

Climate services

Eoclima

EARTH OBSERVATION FOR CLIMATE ACTION

Earth Observation for climate action

Eoclima is the GMV's catalogue of **climate-related geo-information products**, derived from satellite Earth Observation data

Eoclima climate services includes **climate change risk** assessment and monitoring, support to **climate change adaptation** solutions, and contribution to **climate adaptation-mitigation synergistic** approaches for land use and forestry regulation

Eoclima is aligned with **REDD+** and supports the implementation of the **Paris Agreement**, the **Sendai Framework** for Disaster Risk Reduction, the **SDG 13** for climate action, and the pledges from **UNFCCC climate summits**

Eoclima

EARTH OBSERVATION FOR CLIMATE ACTION

15 years' experience in providing Earth Observation climate services across more than 20 countries worldwide

Eoclima

EARTH OBSERVATION FOR CLIMATE ACTION

Meets all existing geospatial data standards. Products can be consumed by any GIS through OGC standard services

Climate Services



Climate risk management and adaptation

- Water resources management
- Coastal risk management
- Ecosystem sustainability
- Forest condition assessment
- Agriculture and food security
- Livestock
- Cities and urban areas



Climate risk assessment and monitoring

- Floods
- Landslides
- Soil erosion
- Water scarcity
- Wildfire
- Extreme temperatures
- Compound risks



Climate adaptation and mitigation synergies

- REDD+ / LULUCF
- Sustainable forestry



Eoclima

EARTH OBSERVATION FOR CLIMATE ACTION

37 Earth Observation products for strengthening climate resilience to cope with the impacts of climate change

Benefits

- **Eoclima** is a single service integrating request, data acquisition, processing, analysis and product delivery with the latest technology.
- **Eoclima** products enable assessment and monitoring of climate change risks including hazard, vulnerability and exposure analyses.
- **Eoclima** supports climate change adaptation solutions for a wide range of sectors including water resources management, cities and urban areas, coastal, agriculture and food security, forestry, ecosystem sustainability and livestock.
- **Eoclima** contributes to the climate change adaptation and mitigation synergistic solutions in support of the land use and forestry regulations.
- **Eoclima** remotely derived climate products reduce field activities and support best targeting ground efforts.
- **Eoclima** product updates allows regular comparison of climate measurements against records from reference periods to assess climate emergencies in a rapid and effective manner.
- **Eoclima** products are internally validated using robust protocols and counts with procedures to facilitate external verification by local communities and stakeholders.

Clients and partners

Eoclima facilitates management of environmental resources by:

- NGOs
- Multilateral climate finance initiatives
- International Financial Institutions (IFIs)
- Environmental and conservation agencies
- National and local Governments



ASIAN DEVELOPMENT BANK



Emergency
Management Service

Climate risk management and adaptation

- Water resources management
- Coastal risk management
- Ecosystem sustainability
- Forest condition assessment
- Agriculture and food security
- Livestock
- Cities and urban areas

Water resources management

Eoclima water resources management service offers the following products:

- Flooding
- Water availability
- Meteorological and hydrological drought
- Wetlands and lakes health

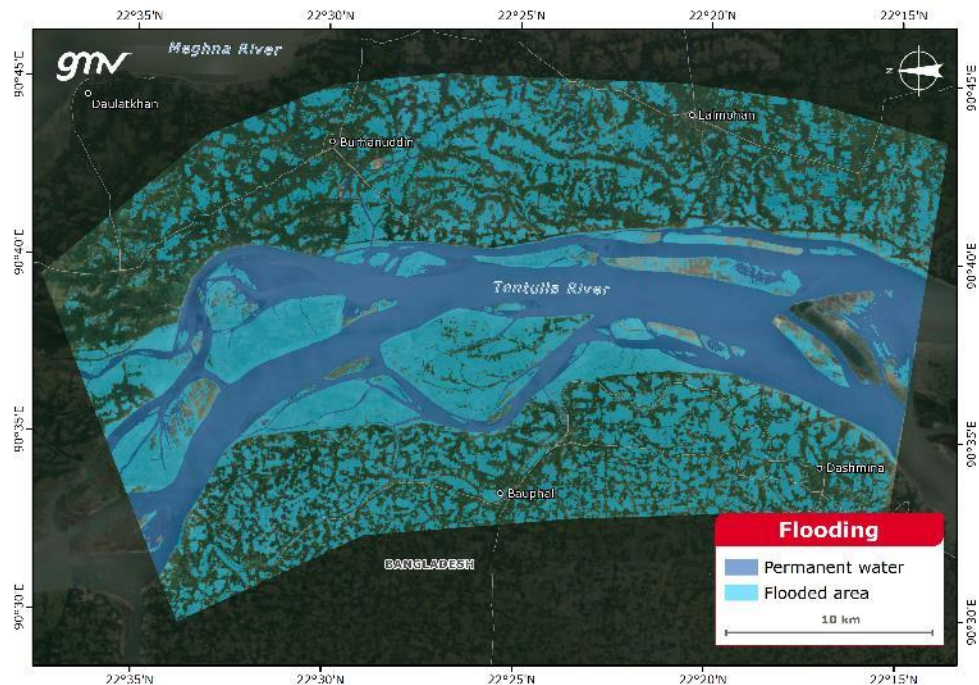


Water resources management

Flooding

Dedicated to the **identification, delineation and impact assessment** of riverine **flood events**, analysis of socio-economic /ecosystem **impacts**, current river **flood risk** estimates for different return periods and river flood risk using future projections and RCP scenarios.

Bhola District, Bangladesh (South Asia)

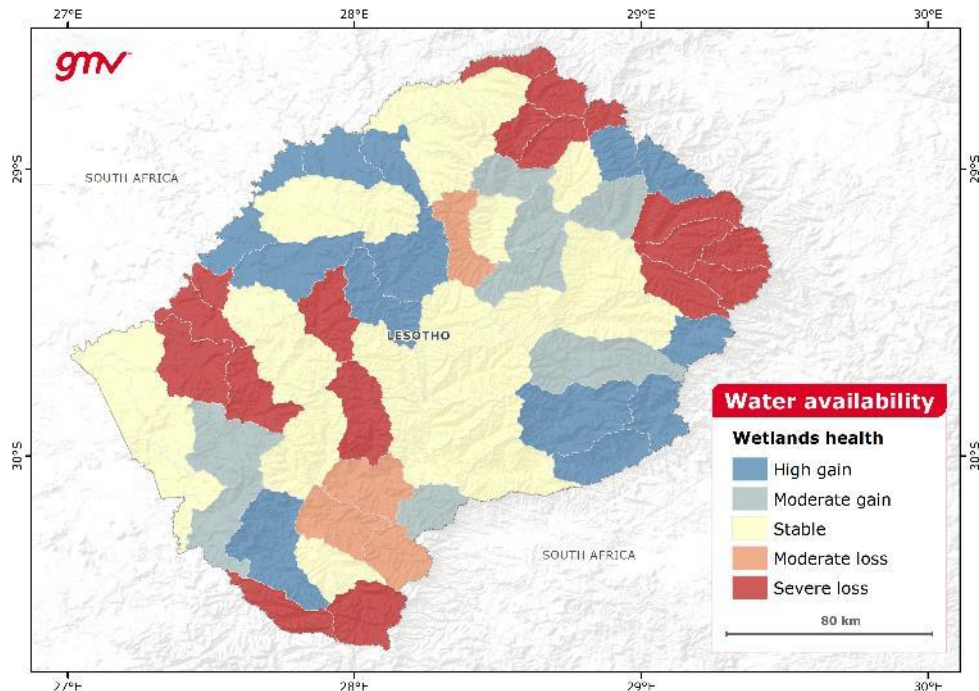


Water resources management

Water availability

Provides time-series information on the **occurrence** and **frequency** of **water bodies** and their extent, and **anomalies** in the **total water storage**. The surface water mapping includes water reservoirs, lakes, and rivers, while the total water storage comprises canopy water, water bodies, soil moisture and groundwater, and it represents a proxy for hydrological dynamics.

Lesotho (Southern Africa)

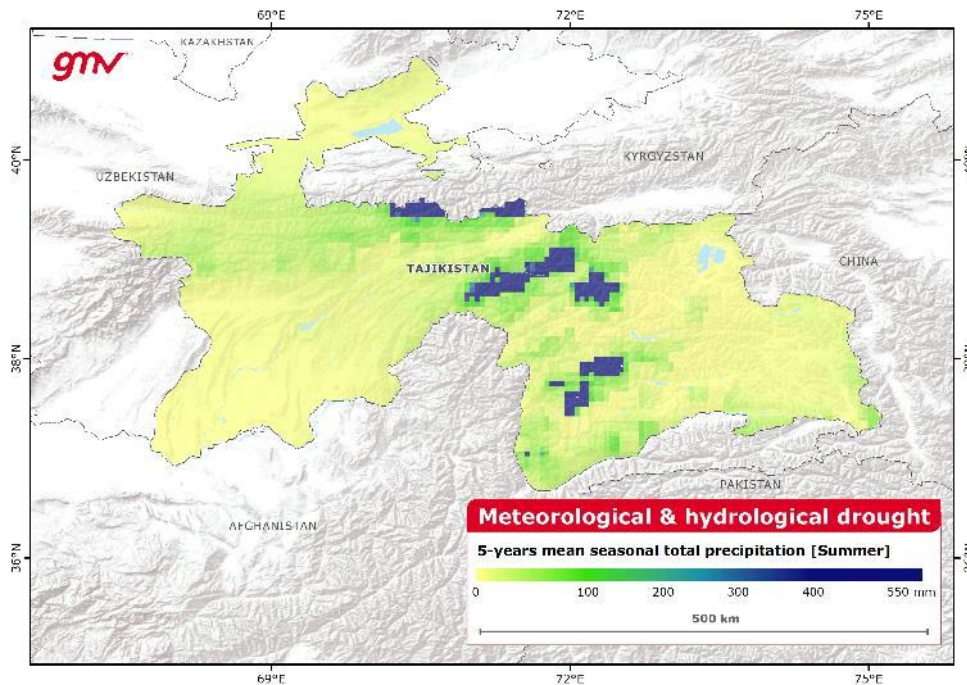


Water resources management

Meteorological and hydrological drought

Provides time-series information and includes analysis of **precipitation**, **evapotranspiration** patterns, **soil moisture** anomalies, decrease of **water bodies' extents**, total water **storage anomalies** and climate **drought indices**.

Tajikistan (Central Asia)

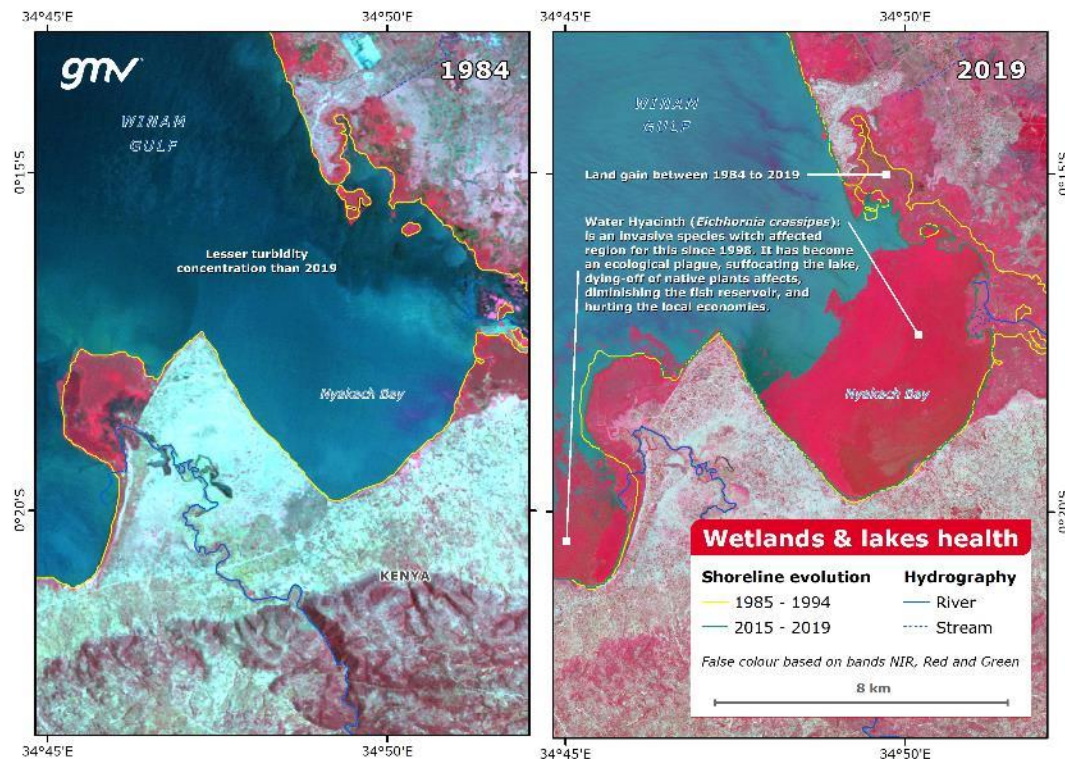


Water resources management

Wetlands and lakes health

Provides identification of **wetlands** and **permanent water bodies**, and monitoring of both **seasonal and climate-driven long-term changes** including water quality, level and extent. The product determines wetlands degradation trends and dynamics, and reports advanced statistical analyses.

