Sectoral brief

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Reducing Risks Together: *Multi-hazards and multi-risks in the wetlands ecosystems sector*

myriad_eu

Executive summary & Recommendations

The MYRIAD-EU project advances disaster risk management by moving beyond single-hazard assessments toward a multi-hazard, multi-sector, and systemic approach. Within this framework, wetlands and other ecosystems have emerged as critical components for reducing disaster risks while providing wider environmental and social benefits. Healthy wetlands mitigate floods, buffer droughts, stabilise coastlines, and strengthen resilience against cascading hazards, yet their ongoing degradation increasingly transforms them into risk drivers.

Through cross-sectoral engagement, MYRIAD-EU demonstrated how integrating ecosystems into risk management enables broader collaboration between policy, science, and practice. Storylines, models, and interactive tools showcased the cascading consequences of past disasters and emphasised nature-based solutions as more effective and sustainable alternatives to hard infrastructure. However, policy gaps remain: many wetlands fall outside existing EU directives, limiting their protection and the valuation of their services in decision-making and economic models.

MYRIAD-EU's findings, tools, and case studies underscore the importance of ecosystem-based approaches to disaster risk reduction through the conservation and sustainable management of wetlands. These initial insights could be further strengthened by integrating a more explicit consideration of wetland ecosystems in future research.

Recommendations:

- **Wetlands connect disciplines, sectors, and communities:** Wetlands, and ecosystems in general, form the foundation linking human activities, living conditions, and economic sectors. Embedding them in disaster risk reduction discussions fosters cross-sectoral collaboration, enabling academia, policymakers, businesses, and public authorities to move beyond silos.

- **Wetlands are integral to addressing multi-hazard risks:**
  - Recognizing wetlands as essential infrastructure for disaster prevention, climate adaptation, and biodiversity protection is critical.
  - Embedding ecosystems into disaster risk frameworks and strengthening their representation in EU policies will be essential to unlock their full potential for resilient societies. The spatial and temporal elements of multi-risks need to be considered when reviewing risk diversification.

This sectoral brief explores the relation between the activities and research carried out in the MYRIAD-EU project and ecosystems through a focus on wetlands ecosystems, which hold immense potential for disaster risk reduction, as 90% of disasters being water-related.

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Wetlands ecosystems: from disaster-risk drivers to eco-DRR tools

Wetlands ecosystems refer to a wide variety of inland habitats such as marshes, wet grasslands, peatlands, floodplains, rivers, lakes, swamps or ponds, as well as coastal and marine areas (no deeper than six meters at low tide) such as saltmarshes, intertidal mudflats, seagrass beds and coral reefs. Human-made wetlands such as dams, reservoirs or wastewater treatment ponds and lagoons are also integrated in the definition of wetlands put forward by the Ramsar Convention Secretariat (2016). Healthy wetlands provide, as shown in Figure 1, multiple functions such as: improved absorption capacity of floodplains during peak flows, managed runoffs and banks flows; enhanced bank stability; and hydrological connectivity between river channels and floodplains. More than being allies during multi-hazard events, healthy wetlands can address the drivers of multi-hazard, and are increasingly recognised for their role in tackling climate change challenges through adaptation, mitigation, and resilience. In fact, ecosystem service valuations indicate that humans and societies derive greater value from wetlands than from other ecosystems (Global Wetland Outlook, 2025).

Figure 1: Potential functions provided by healthy wetlands (Wetlands International, 2018)

However, despite the tremendous potential wetlands hold to face the challenges posed by the triple planetary crisis of pollution, climate change and biodiversity loss, 70% of historical European wetlands have been lost since the onset of the industrial revolution.

Along with their loss, their continued degradation transforms wetlands into risk-drivers. When drained, peatlands lose their capacity to accumulate and store water, which results in reduced flood and drought resistance of large areas they formerly covered. Moreover, drained peatlands are fire prone, and centuries of large-scale drainage is now too often resulting in multiple wildfire events with adverse consequences for nature, people, and economies.

