeast to the city of Xylokaastro, where it reaches the sea.
- **EL2, Cape Maleas:** This area lies in the southernmost part of Peloponnese, including sparsely populated areas, where mainly xerothermic conditions occur. It hosts typical Mediterranean ecosystems such as phrygana and evergreen, sclerophyllous vegetation, adapted to these harsh conditions.
- **EL3, Kefalonia and Zakynthos islands:** The islands of Kefalonia and Zakynthos (part of the Ionian Islands), lie at the western part of Greece, where precipitation is

significantly higher than in the Aegean islands. Kefalonia hosts the Nation Park of Mt Ainos (1,628 m), and Zakynthos hosts a Marine National Park (both part of the Natura 2000 network). The two islands are famous for their unique landscape, however affected by infrastructure developed to support tourism.

- **EL4, Naxos island:** Naxos Island is a typical example of the Cycladic landscape, part of the Cyclades Archipelago, lying in the middle of the Aegean Sea. It hosts traditional and intensive land uses and has a developed infrastructure to support tourism.
- **EL5, Kassandra peninsula (Chalkidiki):** Kassandra is the westernmost part of the Region of Chalkidiki. It is considered as a part of Greece of well-preserved natural beauty and a touristic hotspot for locals and visitors from all around the world. Tourism infrastructure is developed mainly on the coastline, that are well or less effectively integrated in the natural landscape. The region suffers from wildfires, however most burnt areas have been quite adequately restored.
- **EL6, Crete:** The island of Crete is the largest island of Greece, lying in its southernmost part. It includes a variety of ecosystem types, since it hosts high mountains (highest peak: 2,456 m), gorges, dune beaches and unique vegetation, such as the *Phoenix theophrastii* forests (in the South). The island is also perceived as a world-class, unique cultural landscape where since antiquity human activity tries to balance with natural habitats.
- **EL7, Zacharo-Kyparissia-Filiatra:** This area of Western Peloponnese includes one of the longest dune beaches in Greece, as well as protected, extensive dune forests (part of the Natura 2000 network). It also hosts the river Neda and some of the most productive olive groves. The area has been affected by mega-fires and repetitive smaller forest fires during the last 20 years, that challenge ecosystems and restoration efforts.
- **EL8, Menalo:** Mt Menalo (1,981 m) lies in the middle of Peloponnese, and is mainly a mountainous area, part of the Natura 2000 network, covered mostly by the endemic Greek fir (*Abies cephalonica*) forests.
- **EL9, Lagoons and lakes of South Sterea:** This area includes mainly lagoons and lake systems, as well as the lower river route of r. Acheloos. Lagoons and most of the lakes are part of the Natura 2000 Network; the area includes the largest part of the Messolongi National Park.
- **EL10, Mt Vernon – Lakes Cheimaditida and Zazari:** This area lies in the northwestern part of Greece and includes the wider area from the city of Kastoria to Amindeo. It is characterized by extensive beech forests, mountain grasslands and wetland ecosystems around the lakes. Mt Vernon – Lake Cheimaditida and Zazari are also Natura 2000 network sites.
- **EL11, Thessaloniki peri-urban forest, lakes Koronia and Volvi.** This area includes the peri-urban forest of the metropolitan area of Thessaloniki as well as part of the National Park of lakes Koronia and Vovli (also included in the Natura 2000 network).

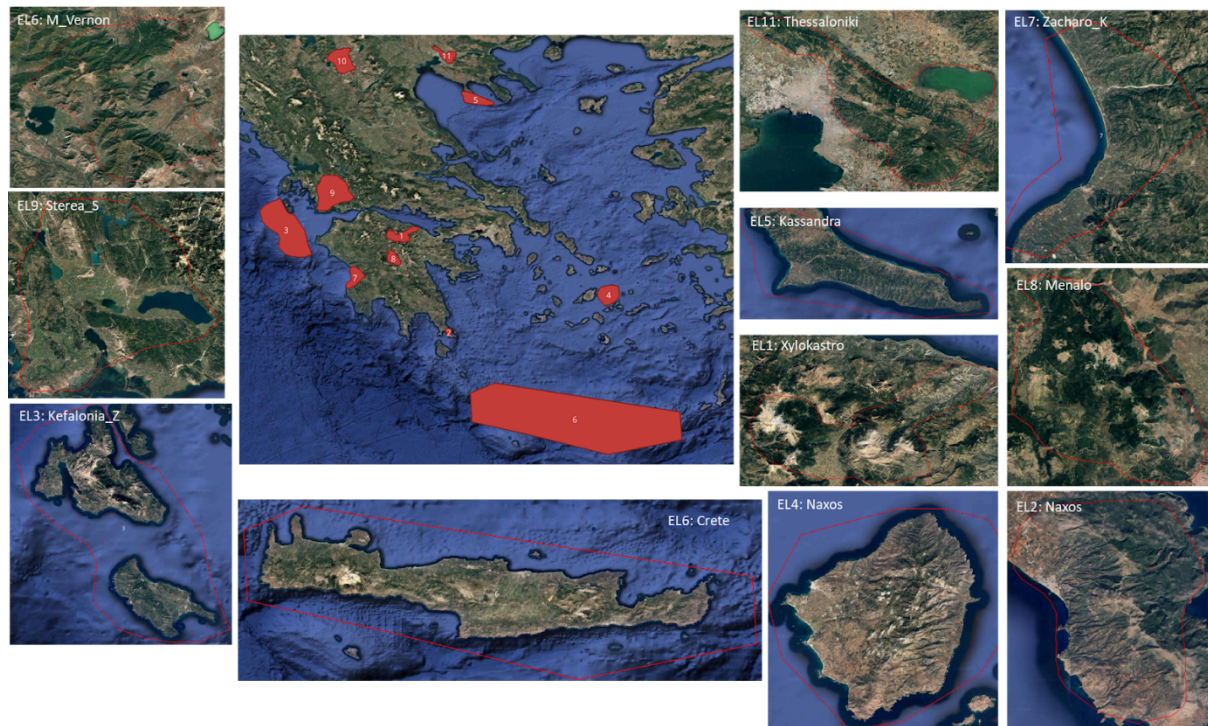


Figure 19. Location of test areas for Greece

Table 15. Mapping of Greece test areas to Ecosystem Functional Groups (EFG).