Lake Victoria, Kenia (East Africa)



Coastal risk management

***Eoclima* coastal risk management** service offers the following **products**:

- Coastal flooding
- Coastal erosion
- Sea-level rise

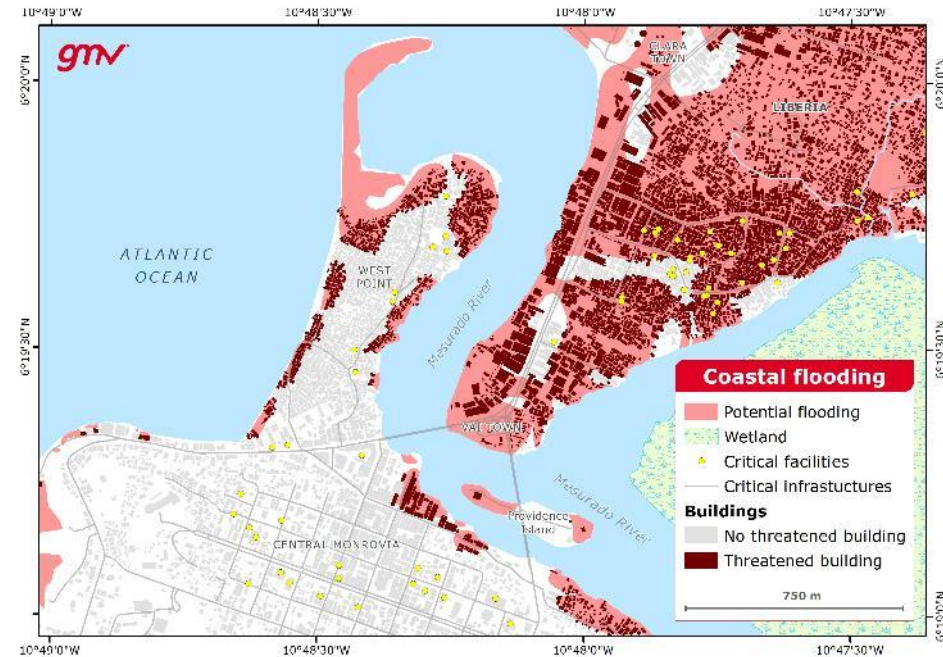


Coastal risk management

Coastal flooding

Provides **identification, delineation** and **grading** of **flood events** and **mapping of flooding** potential in **coastal and riverine environments**. Flooding likelihood integrates analyses of coastal erosion, sea level rise and land subsidence using Earth Observation data.

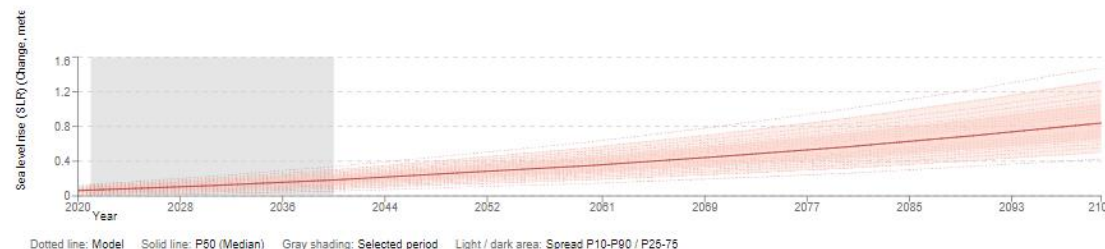
Monrovia, Liberia (West Africa)



Coastal risk management

Sea level rise

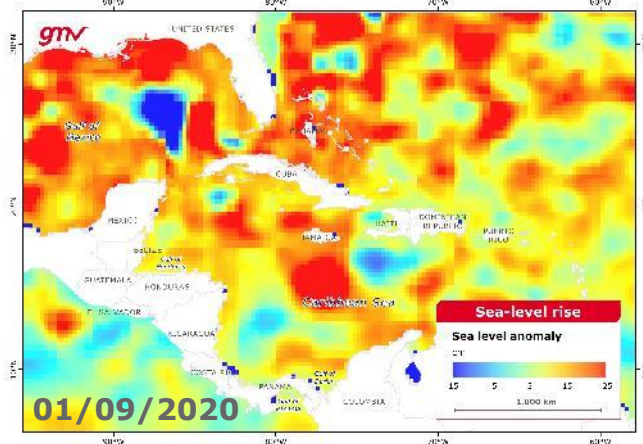
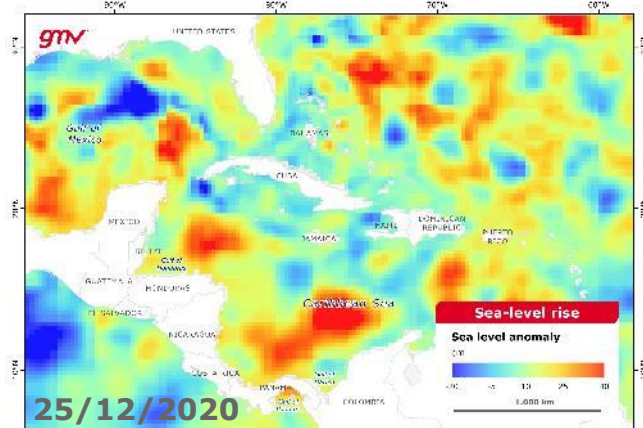
Provides access to both **historic** and **projected global time-series** information on **sea level changes and anomalies**. Historic changes in sea level are observed using satellite SAR altimetry technology and future changes are estimated using climate projections from global and regional climate model ensembles for different GHG emission scenarios.



Cuba
(Caribbean)

Eoclima

EARTH OBSERVATION FOR CLIMATE ACTION

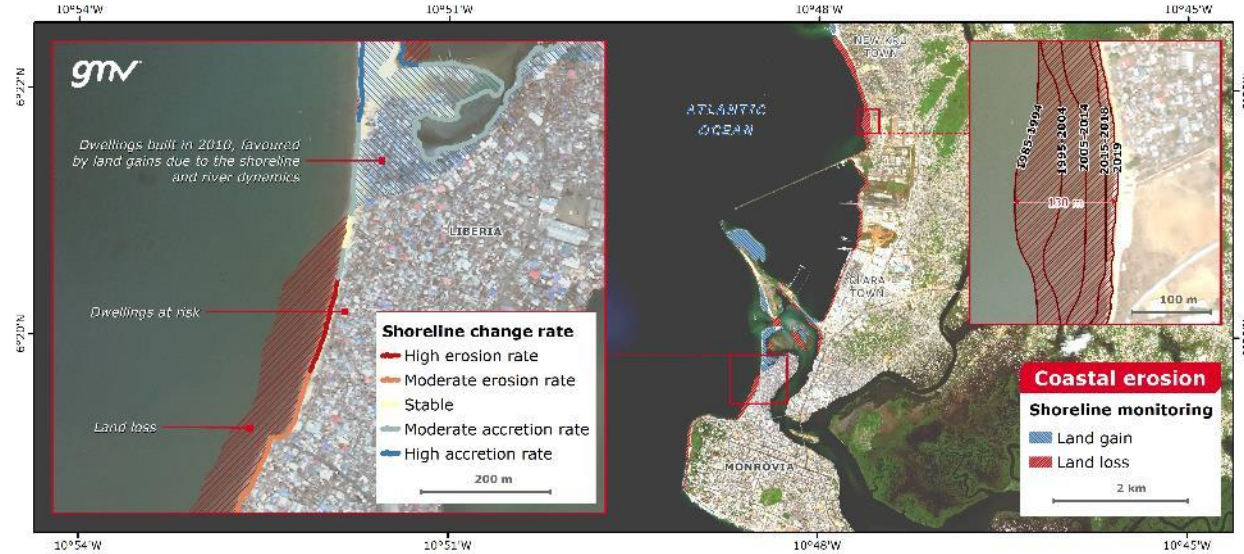


Coastal risk management

Coastal erosion

Evidences the **shoreline changes** for a defined time period. Shoreline change monitoring utilizes a consistent and reliable **water body detection** based on combined satellite optical and SAR imagery. **Accretion and erosion levels** are derived from the shoreline changes and the **geomorphologic analysis** of the coast.

Monrovia, Liberia (West Africa)



Ecosystem sustainability

Eoclina ecosystem sustainability service offers the following products:

- Marine ecosystem health
- Land degradation neutrality
- Soil erosion by water
- Land cover dynamics
- Habitat fragmentation
- Biodiversity loss
- Vegetation disturbances

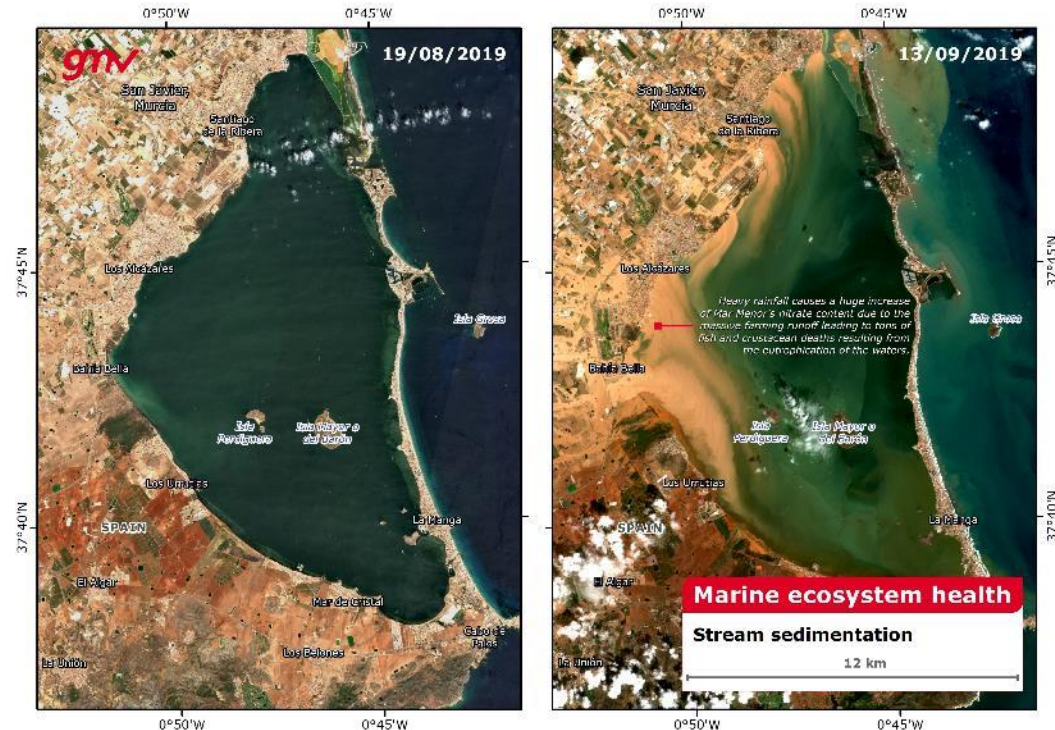


Ecosystem sustainability

Marine ecosystem health

Provides information on the **factors** that affect **productivity**, **species diversity**, and **resilience to climate change** of the marine ecosystem. This information derived from Earth Observation data contributes to marine ecosystem analyses by monitoring **sea surface temperature**, **ocean colour** and **algae blooms**.

