



# EU MISSIONS

ADAPTATION TO CLIMATE CHANGE

## Insights on monitoring climate adaptation activities

Deriving lessons learned from monitoring adaptation activities in projects under the EU Mission on Adaptation

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This document presents the work on the mechanisms for monitoring climate resilience and adaptation in three EU Horizon 2020 projects (ARSINOE, IMPETUS, and TransformAR), and a newcomer Horizon Europe project (NATALIE) under the EU Mission on Adaptation to Climate Change. It synthesises the projects' challenges and lessons learned to support future initiatives in their monitoring endeavours, for other mission projects to learn from. The identified key challenges include tailoring global frameworks to local needs, identifying data availability, and enhancing interdisciplinary collaboration and stakeholder engagement.

## **Introduction**

Monitoring and evaluation are essential for understanding the effectiveness of adaptation actions and policies, tracking their progress, and drawing lessons from regional efforts, which is especially important given that various sectors like transport and healthcare are under regional government control. In this regard, this document outlines the growing importance of monitoring climate resilience, particularly within the context of the EU Strategy on Adaptation to Climate Change, which aims to involve more regions in adaptation initiatives and to promote the broader adoption of locally developed solutions.

The EU Mission on Adaptation to Climate Change supports this effort, with the goal of achieving climate resilience across Europe by 2030. Under the umbrella of the Mission, there are a number of applied research projects that assist regions in implementing adaptation activities and monitoring progress towards enhanced climate resilience. In this context, the Regional Adaptation Support Tool (RAST) was developed under the Mission on Adaptation to monitor and gauge progress with respect to:

- The reduction of climate impacts
- The reduction of risks and vulnerabilities and increasing adaptive capacity
- Meeting adaptation priorities
- Addressing barriers to adaptation

Nonetheless, the design of a monitoring and evaluation framework that comprehensively measures development towards climate resilience can be challenging for various reasons. There is also not one approach that fits all contexts. The differing impacts on various fields such as infrastructure, economy, communities, institutions, and ecosystems, outline the different dimensions that a monitoring approach must cover. It is therefore evident why multiple approaches are needed.

This document presents a collection of challenges and lessons learned grouped into four themes:

- Tailoring global frameworks to regional/local needs
- Data availability, applicability, and evaluation
- Interdisciplinarity in climate adaptation
- Stakeholder engagement

These themes are drawn from three mature EU projects (ARSINOE, IMPETUS, and TransformAR), as they have started implementing resilience measures in vulnerable regions. The REGILIENCE project initiated the gathering of lessons learned from the three projects via joint workshops with experts from the projects to support future mission projects in their monitoring endeavours. In this context, this document provides lessons and initial observations to aid future projects in avoiding common pitfalls and enhancing resource efficiency, and serves as a guide for other projects conducting monitoring and evaluation activities. Additionally, the recently started NATALIE project, gathering common partners with ARSINOE and IMPETUS, provides

insights about the specific challenges related to monitoring nature-based solutions across diverse biogeographical regions.

### Approach used

In developing their monitoring frameworks, ARSINOE, IMPETUS, TransformAr, and NATALIE began by reviewing global frameworks like the Paris Agreement, Sendai Framework, Agenda 2030 and the SDGs, Lancet Countdown, One Health, and Water-Energy-Food Nexus. These frameworks set a foundation for global adaptation goals, focusing on enhancing resilience, adaptive capacity, and reducing vulnerability to climate change.

The Paris Agreement emphasises adaptation's role in maintaining global temperature rise within 1.5°C, and recent COP28 developments stress the need for national monitoring systems by 2030. The Sendai Framework links disaster risk reduction to climate change adaptation, addressing the increased risks of extreme events like floods and droughts. Other SDGs, such as those focused on hunger, water, cities, and ecosystems, highlight the cross-sectoral nature of adaptation.