Name	Area in size (km ²)	EFG types
EL1: Xylokastro	878	F1_1, F1_4, F3_1, F3_2, F3_5, MT1_1, MT1_3, MT2_1, MT3_1, T2_1, T2_2, T3_2, T3_4, T4_4, T6_4, T7_1, T7_2, T7_3, T7_4, T7_5
EL2: CapeMaleas	129	F1_1, F3_2, F3_5, MFT1_3, MT1_1, MT1_2, MT1_3, MT2_1, MT3_1, T3_2, T3_4, T4_4, T7_1, T7_2, T7_3, T7_4, T7_5
EL3: Kefalonia_Z	5595	F1_1, F1_4, F3_2, F3_5, FM1_2, MT1_1, MT1_3, MT2_1, MT3_1, T3_2, T3_4, T4_4, T7_1, T7_2, T7_3, T7_4, T7_5
EL4: Naxos	1175	F1_1, F1_4, F3_2, MFT1_3, MT1_1, MT1_2, MT1_3, MT2_1, MT3_1, T3_2, T3_4, T4_4, T7_1, T7_2, T7_3, T7_4, T7_5
EL5: Kassandra	936	'F1_1', 'F1_4', 'F2_2', 'F2_3', 'F3_2', 'F3_5', 'MT1_1', MT1_2, 'MT1_3', 'MT2_1', 'MT3_1', 'T3_2', 'T3_4', 'T4_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_2'

EL6 : Crete ³	31 759	'F3_1', 'MFT1_3', 'MT1_1', 'MT1_2', 'MT1_3', 'MT2_1', 'MT3_1', 'T2_2', 'T3_2', 'T4_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5'
EL7 : Zacharo_K	769	'F1_1', 'F1_4', 'F3_2', 'F3_5', 'FM1_2', 'MT1_1', 'MT1_3', 'MT2_1', 'MT3_1', 'T3_2', 'T3_4', 'T4_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5'
EL8 : Menalo	475	'F1_1', 'F1_4', 'F3_1', 'F3_2', 'F3_5', 'T2_1', 'T2_2', 'T3_2', 'T3_4', 'T4_4', 'T6_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5'
EL9 : Sterea_S	3 213	'F1_1', 'F1_4', 'F2_2', 'F2_3', 'F3_1', 'F3_2', 'F3_5', 'FM1_2', 'MFT1_3', 'MT1_1', 'MT1_2', 'MT1_3', 'MT2_1', 'MT3_1', 'T2_1', 'T2_2', 'T3_2', 'T3_4', 'T4_4', 'T6_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5'
EL10 : M_Vernon	1 625	'F1_1', 'F1_4', 'F2_1', 'F2_2', 'F3_2', 'T2_1', 'T2_2', 'T4_4', 'T4_5', 'T6_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5'
EL11: Thessaloniki	564	'F1_1', 'F1_4', 'F2_2', 'F2_3', 'F3_2', 'F3_5', 'T3_2', 'T3_4', 'T4_4', 'T7_1', 'T7_2', 'T7_3', 'T7_4', 'T7_5', 'TF1_2'

The total processing area is 133 tiles (20x20km, as highlighted in yellow in figure below.

³ The total size of all test areas is 35% of the nation. As only 6% was foreseen during the co-design phase, and 67% of the total test area is assigned to EL6 (Crete). Initial tests will be done on a subset of EL6 and if sufficient credits are available can be upscaled at the end of co-design phase, else it will be part of the national demonstrator during phase 2.

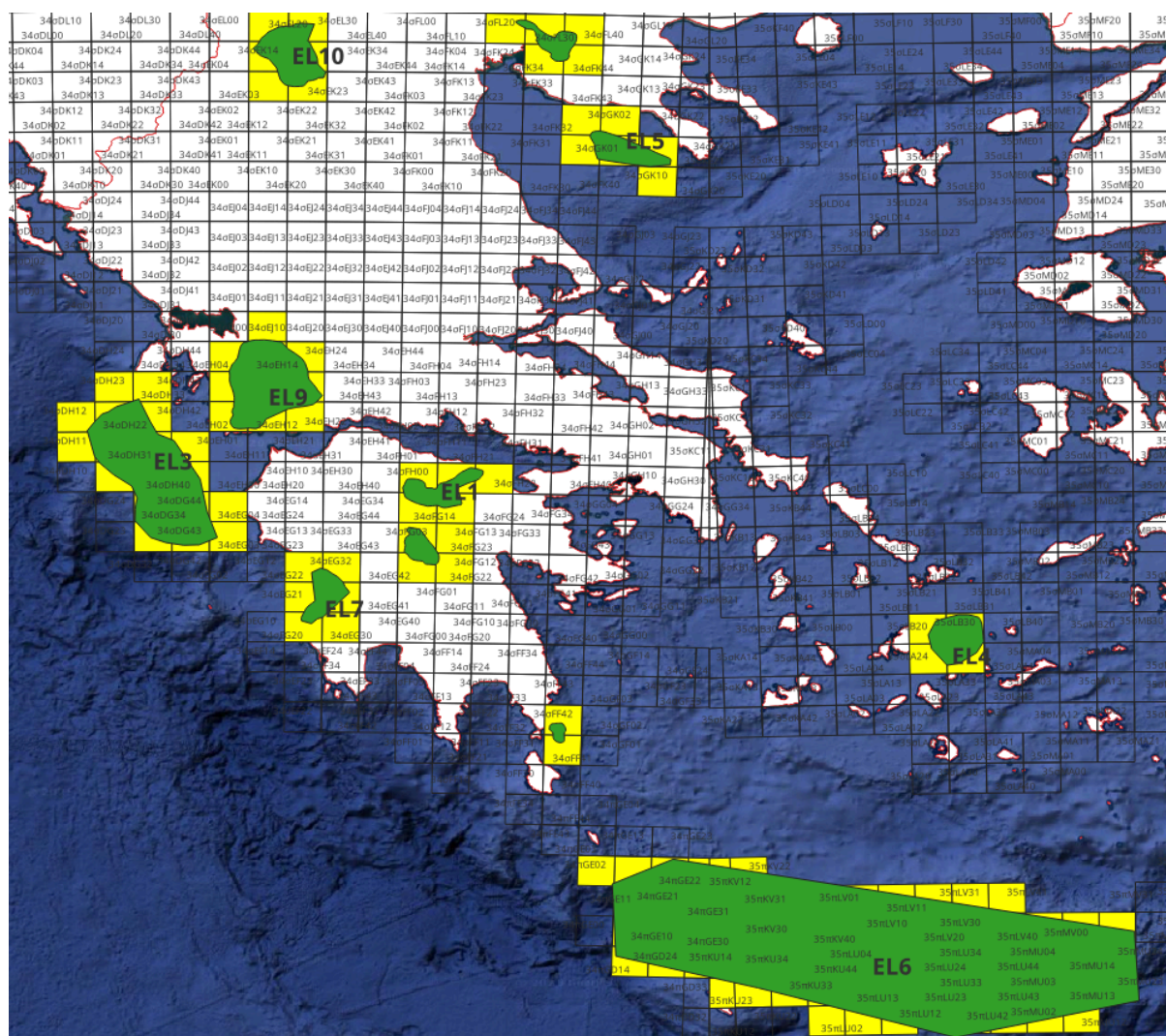


Figure 20. Processing tiles for test areas in Greece.