Mar Menor, Spain (Southern Europe)

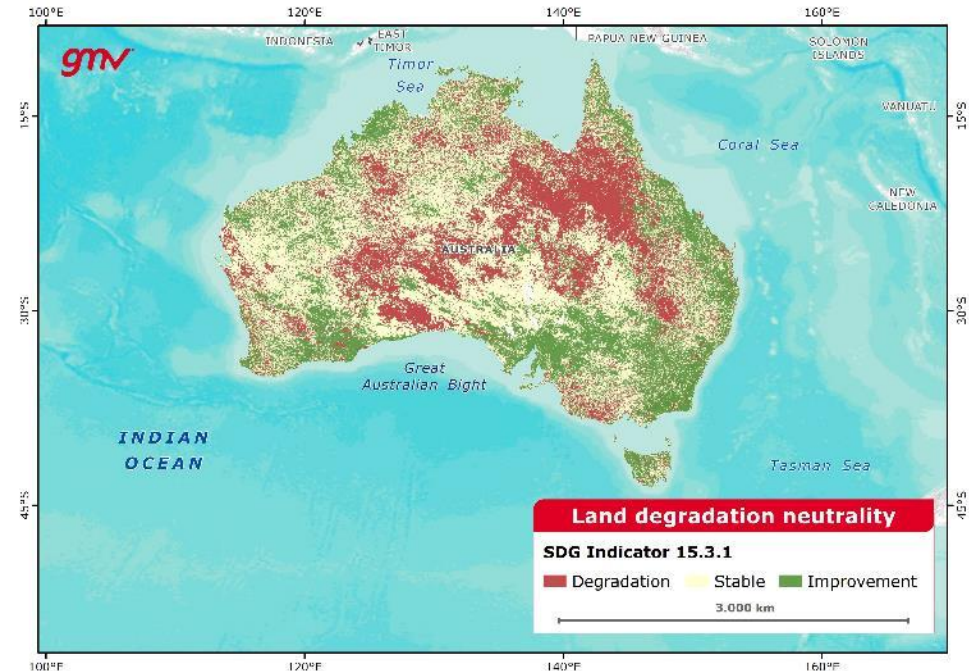


Ecosystem sustainability

Land degradation neutrality

Provides a classification of potential **degraded/not-degraded areas** based on the time-series analysis of **trends** in **land cover**, **plant productivity** and **carbon stock** (SOC and biomass) following the UNCCD's Good Practice Guidance version 2 on how to calculate **SDG Indicator 15.3.1**.

Australia

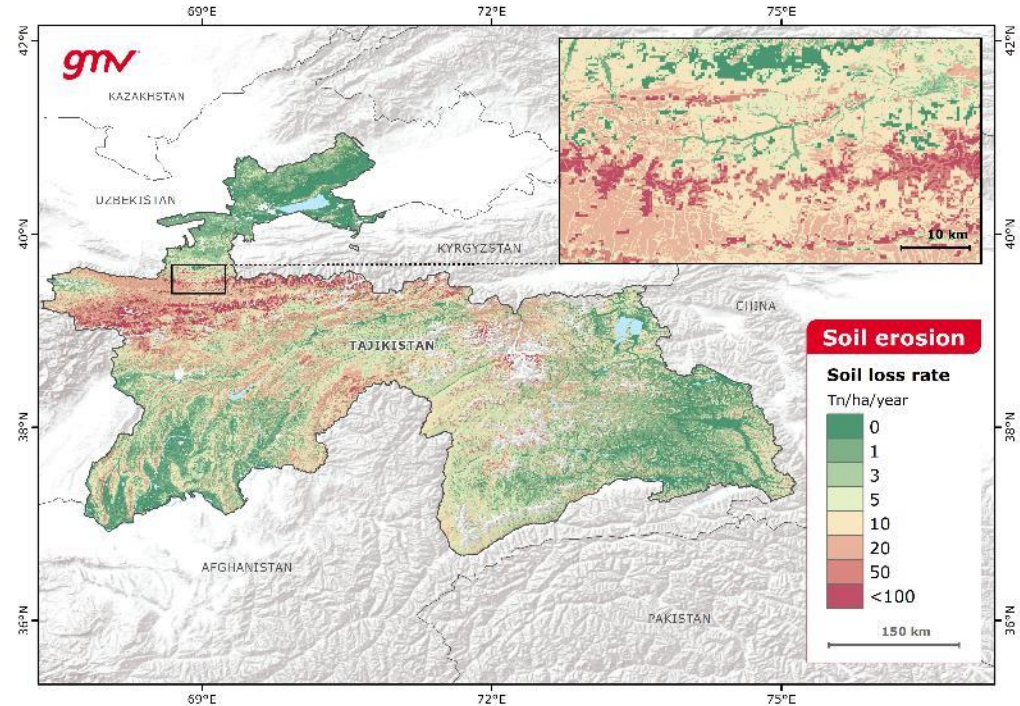


Ecosystem sustainability

Soil erosion by water

Provides **water-related soil erosion rates** at annual intervals. Soil loss rates are derived in Tn/ha/year using the RUSLE2015 model and Earth Observation datasets. The factors affecting the soil loss calculation include: **rainfall erosivity, soil erodibility, topography and cover-management**.

Tajikistan (Central Asia)

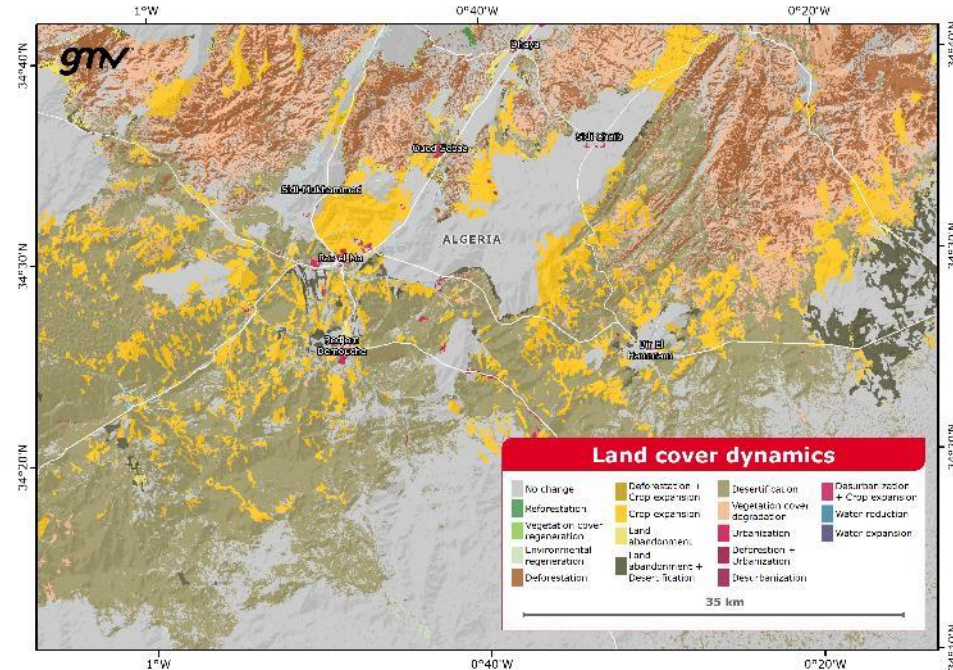


Ecosystem sustainability

Land cover dynamics

Provides information about the **land cover and land use transitions** of a defined area and for a specified time interval, and can be aggregated for **biomes or ecoregions** as requested. The methodology to create the LULC map leverages the information from combined satellite optical and SAR time-series imagery. Transitions include **deforestation, reforestation, crop expansion, urbanization, water expansion, water reduction, wetland degradation and land abandonment**.

Algeria (Northern Africa)

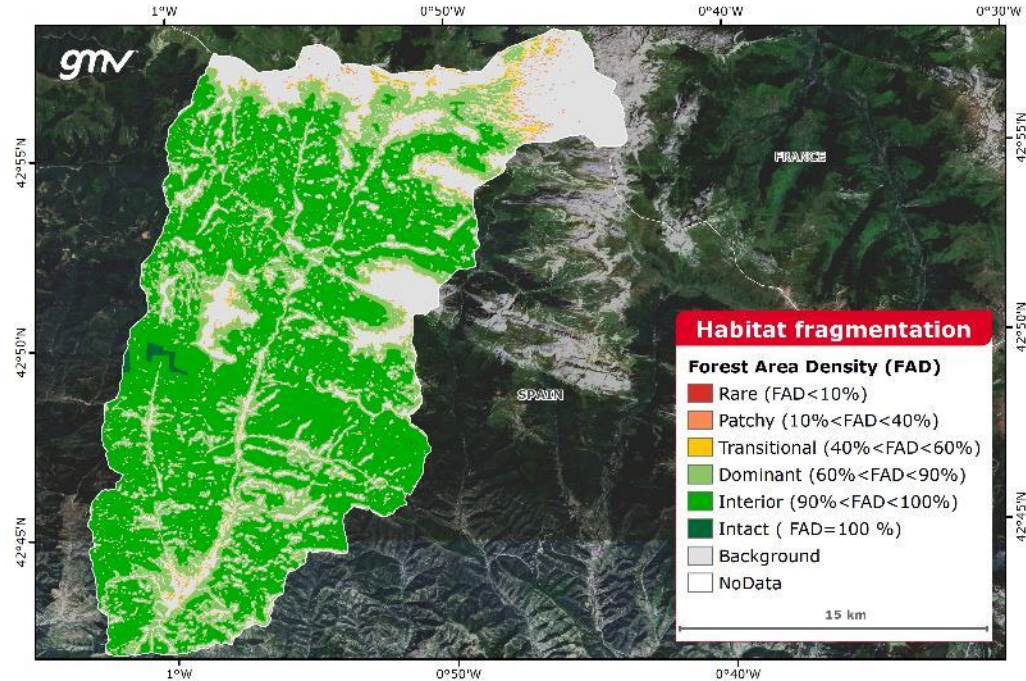


Ecosystem sustainability

Habitat fragmentation

Describes the emergence of **discontinuities in an ecosystem**. The identification of fragmented habitats is obtained by **classifying the spatial patterns** using optical and SAR imagery, and measuring **area density** to quantify the fragmentation.

Navarre, Spain (Southern Europe)

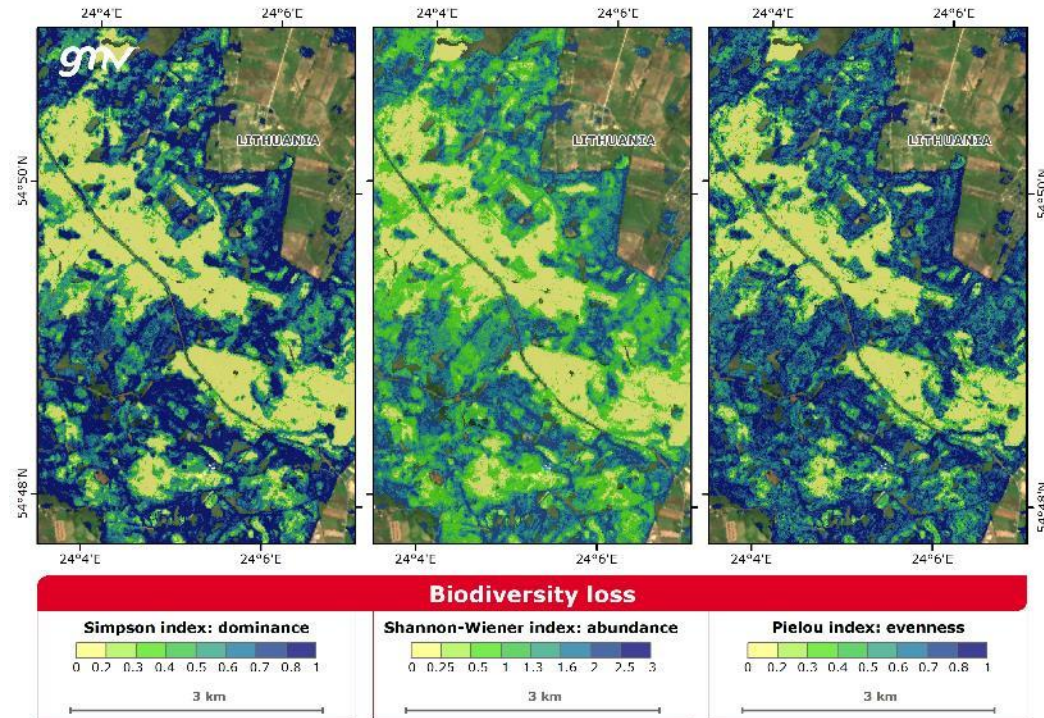


Ecosystem sustainability

Biodiversity loss

Provides the **decline** or disappearance of **biological diversity** by analyzing the intrinsic floral diversity of an ecosystem. This product calculates different **diversity indices** that consider the **number of plant species** or **vegetation associations** present, as well as the relative **abundance**, **dominance** and **evenness** of each species/association.

Dubravos miškas Forest, Lithuania (Baltic)

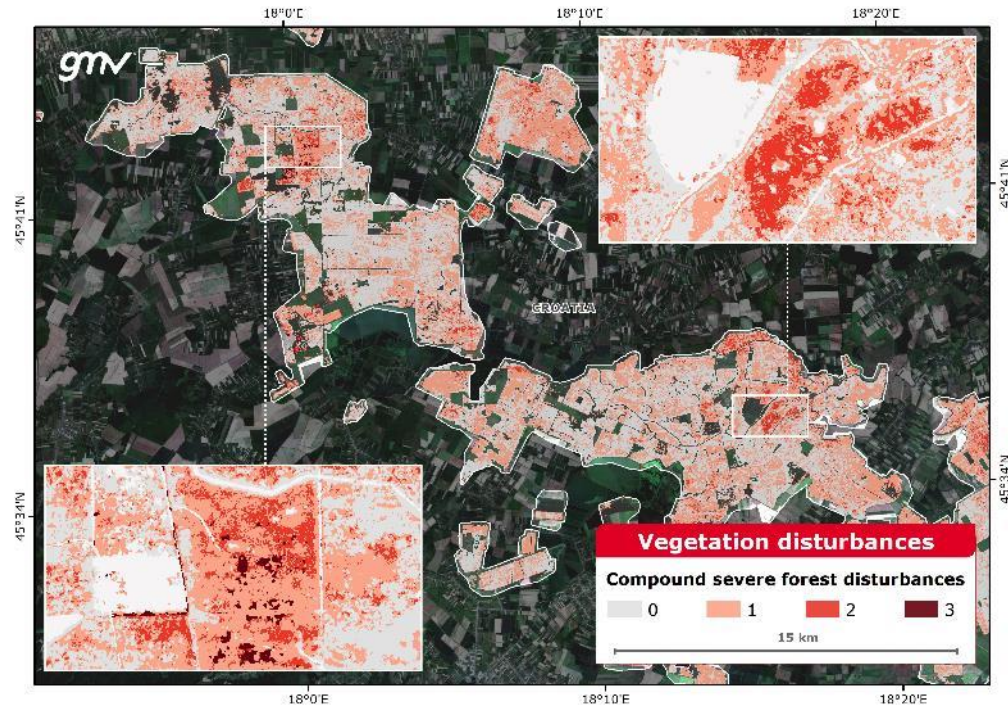


Ecosystem sustainability

Vegetation disturbances

Provides information about the most common **disturbances** that occurs in nature and significantly affects the dynamics of vegetation. This product calculates EO-based products of biophysical indicators of vegetation and combines information on **deforestation**, **fire**, **vegetation stress** and **biotic damage** affecting the vegetation of the ecosystem.

Našice Lowland Forest, Croatia (Balkans)



Forest condition assessment

Eoclima forest condition assessment service offers the following products:

- Deforestation
- Forest condition
- Biotic stress

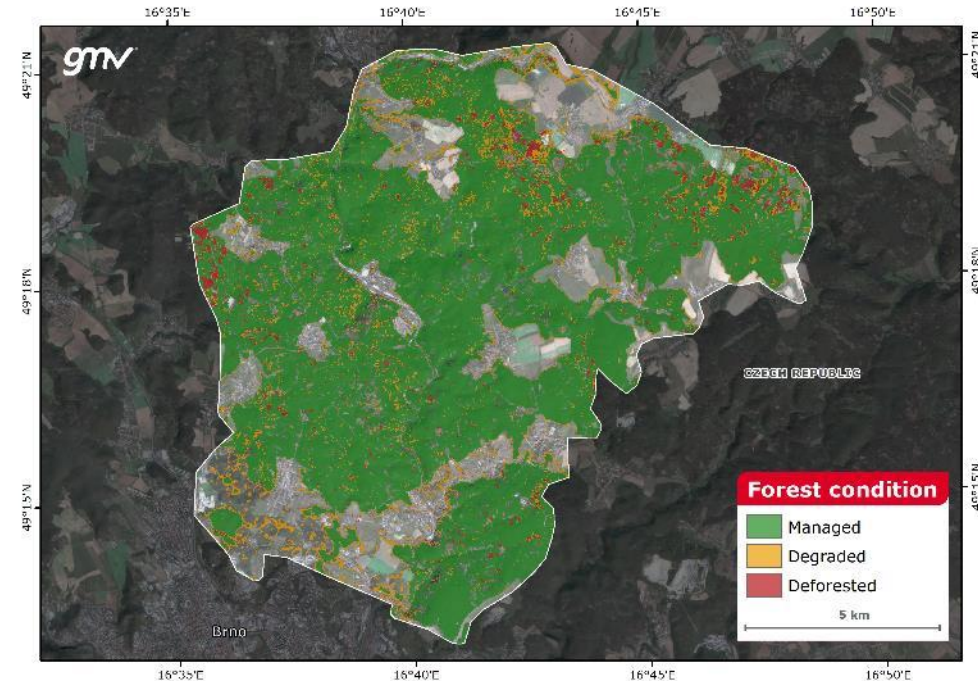


Forest condition assessment

Forest condition

Characterizes a forested area for a reference period and **reports deterioration in the forest health status** by assessing the damage caused by forests threats, including **forest clearing, extreme drought** and **insect plagues**. Robust statistical algorithms are applied over time-series of vegetation indices to correlate forest health decrease with the intensity of the climate-driven damage.

Czech Republic (Central Europe)

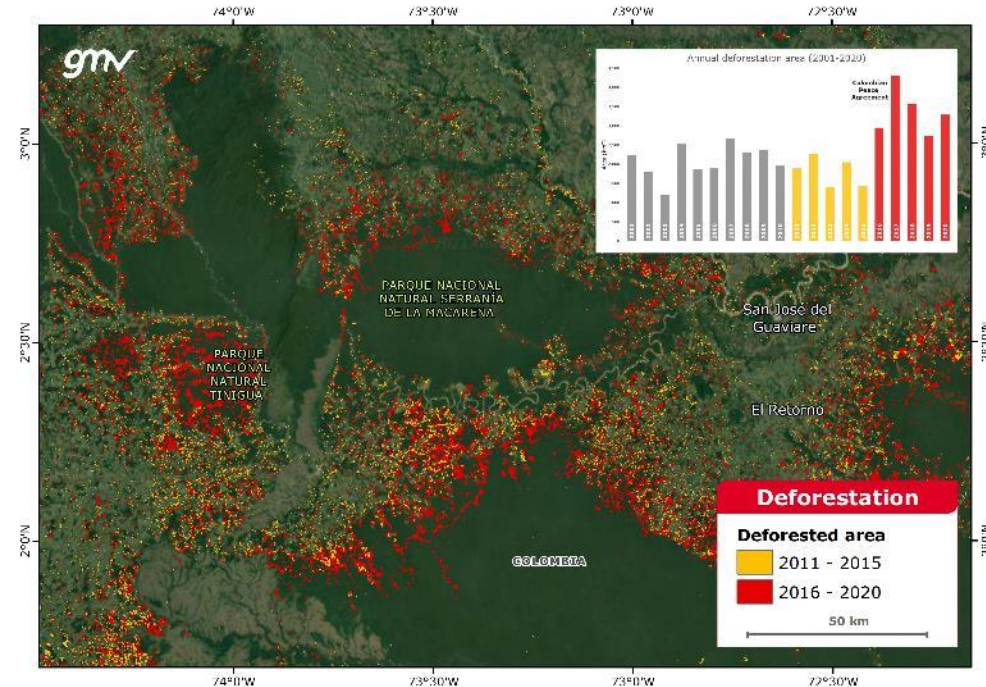


Forest condition assessment

Deforestation

Provides the mapping and **long-term monitoring of forest** covers using satellite-derived forest mask information. The analysis of the forest mask time-series reports the mapping of forest **presence, absence and changes**, and **forest density**. The product includes the detection of natural deforestation as well as detection of logged forest

Colombia (South America)

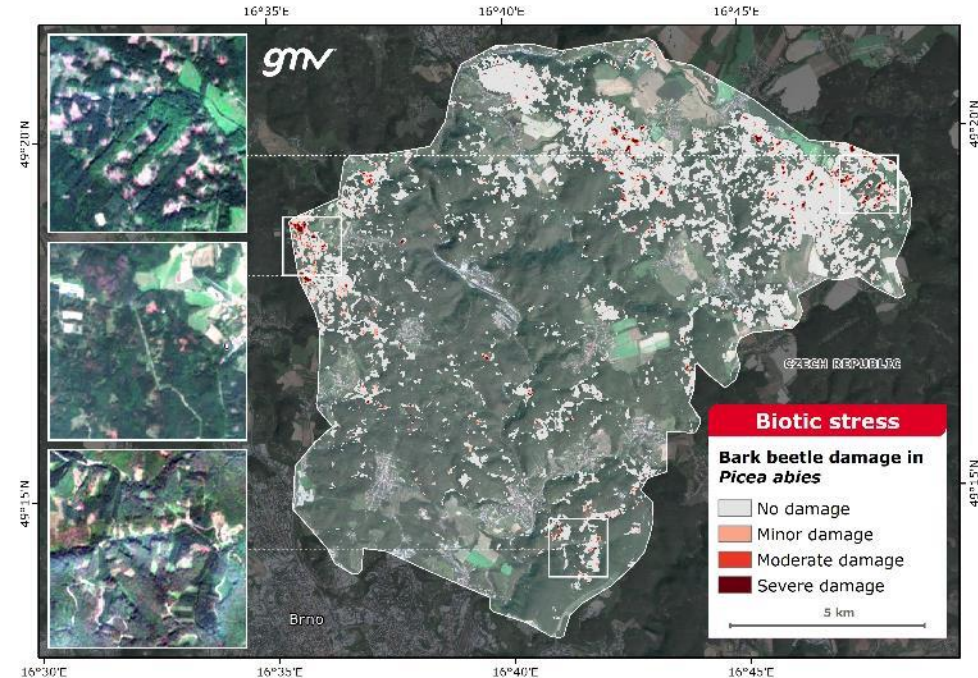


Forest condition assessment

Biotic stress

Maps the forest areas affected by biotic stress and provides a qualitative **classification of the biotic damage**. In forestry, living organisms such as fungi, insects, bacteria, or weeds, among others, can damage the tree's health, and consequently the forest health status. This product looks for **detecting, delimiting and estimating woodland plague** damage using satellite data and machine learning techniques.

Czech Republic (Central Europe)



Agriculture and food security

Eoclima agriculture and food security service offers the following **products**:

- Agricultural drought
- Climate indicators for agriculture
- Crop monitoring and management

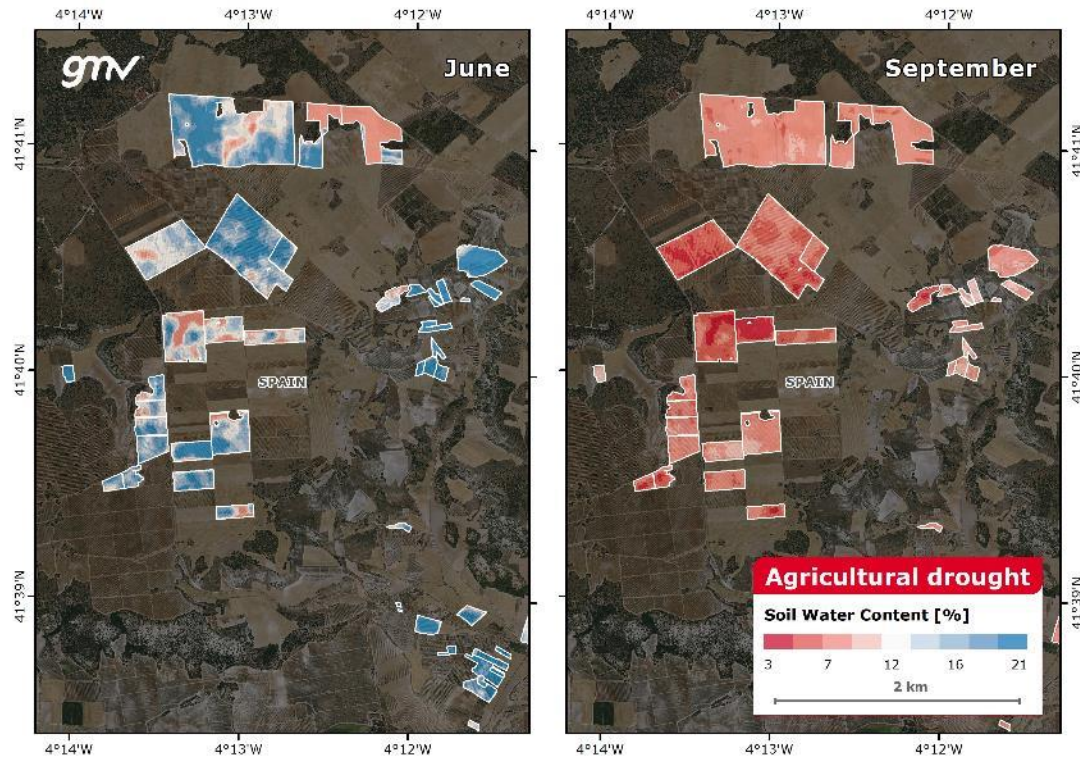


Agriculture and food security

Agricultural drought

Provides time-series information on **vegetation biophysical variables** and **soil moisture** from satellite optical imagery and meteorological reanalysis, and the analysis of **dynamics** and anomalies of **drought indicators**. These elements are used to produce an agricultural combined drought indicator that is based on a cause-effect relationship.