Indicator-based monitoring approaches are useful to policy- and decision-makers at the regional governance scale, and they facilitate knowledge-based stakeholder engagement. However, existing global indicator frameworks pose several limitations and challenges that have been widely discussed in several academic and technical papers. Overall, each framework has its strengths, but limitations arise when applying them locally. These challenges include:

- Global vs. local adaptation: Indicators should be specific to regional contexts, which global frameworks often fail to capture.
- Data gaps: Global metrics do not always reflect local adaptation efforts.
- Absence of clear targets: Unlike mitigation, adaptation lacks defined end-goals, complicating monitoring.
- Lack of baselines: Without a clear baseline, it is difficult to measure change.
- Complexity in success measurement: Time lags, attribution challenges, and quantifying avoided impacts make adaptation success difficult to evaluate.
- Maladaptation risks: Existing indicators may not catch maladaptation or unintended negative effects.
- Resource intensity: Monitoring requires significant data and technical resources, often hindered by decentralised data sources and inconsistent methodologies.

These challenges therefore make the need for flexible, context-specific monitoring approaches tailored to regional conditions evidently clear.

## Lessons learned

The following are practical challenges and lessons learned from ARSINOE, IMPETUS, TransformAr, and NATALIE, focusing on the development of monitoring frameworks. The identified key challenges and lessons learned include:

### 1. Varying Global and Local Indicators:

- Projects use global frameworks (like SDGs and Sendai) but they should ideally be adapted to local needs. The added value of site-specific indicators is that they can offer more relevant insights, however they can potentially reduce comparability across regions.
- Projects should prioritise a set of key indicators and build on them as they gain experience, with resources (time and financial) allocated early for realistic monitoring efforts:
  - IMPETUS project has an overarching approach to monitoring that started with the development of a flexible indicator-based monitoring framework suitable for all the European biogeographical regions by accommodating their diverse characteristics. It encompasses two core frameworks addressing climate vulnerability and climate adaptation, which are potentially applicable to all demonstration sites of the project and to most situations. They are organised into different categories and subcategories and are searchable by sector and impact. As a structured tool for climate-sensitive decision-making and as an indicator repository, the IMPETUS framework provides a meaningful starting point that can and should be adapted based on new learnings and context-specificities at local and regional level.
  - NATALIE is developing indicators across its eight case studies, aligned with the RAST while integrating NBS-focused performance metrics. NATALIE also works on policy integration to ensure that NBS monitoring frameworks align with existing governance structures and regulatory standards in local, regional, national and EU level.

### 2. Data for Monitoring:

- Accessing appropriate regional data is crucial. Therefore, projects should assess data availability early to avoid limitations at a later stage, especially with socio-economic data. In this respect, baseline data is essential to evaluate adaptation measures. In addition, data on future climate and socio-economic scenarios should be incorporated to assess future impacts.
- When quantitative data is lacking, qualitative data (e.g., from interviews and living labs) can help to cover social and cultural aspects. Qualitative approaches and the introduction of proxy indicators can also enhance the capacity to monitor adaptation actions in resource-constrained contexts.

However, the harmonisation of data formats is key to ensure a common understanding of results. It could therefore be helpful to start with a smaller number of indicators if data is limited and build up the set as experience grows. The added value of such an approach is that it could be easier to apply and to adapt in due course.

### 3. Interdisciplinarity in Climate Adaptation:

- Climate adaptation requires collaboration across various disciplines (e.g., science, engineering, economics). In the IMPETUS project, the flexible monitoring framework incorporates cross-sectoral indicators to achieve a comprehensive coverage. In this complexity, the definition of key terms like resilience and vulnerability is therefore crucial to establish a shared understanding and effective monitoring. NATALIE's interdisciplinary approach bridges cross-sector collaboration, as for example in the Case Study 4 "Alternative Water Management Solutions in Spanish Archipelagos", where hydrological models are combined with stakeholder-driven governance. The projects should support the interdisciplinary collaboration and co-design indicators to ensure a holistic understanding of adaptation and resilience. Projects should promote collaboration across sectors and disciplines, recognising the interconnectedness of systems. The added value of such a collaborative approach is that different expertise, roles, and perspectives are crucial for overcoming challenges in the interdisciplinary context. Furthermore, the promotion of a holistic understanding of the complexity of resilience and adaptation, as well as the breaking down of interdisciplinary silos can increase the understanding that each hazard entails a complex and intricately connected systems.

