VALIDATED LOCAL RISK ACTIONABLE DATA FOR ADAPTATION

CHAMPION STORY #2
MARCH 2026

Supporting Climate Change Risk Management in the Molise Region, Italy

The Challenge

The Molise region is located in central-southern Italy and is the country's second smallest region, covering an area of just 4.438 km^2. Occupying a transitional position between the limestone massifs of the Abruzzo Apennines and the flat plains of Puglia, it combines mountainous and hilly landscapes, which account for 55,3% and 44,7% of its surface area, respectively. Despite its limited size, Molise boasts a variety of natural environments, ranging from the 35-kilometre-long Adriatic coastline to the 2.184-metre-high peaks of the Mainarde chain. The region is home to 289.840 inhabitants (ISTAT, 2022), a figure which has steadily declined over the past decade.

With a population density of 64,8 inhabitants per km^2, it is one of the least densely populated regions in Italy. Its demographic structure reflects significant spatial and social imbalances: approximately one-third of the population resides in the three largest municipalities - Campobasso (47.075 inhabitants), Termoli (32.235 inhabitants) and Isernia (20.617 inhabitants) - while the remainder is scattered across 133 smaller municipalities, many of which are facing issues of ageing, depopulation and economic stagnation. Agriculture has traditionally been a cornerstone of Molise's economy and identity, shaping its landscapes and local livelihoods. The region is particularly renowned for its cereal cultivation, especially durum wheat, which accounts for nearly 40% of the total Utilised Agricultural Area (UAA). While the agricultural sector's contribution to the regional economy is limited, it is vital for local employment, food production and land management. It is also particularly sensitive to changes in climate conditions.

Figure 1 Location of Molise Region, Italy

Climate change poses significant and multifaceted challenges for Molise, primarily driven by increasing temperatures, reduced and more variable precipitation, and growing hydro-climatic extremes. Rising temperatures and a progressive reduction in average precipitation, combined with increased variability, are intensifying drought conditions and reducing the availability of surface and groundwater resources. These trends are already affecting the agricultural and livestock sectors by contributing to soil degradation, increased wildfire risk, and pressures on ecosystems and biodiversity, particularly in inland and rural areas. At the same time, the region is increasingly exposed to extreme precipitation events concentrated over short periods, which exacerbate runoff, soil erosion, landslides, and localised flooding in a territory characterised by widespread hydrogeological fragility.

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The Adriatic coastal zone is subject to further threats in the form of rising sea levels and extreme weather events, resulting in coastal erosion, saltwater intrusion, and damage to infrastructure and settlements. At the same time, social vulnerability exacerbates the region's exposure to climate risks.

An ageing population, combined with youth migration and low population density, reduces the region's ability to adapt, leaving rural areas particularly vulnerable to climate-related impacts. Within the VALORADA project, these dynamics were reflected using Climate Impact Chains that link hazards (e.g. drought, extreme precipitation, sea-level rise) to sectoral exposure (agriculture, infrastructure, forests, coastal systems) and underlying socio-economic vulnerabilities, clarifying the main regional risk pathways. For Molise, the relevant CIC was the "Floods & Rural Livelihoods[1]" which maps the impact chain from "increasing intensity, frequency and duration of rainfall" (the hazard) to the "hydrogeologic affectation on rural livelihoods, rural infrastructure and agricultural means of production" (the risk).

SDG 13: Climate Action calls for urgent action to combat climate change and its impacts by strengthening resilience and adaptive capacity worldwide. It emphasizes the integration of climate measures into national policies, strategies, and planning (Target 13.2), and the need to improve education, awareness, and institutional capacity for climate change mitigation, adaptation, and early warning (Target 13.3).

How can VALORADA help ?

Against this backdrop, and in the face of mounting climate-related challenges impacting its agriculture, ecosystems, inland and coastal regions, through the VALORADA project, the Molise Region and the Euro-Mediterranean Centre on Climate Change (CMCC) are collaborating to develop the VALORADA climate indicators, co-creating services and geographic information tools that can promote more effective climate adaptation.

These indicators are designed to enhance understanding of local vulnerabilities and inform adaptation planning. The resulting VALORADA dashboard for Molise provides a comprehensive and user-friendly overview of the region's climate and vulnerability indicators. It brings together two main types of information. The first type comprises a variety of climate indicators obtained directly from the Climate Data Store, including mean temperature, number of tropical nights, days of extreme precipitation, extreme wind events and flood occurrence. These indicators provide an essential overview of evolving climate patterns and hazards across Molise's mountainous interior and coastal lowlands.

The second group of indicators was specifically requested and co-designed by the Molise regional administration to address local adaptation priorities and data needs. These include the number of people living in flood-prone areas, the number of critical infrastructures exposed to flood risks, the proportion of the region covered by flood risk areas and the impact of water scarcity, wildfires or flooding on the local economy and livelihoods.

Other indicators focus on environmental and land use, such as soil degradation and desertification, vulnerable agricultural crops, forest ecosystem composition (including mixed and total forest area), protected natural areas, agricultural land and crop water needs. Together, these indicators provide an integrated picture of Molise's exposure, sensitivity and adaptive capacity, connecting climatic data with the region's social, economic and ecological realities.

[1] https://valorada.github.io/documentation/climate-impact-chains/chain-5-floods-rural-livelihoods/

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The selection process was followed by identifying the local data sources necessary for calculating these indicators. This involved collecting and formatting a wide range of non-climate spatial datasets, including demographic, agricultural and infrastructural information. However, challenges were encountered during this phase, such as restrictions on data access and inconsistencies with INSPIRE compliance standards. To complement the local data, climate projections were obtained from the Copernicus Climate Data Store to ensure a consistent, scientifically robust basis for understanding current and future climatic trends.

The VALORADA dashboard integrates data from multiple sources, including CORINE Land Cover (CLC) open data, local and regional datasets (statistical information, national datasets, agricultural census), and European sources such as the Copernicus Climate Data Store or Natura2000 and the CDDA. By consolidating these diverse data streams, the dashboard becomes a practical tool for the Molise administration and local stakeholders. It supports the region's efforts to identify emerging risks, prioritise adaptation measures and monitor progress in reducing vulnerability over time. Most importantly, it transforms scientific and statistical information into actionable insights, helping decision-makers to strengthen the resilience of the agricultural sector, protect critical infrastructure and preserve the natural assets that underpin the region's economy and identity. The dashboard is structured to allow users to move from climate trend analysis to thematic risk dashboards (e.g. flooding, agriculture, forests), supporting a stepwise assessment from hazard evolution to territorial exposure. Interactive maps, summary panels and time-series visualisation enable comparison across time horizons and facilitate diagnostic analysis for planning and prioritisation.

Figure 1 Welcome page of the platform for Molise region

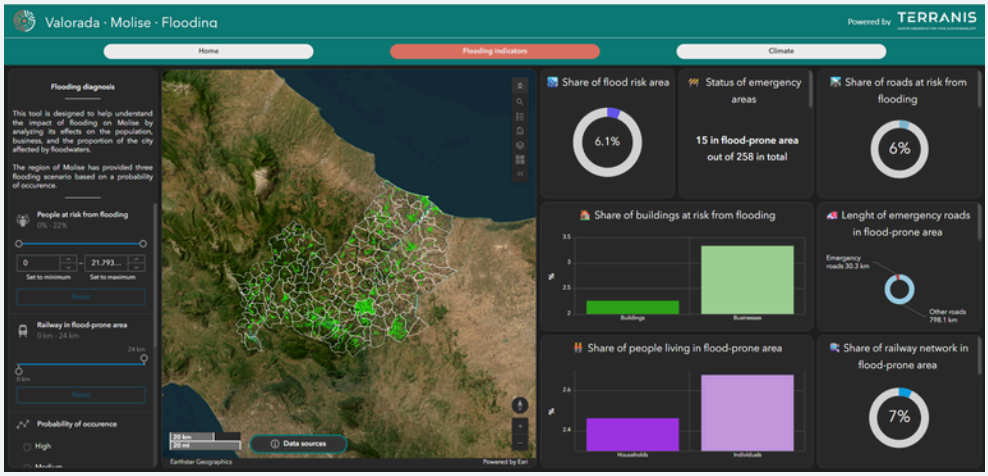

Figure 2 Platform for Molise region

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Who is concerned?