Ribera del Duero, Spain (Southern Europe)

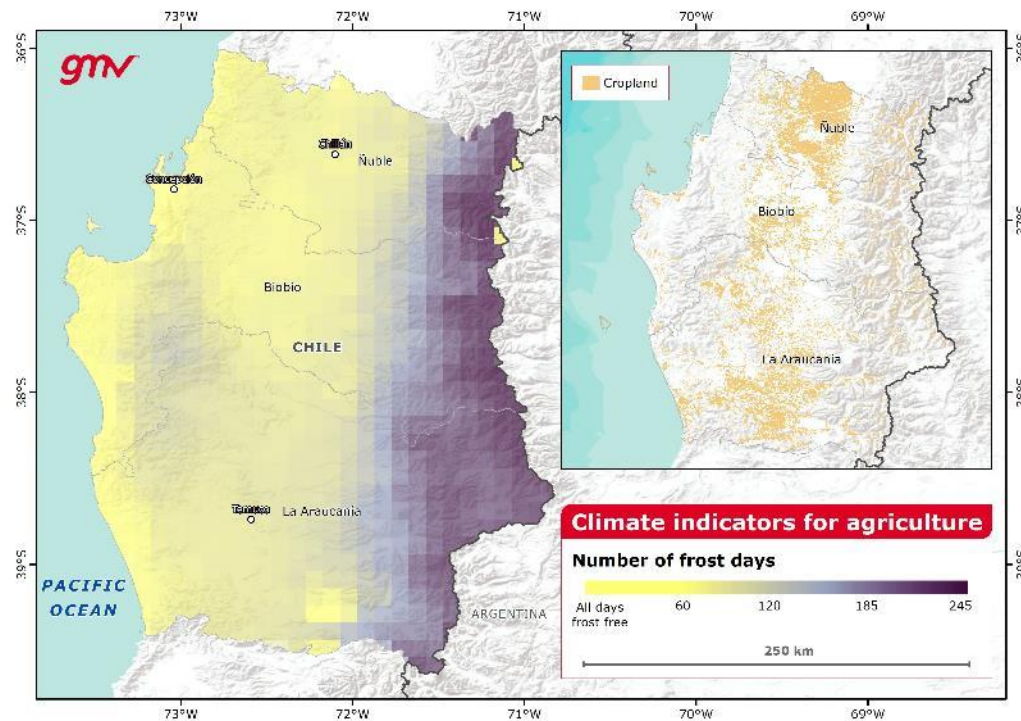


Agriculture and food security

Climate indicators for agriculture

Provides climate indicators aimed at classifying and quantifying the potential **impacts of extreme climate events for agriculture**. The indicators comprised in this product are derived from **satellite data, meteorological models and climate models**, and calculated following the common definitions internationally agreed by the scientific community. The indicators correspond to the globally accepted info satisfying the needs of **agriculture for climate impact assessment**.

Central Chile (South America)

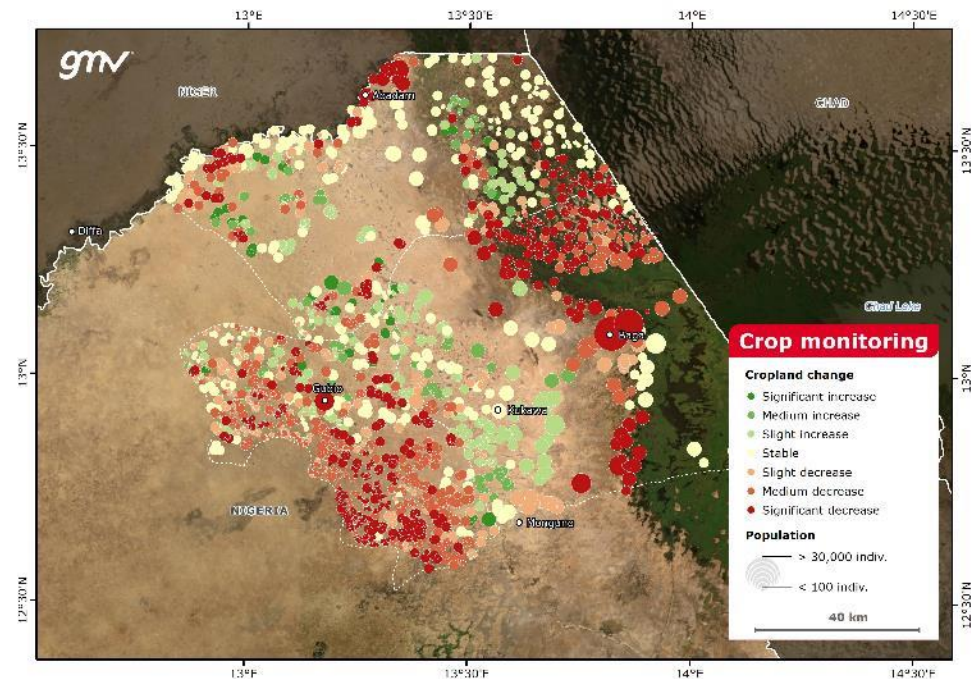


Agriculture and food security

Crop monitoring and management

Provides satellite information to support climate-resilient agriculture. This includes **monitoring** and **change assessment** of **crop area**, **crop type identification**, **water deficit** estimated from soil moisture, determination of available water in reservoirs, and monitoring of ground water storage.

Nigeria (West Africa)



Livestock

Eoclima livestock service offers the following **products**:

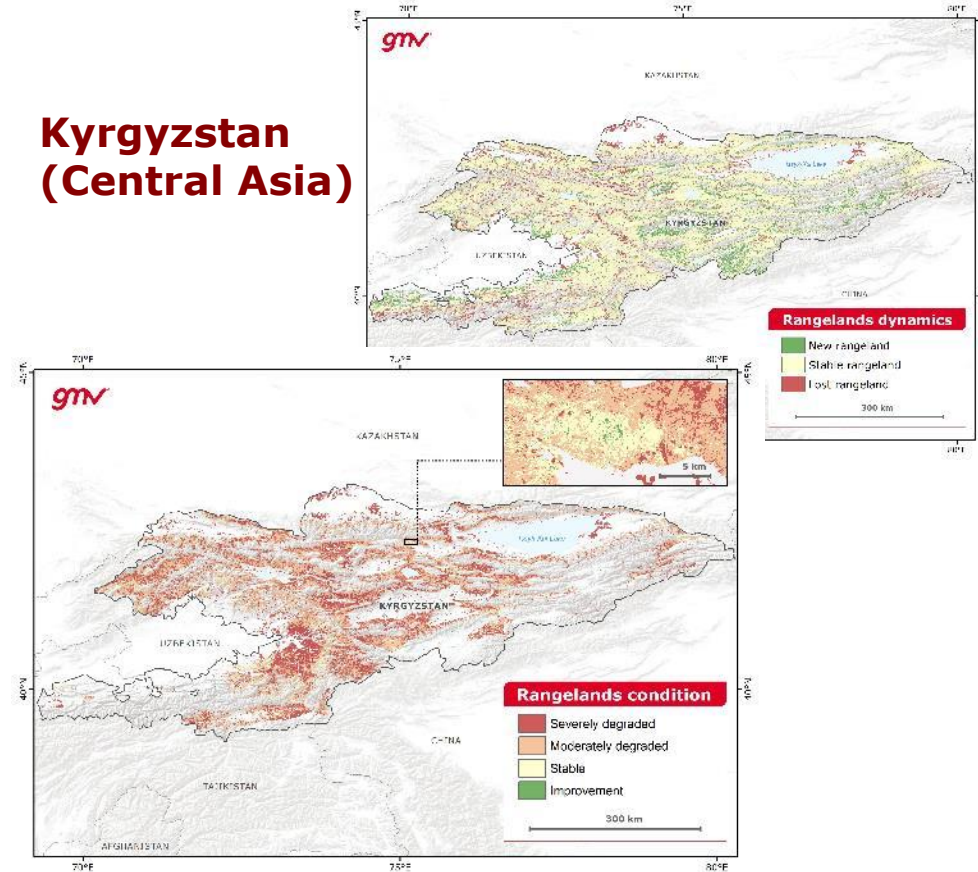
- Rangelands condition
- Climate indicator for livestock
- Water availability



Rangelands condition

Provides **identification of rangelands** and **assessment of long-term changes** per season for a defined timespan. The product computes biophysical vegetation indicators to assess the **rangeland productivity trends**. Indices are weighted according to their capacity for condition assessment. **Grazing practices of local pastoral communities** are integrated for retrieval of **pasture degradation**.

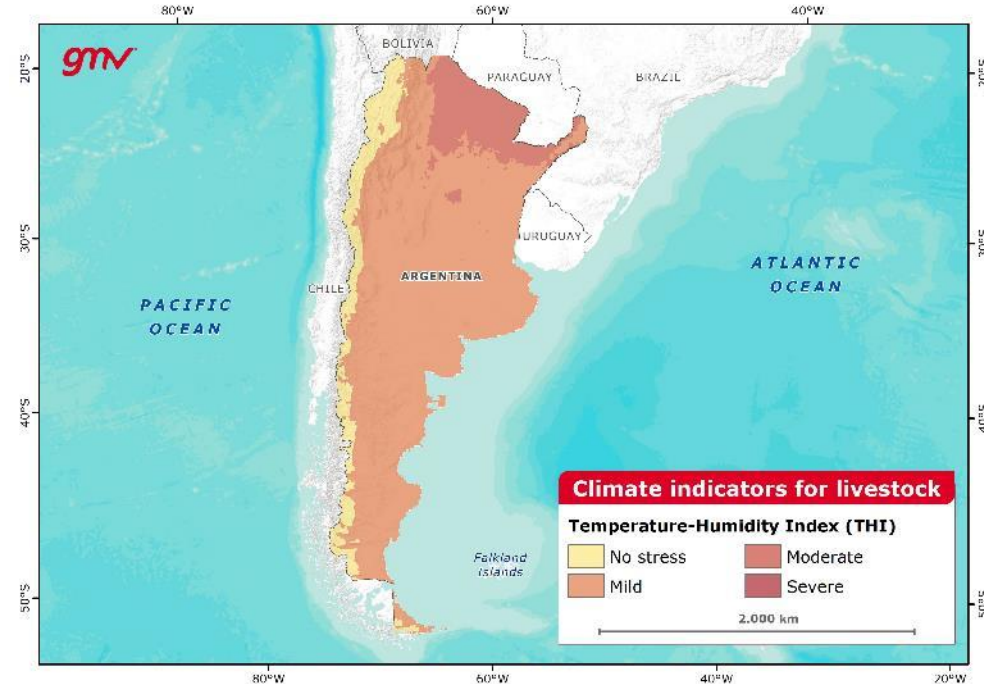
Kyrgyzstan (Central Asia)



Climate indicators for livestock

Provides information about **historic, current and future environmental stress of livestock**. This product includes the **temperature-humidity, wind-chill** and the **comprehensive climate indices**. Heat/cold stress charts for particular species are necessary to properly assess impact. Indices are calculated using climate data from meteorological models and climate regional and global models.

