Eoclima

EARTH OBSERVATION FOR CLIMATE ACTION

Eoclima for water resources monitoring

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 water resources monitoring challenges and supports climate risk management and adaptation.

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CHALLENGES

Wetlands as broadly defined by the Ramsar Convention on Wetlands, includes among others types, all lakes and rivers, swamps and marshes, and wet grasslands. Wetlands are indispensable for the countless benefits or "ecosystem services" that they provide to humanity, ranging from freshwater supply, food and building materials, and biodiversity, to flood control, groundwater recharge, and climate change mitigation. Yet study after study demonstrates that, in the scope of the global climate change, wetland extent and quality increasingly continue to decline in large parts of the world. As a result, the ecosystem services that wetlands provide to people are seriously compromised.

SOLUTION

We must restore wetlands for climate, biodiversity and SDGs. Information on the extent and morphology of wetlands is essential for basin and ecosystem management, guide targeted restoration efforts and to evaluate their effectiveness. The impact of a changing climate on the functioning of monitored wetlands can be assessed quantitatively by a time-series mapping and monitoring Earth Observation service. This service provides the foundation for the identification and delineation of wetlands, assessing their conditions and functions, and determining trends over time.
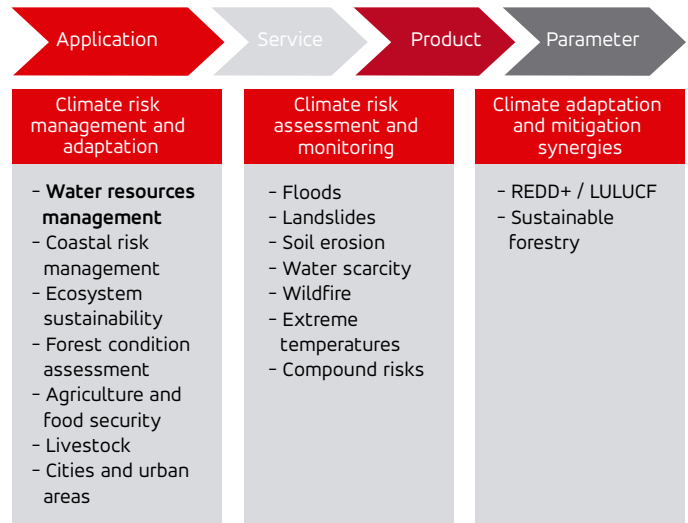
GMV has worked on several projects to integrate EO services into the decision making and design processes to help solve a range of problems for water resources management. As climate finance becomes increasingly aware of the strengths and benefits of EO data, they are being used for an even greater range 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 **water resources management** service offers the following **products**:

The **flooding** product is 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 Representative Concentration Pathway (RCP) scenarios.

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.

The **meteorological and hydrological drought** product 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 indexes.

The **wetlands and lakes health** product 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.