The Regional Administration of Molise is the primary public authority responsible for coordinating and implementing climate adaptation policies throughout the region. Acting as the interface between the European, national and local levels of governance, the Regional Administration plays a central role in translating policy frameworks into territorial strategies that address the specific vulnerabilities of Molise's mountainous, agricultural and coastal landscapes. Within Italy's national climate adaptation system, regions hold a legally recognised strategic position. The National Strategy for Adaptation to Climate Change (SNAC), adopted by the Italian Ministry for the Environment, Land and Sea in 2015, and the forthcoming National Adaptation Plan (PNACC) establish the framework for assessing climate risks and planning adaptation measures. Regional governments, including that of Molise, are responsible for integrating these objectives into their Regional Environmental and Energy Plans, territorial and civil protection strategies, and rural development programmes. This ensures that adaptation is treated as a cross-cutting objective embedded in land management, infrastructure planning, water resource management, agriculture and biodiversity protection, rather than a separate policy. In 2022, the Molise Region adopted the Regional Strategy for Adaptation to Climate Change (SRACC) (Regional Council Resolution No. 444 of 29 November 2022), aligning with EU and national climate policies. The SRACC provides a comprehensive reference framework for regional sectors, administrations, and organizations, supporting the assessment of climate change impacts and guiding sectoral and territorial policies and strategies aimed at enhancing regional resilience.

At the European level, these responsibilities are reinforced by the EU Strategy on Adaptation to Climate Change (2021) and the European Climate Law (Regulation (EU) 2021/1119), which require Member States to develop coherent strategies to build resilience by 2050. Regions such as Molise contribute to this effort by generating and reporting climate-related data, supporting implementation at a local level and ensuring consistency with EU principles on sustainability, the circular economy and territorial cohesion. Reporting obligations under Regulation (EU) 2018/1999 on the governance of the Energy Union and Climate Action further highlight the regional role in providing data on adaptation progress and climate impacts. This data feeds into national and European monitoring mechanisms coordinated by the European Environment Agency (EEA). For the Molise Region, these governance responsibilities translate into practical actions across several domains. The regional administration coordinates risk assessments for key sectors such as agriculture, forestry, water management and coastal protection. This ensures that adaptation measures are evidence-based and aligned with regional development objectives. It also supports local municipalities in preparing civil protection and emergency response plans to address extreme weather events such as floods and wildfires.

Furthermore, by collaborating with research institutions such as the Euro-Mediterranean Centre on Climate Change (CMCC) and initiatives like VALORADA, the regional administration strengthens its technical and scientific capabilities, enabling it to incorporate data-driven insights into policy and planning. In the context of Molise's specific climate challenges, the regional administration plays a decisive coordinating role. In response to rising temperatures and drought, it promotes water efficiency, sustainable land use and agricultural diversification to bolster the resilience of rural economies.

[3] https://www.europarl.europa.eu/RegData/etudes/BRIE/2025/772858/EPRS_BRI(2025)772858_EN.pdf

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In the face of the risk of wildfires, it collaborates with forestry and civil protection authorities to implement prevention and monitoring measures. To counter soil erosion and desertification, it supports sustainable farming practices and reforestation initiatives. Along the Adriatic coastline, the administration plans and manages coastal defence and adaptation strategies to protect both ecosystems and human settlements from sea level rise and extreme events. In a region characterised by social vulnerability and demographic decline, the administration also plays a social role, integrating adaptation measures with policies that sustain rural livelihoods, retain younger generations and enhance community resilience. Through these responsibilities, Molise acts as a policy leader and facilitator of collaboration, ensuring adaptation is a shared commitment across institutions and communities. It plays an essential role in translating the knowledge generated through initiatives such as VALORADA into concrete action, building a more resilient, informed and sustainable future for the region and its people.