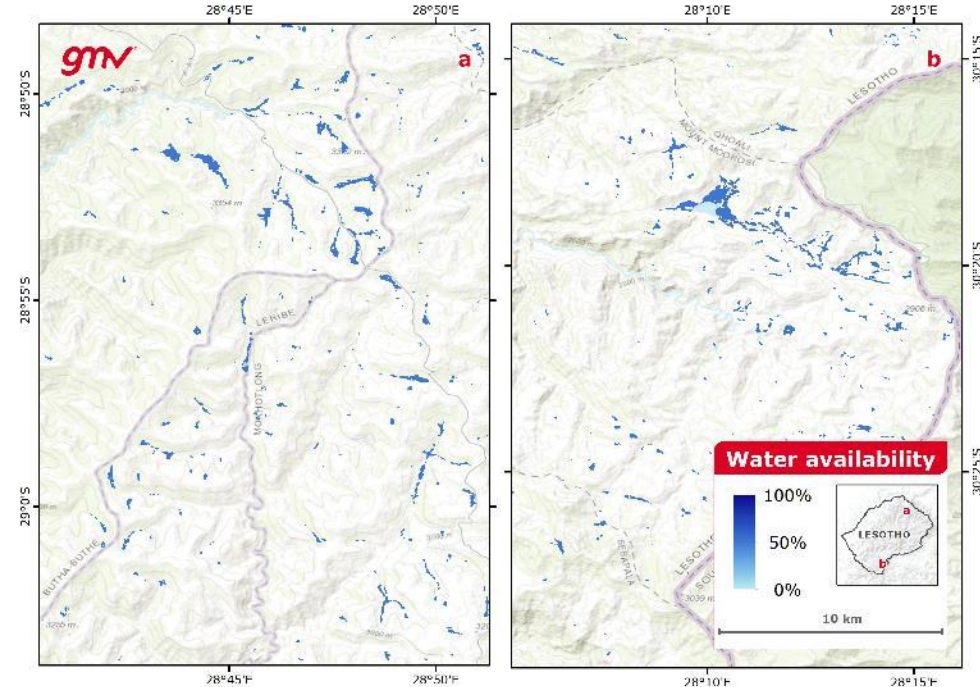
Argentina (South America)



Water availability

Provides time-series information on the **occurrence** and **frequency of water bodies and their extent, and anomalies in the total water storage**. The indicators include water occurrence, water occurrence change intensity, water surface persistence, water seasonality, total water surface area, annual water recurrence, and other descriptors to **describe water dynamics**.

Lesotho (Southern Africa)



Cities and urban areas

Eoclima service for **cities and urban areas** provides the following **products**:

- Urban heat island
- Urban flooding



Cities and urban areas

Vietnam (Southeast Asia)

Urban flooding

Provides the **damage grading** and **delineation** of the **flood extent** affecting an urban area. The drainage pattern of land is disrupted when a natural landscape is transformed by urban development. The accumulation of floodwaters resulting from inflow of storm water can exceed the drainage capacity leading to urban flooding.

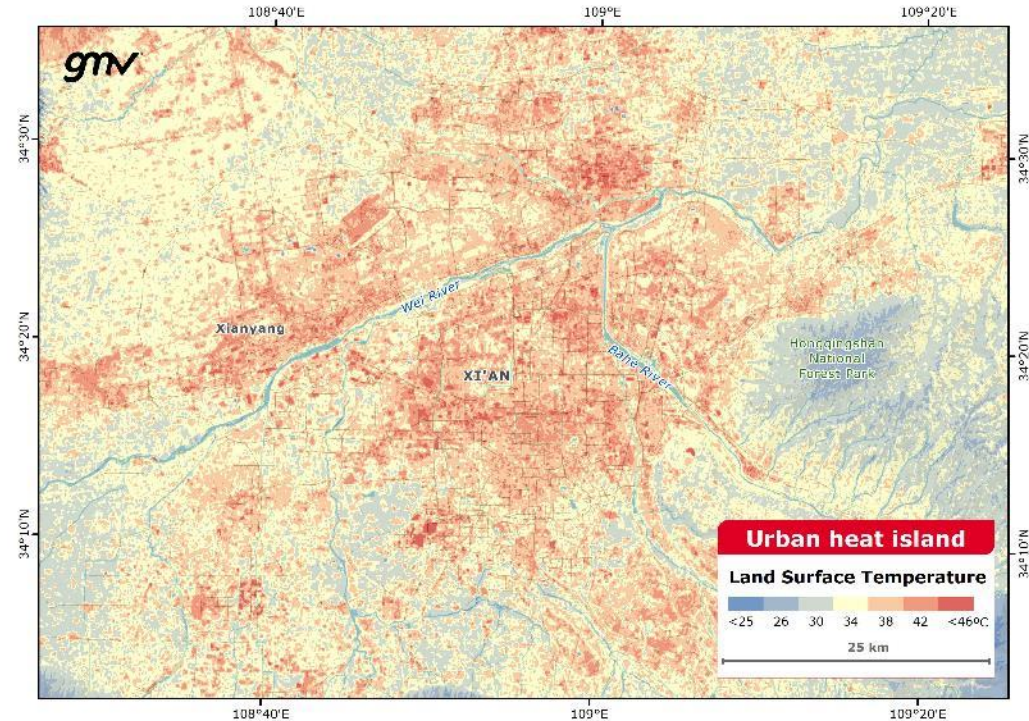


Cities and urban areas

Urban heat island

Provides information on **urban heat islands** by measuring land **surface temperatures** from thermal observations of satellite, and deriving **air temperatures** at the city by using meteorological data. This product also includes **mapping** of the urban green cover to analyse impacts of the **green and the build-up areas** on the urban heat island

Xi'an city, China (East Asia)



Climate risk assessment and monitoring

These products address **hazards**, and the **vulnerability** and **exposure** aspects of the **climate risk**.

Using socio-economic data derived from satellite-based global sources and/or local data the determinants of the risk are combined with the hazard to assess all the risk drivers.

Climate risks

Eoclima service for **climate risk** assessment offers the following **products**:

- Floods
- Landslides
- Soil erosion
- Water scarcity
- Wildfire
- Extreme temperatures
- Compound risks

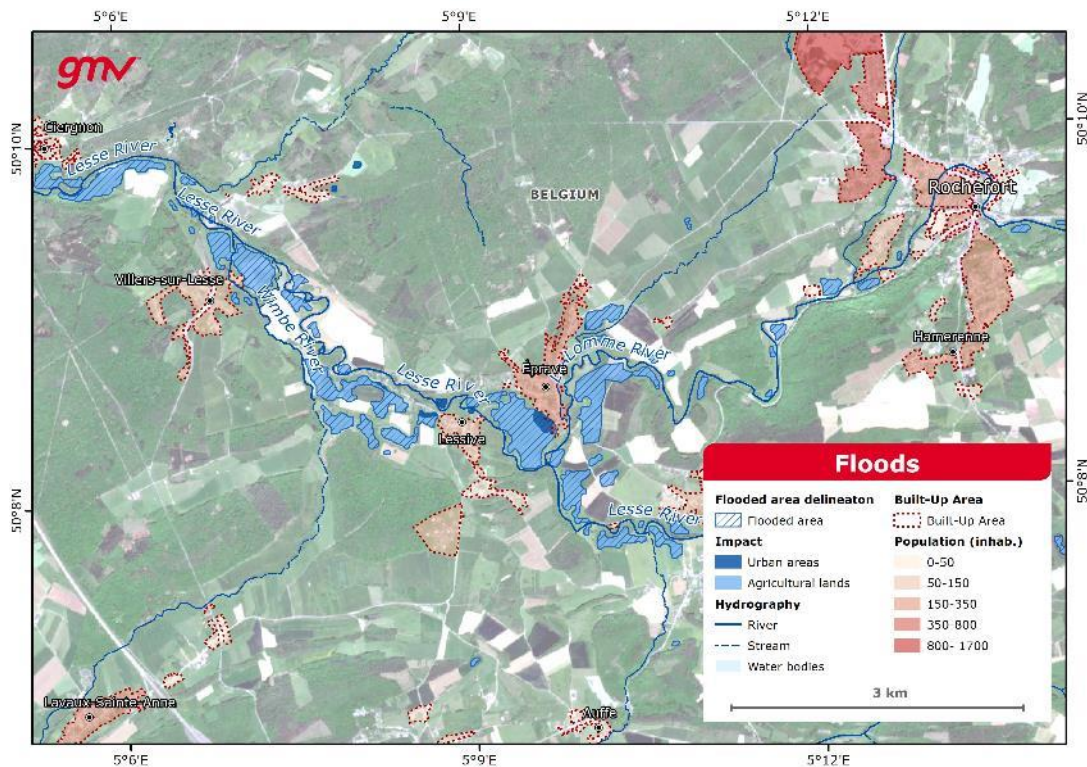


Climate risk assessment and monitoring

Floods

Dedicated to the analysis of flood hazards through the **delineation** and **grading** of documented **flood events**, and estimation of **probability of flood occurrence**. It includes mapping of historical flood events, **analysis of socio-economic /ecosystem impacts** caused by floods, current river **flood risk** estimates for different return periods and river flood risk using future projections and RCP scenarios

Belgium (Western Europe)

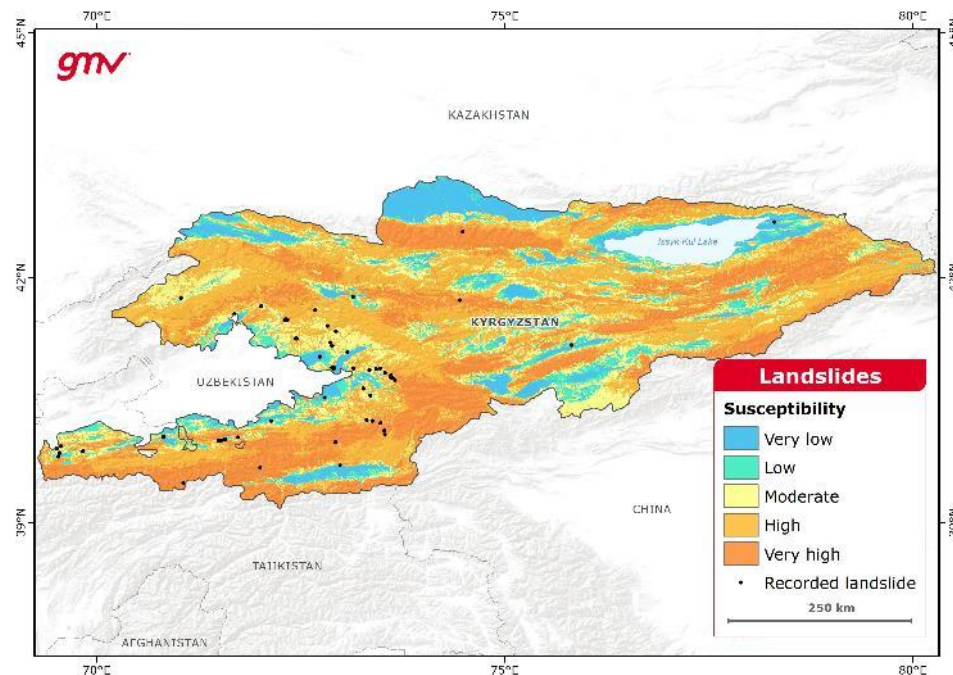


Climate risk assessment and monitoring

Landslides

Provides information for the **assessment of landslide susceptibility** in mountainous terrain. Susceptibility maps of landslides resulting from heavy rains are derived from **rainfall-driven landslide models** and analysis of **event-based landslide records** from repositories and delineations. Delineation and grading of historical events on susceptible areas is derived from EO radar and optical approaches.

Kyrgyzstan (Central Asia)

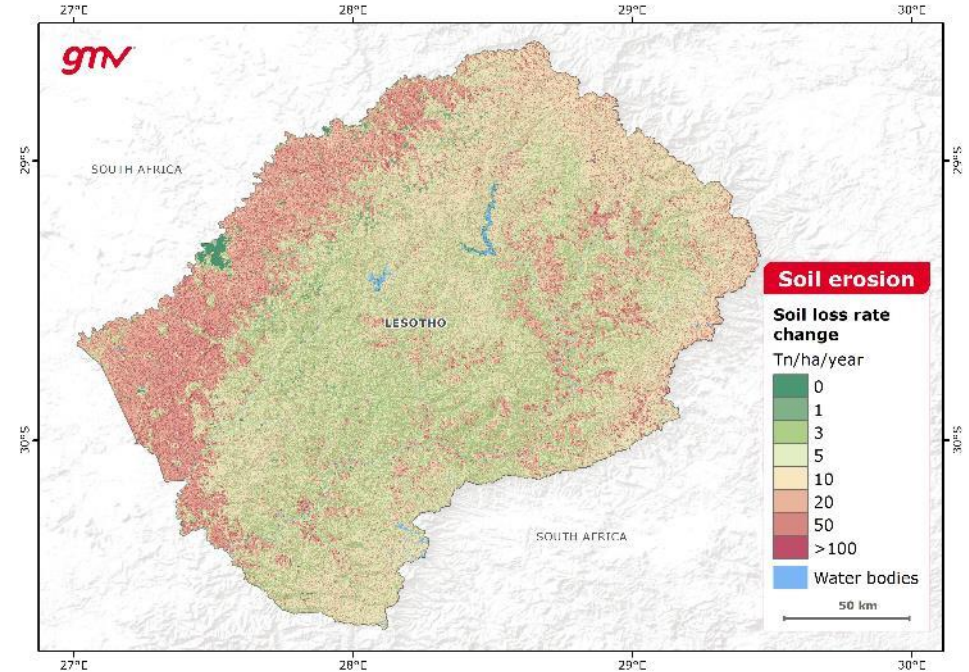


Climate risk assessment and monitoring

Soil erosion

Provides the **water-related soil erosion trend** over a defined time period. Soil loss rates are derived in Tn/ha/year using the RUSLE2015 model and EO datasets. Factors affecting the soil loss that are calculated include: **rainfall erosivity**, **soil erodibility**, **topography** and **cover-management**.