A similar logic can be observed in coastal lowlands, where coastal wetlands traditionally slow down tides, limit erosion and reduce risks of coastal flooding in the event of storm surges. If degraded or destroyed, coastal wetland ecosystems stop providing these disaster-risk reduction (DRR) services. They can even contribute to lowering land surface down to sea or river level, leading to frequent or permanent flooding.

The representation of wetland ecosystems within the context of the MYRIAD-EU project allowed for the exploration of how wetlands could be embedded in an innovative multi-hazard, multi-sector and systemic risk management framework, as presented in the following section.

MYRIAD-EU : an innovative approach

1. Enabling cross-sectoral dialogue

Knowing the crucial role wetlands can play in disaster risk reduction is unfortunately not sufficient to advocate for their widespread conservation and restoration as nature-based solutions (NbS) for eco-DRR. One needs the right lexicon not only to speak about wetlands, but to understand and engage with the DRR

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community, policies and opportunities. MYRIAD-EU allowed, in numerous ways, to build bridges between communities by evening the linguistic playing field, notably through the publication of the Handbook of Multi-hazard, Multi-Risk Definitions and Concepts (Gill et al, 2022) and the Disaster Risk Gateway. This shared understanding of multi-hazard disaster risk fostered closer relationships with other projects and communities. For example, wetlands restoration practitioners involved in the WaterLANDS Horizon project and the MYRIAD-EU consortium held a joint event which proved successful in enabling exchange between these usually siloed communities, allowing them to identify synergies to be further explored.

2. Visualising concrete case studies to fight maladaptation

Through its cross-sectoral approach, the MYRIAD-EU project enabled all sectors and participants to deepen their understanding of each other's work and expertise. The creation of interactive storylines on past or future events is a concrete, interactive and visually appealing way to underline the urgency to break down silos and observe multi-risk, multi-hazard scenarios and cross-sectoral impacts to prepare for the future. For example, the North Sea storyline on the 1953 North Sea floods, which impacted the Netherlands, Belgium and the UK, is a particularly useful one. Not only does it highlight the cascading impacts of a storm surge which transformed into deadly flooding, but it also underlines that the maladaptation reflexes of the times, i.e. the immediate erection of grey infrastructure such as dams and dykes, would not and should not be the preferred response now. Instead, this storyline concludes that building with nature, and not against it, is now proven to be more efficient and less costly in a majority of cases. In doing so, this storyline makes the case for wetlands restoration and better integration of wetlands NbS in disaster risk management, floods control plans and climate adaptation strategies. The project developed a repository of multi-hazard storylines similar to this example.

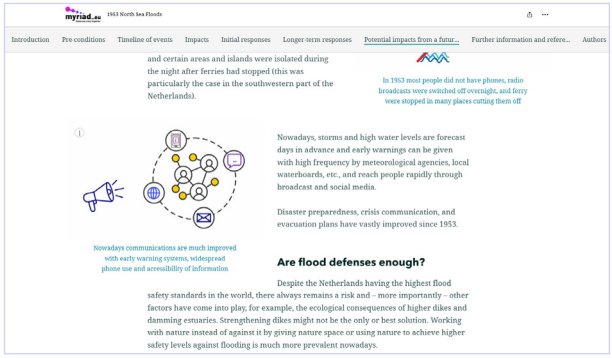

Figure 2: Storyline of the 1953 North Sea floods. Image taken from MYRIAD-EU Dashboard website.

3. Unveiling needs and gaps to better understand, monitor and evaluate wetlands ecosystems to enhance their role in disaster risk reduction

The approach adopted within the MYRIAD-EU project, and translated in the MYRIAD-EU framework (Hochrainer-Stigler et al., 2023) requires to define systems and identify a variety of elements, including system boundaries, the stakeholders acting within them, applicable policy frameworks, as well interactions between these diverse system elements. This comprehensive MYRIAD-EU framework allows for the identification of key relations between sectors and policies, which can help to shy away from outdated perspectives or fight misinformation. For example, European wetlands have historically long been considered as low productive and hostile land to be drained in order to increase arable land cover and support dry and often intensive agricultural practices. Within MYRIAD-EU, the biological, hydro-ecological and socio-economic values and status of wetlands, and more largely nature and ecosystems, long overlooked to favor other needs and sectors, can be rediscussed with a wide array of stakeholders working toward a common goal to assess and reduce disaster risk. While the Handbook enables exchange by creating a shared lexicon between stakeholders, other outputs revealed gaps and limitations to be dealt with in order to fully integrate cross-sectoral perspectives in the approach. For example, the Scandinavian pilot used the

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GRACE model to upscale sectoral-specific climate impacts to the macroeconomic level (Ducros et al, 2024). In doing so, they identified gaps in the representation of non-market value sectors such as ecosystem services yet essential to reduce disaster risk.

This limitation highlights the urgent need to improve the valuation of ecosystem services to ensure models such as GRACE can operate to assess the cascading impacts of multi-hazard events. Moreover, it reveals the need for interdisciplinary disaster risk research.

Wetlands' conservation status and ability to provide ecosystem services is impaired by their lack of recognition or protection through EU policies, with numerous wetlands types falling outside the scope of the Habitats Directive, Water Framework Directive or Marine Strategy Framework Directive, or wetlands and other ecosystem types insufficiently included and protected as in DRR policies.

The MYRIAD-EU project, through the research and outputs it delivered, provides evidence for a greater protection and restoration of wetlands in EU policies, in line with the observed needs and gaps in risk assessment and adaptation to climate change in the EU identified by the European Commission's Joint Research Centre (JRC) in its latest analysis of risks Europe is facing (JRC, 2025).

Research

- Need of solutions for improved data sharing among countries and harmonised risk assessment
- Need of better understanding of emerging risks and intangible impacts (such as to cultural heritage and ecosystem services)
- Need for systemic mul-ti-hazard approach to manage simultaneous disasters (assessing risk drivers, compound relations and cascading impacts)
- Need for improvement of disaster loss data collection and availability

Policy

- Limited mainstreaming of disaster risk management into other policies
- Insufficient investment in risk prevention
- Limited integration of climate change adaptation strategies in DRM planning
- Need for a whole-of-society approach to DRM enganging public institutions, academic and research bodies, private sector, civil society, communities
- Need to recognise and assess risk impacts of policy initiatives

Operational

- Need to enhance cross-border coordination among MS, including developing coordinated response efforts and sharing best practices and data
- Need to establish a data sharing and information exchange mechanism between countries and stakeholders
- MS have disparate levels of governance readiness and capabilities to address risks, with some countries having more advanced capabilities than others

Table on needs and gaps in risk assessment and adaptation identified from selected reports analysed by the European Commission's Joint Research Centre in its 'Analysis of Risks Europe is Facing' (2025)

Recommendations

First, we would like to recall previous recommendations for decision-makers on the valuation of wetlands in DRR:

- Accounting for the delimitation of an ecosystem's hydrological and ecological functioning in terms of DRR challenges;
- Setting goals for wetland protection and restoration with relevant stakeholders/actors;

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- Recognising wetland ecosystem functions to protect against multi-hazard events in local and regional legislative framework;
- Bridging the policy-practice-science gap to understand and reinforce nature-based solutions as adaptive solutions.

These recommendations are detailed in a 2023 article on the role of wetlands as game-changers for climate change mitigation and adaptation (CICERO & Wetlands International Europe, 2023).

Second, reflecting on our experience as Sectoral Representatives for ecosystems, working with wetlands at heart; Wetlands International Europe recommends to keep the following in mind for future MYRIAD-EU chapters to be written:

- **Wetlands connect disciplines, sectors, and communities:** Wetlands and other ecosystems form the foundation linking human activities, living conditions, and economic sectors. Embedding them in disaster risk reduction discussions fosters cross-sectoral collaboration, enabling academia, policymakers, businesses, and public authorities to move beyond silos.
- **Wetlands are integral to addressing multi-hazard risks:**
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  - Embedding ecosystems into disaster risk frameworks and strengthening their representation in EU policies will be essential to unlock their full potential for resilient societies.

Conclusion

To conclude, it is important to note the termination of the MYRIAD-EU project must be regarded as the end of the beginning. It is only the closure of a pioneering chapter providing steps, tools and methods to enable a shift toward multi-hazard risk assessment and management.

If MYRIAD-EU's findings, tools and case-studies help make the case for improved wetlands conservation as detailed in this brief, there is immense potential yet to be explored. Ecosystems should be integrated and considered as both framing and enduring other sectors' activities. In so being, ecosystems are a non-negotiable variable to consider and work with from the start, from disaster-risk assessment to disaster-risk management. Further developments could benefit from a sharper focus on wetlands ecosystems, including them in all pilot studies for example. Given that 90% of disasters are water-related, understanding the key role rivers, floodplains, coastal wetlands or peatlands can play as both risk-drivers and ecosystem-based DRR tools would be a game-changer.

Integrating this vision in future research stemming from MYRIAD-EU findings would be immensely beneficial not only to practitioners in wetlands conservation and restoration, but also for those designing climate and disaster strategies and plans. It would support the development of fit-for-purpose tools, aligned with on-the-ground practices and needs, to effectively address he challenges posed by the twin climate and biodiversity crises while advancing related policy-goals.

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List of resources

Peer-reviewed articles

- Ducros, G. , Tiggeloven, T., Ma, L., Daloz, A.S., Schuhen, N., de Ruiter, M.C., 2024. Multi-hazards in Scandinavia: Impacts and risks from compound heatwaves, droughts and wildfires, EGUsphere, https://doi.org/10.5194/egusphere-2024-3158

- Hochrainer-Stigler et al., 2023. Toward a framework for systemic multi-hazard and multi-risk assessment and management. iScience, 106737, https://doi.org/10.1016/j.isci.2023.106736

Reports

- Convention on Wetlands, 2025. Global Wetland Outlook 2025: Valuing, conserving, restoring and financing wetlands. Gland, Switzerland: Secretariat of the Convention on Wetlands, doi: 10.69556/GWO-2025-eng.

- JRC, 2025 Analysis of Risks Europe is Facing. European Commission Joint Research Centre,, https://data.europa.eu/doi/10.2760/0176850

- Gill, J.C., Duncan, M., Ciurean, R., Smale, L., Stuparu, D., Schlumberger, J, de Ruiter M., Tiggeloven, T., Torresan, S., Gottardo, S., Mysiak, J., Harris, R., Petrescu, E. C., Girard, T., Khazai, B., Claassen, J., Dai, R., Champion, A., Daloz, A. S., ..., Ward, P.J., 2022. MYRIAD-EU D1.2 Handbook of Multihazard, Multi-Risk Definitions and Concepts. H2020 MYRIAD-EU Project Deliverable, https://zenodo.org/records/7135138

- Ramsar Convention on Wetlands Secretariat (2016) An Introduction to the Ramsar Convention on Wetlands, 7th ed. https://www.ramsar.org/sites/default/files/documents/library/handbook1_5ed_introductiontoconvention_final_e.pdf

Websites and web articles

- MYRIAD-EU repository of multi-hazard storylines: https://dashboard.myriadproject.eu/storylines-repository/

- MYRIAD-EU Disaster Risk Gateway: https://disasterriskgateway.net/index.php/Main_Page

- CICERO & Wetlands International Europe (2023) Wetlands as game-changers for climate change mitigation and adaptation, https://europe.wetlands.org/wetlands-as-game-changers-for-climate-change-mitigation-and-adaptation/

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