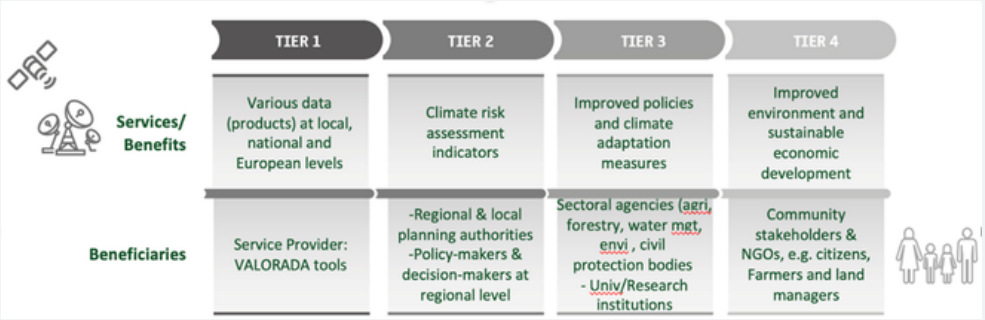

Figure 3 Value chain of the demonstrator

What are the benefits?

Using the VALORADA tools generates a wide range of scientific, regulatory, societal, economic and environmental benefits, strengthening the capacity and required insights for climate adaptation across Molise region. By combining validated EO inputs with stakeholder-driven indicators and accessible dashboards, the tools improve the availability and usability of climate risk information. This supports more informed decision-making, more efficient governance processes and more climate-resilient regional development. The following are the key benefits:

Regulatory

- Supports better regulations by enabling evidence-based policy design (Primary user: authorities)
- Supports improved monitoring through visualisation of flood, land, forest and social indicators (Primary user: authorities)
- Supports improved reporting via easier access to consolidated data (Primary user: authorities)
- Raises awareness of climate risks among stakeholders and the public (General public, communities)
- Supports policy evaluation by providing data to evaluate policy outcomes (Primary user: authorities)
- Strengthens accountability/transparency through EO-based visualisation (Primary user: authorities; General public)

Economic

- Efficiency gains (time/material saved) by improving availability and usability of climate data (Primary user: authorities)

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Societal

- Supports civil security by providing risk awareness (Secondary beneficiary: communities)
- Supports public awareness through accessible dashboards (General public, communities)
- Supports community & quality of life indirectly through resilience awareness (Secondary beneficiary: communities)
- Improves oversight/coordination via shared data and a common operational picture (Primary user: authorities)

Environmental

- No direct environmental benefits evidenced (pollution, biodiversity, resource depletion) as the tool informs decisions but does not directly change environmental outcomes

Innovative/entrepreunarial

- No evidence of changed business practice linked to the platform (limited impact; mainly supports planning awareness)
- No evidence of start-up creation or patents linked to the platform

Scientific

- Supports academic publication(s) linked to the service actors; Service provider: CMCC/VALORADA
- Supports improved understanding by contributing data/insight for publication(s) (Primary user: authorities; Secondary beneficiary: communities)

Extended impact

The Molise demonstrator shows strong potential for replication and long-term sustainability. This approach could be adopted in other Italian regions that are experiencing similar climate pressures, such as Abruzzo, Basilicata and Apulia. It could also be implemented in Mediterranean areas such as Sardinia, Sicily, Greece and the Western Balkans, where rising temperatures, drought, wildfires and coastal flooding are shared challenges. It also aligns with the EU Mission on Adaptation to Climate Change, making it relevant for other European regions with comparable agricultural and coastal vulnerability profiles. Institutionally, the methodology and dashboard could support Italy's regional and national adaptation frameworks, complementing the National Adaptation Plan (PNACC) and informing the work of bodies such as the Ministry for the Environment and Energy Security (MASE), the Ministry of Agriculture, and the Department of Civil Protection. The Molise regional administration can use the tool to inform spatial planning, water management, and rural development policies, while local authorities can use the indicators to inform flood prevention and land management policies. The results may also benefit private operators, research institutions and civil society organisations by providing them with access to localised climate risk data for planning, research and community resilience purposes. Technically, the dashboard's open architecture and Copernicus-based data make some of the indicators easily replicable and sustainable.

Contact us

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