6.4. Test-sites Norway

Norway has defined two test regions for the co-design phase. The total area of the priority test regions is 29 thousand km² (7.7% of the country).

- **NO1, Oslo-Viken**

Oslo-Viken is in the South-East of Norway. Viken consists of three counties surrounding Oslo. Viken has a population of around 1.2 million people and is considered the green lung of Oslo. The largest nature reserve, Hardangervidda National Park, is in the new county and popular for outdoor sports.

- **NO2, Finnmark**

(Lowartic_)finnmark is the northernmost and easternmost county of Finland. It is the least populated area with 75 thousand inhabitants. It has a large coastline with many large fjords (not carved out by glaciers) and hosts one of the largest seabird colonies. It has an annual mean temperature of -3°C and an average annual precipitation of 914 millimeters,

categorized as a subarctic climate. Elevations are typically 100 to 200m in coastal areas (in Western part) and 300 to 500 meters inland with an alpine climate.



Figure 21. Location of test areas for Norway

Table 16. Mapping of Norwegian test areas to Ecosystem Functional Groups (EFG).

Name	Area in size (km ²)	EFG types
NO1: OsloViken	25 067	F1_3, (F2_1), F2_4, F3_1, (F3_2), (F3_4), (F3_5); FM1_1, FM1_2; MT1_1, MT1_3, MT1_4, MT2_1, MT3_1; T2_1, T2_2, T6_1, (T6_é), T6_3, (T6_'), T7_1, T7_2, T7_3, T7_4; TF1_6, TF1_7
NO2: Finnmark	4 412	F1_3, (F2_4); FM1; MT1_4, (MT3_1); T2_1, (T6_2), T6_3, T6_4, T7_1, T7_2, T7_4; (TF1_6), (TF1_7)

The total processing area is 125 tiles (20x20 km grid), as highlighted in yellow in figure below.

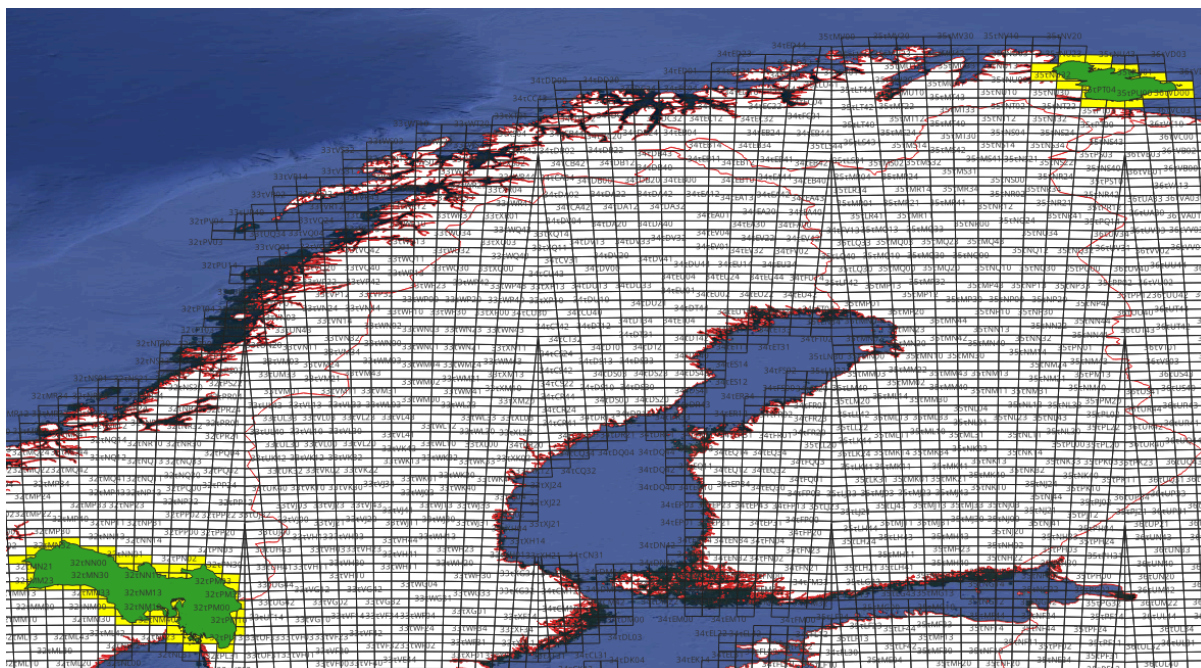


Figure 22. Processing tiles for Norway test sites.

6.5. Test-sites South Africa

South Africa has defined eleven test sites for the co-design phase. The total area of the priority test regions is 12 thousand km² (1% of the country).

- **SA1, Cape Point**

Cape point is located at the SouthEast corner of Cape Peninsula. Cape Point is situated within the Table Mountain National Park, within a section of the park referred to as Cape of Good Hope. This section covers the whole of the southern tip of the Cape Peninsula, and which takes in perhaps 20% of its total area. The Cape of Good Hope section of the park is generally wild, unspoiled and undeveloped and is an important haven for seabirds. The vegetation at Cape Point consists primarily of Peninsula Sandstone Fynbos.

- **SA2, Grootbos**

Grootbos, is a private Nature Reserve in the Western Cape province of South Africa. It overlooks Walker Bay and is surrounded by indigenous Fynbos (shrubs) and forest clad hills. The 1750-hectare reserve hosts more than 750 different plant species and conservation of endangered endemic flora and fauna and social responsibility programmes are at the heart. It includes 1000-year-old Milkwood trees and Afromontane forests and is close to the Walker Bay coastline, a pristine, deserted stone-age shore.

- **SA3, Jonkershoek**

Jonkershoek, is a Nature Reserve is a CapeNature nature reserve located approximately 10 km (6 mi) south-east of the town of Stellenbosch in the Western Cape province of South Africa. It covers an area of approximately 11,000 hectares. Jonkershoek mountains are important for fauna (mammals and birdlife).

- **SA4, West Coast National Park**

This park inside the Cape West Coast Biosphere Reserve is located north of Cape Town in the Western Cape. The park is particularly known for its bird life and for the spring flowers which occur in the months from August to September. The park is composed of various kinds of habitats, as well as the Langebaan fynbos and lagoon.

- **SA5, De Hoop**

De Hoop is one of the largest natural areas of 34 thousand hectares, three hours from Cape Town. It consists of white dunes at the Indian Ocean, more than 1500 plant species with largest part native consisting of Fynbos with Erica and Protea's.

- **SA6, Kogelberg**

The Kogelberg is a range of mountains along the False Bay coast in the Western Cape and known as the steepest and highest drop directly in the ocean of any southern African coastal stretch. It is rugged terrain, extremely rich in fynbos. They contain more plant species than anywhere else in the floral region and are uniquely classified as Kogelberg Sandstone Fynbos.

- **SA7, Drakensberg**

A set of catchments east of Lesotho, in the east of South-Africa, located in the Cathedral Peak Reserve in Northern Drakensberg. It reaches a high elevation of above 3000 metres at the border. They consist of alti-montane grassland and woodlands with steep slopes. The high rainfall generates many mountain streams and rivers. The mountains are rich in plant life with a large list (119) of endangered species. The grasses are mainly tussock grass, creeping plants, and small shrubs such as ericas. At the lower slopes we can find mainly grassland but also some conifers.

- **SA8, GardenRoute**

The Garden Route is a well-known tourist route, a coastal corridor extending from Mossel Bay in the Western Cape through to the Tsitsikamma forests in the Eastern Cape. It covers ancient forests, glistening rivers, beaches, lakes and plenty of mountain scenery.

- **SA9, Groenfontein**

An area to south of Swartberg, consisting of several nature reserves as Paardenberg, Rooiberg mountain catchment area and Gamkaberg, situated at the lowlands of the Little Karoo. It is a newly established World Heritage Site (1974). It hosts five biomes, namely renosterveld, Afri-montane Forest, fynbos, succulent Karoo and subtropical forest.

- **SA10, Swartberg**

The Swartberg (black mountain in English) are a mountain range in the Western Cape province. It is composed of two main mountain chains above 2000m altitude. To the north of the range lies a large semi-arid area named the Great Karoo.

- **SA11, CapeFloral**

Cape Floral is a floristic region located near the southern tip of South Africa, known for its extraordinary high diversity and endemism. Much of the diversity is associated with the fynbos biome, a fire-prone shrubland occurring on acid sands or nutrient-poor soils. The region consists of three ecoregions: the lowland fynbos and renosterveld, the montane fynbos and renosterveld and the Albany thickets.



Figure 23. Location of test sites in South-Africa

Table 17. Mapping of South-African test areas to Ecosystem Functional Groups (EFG).

Name	Area in size (km2)	EFG types

SA1: Cape point	222	F1_1, F1_4, F1_6, F3_2, F3_5; FM1_3; MT1_1, MT1_2, MT1_3, MT2_1, MT3_1; T3_2, T7_1, T7_3, T7_4; TF1_2
SA2: Grootbos	465	F1_1, F1_4, F1_6, F2_2, F3_2, F3_5; FM1_3; MT1_1, MT1_2, MT1_3, MT2_1, MT3_1; T3_2, T7_1, T7_2, T7_3, T7_4; TF1_2
SA3: Jonkershoek	50	F1_1, F1_4, F1_6, F3_1, F3_2, F3_5; T3_2, T7_3, T7_4; TF1_2
SA4: West Coast NP	681	F1_1, F1_4, F1_6, F2_3, F3_2, F3_5, FM1_3, MFT1_3, MT1_1, MT1_2, MT1_3, MT2_1, MT3_1, T3_2, T5_2, T7_1, T7_3, T7_4, TF1_2
SA5: De Hoop	1141	F1_1, F1_2, F1_4, F1_5, F1_6, F2_2, F3_2, F3_5, FM1_3, MT1_1, MT1_2, MT1_3, MT2_1, MT3_1, T3_2, T7_1, T7_3, TF1_2
SA6: Kogelberg	1078	F1_1, F1_4, F1_6, F3_1, F3_2, F3_5, FM1_3, MT1_1, MT1_2, T1_2, T3_2, T7_1, T7_2, T7_3, T7_4, T7_5, TF1_2
SA7: Drakensberg	113	F1_1, F3_1, T2_4, T4_1, T4_2, T4_5, T7_5
SA8: GardenRoute	2265	F1_1, F1_4, F1_6, F2_2, F3_1, F3_2, F3_5, FM1_3, MFT1_3, MT1_1, MT1_2, MT1_3, MT2_1, MT3_1, T2_4, T3_2, T7_1, T7_2, T7_3, T7_4, TF1_2, TF1_5
SA9: Groenfontein	2228	F1_1, F1_2, F1_4, F1_5, F1_6, F3_1, F3_2, F3_5, T1_2, T3_2, T5_2, T7_1, T7_2, T7_3, T7_4, T7_5, TF1_2
SA10: Swartberg	2511	F1_1, F1_2, F1_4, F1_5, F1_6, F3_1, F3_2, F3_5, T1_2, T3_2, T5_1, T5_2, T7_1, T7_2, T7_3, T7_4, T7_5, TF1_2
SA11: CapeFloral	1569	F1_1, F1_4, F1_6, F3_1, F3_2, F3_5, T3_2, T5_2, T7_1, T7_2, T7_3, T7_4, TF1_2

The total processing area is 62 processing tiles (20x20km), as highlighted in yellow in figure below.

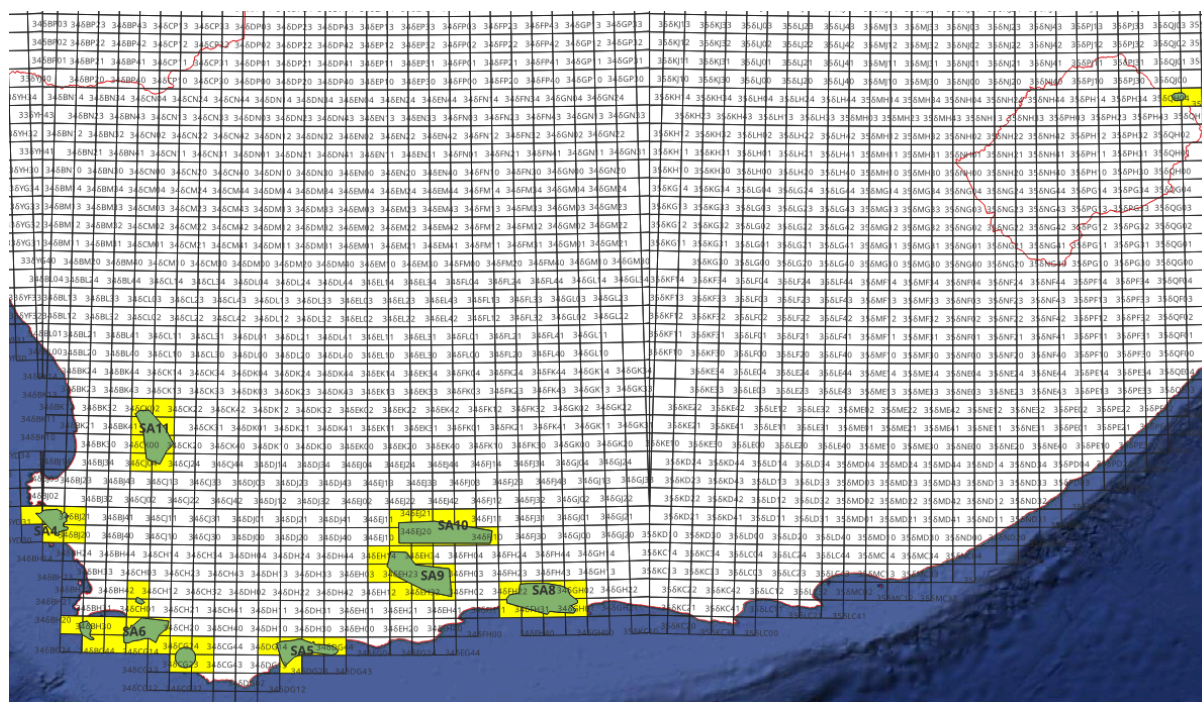


Figure 24. Processing tiles for South-Africa test sites.

6.6. Test-sites Vietnam

Vietnam has defined *three* test sites for co-design during phase 1. The total area of the priority test regions is 11 thousand km² (3.4% of the country).

• VN1: Wetlands and estuaries along the coast of Quang Ninh – Hai Phong

Coastal wetlands occupy a significant portion of the 3,260 km coastline of Vietnam. These coastal areas range from subtropical ecologically in the North to subtropical ecologically in the Central and Southern. There are many estuaries along the coastline, including about 100 large estuaries. The estuaries of large rivers are of special significance because these are areas with large deposits, which are inhabited by species of organisms with various types of wetlands. About 41% of the wetland area in the Red River Delta and the Mekong Delta. The Red River Delta with an area of 229,762 hectares, although smaller than the Mekong Delta, has many types of wetlands. The estuary wetland is one of the most important wetlands in Vietnam in terms of biodiversity and economic diversity. It is an important habitat for mangroves, swamps, salt marshes and algae, and is home to endemic and migratory species, providing essential habitat and feeding areas on migratory routes for birds. The wetland system contributes a large part to economic development through the strengthening of economic activities, especially in agriculture, fisheries and tourism.

Coastal wetlands in Hai Phong and Quang Ninh include Tien Yen estuary area – Tien Yen district, Dam Ha (Quang Ninh); Van Au River Estuary – Tien Lang district (Hai Phong) belonging to the Northeast coastal wetland specific ecology is identified as one of the 12 most severely degraded specific ecological areas today. Mangrove forests in Hai Lang, Dong Rui communes, Tien Yen district, Quang Ninh province used to have a total area of about 6000 hectares, that is considered a typical mangrove ecology of the northern region of Vietnam. In the past, local mangrove forests had good forest quality, very rich in the number of tree species, ecology, and habitats of aquatic species of high economic value, which has

brought good resources and livelihoods to local people. However, in the last 15 years, the mangrove forest here has been seriously degraded, both in terms of quality and quantity. Currently, the remaining forest sites are still under threat.

- **VN2: Pu Mat National Park, Nghe An Province**

Pu Mat National Park is a special-use forest in the west of Nghe An province. In Thai, Pu Mat means steep slopes. It was established under Decision No. 174/2001/QĐ-TTg of the Prime Minister dated November 8, 2001 on upgrading Pu Mat Nature Reserve to a National Park. Pu Mat National Park is currently identified as the core zone of the Western Nghe An Biosphere Reserve recognized by UNESCO in 2007. Pu Mat National Park is located at 18°46' North latitude and 104°24' East longitude in Nghe An province. Pu Mat National Park is located on the administrative boundaries of 3 districts: Anh Son, Con Cuong, and Tuong Duong, the southern boundary of the National Park (NP) runs along the Vietnam-Laos border. Pu Mat National Park is located in the tropical monsoon climate zone. The average annual rainfall here is 1,800mm and the average temperature is 23.5°C.

Located in the Central strip of land, Pu Mat National Park has many advantages in developing tourism: large area, high biodiversity with many species of forest animals and forest plants newly discovered in recent times: 2,500 species of plants belonging to 160 families and nearly 1,000 species of animals.

- **VN3: Cu Lao Cham - Hoi An as a world biosphere reserve**

On May 26, 2009, in Jeju Island - Korea, the International Coordinating Committee of the World Man and Biosphere Programme of UNESCO recognized Cu Lao Cham - Hoi An as a world biosphere reserve. It can be said that the title of Cu Lao Cham - Hoi An Biosphere Reserve is a product of conservation work, the result of long-term efforts of the local community and departments and branches of Hoi An city. Cu Lao Cham - Hoi An Biosphere Reserve is located at the end of the Thu Bon River, inheriting the diversity of ecosystems such as: reed beds, sedge beds, sand dunes, mangrove forests, nipa forests, seagrass beds, coral reefs, seaweed communities, and natural forests on the island. These ecosystems are spread along the river branches and surround Hoi An, giving Hoi An a wealth of natural and human resources, creating ecological services, which are favourable premises for local socio-economic development. In recent times, Hoi An city has approached the concepts of conservation and sustainable development, by building practical models including: preserving cultural heritage associated with tourism development; implementing marine conservation in Cu Lao Cham, conserving mangrove forests in Cam Thanh, protecting stone crabs with the leading role of the community, etc. Cu Lao Cham - Hoi An Biosphere Reserve has a total area of 33,146 hectares, a population of about 84,000 people, divided into 03 functional areas, including: core zone, buffer zone and transition zone.

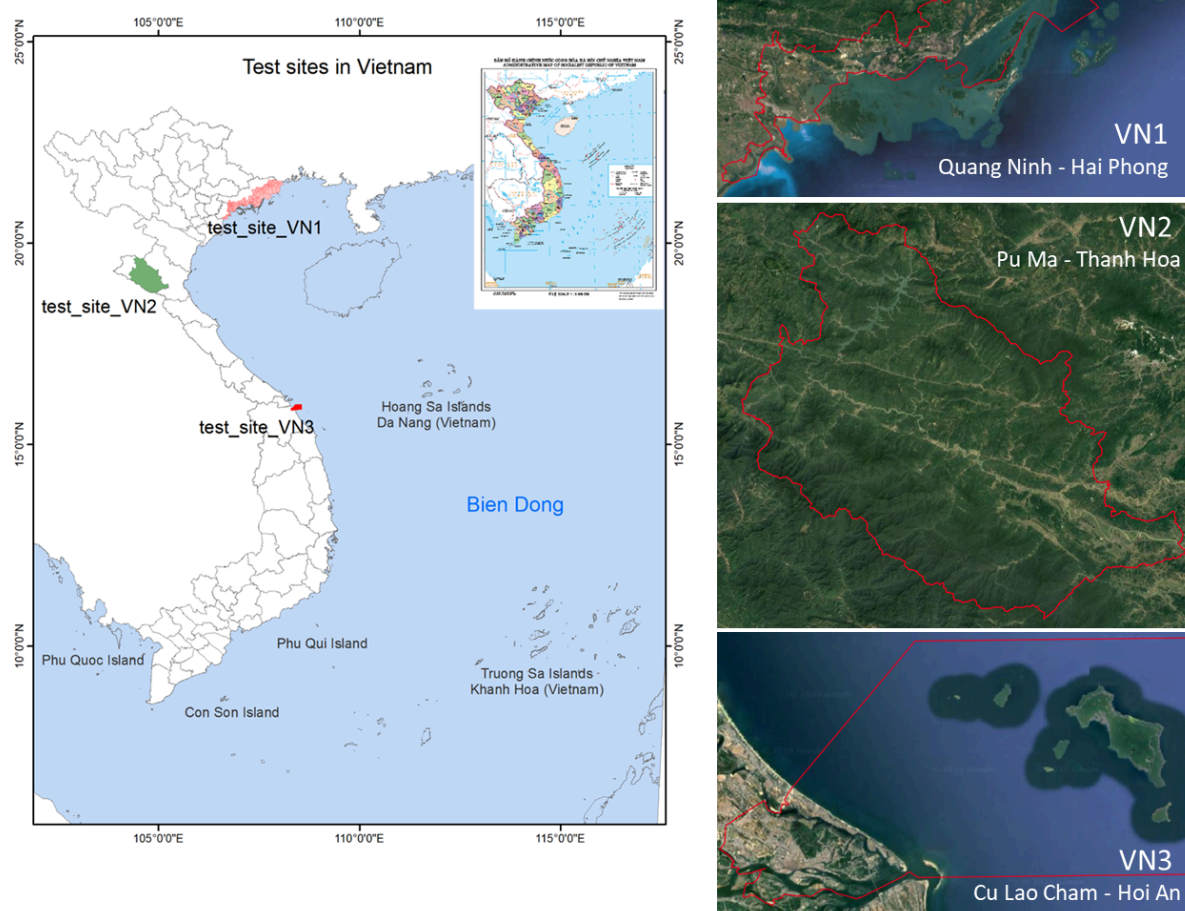


Figure 25. Location of test sites in Vietnam

Table 18. Mapping of Vietnamese test areas to Ecosystem Functional Groups (EFG).

Name	Area in size (km2)	EFG types
VN1 : Quang Ninh - Hai Phong	5031	F1_1, F1_2, F1_4, F2_2, F2_3, F3_2, F3_3, F3_4, F3_5; FM1_2, FM1_3; MFT1_2, MFT1_3; MT1_1, MT1_2, MT1_3, MT2_1, MT3_1, T1_1, T1_3, T2_4, T7_1, T7_2, T7_3, T7_4, T7_5 TF1_1, TF1_4
VN2 : Pu Mat - Thanh Hoa	5801	F1_1, F1_4, F1_5, F3_2, F3_3, F3_4, F3_5; T1_1, T1_2, T1_3, T7_1, T7_2, T7_3, T7_4, T7_5 TF1_1

The total processing area is 60 processing tiles (20x20km), as highlighted in yellow in figure below.



Figure 26. Processing tiles for Vietnam test sites.

6.7. Additional test-sites

The test sites, as described in the previous sections, were intersected with the default IUCN indicative⁴ GET maps, which indicate a value of 1 (major suitability), 2 (minor suitability). The table below provides an overview of the potential ecosystem types that intersect under analysis with through the selected test sites. Despite being indicative maps, this analysis broadly enables the identification of GET EFGs that may have not been captured in the selection of field sites.

Therefore, additional test sites are to be added for the non-covered ecosystem types, as described below the table.

6.7.1. Analysis of coverage by test sites

Table 19. Ecosystem types (Ecosystem Functional Groups) covered by all Test Sites as requested by the champion users for Freshwater and Intertidal.

EFG code	Ecosystem Functional Group	NOR	CZE	GRC	COL	ZAF	VNM
F1_1	Permanent upland streams		2	2	2	2	2
F1_2	Permanent lowland rivers		2		1	2	1
F1_3	Freeze-thaw rivers and streams	1	1				
F1_4	Seasonal upland streams		1	1	1	1	1
F1_5	Seasonal lowland rivers		2		2	2	2
F1_6	Episodic arid rivers					2	
F1_7	Large lowland rivers				1		
F2_10	Subglacial lakes						
F2_1	Large permanent freshwater lakes	2		2	2		
F2_2	Small permanent freshwater lakes		1	1	1	1	1
F2_3	Seasonal freshwater lakes			2	1	2	2
F2_4	Freeze-thaw freshwater lakes	1	2				
F2_5	Ephemeral freshwater lakes						

⁴ Indicative means the intention to broadly show the global distribution of a particular EFG (e.g. like a range map in a field guide).

F2_6	Permanent salt and soda lakes						
F2_7	Ephemeral salt lakes						
F2_8	Artesian springs and oases						
F2_9	Geothermal pools and wetlands						
F3_1	Large reservoirs	1	1	1	1	1	
F3_2	Constructed lacustrine wetlands	2	1	1	1	1	1
F3_3	Rice paddies				2		1
F3_4	Freshwater aquafarms	2	2		2		2
F3_5	Canals, ditches and drains	2	1	2	1	2	1
FM1_1	Deepwater coastal inlets	1					
FM1_2	Permanently open riverine estuaries and bays	1		1			1
FM1_3	Intermittently closed and open lakes and lagoons					1	1
MFT1_1	Coastal river deltas				1		1
MFT1_2	Intertidal forests and shrublands				1		2
MFT1_3	Coastal saltmarshes and reedbeds			2		2	2
MT1_1_	Rocky shores	1		1	1	1	1
MT1_2_	Muddy shores			2	2	2	2
MT1_3_	Sandy shores	1		1	2	1	1
MT1_4_	Boulder and cobble shores	1					
MT2_1_	Coastal shrublands and grasslands	1		1	1	1	1

Table 20. Ecosystem types (Ecosystem Functional Groups) covered by all Test Sites as requested by the champion users for Terrestrial and Intertidal.

