Eoclima
EARTH OBSERVATION FOR CLIMATE ACTION

gmv
INNOVATING SOLUTIONS

Eoclima for livestock

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 climate challenges faced by livestock**, and supports climate risk management and adaptation.

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ACCELERATE CLIMATE ACTION FOR ALL SDGs

CHALLENGES

Livestock grazing makes use of over 60% of the world's agricultural land, using highly variable and marginal rangelands for the production of high-density protein for nutrition. But pastoral systems produce also additional benefits: improving biodiversity, enhancing environments and providing the only possible source of livelihood for many, including in marginalized settings.

Intensive livestock farming creates a huge carbon footprint and has a very high global warming potential. However, extensive livestock production can be in carbon balance, with the carbon released equal to the amount that is absorbed. Light grazing by mobile livestock results in increased sequestration, while dispersed deposition of manure reduces GHG emissions. Many of the world's grazing areas are threatened with degradation, especially in semi-arid and sub-humid zones. As a result of overgrazing, climate change and policies favouring cropping, much of the best pastures are being exhausted and degraded over time.

SOLUTION

Sustainable livestock management is essential to avoid destruction of rangelands. Knowledge of rangelands environments offers many opportunities for climate mitigation when geared to local conditions.

Earth Observation (EO) services are valuable tools for assessing degradation, identifying restauration opportunities and understanding exposure to present and future risks, making them a crucial tool for livestock management. GMV has worked on several projects to integrate EO services into the decision making processes to help solve livestock challenges. As climate finance becomes increasingly aware of the strengths and benefits of EO data, they 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 **livestock** service offers the following **products**:

The **rangelands condition** product provides identification of rangelands and assessment of seasonal changes in the rangelands condition for a defined timespan. The product's methodology relies on the computation of well-established biophysical vegetation indicators, indexes of photosynthetic activity and vegetation water content indices as a proxy to assess the vegetation temporal evolution.

The **climate indicator for livestock** product provides information about historic, current and future environmental stress of livestock. This product includes provision of the temperature-humidity index that is applicable in moderate to hot conditions, the wind-chill index that serves as a rough guide for measuring cold stress, and the comprehensive climate index that is a hot and cold temperature index providing temperature adjusted by the effects of relative humidity, solar radiation and wind speed.

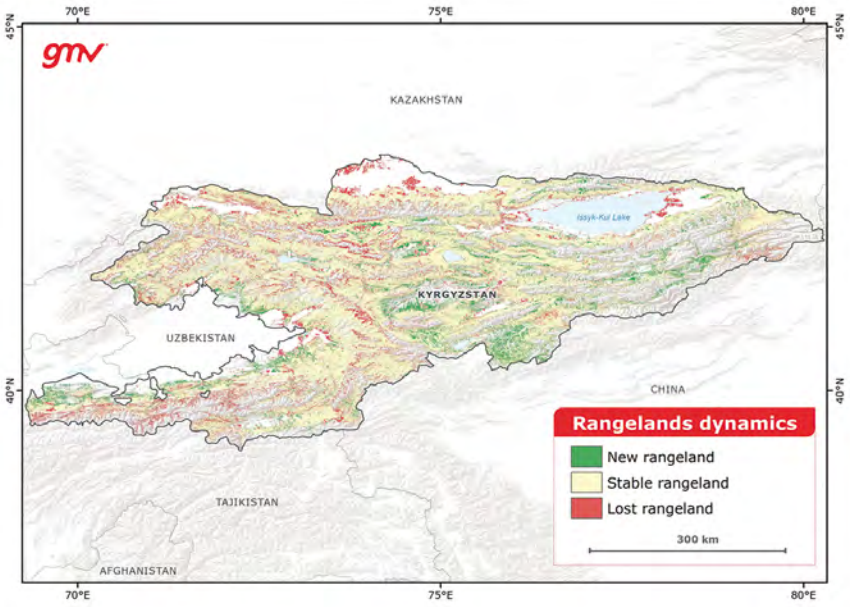
The **water availability** product provides time-series information on the occurrence and frequency of water bodies and their extent, and anomalies in the total water storage.

