Eoclima
EARTH OBSERVATION FOR CLIMATE ACTION

gmv
INNOVATING SOLUTIONS

Eoclima for ecosystem sustainability

We present ***Eoclima,*** GMV solution to support climate action through climate-related geo-information products, derived from satellite-based Earth Observation data. We will show how ***Eoclima*** contributes to **addressing environmental degradation challenges,** supports sustainable ecosystems, and facilitates climate risk management and adaptation.

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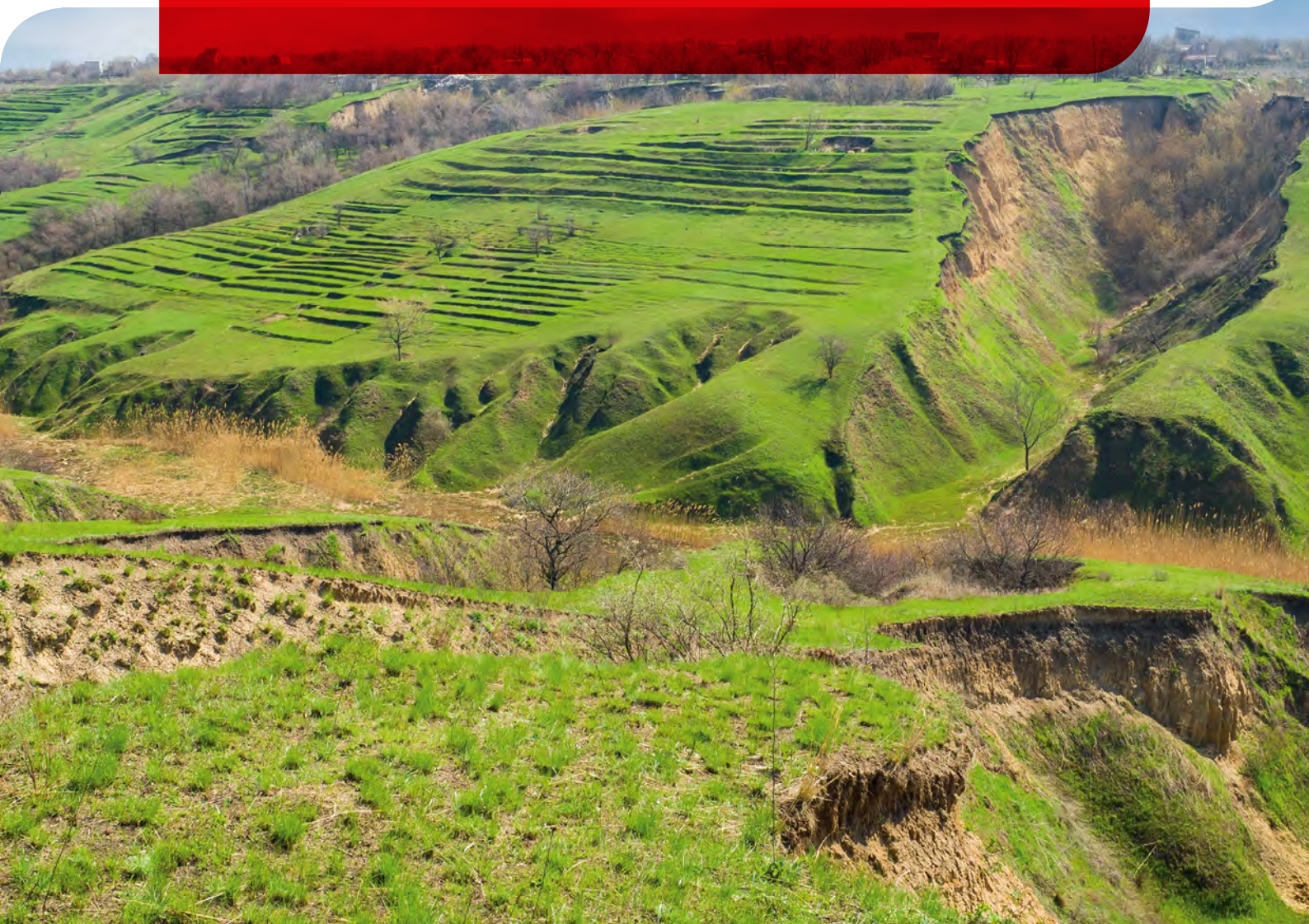


CHALLENGES

Environmental degradation is the deterioration of ecosystems through exhaustion of natural assets such as water, soil, and air, including habitat fragmentation, biodiversity loss, soil erosion, land degradation, vegetation disturbances, and environmental pollution.

Ecosystems are highly sensitive to changes in climate and their services play a key role in climate change adaptation solutions and disaster risk reduction management. Climate change and environmental degradation are an existential threat to European and world societies. The distinctive nature of the present environmental problems is that they are caused more by anthropogenic-driven climate change than by natural phenomena.

SOLUTION

Sustainable environmental management is essential to avoid the destruction or overuse of natural resources and to reduce pollution and prevent the continued degradation of nature, especially in the face of climate change.

Earth Observation (EO) data and services are valuable tools for assessing and understanding environmental relationships and exposure to present and future risks, making them a crucial tool for ecosystem sustainability. They can be used to identify structural constraints, inform modelling activities, and investigate development opportunities.

GMV has worked on several projects to integrate EO services into the decision making and design processes to help solve a range of problems for forestry. As climate finance becomes increasingly aware of the strengths and benefits of EO data, satellite observations are being used for an even greater range of problem-solving to help build climate resilience in many different contexts.

Eoclima is GMV's catalogue of climate-related geo-information products to facilitate the management of environmental resources by organizations involved in the process: NGOs, multilateral climate finance initiatives, International Financial Institutions (IFIs), and environmental and conservation agencies as well as national and local Governments.

Eoclima meets all currently existing geospatial data standards so, our geospatial products can be downloaded into and/or consumed by any geo-viewer through Open Geospatial Consortium (OGC) standard services.

Eoclima SUPPORT FOR CLIMATE POLICY

Eoclima products support the climate resilient pathways through the societal transformational process to achieve long-term emissions reductions and sustainable resilient development. This support is decoupled into main broad applications that lead to climate services tailored into products, here presented, and EO-derived parameters.

Application	Service	Product	Parameter

Climate risk management and adaptation	Climate risk assessment and monitoring	Climate adaptation and mitigation synergies
- Water resources management - Coastal risk management - **Ecosystem sustainability** - Forest condition assessment - Agriculture and food security - Livestock - Cities and urban areas	- Floods - Landslides - Soil erosion - Water scarcity - Wildfire - Extreme temperatures - Compound risks	- REDD+ / LULUCF - Sustainable forestry

Eoclima **ecosystem sustainability service** offers the following **products**:

The **Marine ecosystem health** product provides information on the factors that affect productivity, species diversity, and resilience to climate change of the marine ecosystem.

The **Land degradation neutrality** product provides a classification of potential degraded and not-degraded areas based on the analysis of trends in land cover, land productivity and carbon stocks following the UNCCD Good Practice Guideline on how to calculate SDG Indicator 15.3.1.

The **Soil erosion by water** product provides water-related soil erosion rates at annual intervals. It can be used to define the soil erosion potential, to track changes over time due to climate variability, to support intervention policies at country and regional level and to monitor rehabilitation measures.

The **Land cover dynamics** product 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 by the client.

The **Habitat fragmentation** product describes the emergence of discontinuities in an ecosystem. In many cases the presence of grey infrastructures causes population fragmentation and ecosystem decay, what is exacerbated by climate change.

The **Biodiversity loss** product provides the decline or disappearance of biological diversity by analyzing the intrinsic floral diversity of an ecosystem.

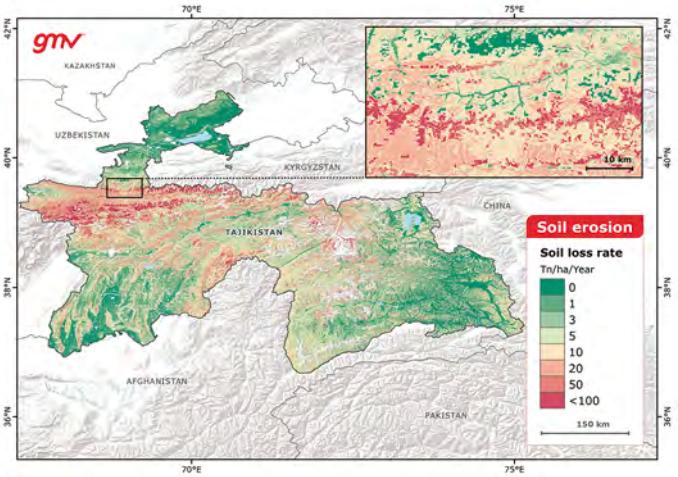
The **Vegetation disturbances** product provides information about the common disturbances that occurs in nature and significantly affects the dynamics of vegetation. This product comprises information on deforestation, fire, vegetation stress and biotic damage.

