Policy Brief

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Integrating Multi-Hazard Risk Management Approach into Key EU Policies

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Executive Summary & Recommendations

Urgent action is needed to address accelerating climate risk drivers and cater for cross-border, cascading and compound climate risks (EEA, 2024), yet policy preparedness is lagging in the EU and in Member States. How can policy-makers, practitioners and authorities, from the local to the Union's level take action now and include compounding hazards, risk cascades, and wildcard events into climate risk assessments?

This policy brief tries to answer this crucial question and advise policy-makers on how to include the following recommendations into their thinking :

- Embed systemic multi-hazard risk assessments in all major EU climate and disaster-related strategies, using among others MYRIAD-EU methods and tools as reference implementations.
- Prioritise regional (climate) risk hotspots and place-based pathways, drawing on MYRIAD-EU Pilot Studies as templates and inspiration for hotspot-specific, co-created solutions.
- Improve inter-state and multi-sectoral integration through common scenarios, harmonised multi-hazard indicators (including non-economic losses), and better data interoperability, building on MYRIAD-EU's outputs.
- Strengthen citizen engagement and disaster-risk intelligence by investing in impact-based early warning, civil-protection training, Earth Observation, and digital twins that can host and operationalise MYRIAD-EU outputs and support multi-hazard literacy.

This policy brief explains how the approach developed within MYRIAD-EU can contribute to the implementation of existing EU policies and support the development of future-proof European policies, to enhance the European Union's capacity to manage complex, interconnected, multi-hazard, and systemic risks.

Policy Brief: Reducing Risks Together: Integrating MYRIAD-EU's Systemic Risk Management into Key EU Policies

Context:

Europe is increasingly exposed to severe climate-related natural hazards— e.g. floods, wildfires, droughts, storms, and heatwaves— their intensity and frequency are influenced by climate change and environmental degradation. Moreover, Europe faces non-climate related hazards, such as earthquakes and volcanic eruptions. These events are associated with rising economic losses, infrastructure breakdowns, and social disruptions across member states. Traditional risk assessments, which focus on isolated hazards, fail to capture the interdependencies and cascading effects among sectors such as food and agriculture, energy, infrastructure and transport, finance, ecosystems and forestry, or tourism.

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The MYRIAD-EU project is designed to catalyse the paradigm shift required to move towards a multi-risk, multi-sector, systemic approach to risk assessment and management to address the aforementioned challenges. To achieve this, we co-developed tools, methods, and knowledge to enhance our ability to carry out such multi-hazard-risk assessments, as well as developing forward-looking DRM pathways in five Pilot EU regions: Danube, Scandinavia, North Sea, Veneto, and Canary Islands. Within these Pilots, we assessed trade-offs and synergies of various strategies across sectors (energy, ecosystems & forestry, finance, food & agriculture, tourism, and transport & infrastructure), hazards, scales, and regions.

Some of the main outputs and tools from the MYRIAD-EU project include:

- **Handbook of Multi-Hazard, Multi-Risk Definitions and Concepts:** handbook providing a consistent set of terms and definitions for multi-hazard and multi-risk concepts

- **Disaster Risk Gateway:** an open-access and publicly editable wiki for the discovery and sharing of multi-hazard risk approaches and resources. It contains: (1) a catalogue of examples of frameworks, platforms, methods, and tools; (2) definitions related to multi-hazard and multi-risk terminology and concepts; and (3) a list of resources signposting users to relevant multi-hazard risk information, projects, and initiatives.

- **MYRIAD-EU Framework:** a harmonised six-step framework for multi-hazard, multi-sector, and systemic risk management.

- **MYRIAD-EU Dashboard:** online dashboard that provides different tools and methods developed in MYRIAD-EU that can support the execution of each step of the aforementioned MYRIAD-EU Framework.

- **Metadatabase for Dynamics of Risk Drivers:** online catalogue of data, algorithms, and methods to empirically assess the dynamics and feedback of risk drivers.

- **VulneraCity:** a database of unique urban vulnerability drivers for six different hazards (coastal flooding, pluvial flooding, earthquakes, heatwaves, drought, waterborne diseases), providing descriptions, classifications, and sources.

- **MYRIAD-EU Multi-Risk Toolkit:** software for multi-hazard risk assessment, containing the Vulnerability Curve Explorer; Exposure at Risk Explorer; Multi-Risk Vulnerability Index; Multi-Hazard Scenario Calculator and Decision Support System; Multi-Hazard Scenario Showcase; and Multi-Risk and Resiliency Observatory.

- **MYRIAD-Hazard Event Set Algorithm (MYRIAD-HESA):** an algorithm that compiles single-hazard footprints into multi-hazard event sets based on their spatial and temporal overlap, and an accompanying global dataset of past multi-hazard event footprints.

- **MYRIAD-Stochastic vIne-copula Model (MYRIAD-HIS):** a multi-hazard weather generator that simulates potential combinations of extreme climate events while preserving their spatial and temporal dependencies.

- **Dynamic Adaptive Policy Pathways-Multi Risk (DAPP-MR):** an approach for developing forwards-looking DRM pathways, tested in Pilot regions across Europe.

- **Storyline Repository:** a set of multi-risk storylines visualising examples of the multi-hazards faced and the factors influencing the impacts of multi-hazard events in five regions.

- **Bridging the Silos Game:** an online multi-player serious game designed to support various stakeholders (including policy makers, risk managers, researchers) in understanding and managing the complexities of DRR measures in a multi-risk environment.

- **AI for Ecological Status:** an AI-based framework links climate and land use to key water quality indicators, supporting the implementation of the Water Framework Directive in the Veneto region.

- **Integrating AI and climate change scenarios for coastal multi-risk assessment:** a two-tier Machine Learning approach to estimate risks associated with extreme weather events for the Veneto coastal municipalities under current and future scenarios.

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- **AI for the prioritisation of coastal risks and adaptation strategies:** COAST-AId, a custom Large Language Model, designed to facilitate the analysis and synthesis of diverse information relevant for climate risk assessment and management along the Veneto coast. The tool facilitates the application of the risk assessment framework proposed in the European Climate Risk Assessment (EUCRA) analysing the specific climate risk challenges of this region.

How does MYRIAD-EU relate to EU policy?

Over four years, the MYRIAD-EU project engaged with policy-makers, decision-makers, public authorities, private and public sectors representatives, academia, and practitioners at local and national level to enable them to develop forward-looking disaster risk management pathways that assess trade-offs and synergies across sectors, hazards and scales across five Pilot regions. This continuous outreach and engagement has already borne fruit and opened avenues for collaboration, from the establishment of new partnerships with sibling projects to the uptake of tools and methods by municipalities or sectoral industries.

The close relation between science and policy has been integral to the project's advancement. The five challenges in assessing and managing multi-hazard risks identified during the project through stakeholder workshops all relate to either EU policy objectives or gaps, namely: (1) governance; (2) knowledge of multi-hazards and multi-risks; (3) existing approaches to disaster risk management; (4) translation of science to policy and practice; and (5) lack of data (Šakić Trogrlić et al., 2024).

Looking at an innovative project such as MYRIAD-EU, one can wonder: if novel ways to assess and manage disaster risk were explored in the project, is the policy landscape already in place adapted to the uptake and mainstreaming of the project's approach?

Well, yes and no. To a certain extent , the existing EU policy framework is already fit to support its uptake: there is no need to reinvent the wheel. Mainstreaming MYRIAD-EU into EU policy can piggyback on ongoing efforts to bridge silos and build on synergies between policy areas, especially in the fields of disaster risk reduction and climate change adaptation. As complex as the problems the MYRIAD-EU project dealt with are, integrating a multi-risk, multi-sector, and systemic approach to risk assessment and management in EU policies aligns seamlessly with the 'all-hazards approach' of the EU Preparedness Union Strategy. The completion of the project therefore aligns with the undergoing development of novel policies and legislation representing an unprecedented opportunity to truly include a multi-hazard, multi-risk approach to disaster risk assessment and management into EU policies.

How can MYRIAD-EU benefit policy design and implementation?

The first European Climate Risk Assessment published by the European Environment Agency in March 2024 (EEA, 2024) clearly underscored the need for urgent action to address accelerating climate risk drivers and cater for cross-border, cascading and compound climate risks (EEA, 2024). Ringing the alarm, the report also stressed the lagging policy preparedness in the EU and in Member States – if urgent steps are not taken, consequences could be dramatic, to say the least. This flagship report provided policy-makers, practitioners and authorities, from the local to the Union's level, with clear impetus to include compounding hazards, risk cascades, and wildcard events into climate risk assessments – **but how?**

This is where MYRIAD-EU comes into play, providing interested parties with timely research to understand multi-hazard, multi- risk dynamics, or a detailed six-steps framework to order and structure complexity to harmonise multi-hazard, multi-risk assessment and management.

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Key EU policies and their connection with MYRIAD-EU

- **DRR Policies**

The MYRIAD-EU project, with its harmonised MYRIAD-EU Framework and Dashboard, is designed to inform and enhance disaster preparedness and response, addressing cascading risks and cross-border impacts, directly relates to the number of EU policies aiming at assessing and managing disaster risk in the EU, and has, on a number of occasions, explored how to integrate its findings into flagship initiatives. A policy workshop held in 2024 explored how MYRIAD-EU can contribute to achieving the Disaster Resilience Goals, introduced in 2023, and in particular the first three goals (Anticipate, Prepare and Alert). The numerous tools and methods on risk dynamics developed within MYRIAD-EU (e.g. MYRIAD-EU Multi-Risk Toolkit, VulneraCity, DAPP-MR, MYRIAD-HIS, MYRIAD-HESA, Storyline Repository, Bridging the Silos Game) are already feeding into the EU Civil Protection Mechanism (UCPM) through its Knowledge Network.

MYRIAD-EU's findings can contribute to operationalise the first two pillars of the EU Preparedness Union Strategy, adopted in March 2025 and integrating an all-hazards, whole-of-society and whole-of-government approach. The first two pillars of this Strategy, dealing with foresight and anticipation and resilience of vital societal functions, could benefit from MYRIAD-EU tools, datasets and software, which might facilitate the development of a Comprehensive EU Risks and Threats assessment in the near future.

Further collaboration between MYRIAD-EU partners, the UCPM Knowledge Network, and the Joint Research Centre to translate project tools into training materials, guidance and operational platforms for civil-protection authorities could support impact-based early-warning and enhanced climate-risk literacy by making MYRIAD-EU datasets, models and visualisations accessible to citizens and local authorities through trusted, multilingual digital platforms.

- **Climate and environmental policies**

There is significant potential in considering and integrating the outcomes of MYRIAD-EU into climate and environmental policies in the EU. There are evident links with climate policies, such as the EU Strategy on Adaptation to Climate Change, or with historic legislation underpinning efforts to maintain water ecosystems' environmental status and manage flood risks, namely the Water Framework Directive and the Floods Directive.

MYRIAD-EU can support these directives by introducing methodologies to evaluate multi-hazard interactions, refining risk maps, and improving spatial planning, as explored within the project's Veneto Pilot Study (AI for Ecological Status). National and EU-level climate adaptation plans increasingly require comprehensive, multi-hazard assessments, to which MYRIAD-EU could directly contribute by developing forward-looking pathways that help policymakers integrate multi-sector perspectives into adaptation planning. Moreover, MYRIAD-EU can support the implementation of nature policies, such as the historic Habitats Directive, or the recently adopted Nature Restoration Law, which drives Europe's transition toward a sustainable economy by protecting ecosystems, such as wetlands ecosystems, that naturally buffer water-related hazards. This transversal approach, from ecosystems conservation to water-resilience and disaster risk reduction, is particularly salient in the EU Water Resilience Strategy, which promotes sustainable water management and preparedness for floods and droughts through green infrastructure, improving the water retention function of the soil and integrated river basin approaches.

- **Cohesion Policy and regional development**

The MYRIAD-EU project directly supports the EU Cohesion Policy and regional development policies by promoting an integrated, multi-risk, and systemic approach to disaster

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risk management across sectors and regions. This can be exemplified through the project's Pilot Studies and direct references to regional policies such as the EU Strategy for the Danube Region. MYRIAD-EU's forward-looking DRM pathways (Gottardo et al., 2025) address cross-sectoral and interregional risks, aligning with key EU goals of reducing disparities, fostering balanced development across its territories, and supporting resilient regions and local communities by enhancing their capacity to assess and respond to multi-hazard threats.

- **Sectoral policies**

The MYRIAD-EU project integrates multi-risk management across multiple key sectors, including food and agriculture, energy, infrastructure and transport, finance, ecosystems and forestry or tourism, by including them in the co-development of the framework, pathways and tools that help these industries anticipate, respond to, and recover from multi-hazards threats. In practice, MYRIAD-EU's Pilot Studies focused on real-world challenges these sectors are facing, and the sectoral policies framing their activities. Tools and applications tailor-made for the tourism or the finance sectors are already transforming the ways practitioners approach uncertain scenarios. Detailed impact from the MYRIAD-EU project on each sector and related policies can be explored in dedicated Sectoral Briefs:

- Transport and infrastructure (Adesiyun, 2025)
- Energy (Bulder et al., 2025)
- Food and Agriculture (Campillo and Gonzalo, 2025)
- Finance (Champion and Madappatt, 2025)
- Wetlands ecosystems (Cordier and Appulo, 2025)
- Tourism (Khazai et al., 2025)

The project facilitated sectoral representatives and stakeholders to identify dependencies, trade-offs, and synergies, allowing for more harmonious cross-sectoral action and mainstreaming risk reduction within policy planning. This systemic, forward-looking approach strengthens the EU's ability to address cascading effects among sectors, ultimately supporting policy goals for sustainability, resilience, and inclusive growth in critical industries. To name a few, the MYRIAD-EU project directly supports the goals of several key EU sectoral policies, such as the TEN-T (Trans-European Transport Network), the Revised Renewable Energy Directive, the Common Agricultural Policy (CAP) or the recently published Vision for Agriculture.