## USE CASE: MONITORING WETLANDS OCCURRENCE AND HEALTH FOR CLIMATE RESILIENCE ACTIONS IN LESOTHO

From flood protection and erosion control to water purification, Lesotho's wetlands provide an array of ecosystem services that enable the landlocked country to reduce risks to communities and safeguard a resource that is of paramount importance, socially and economically, to both Lesotho and South Africa. However, wetlands in Lesotho have come under increasing pressure due to a combination of human and climatic factors (e.g. drought, soil erosion). Recognising this, the International Fund for Agricultural Development (IFAD) launched a programme to promote the adoption of transformational land management practices among Lesotho's rural communities, with the ultimate goal of realising the following ambitions: 1) healthy and regenerated landscapes, and 2) rural livelihoods that are sustainable and prosperous. The persistent gaps in the availability of quality and timely data about Lesotho's wetlands can be overcome with Earth Observation that facilitates the identification of wetlands and assessment of trends in the overall area of wetlands in the country. The **'Wetlands and lakes health'** product is employed to respond to this need, presenting wetland occurrence and productivity trends for catchments and (sub-)catchments across Lesotho. These products enable IFAD and IFAD's beneficiaries to possess clear evidence regarding climate-driven trends in wetlands extent and productivity and hot spots of severe wetland degradation.
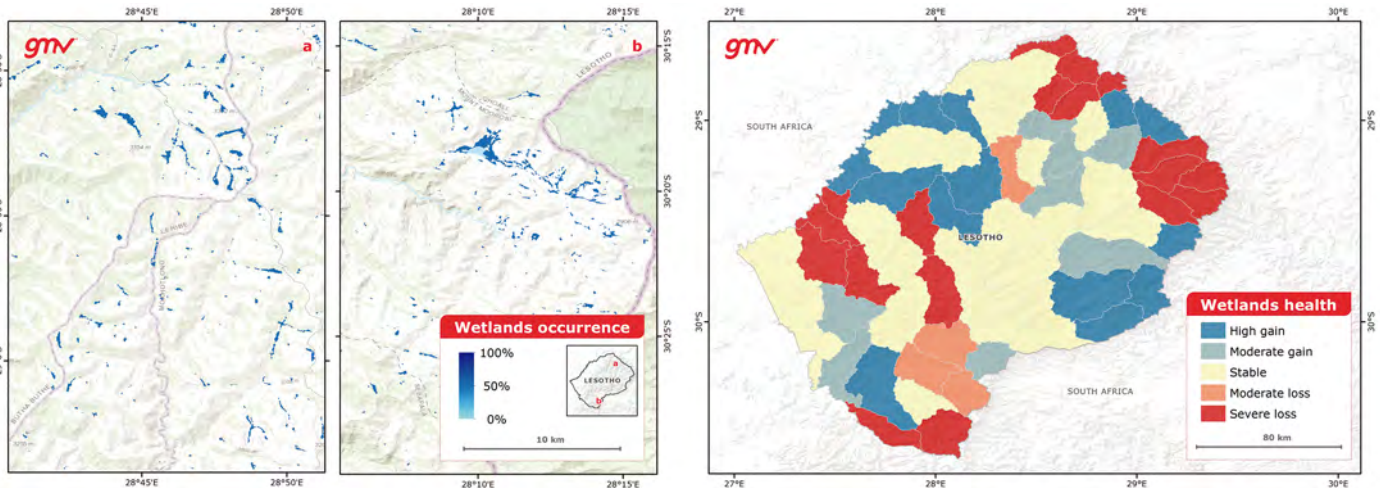
(left) Wetlands occurrence (2017–2019), (right) Wetlands condition changes aggregated per sub-catchment (2017–2019)

Long-term patterns in wetland condition were assessed by using maps that depict the evolution of permanent and temporary wetlands at the sub-catchment level. These maps were generated using 20m resolution satellite optical imagery covering the period 2017 to 2019. This comprised four key elements: country-level wetland recurrence, changes in wetland area extent, changes in temporary and permanent wetland areas, and analysis of precipitation-driven wetland changes. The results show that 41 per cent of sub-catchments are stable, 43 per cent are experiencing a loss of wetland area, and only 16 per cent gaining area, with almost a quarter of all sub-catchments (24 per cent) experiencing a severe loss of wetland area, providing evidence-based target areas for IFAD and benefitiaries to promote the adoption of transformational land management practices among Lesotho's rural communities.

Finally, monthly precipitation and wetland area are strongly coupled, indicating that any forecast precipitation deficits are likely to precipitate a deterioration in wetland health. Whilst climate is a significant driver of wetland change, human activity is also an important trigger.
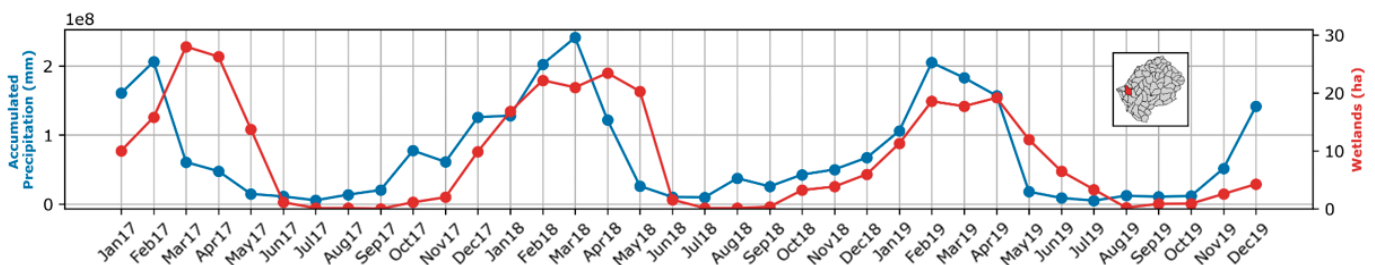
Monthly precipitation (blue) and evolution of wetlands area (red) for a sample sub-catchment with severe loss of area

Using GMV EO-based products IFAD can **assess where wetlands are least resilient to climate variability** and where **communities** are most **at risk** as a consequence. This helps IFAD and its beneficiaries to target transformative resilience interventions that improve land and wetland management for the benefit of generations to come.

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: