

A multi-hazard Decision Support System for enhanced local and regional disaster risk management

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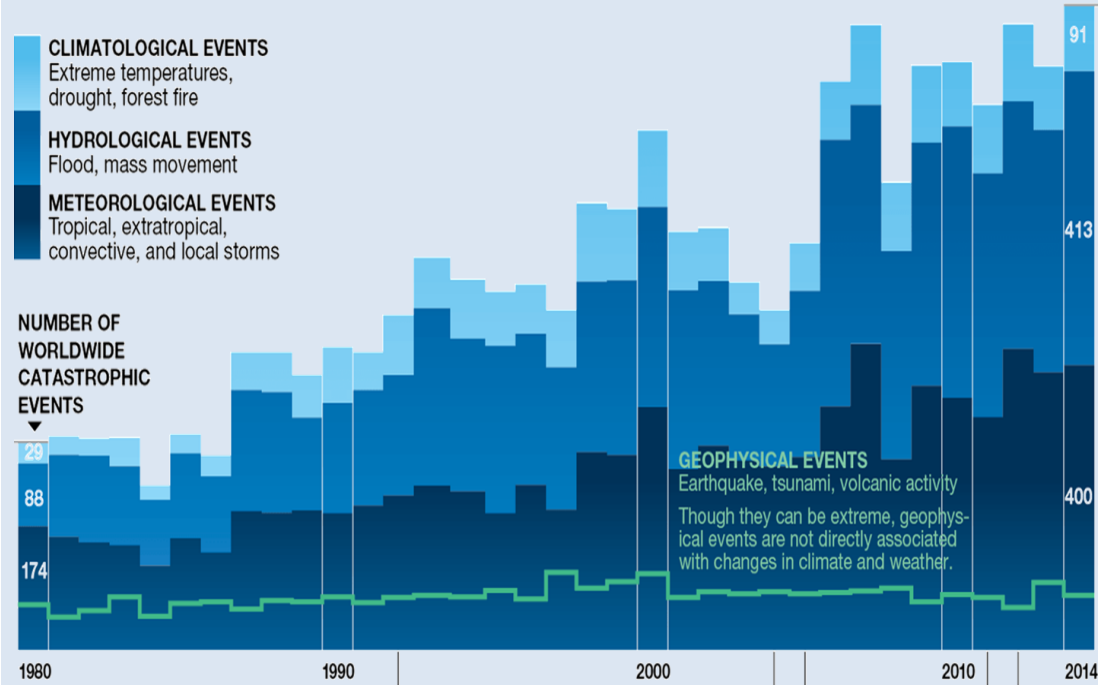
Natural hazards and risks in Europe

- Between 1980 and 2020, weather- and climate-related events caused economic losses of around half a trillion euros and led to between 85 000 and 145 000 human fatalities across Europe.
- Climate change is not the only driver of future economic losses and fatalities. An increase in adaptive capacity and an increase in exposure and vulnerability will also affect future economic, social and environmental losses.



Changes in hazards

- Although analysing trends in economic losses is difficult, climate-related extreme events are becoming more common.
- There is a need to consider the long-term implications of natural hazards and the related multiple risks

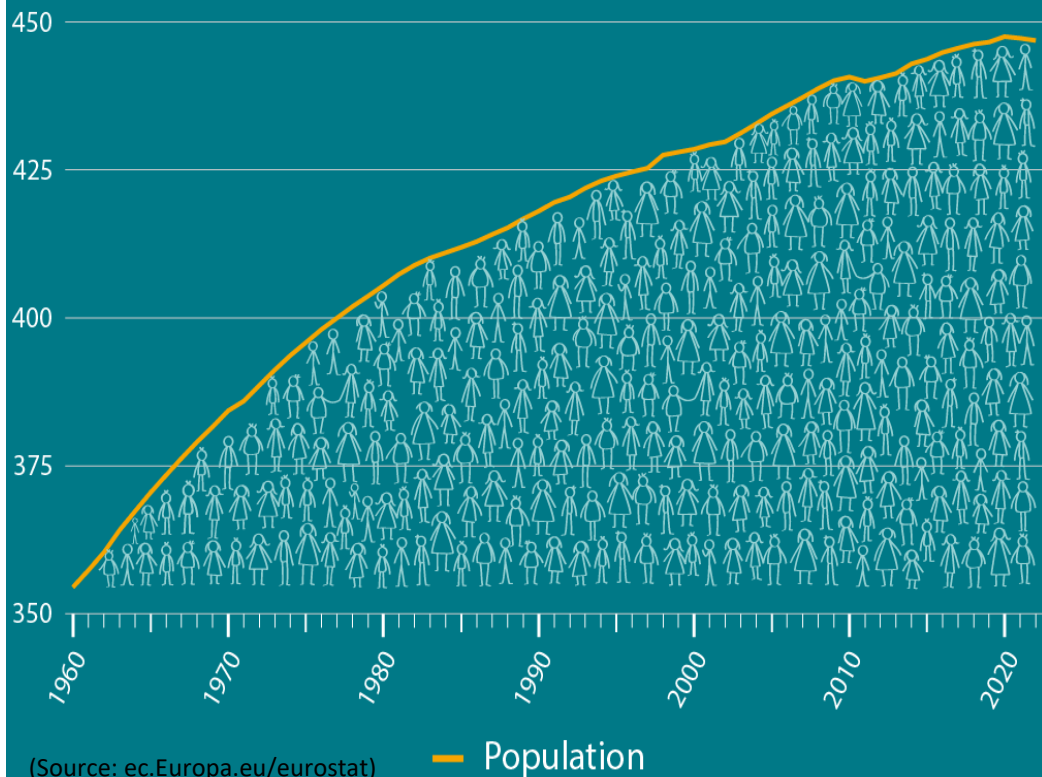


Changes in risks

- Risk processes comprise exposure and vulnerability components
- Exposure and vulnerability features and their future dynamics are particularly complex to quantify

EU population, 1960-2022

(on 1 January, million persons)



Challenges

- Different phases of both hazards and risk processes are often addressed separately, not with an integrated approach.
- Risk analyses are not performed from a multi-disciplinary perspective, integrating physical, economic, and social impacts
- Compounding and cascading effects of hazards are not regularly included within risk and resilience assessments.

Consequently, decision makers struggle to comprehensively understand local hazard change impacts, thus failing to successfully plan integrated adaptation and impact mitigation strategies.



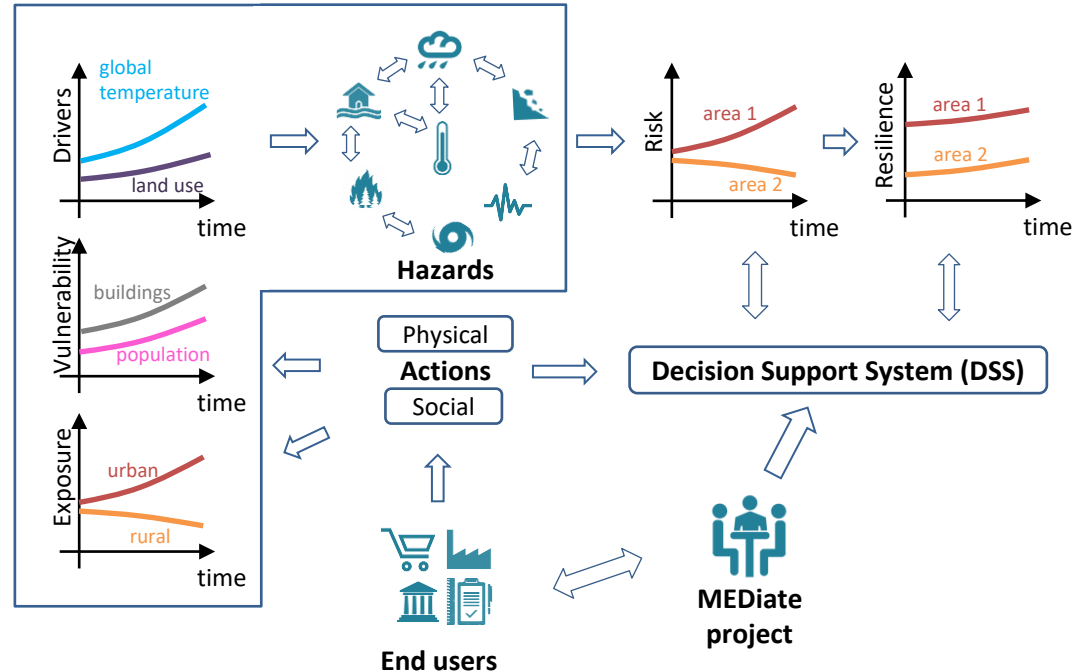
Multi-hazard and risk informed system for Enhanced local and regional Disaster risk management

- **Multi-hazard:** *“the set of hazards (October 2022 to September 2025) that [a] country faces, and the specific contexts where hazardous events may occur simultaneously, cascadingly or cumulatively over time, and taking into account the potential interrelated effects” (UNDRR)*
- **MEDiate Consortium:** a multi-disciplinary team of 18 partners from 7 European Countries (universities, research institutes, local and regional authorities)
- Objectives:
 - contribute to enhanced assessment of disaster risks
 - improve disaster risk management and governance



Objectives

- Improving multi-hazard assessments and highlighting potential trends due to climate change
- Improving multi-hazard risk and resilience assessments accounting for interactions and trends in their components
- Advancing beyond the state-of-the-art in multi-hazard hazard and risk approaches
- Providing end users with a means to visualize potential scenarios and model the impact of mitigation



Testbeds - Validation

The DSS will be validated and verified in four Testbeds. The Testbed leaders, who are disaster managers (local/regional authorities), will act as co-developers of the DSS and will be the end-users of the system.

Testbed	Main hazards
Oslo	Flooding, extreme rain/snowfall, landslides, storm surge, earthquakes
Nice	Earthquakes, flooding (river floods & flash floods), landslides, heatwaves
Essex	Flooding, heatwaves
Austurbrú	Avalanches, landslides, mudflows



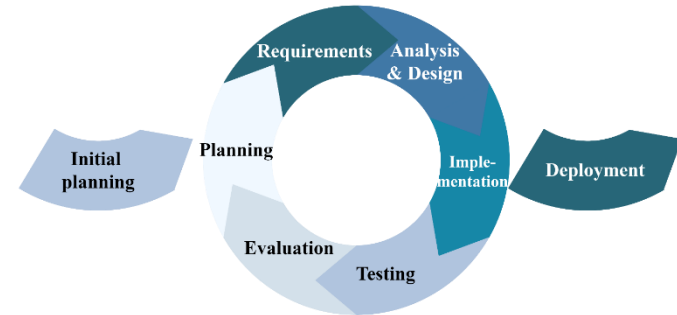
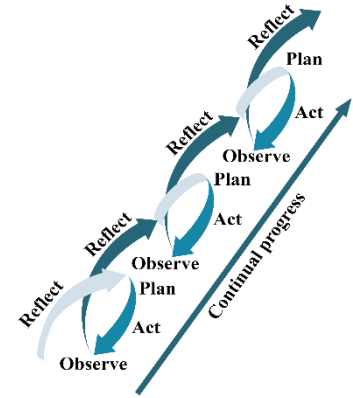
Methodology - overview