Upcoming policies – not-to-be-missed opportunities

- **The Next Multiannual Financial Framework**

As the EU's spending blueprint for upcoming years, the next Multi-Annual Financial Framework (MFF) is set to prioritise investments in climate adaptation and infrastructure resilience. Put forward by the European Commission in July 2025, the current budget proposal of almost EUR 2 trillion will be subject to numerous amendments and undergo difficult negotiations before its adoption for the next programming period, spanning from 2028 to 2034. As stressed in the Proposal, the MFF intends 'protecting people and building preparedness and resilience to new challenges' (European Commission, 2025).

This framework and its content will be critical to allocate substantial funding for research and innovation and thus not only support the continuation of the research started within MYRIAD-EU, but ensure the urgent uptake of MYRIAD-EU findings into EU policy.

The next Multiannual Financial Framework and related EU instruments can notably accelerate uptake by earmarking support for multi-hazard, systemic risk assessment and management in programmes for climate, cohesion, transport, energy and agriculture, and recognising MYRIAD-EU-type tools as eligible investments that improve targeting and effectiveness of EU spending. Furthermore, the use of MYRIAD-EU's frameworks in project appraisal and screening for EU-funded infrastructure and territorial investments could

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be encouraged to ensure that financed projects under the next MFF are resilient under compound and cascading risk scenarios and contribute to co-beneficial outcomes.

- **Integrated Framework for European Climate Resilience and Risk Management**

If the urgent need for multi-hazard approaches to be included in climate risks assessments is being increasingly recognised by researchers and EU policy, the implementation of such approaches is still falling short, focusing mostly on single-hazards. Announced by the European Commission for the second-half of 2026, the Integrated Framework for European Climate Resilience and Risk Management represents a crucial opportunity to finally integrate much-needed multi-hazard approaches into EU policy in a holistic way.

As wisely pointed out in the recommendations from the European Geoscience Union (EGU) answer to the Call for Evidence opened by the European Commission to inform the development of this new legislation, the framework should address the interconnectedness between hazards, compounding vulnerabilities, and cascading impacts across geographies and sectors. The EGU advice stressed the importance for this framework to include a multi-hazards approach that considers cascading and compound risks, as well as co-beneficial solutions, including risk reduction, adaptation and mitigation strategies that benefit multiple sectors over a longtime period (EGU, 2025).

To most of the recommendations put forward by EGU, MYRIAD-EU provides evidence and tools upon which further operational solutions can be created. These recommendations include: (1) the need to recognise that climate change impacts local communities and environments unequally and assessments shall therefore prioritise high risk regional 'hotspots', (2) that EU policy coherence requires the use of common climate change reference scenarios, as well as indicators informed by earth observation systems, and which include non-economic health and cultural impacts; or (3) the need to strengthen public engagement through participation in civil protection mechanisms and improved risk communication, including the integration of local and indigenous knowledge in assessment and implementation.

Recommendations

Building on recent scientific evidence stemming from the MYRIAD-EU project, as well as the recent EGU Climate Hazards and Risks Task Force's recommendations to policymakers, this brief makes four overarching asks to EU policymakers that support the uptake and scaling of MYRIAD-EU's tools and findings into existing and upcoming EU policies:

- **Embed systemic multi-hazard risk assessments in all** major EU climate and disaster-related strategies, using among others MYRIAD-EU methods and tools as reference implementations.
- **Prioritise regional (climate) risk hotspots and place-based pathways,** drawing on MYRIAD-EU Pilot Studies as templates and inspiration for hotspot-specific, co-created solutions.
- **Improve inter-state and multi-sectoral integration through common scenarios,** harmonised multi-hazard indicators (including non-economic losses), and better data interoperability, building on MYRIAD-EU's outputs.
- **Strengthen citizen engagement and disaster-risk intelligence** by investing in impact-based early warning, civil-protection training, Earth Observation and digital twins that can host and operationalise MYRIAD-EU outputs and support multi-hazard literacy.

By aligning scientific innovation with policy and practice, MYRIAD-EU paves the way for a more resilient, sustainable and just future in Europe, enhancing the Union's readiness in the face of a rapidly-evolving and increasingly complex risk landscape.

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List of resources

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Other linked resources

- Handbook of Multi-Hazard, Multi-Risk Definitions and Concepts
- Disaster Risk Gateway
- MYRIAD-EU Framework
- MYRIAD-EU Dashboard
- Metadatabase for Dynamics of Risk Drivers
- VulneraCity
- MYRIAD-EU Multi-Risk Toolkit
- MYRIAD-Hazard Event Set Algorithm (MYRIAD-HESA)
- MYRIAD-Stochastic vIne-copula Model (MYRIAD-HIS)
- Dynamic Adaptive Policy Pathways-Multi Risk (DAPP-MR)
- Storyline Repository
- Bridging the Silos Game

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