Lesotho (Southern Africa)

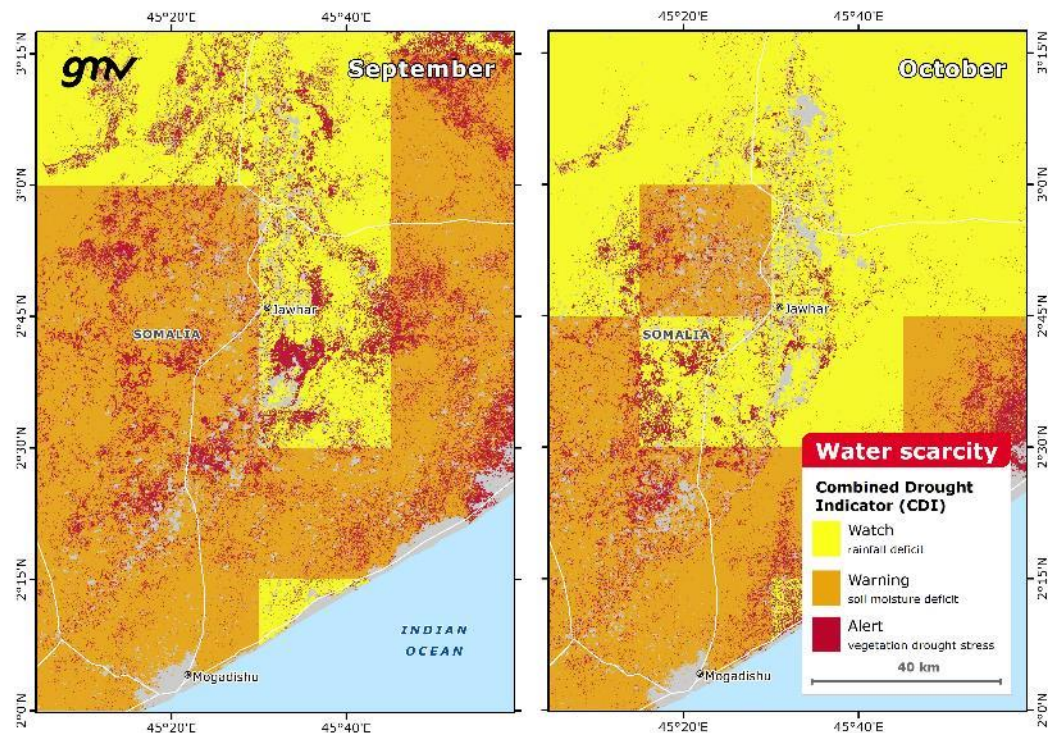


Climate risk assessment and monitoring

Water scarcity

Provides information on all components of a drought, including analysis of **precipitation/evapotranspiration** patterns, **soil moisture** anomalies, decrease of **water bodies' extents**, **total water storage** anomalies, **vegetation productivity**, and dynamics of **drought indicators**. These elements are used to produce a combined drought indicator that is based on the cause-effect relationship.

Somalia (East Africa)

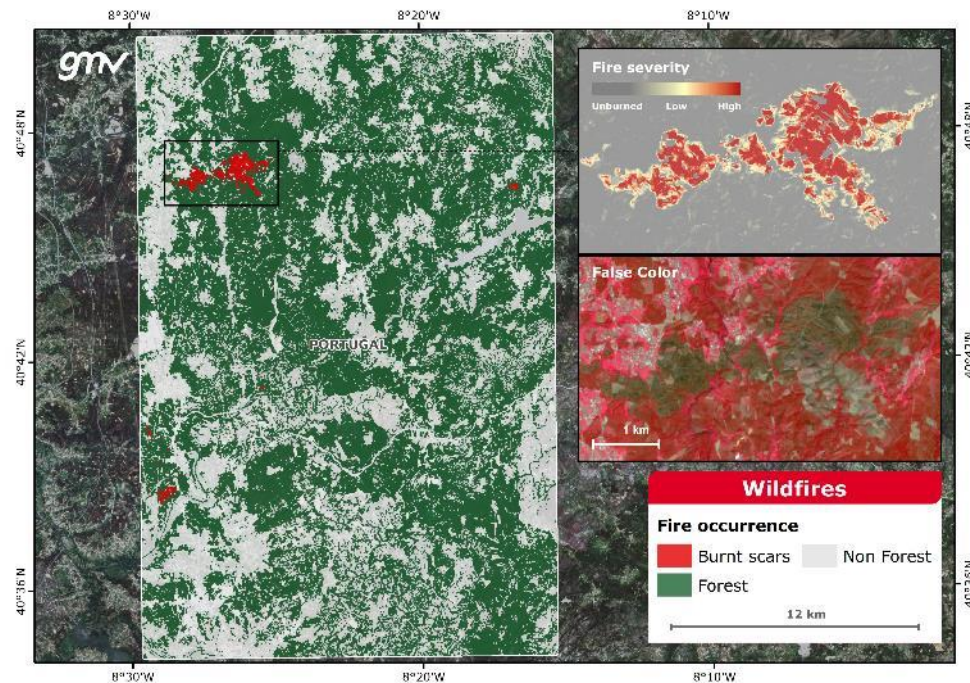


Climate risk assessment and monitoring

Wildfires

Provides **fire disturbance** maps of medium spatial resolution using **thermal anomalies**, and higher spatial resolution employing combined optical and radar imagery for **detection of burnt areas**. This product supports post-disaster recovery plans by providing the area affected by the fire and **estimating the fire severity** and corresponding confidence level.

Baixo Vouga, Portugal (Southern Europe)

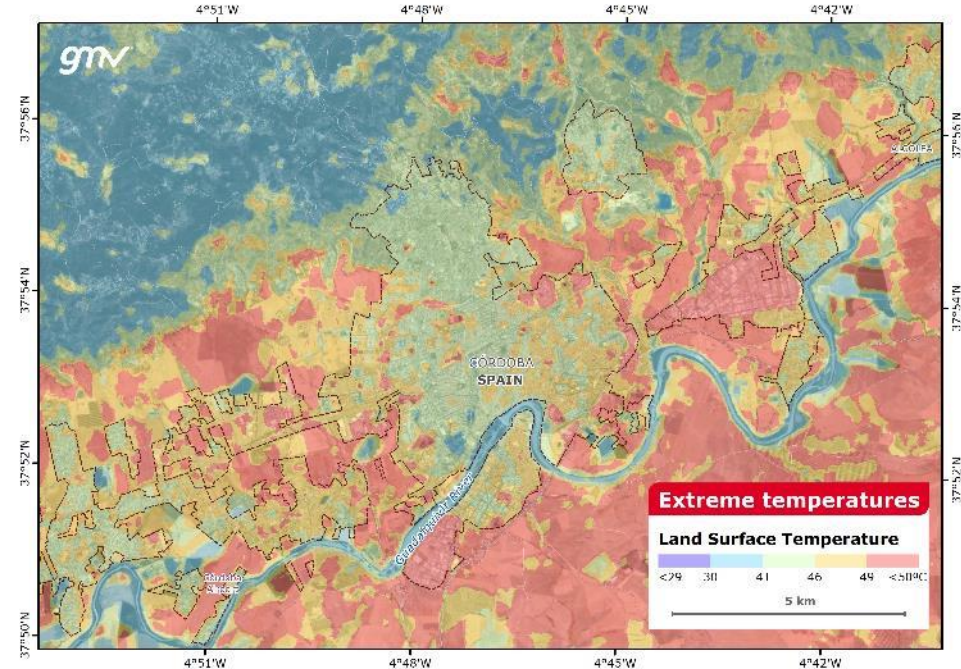


Climate risk assessment and monitoring

Extreme temperatures

Provides information on the **heat and/or cold waves** affecting a region. The product is obtained by measuring **land surface temperatures** from thermal observations of satellite, meteorological and ancillary data resources.

Cordoba, Spain (Southern Europe)

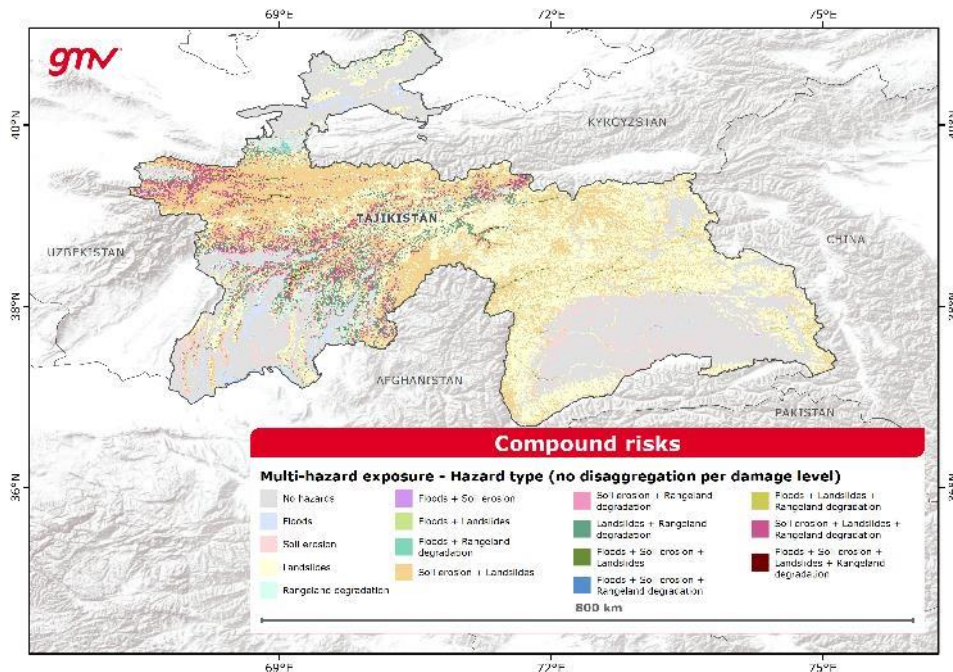


Climate risk assessment and monitoring

Compound risks

Combines the EO-derived **hazard damage level** from **floods, landslides, soil erosion, water scarcity, wildfire** and **extreme temperatures** to produce **multi-hazard maps** that follow the definition by UNDRR. GIS techniques are used to create maps by classifying the hazard potential (low hazard to high hazard) and overlaying the information of the hazardous events. **Climate-driven hazards** are likely to intersect with **other threats, compound risk maps** can be developed to assess the collective impact.