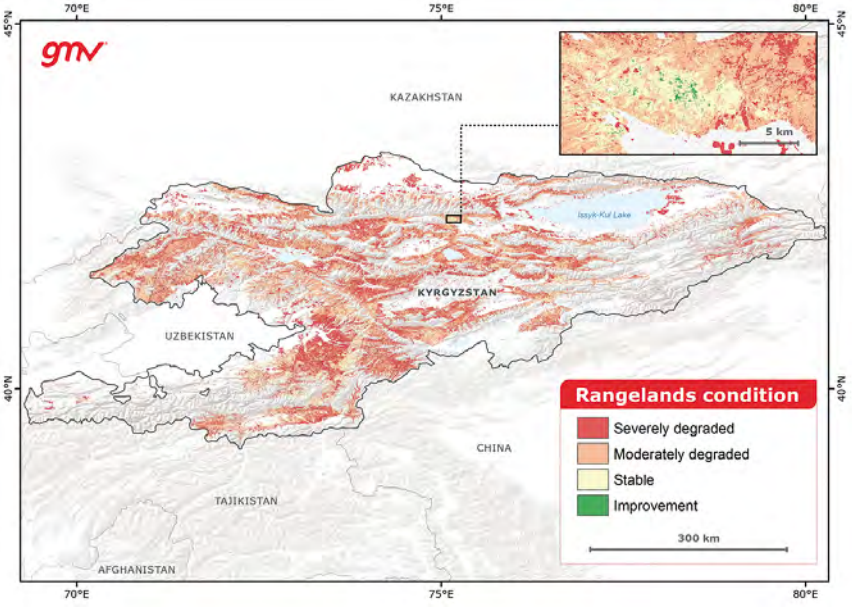
USE CASE: ASSESSING RANGELANDS CONDITION TO IDENTIFY PRIORITY AREAS FOR REHABILITATION IN KYRGYZSTAN

Rangelands ecosystems cover nearly half of Earths' surface and contain substantial amounts of soil organic carbon (see https://www.rangelandsdata.org/atlas/). The health and productivity of this land is essential for many rural communities, especially for those whose economy depends directly on pasture activities since these areas are grazed by livestock. In Central Asia (e.g., Kyrgyzstan, Tajikistan), the largest contiguous area of grazed land in the world, rangelands serve as an important source of livelihood for pastoral and agro-pastoral communities in the region. Soil carbon stocks are sensitive to management and land use changes: grazing, species composition, and mineral nutrient availability can lead to losses or gains of soil carbon. Unsustainable management of rangelands and climate change impacts have led to their increasing degradation by downgrading their potential agro-ecological, environmental and socio-economical roles and threatening the lifestyle of many rural people. Land degradation is indeed recognized as a main environmental problem that adversely depletes soil organic carbon stocks, which in turn directly affects soils, their fertility, productivity and overall quality.

There has been growing interest in the pastoral community in how changes in management might shift the net balance of these flows, stemming losses from degrading pastures or managing systems to increase soil carbon stocks (i.e., carbon sequestration). The International Fund for Agricultural Development (IFAD) is addressing the identification of the most degraded areas and exploring restoration and rehabilitation measures that land managers can adopt to invert the deterioration dynamic and enhance the sustainable management of rangelands at national level.

Earth Observation provides information on pastures degradation by assessing the changes of palatable species' health in rangelands over the last decades. This information is used to evaluate the impact of rangelands on the depletion of soil organic carbon stocks allowing to predict the impacts of land management on the carbon losses to the atmosphere and associated global warming. The ultimate goal being to reduce poverty and enhance economic growth in pasture communities from Central Asia by improving livestock productivity and climate resilience – and thereby promoting equitable returns to livestock farmers.





The **rangelands dynamics** product allows you to assess pasture maps at municipality level, understand land processes, land management policies, target landscape rehabilitation investments, etc.

Based on a map of Land Use Land Cover for Kyrgyzstan from the Food and Agriculture Organization (FAO) optimized with information from the pastoral community, a rangeland map was derived and used to identify land use changes in rangelands for different years using an AI-based model fed with satellite optical imagery. Rangeland areas converted into croplands, bare soils or settlements are classified as lost rangelands in the trend map.

The **rangelands condition** product allows you to monitor rangeland trends over time, to determine current rangelands condition, to identify restauration opportunities, to assess success of restauration measures, to design rehabilitation investments, to update Nationally determined contributions (NDCs) for climate policy formulation, to promote advocay and lobbying on rangelands, etc.

Changes in pastures condition in Kyrgyzstan over the period 2000-2020, in this case for the summer season, developed using a weighted composite of multiple satellite-based indexes, Land Use / Land Cover (LULC) map, digital elevation model, Intergovernmental Panel on Climate Change (IPCC) guidelines for grasslands degradation, and integrating the local knowledge on grazing practices of the pastoral community on grazing seasonal periods, max slopes of rangelands grazed by livestock and grazing altitudes per season for each district.

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:

Product info at ***Eoclima*** web
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