### 4. Stakeholder Engagement:

- The involvement of stakeholders is essential for developing relevant indicators. Methods like the Quadruple and Quintuple Helix models<sup>1 2</sup>, which were used in the ARSINOE, IMPETUS and NATALIE projects, ensure participation from government, academia, private sector, civil society, and the environment is enhanced. The added value of these models is that they collaboratively define a problem statement and a vision that outlines solutions to address the identified issues. This co-creation and inclusive approach, ensures the relevance and applicability of indicators while fostering local ownership of social and technological innovations, as well as monitoring systems.
- Stakeholder engagement uncovers previously overlooked aspects and improves monitoring priorities, with living labs and participatory methods

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<sup>1</sup> [Braun R, Hagan KC, Gerhardus A: Quadruple Helix Collaboration in practice. 2021.](#)

<sup>2</sup> [Carayannis EG, Barth TD, Campbell DF: The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. J Innov Entrep. 2012.](#)

enhancing the adaptation process. Subsystems that were not initially recognised or considered important could be revealed through stakeholders' hints, especially through identifying interlinkages of vulnerabilities, compound hazards and cascading risks. In the ARSINOE project, living labs adopt the System Innovation Approach which specifically facilitates the development of monitoring strategies tailored to each case study region. In the IMPETUS project, a Decision Theatre methodology<sup>3</sup> is used, where a combination of data-driven simulations and interactive visualisations, enable collaborative decision-making, enhancing stakeholders' understanding of complex interdependencies. This innovative methodology allows policymakers, researchers and community representatives, to have evidence-based discussions, potentially explore various future scenarios, and co-develop adaptive solutions to climate-related effect.

- In the NATALIE project, a robust methodology was developed for stakeholder mapping and engagement, while a co-creation approach was adopted through the Transformation Labs to co-design activities tailored to the specific hazards each Demo Site seeks to tackle, supporting climate adaptation strategies. In NATALIE's co-creation activities, a transversal action was developed including a participatory assessment framework to address how social transformation to increase resilience takes place through open innovation actions. Stakeholders can also contribute to qualitative data, allowing for a holistic understanding of adaptation efforts, often facilitated through workshops and focus groups. A flexible and adaptable approach allows for active co-creation with stakeholders, facilitating the identification of tailored indicators aligned with their unique adaptation pathways.

## Conclusions and outlook

The results from ARSINOE, IMPETUS, and TransformAR emphasise the interdisciplinary nature of climate adaptation, which requires integrating diverse perspectives, methodologies, and data sources. Key recommendations which can be applied to other projects include:

- The definition of clear terms and ensuring collaboration across different disciplines.
- Using global frameworks for indicator development while adapting them to local contexts.
- Ensuring accessible and reliable baseline data.
- Implementing strong stakeholder engagement from the project's start to incorporate diverse viewpoints.

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<sup>3</sup> Decision Theatre (DT) is an IT-supported participatory method used in research on societal challenges.

- Planning for ongoing monitoring and evaluation after the project's completion.

NATALIE highlights the importance of financial sustainability in adaptation monitoring by testing funding and financing and financing mechanisms to ensure that NBS remain viable beyond the project's duration, and the need for capacity building among private sector stakeholders to enhance their engagement in the local context during the project cycle. Additionally, raising awareness and enhancing the acceptance of NBS among policymakers and local communities is crucial for successful integration into regional and national policies.

In terms of the outlook for the future, we suggest further analysis into:

- The integration of monitoring with digital technologies, including AI-driven predictive modelling, to improve adaptability and responsiveness.
- The knowledge exchange across borders, so that cross national collaboration can allow replication of successful monitoring practices in different socio-economic and climatic conditions.

We are hopeful that the insights from these projects can encourage wider discussions within the Mission Implementation Platform, thereby promoting a broader community of practice for regional climate adaptation and monitoring efforts.



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