Tajikistan (Central Asia)



Climate adaptation and mitigation synergies

- REDD+ and Land Use, Land-Use Change and Forestry (LULUCF)
- Sustainable forestry

REDD+ / LULUCF

Eoclina land use and forestry regulation service offers the following **products**:

- Deforestation, afforestation and reforestation
- Ecosystems restoration potential
- Carbon stock
- Carbon emission/National GHG inventory

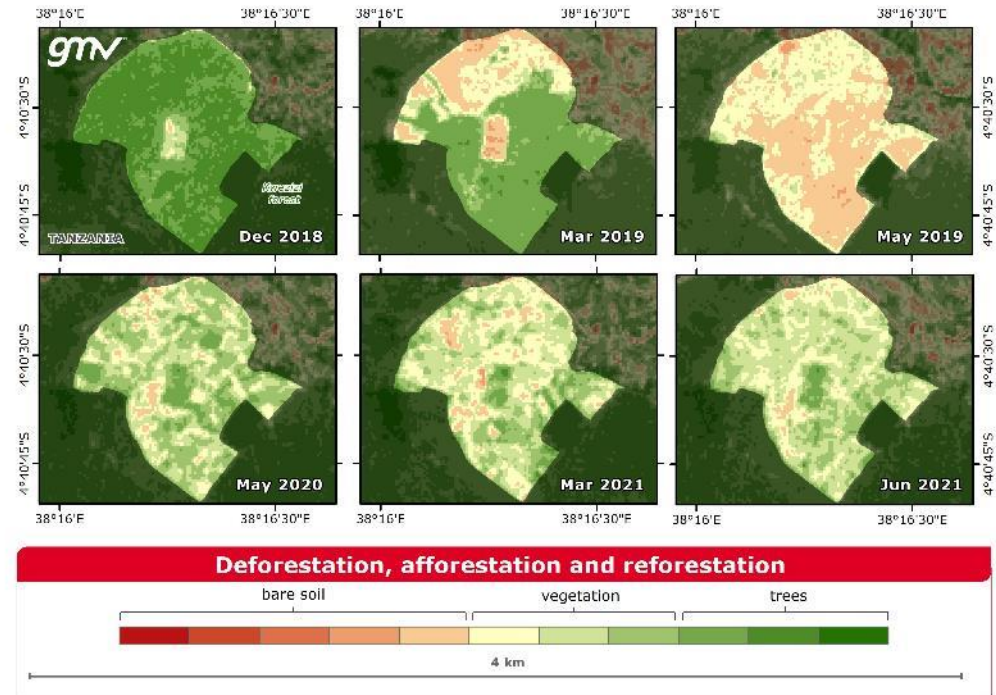


REDD+ / LULUCF

Deforestation, afforestation and reforestation

Provides information about the **deforestation process**, and **afforestation** and **reforestation activities** in a region of interest. This product includes time-series **forest change** detection and quantification, and analysis of **land cover dynamics**.

Irente planting site (Tanzania, East Africa)



Ecosystems restoration potential

Maps the **opportunities for restoration on degraded lands**, especially for forests. This product includes the analysis of the current **ecosystem coverage and condition**, the **potential ecosystem coverage** under current and future climate conditions, and the **human pressure** including population density, built-up areas, pasturelands and croplands.

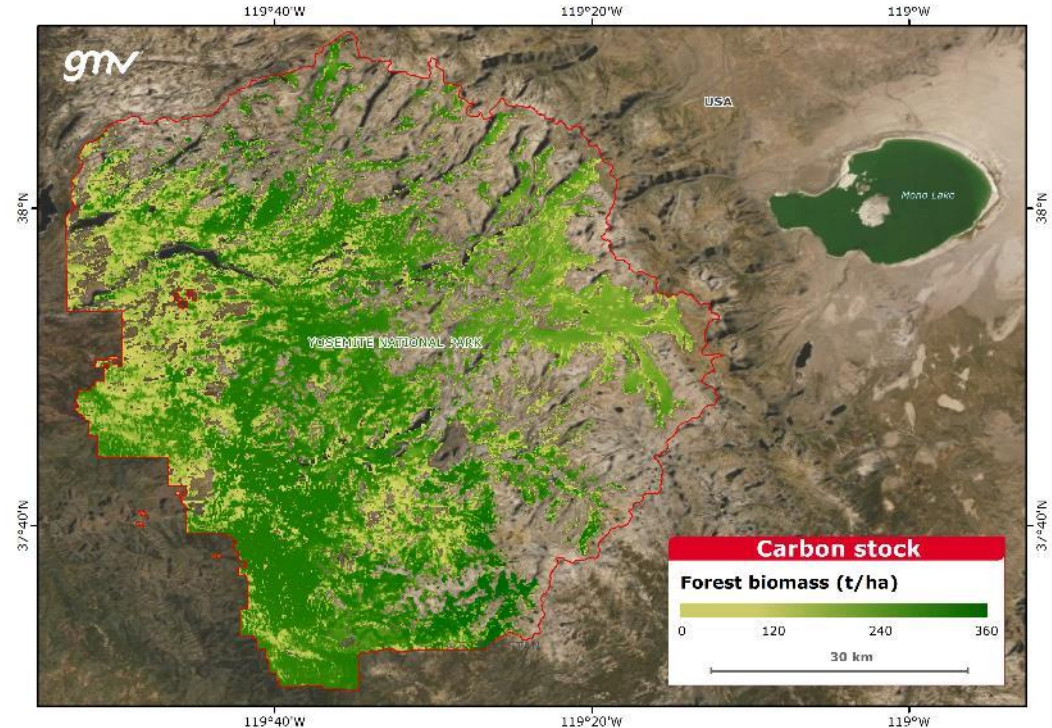
Hispaniola (North America)



Carbon stock

Maps the **carbon content** of an area of interest from EO-based **above-ground biomass** measurements of forested areas and **soil organic carbon** estimates as proxy for soil carbon stocks. Biomass estimates are retrieved from Lidar-based altimetry measurements combined with digital surface models.

Yosemite National Park (USA, North America)

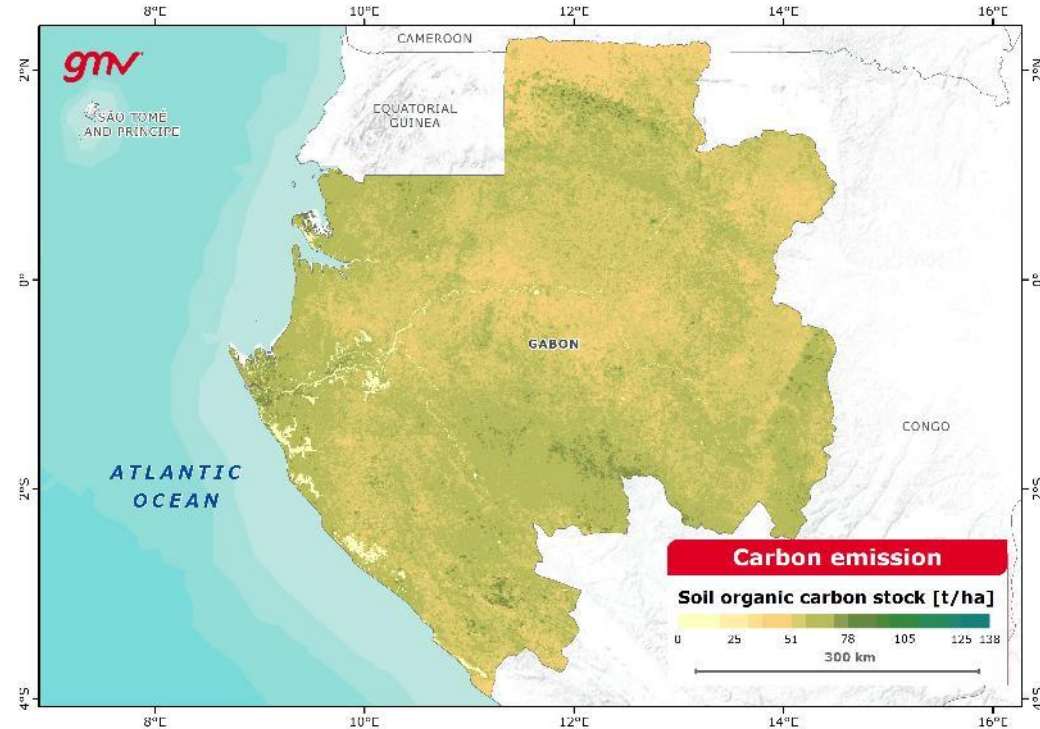


REDD+ / LULUCF

Carbon emission / National GHG inventory

Provides information to support all Tiers of the IPCC's Guidelines for **National GHG Inventories**. This product calculates the **carbon stock changes** to retrieve the **GHG emissions** by monitoring **changes in land use** and estimating multi-source spatial **variations on biomass density** (forestry) and **soil carbon** (soils).

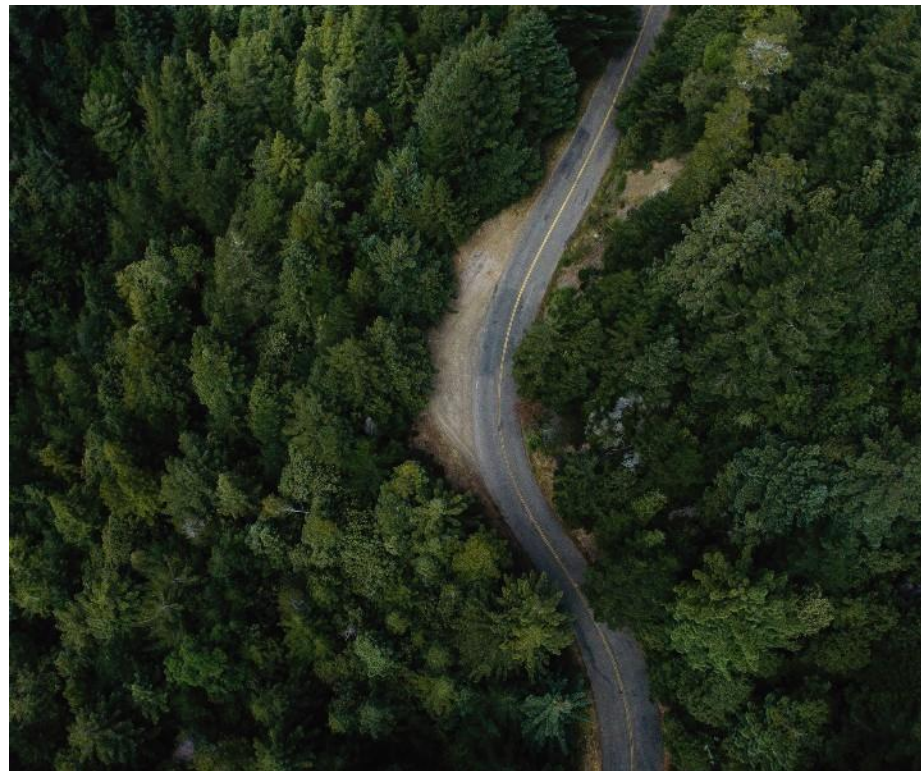
Gabon (Central Africa)



Sustainable forestry

Eoclima land use and **forestry** regulation service offers the following products:

- Certificate of deforestation-free product

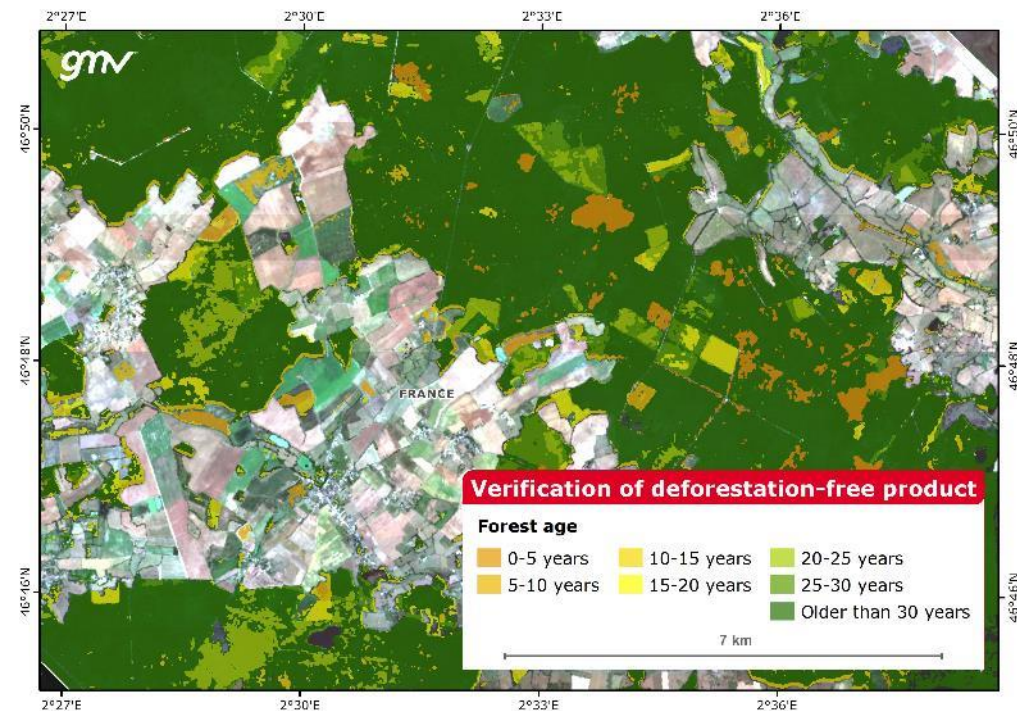


Sustainable forestry

Verification of deforestation-free product

Provides EO-based **maps and analytical plots**, at jurisdictional scale to **demonstrate that imported products** are **not** associated, currently or in the past, to any legal or illegal **deforestation** and **land degradation** processes.

Bois d'Arpheuilles, France (Western Europe)



Eoclima

eoclima@gmv.com