EFG code	Ecosystem Functional Group	N O R	C Z E	G R C	C O L	Z A F	V N M
T1_1	Tropical-subtropical lowland rainforest				1		2

T1_2	Tropical-subtropical dry forests and thickets				1	2	2
T1_3	Tropical-subtropical montane rainforests				1		2
T1_4	Tropical heath forests				2		
T2_1	Boreal and temperate montane forests and woodlands	1		2			
T2_2	Deciduous temperate forests	1	1	1			
T2_3	Oceanic cool temperate rainforests						
T2_4	Warm temperate laurophyll forests					1	2
T2_5	Temperate pyric humid forests						
T2_6	Temperate pyric sclerophyll forests and woodlands						
T3_1	Seasonally dry tropical shrublands					2	
T3_2	Seasonally dry temperate heaths and shrublands				1		1
T3_3	Cool temperate heathlands						
T3_4	Rocky pavements, screes and lava flows					2	
T4_1	Trophic savannas						1
T4_2	Pyric tussock savannas					1	1
T4_3	Hummock savannas						2
T4_4	Temperate woodlands				2	1	
T4_5	Temperate tussock grasslands				2	2	
T5_1	Semi-desert steppes						1
T5_2	Thorny deserts and semi-deserts					2	1

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The test sites cover 80% (60 out of 75) of the targeted EFG types, hence additional test areas are to be defined for at least the following EFGs with an option to select additional test sites in the champion users (numbers are expressed in km²) or other countries.

6.7.2. Addition of test sites

Table 21 below shows the non-covered EFG types (15 in total) and an indication on coverage by the champion users as well as other countries based on the IUCN GET suitability maps as used earlier.

Table 21. Ecosystem Functional Groups to be complemented with additional test areas.

EFG code	Ecosystem Function Group	Countries with highest suitability	Colombia	CzechR	Greece	Norway	SouthA	Vietnam
F2_5	Ephemeral freshwater lakes	Kazakhstan, India, Australia	(1)		7		821	10
F2_6	Permanent salt and soda lakes	Kazakhstan, Azerbaijan, Turkmenistan						
F2_7	Ephemeral salt lakes	Australia, Kazakhstan, China					13598	
F2_8	Artesian springs and oases	Algeria, USA, Australia, Libya						
F2_9	Geothermal pools and wetlands	USA, Canada, Russia, Japan						
F2_10	Subglacial lakes	(Antarctica), Greenland, China, USA						
T2_3	Oceanic cool temperate rainforests	Chile, Australia, USA, New-Zealand						
T2_5	Temperate pyric humid forests	Australia (only 1 country)						
T2_6	Temperate pyric sclerophyll forests and	Australia, Spain, Italy, Portugal						
T3_3	Cool temperate heathlands	Canada, France, UK						
T4_3	Hummock savannas	Australia (only 1 country)						
T5_3	Sclerophyll hot deserts and semi-deserts	Australia (only 1 country)						
T5_4	Cool deserts and semi-deserts	China, Kazakhstan, Mongolia, USA						
T5_5	Hyper-arid deserts	Saudi-Arabia, Libya, Algeria						
TF1_3	Permanent marshes	Russia, Australia, China, Kazakhstan	(2)					12034

- (1) Scarcely present in Colombia, located near the coastal areas of northern Colombia (La Guajira), in very dry regions and mainly saline.
- (2) Different types of permanent marshes exist in Colombia, but they are not classified under TF1_3.

During the co-creation, preference will be given to champion users to add additional test sites. The additional test sites will be added during the co-creation process, and if applicable also linked to the phase-2 countries when selected.

7. Tasks and contributions

The following collaborations are agreed upon in the contract with the Champion Users.

7.1. Requirements Engineering

As input to D1.2 (Requirements Baseline)

- contribute to the refinement and consolidation of user requirements
- review the requirements baseline (in-depth analysis of policy frameworks and analysis of strengths and weaknesses of current practices)

7.2. Co-design

- participate in the co-design of EO-integrated solution following a user participatory approach; support the definition and elaboration of the sites where to test and validate the EO-integrated solution.
- facilitate access to existing user data (e.g. existing national maps, field data such as vegetation plots, etc.) that can support the development of the methods.
- contribute to the validation and quality assessment of the ecosystem maps, both on the test sites during the algorithm development and testing before scaling up the approach

7.3. Demonstration

Same as phase-2 end users, see below.

7.4. Outreach

- contribute to the production of a User Handbook
- attend and participate in three Living Labs
 - LL1: a co-design living lab to agree on the contributions of the project, collect a review of user requirement, select the areas for algorithm developments and organization of ground truth data
 - LL2: a proof-of-concept living lab to present the results of the Proof of Concept and the preliminary data products (ecosystem characterization data layers and ecosystem extent maps) on the test sites, and organize the implementation of the national demonstrators and associated use cases
 - LL3: an open stakeholder living lab to transfer knowledge from the countries involved in the project to a larger community on the use of the WEED platform solution and products
- attend and participate in capacity building activities organized by the project (in person or remotely)

The following tasks and contributions are agreed with the additional phase-2 users, through a signed collaboration agreement:

7.5. Demonstration Phase2

- perform an evaluation on the quality and utility of the EO-integrated solution and products (i.e. national ecosystem maps),
- perform an assessment of their adequacy and suitability for use (showcase);
- contribute to the validation and quality assessment of the ecosystem maps during the large-scale demonstrations (national or subnational ecosystem maps);

7.6. Outreach Phase2

- attend and participate to at least living lab 2 (LL2, see above)

7.7. Validation

During the interviews, special care was taken to discuss the contributions to the validation process. This section summarizes these discussions, while more details will be worked out in the Product Validation Plan (PVP, Deliverable 3.3).

- *Colombia*
 - has access to ground truth samples for selected regions
 - has foreseen additional data collection in 2025, mainly in the Amazonia area
 - has the capacity to cross-reference collected data to the IUCN GET typology
 - has no clear strategy on validating change. However, photointerpretation could be used with a focus on mangroves (in cloudy areas), paramos, wetlands, dry forests, flooded savannah, pastures and mixed areas.
 - consider, in general terms, validation should be conducted using data with temporal relevance (recency and frequency) and the highest possible resolution, such as high-resolution images, drone photographs, or field data. It is important that validation is preceded by a sampling design that allows for the assessment of each class, accuracy and the confidence levels of these measurements. For statistical analysis, error matrices and other methods can be used to identify commission and omission errors. It may also be necessary to assess the involvement of experts from different regions and entities in validating certain procedures. During the phase2 (national demonstrator) a less restrictive validation is expected on quantitative analysis due to limits of field data and/or capacity. This will be complemented with expert-opinion methods involving different institutes.
 - To take advantage of the work started by DANE and ARIES teams, it is essential to obtain the methodologies used to derive the ecological layers considered more relevant to identify ET in the MEC v2.1 dataset, namely: climate classes, preliminary biomes, biotic units, combinations of pedogenetic environment (geomorphology and type of soil), types of stream water physical/chemistry properties, marine ecosystems, and degrees of ecosystem transformation. While some can be considered more static (climate, biomes, geomorphology and soil type), the others should be updated to provide correct estimates of the ET mapping in the target period of this project. In case more recent layers were published for those variables, obtaining them

and the more recent methodologies used (if they changed) would be very important.