USE CASE: USING EARTH OBSERVATION TO MONITOR SOIL EROSION IN TAJIKISTAN'S RURAL ECOSYSTEMS

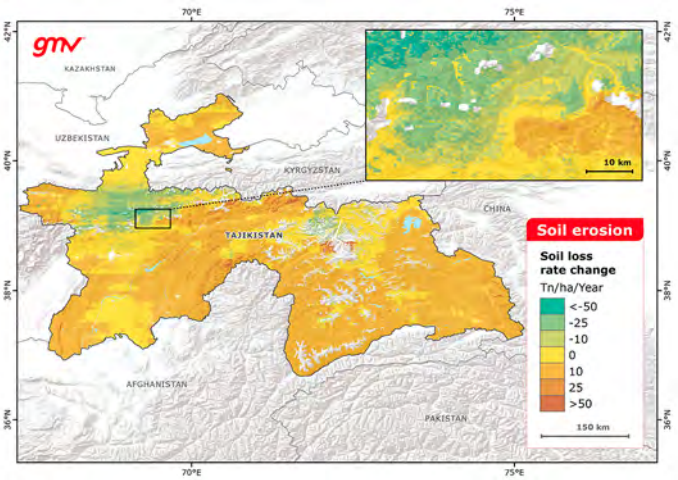
Tajikistan has a population of 9.314 million in 2020, of which 74 per cent live in rural areas. Agriculture (livestock and crops) contributes 20 per cent to the GDP and provides 61 percent of the employment of the mountainous Tajikistan. While Tajikistan has seen progress in reducing poverty, the country remains in 114th place in the Environmental Performance Index (EPI), with one-fifth of the population affected by food insecurity. With a quarter of Tajikistan's territory suitable for agriculture, soil erosion and land degradation represent a major threat to the natural (soil and water) resources the country needs to ensure sustainable food production. Overgrazing has contributed along the last decade to extensive land degradation, resulting in soil erosion and landslides, and a reduction in livestock productivity. In addition to the degradation of natural resources due to unsustainable agricultural practices, forests, rangelands, and other sensitive ecosystems are also under stress from climate change. Climate change, therefore, presents an additional threat to natural resources and may cause both further damage to forests and rangelands and shocks to the broader rural economy. In spite of these challenges, the International Fund for Agricultural Development (IFAD) is pursuing activities in Tajikistan aiming to restore damaged ecosystems and spur inclusive growth and drive poverty reduction among highly vulnerable, rural poor communities. In order to provide a comprehensive assessment of the magnitude of the soil erosion and land degradation in the country and to support the selection of effective soil conservation measures, quantitative data on the extent and rates of soil erosion was needed.

Earth Observation provides information on soil erosion trends by monitoring the annual soil loss rates over time. The water-related soil erosion can be estimated from satellite by assessing the main factors affecting the soil loss, i.e., rainfall erosivity, soil erodibility, topography, cover-management and supporting practices. Rainfall erosivity is driven by precipitation accumulation and intensity, soil erodibility depends on the soil composition, topography defines the slope gradients and the cover-management reflects the effect of cropping/rangelands practices and land management. The EO-based products provides evidence related to soil erosion condition that supports the priorization of catchment areas for landscape restoration and rehabilitation.

The **soil erosion product** allows you to monitor soil loss rates at national and municipality level, assess soil dynamics, understand land processes, land management policies, target landscape rehabilitation investments, to assess impact of restauration and mitigation measures, climate policy formulation, etc.



The top figure shows the **average soil erosion rate by water** in Tajikistan for the period 2016-2020 in a 100m grid map. The product maps soil loss rates in Tn/ha/year for Tajikistan using the RUSLE2015 model formulated by the European Soil Data Centre (ESCAC) and Earth Observation datasets including rainfall data from the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS), soil composition from SoilGrids, the NASA's Shuttle Radar Topography Mission (SRTM) digital elevation model, land cover classification from the Copernicus Climate Change service (C3S) and vegetation biophysical attributes (e.g. vegetation fraction cover) derived from Copernicus Global Land service data.



The bottom figure shows the **soil erosion rate change** in Tajikistan when comparing the average soil loss values obtained for the period 2001-2005 and values derived for the period 2000-2020. Mapping changes in soil erosion trends facilitates the assessment of the restauration activities and soil conservation practices taken in sustainable ecosystem management projects. Changing patterns resulting more erosion leads to more carbon release to atmosphere, which in turn means increase greenhouse gas emission. What is key for climate policy formulations.

The annual soil erosion rates as well as the decadal trends provided at different spatial aggregations (e.g. by catchment, by land use, by district, by region) are to be used by IFAD to support intervention policies in Tajikistan at country and regional level, to identify climate vulnerable pastoral communities and to analyse the landscapes degradation.

Remote Sensing
&
Geospatial Analytics

For more information on the products under this service and the parameters included contact us on eoclima@gmv.com!

A product by:

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