- *Czech Republic*
 - has access to ground-truth samples, with 1/15th area per year vegetation plots, across the entire country
 - AOPK plans another 1/15th area, however the protocol cannot be changed to add additional information
 - can cross-reference collected data to EUNIS typology
 - no clear strategy is yet foreseen to collect change ground-truth samples
 - suggests performing a comparison (confusion matrices) with the CLE layer. The use of Laco-WIKI will be further evaluated to add comparison with other information.
- *Greece*
 - has ground-truth samples available across the country, with prime focus on protected areas (Natura 2000 sites and national parks)
 - can collect additional samples in 2025 through several planned campaigns.
 - has the capacity to cross-reference the samples to IUCN GET typology in combination with EUNIS typology
 - can provide binary opportunistic change areas based on continuous monitoring of habitats with focus on transition to mixed forests
 - proposes to do a multi-tier approach, using statistical methods for some areas through field validation while selected case studies for other areas
- *Norway*
 - has access to ground-truth samples, mainly from the NiN may with focus on nature (not agriculture or managed forest)
 - Several campaigns are foreseen in 2025 on specific regions, but it is yet unclear how they can be used. The campaign owners will be contacted to include, if feasible, collecting information on vegetation cover and species occurrence.
 - have the capacity to cross-reference collected data to the IUCN GET, and EUNIS, typology
 - No clear strategy is yet foreseen to collect change ground-truth samples. Available samples will be explored if usable, or as alternative, experts to identify important (binary) change areas
 - proposes to statistically use ground truth samples, with special focus on wetlands, next to comparison with ongoing work as is the wetland mapping project. Special attention will be given also to uncertainties and bias-corrected statistics.
- *South Africa*

- has ground-truth samples available across selected regions, crossing several biomes. The results of the recent bioscope campaign have sampled approximately 200 plots across the cape floristic region
 - can collect additional samples in 2025 based on planned campaigns for the Jonkershoek Valley and Cape Point. Focus can be set to species composition, vegetation height and % cover
 - can link to the work that SANBI is doing on cross-referencing to the IUCN GET typology, and/or procure experts for species id's
 - Change can be evaluated based on the SAEON nodes that are regularly sampled as well as revisits in Jonkershoek valley and Cape Point
 - proposes hosting a workshop for consultation with park managers and landowners during the first phase, and possibly to include a local forum or biodiversity engagement platform during the second (national demonstrator) phase.
- *Vietnam*
 - has access to ground-truth data for selected regions related to land use, forest, and wetlands.
 - has foreseen a field data collection campaign in 2025 in North-East, focusing on collecting soil characteristics, water quality and vegetation types
 - has the capacity to cross-reference collected data to the IUCN GET typology
 - suggest inter-comparison with existing maps at national scale

8. Collaboration & Timeline

Figure 27 shows an overview of the expected contributions from the Champion Users during the entire duration of the project. The contribution is expressed in average man-days per month and is just given as a very rough estimate and is by no means meant as an exact figure. Champion users are encouraged to planify at least this number of days for their involved personnel.

During the first six months, the main interaction with the champion users is to collect their current practices, requirements, and definition of test sites and national datasets. The inputs were gathered through two online interview meetings with the champion users (conducted in October and November), followed by some email exchanges to clarify final open issues. The results are described in this document. This phase will end with a first Living Lab (LL1 part A virtual), to baseline these results, which act as an input for the Requirements Review milestone.

Thereafter, for the next (at least) nine months, an iterative development is scheduled to generate different datasets over the defined test areas. Champion Users are expected to analyze (qualitative and quantitative) these datasets, discuss potential improvements (including contribution of national data), and provide general feedback on the use of the WEED platform solution. The phase will start with virtual training to access and use the WEED platform solution, followed by the iterative co-design. Regular meetings to discuss progress and results will be set up. Despite its continuous iterations, 2 important iteration phases are foreseen:

- iteration co-design test cycle 1 (2-3 months before European summer), with a focus on testing the impact on using national data into the solution. During this test cycle the second part of the first Living Lab (LL1 part B in-person, location to be decided upon in Europe) will be organized.
- iteration co-design test cycle 2 (3-4 months after European summer), with a focus on optimizing the results. This second test cycle will end with the second Living Lab (LL2 in-person, location to be decided upon in Europe). In this LL2, an additional five countries will participate.

Thereafter, in phase 2 all users are requested to use the WEED platform solution to generate their national (or sub-national) ecosystem extent maps (2018 - 2024) and derived indicators and perform the validation on the quality of the results as well as their use in operational processes. All users will be requested to write a validation result document, qualitative and where possible adding quantitative information, that will be presented (as a summary, with a few demonstration cases) in the final outreach Living Lab (LL3).

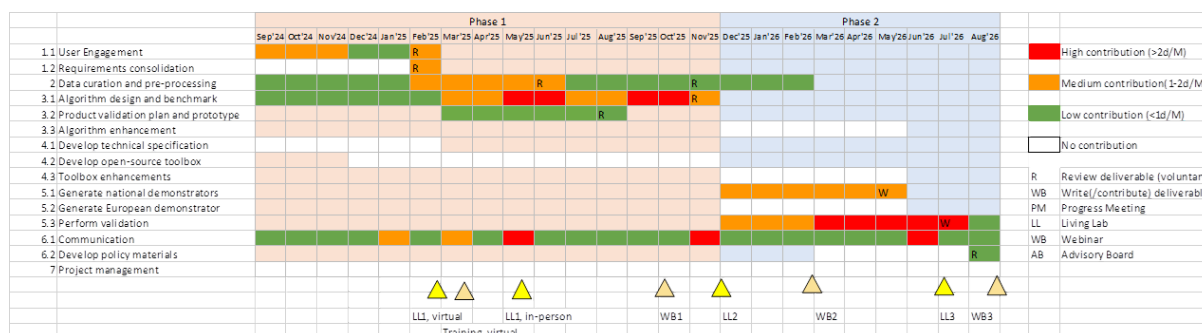


Figure 27. Overview of estimated contributions for champion users during the project.