- Develop a decision support system (DSS) for disaster risk management of multiple interacting hazards and impacts
 - Risk/Resilience informed (strategic focus)
 - People centric (tactical focus)
 - Service orientated (operational focus)
- Co-design, develop, implement and validate the MEDiate DSS with end-user stakeholders
 - Develop a transdisciplinary research methodology to generate new understandings and support the development of the DSS

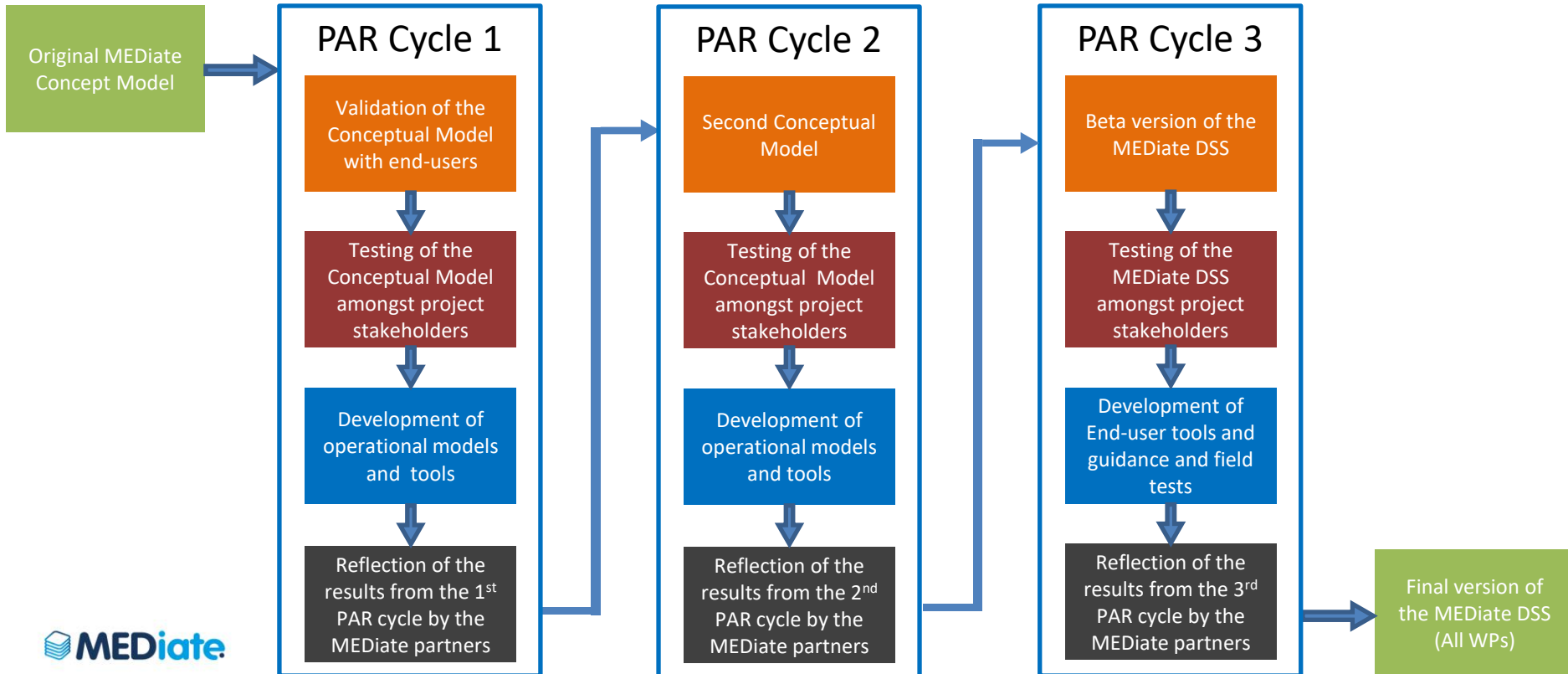
Participatory Action Research

PAR is a cyclical research activity that seeks to develop solutions to problems/issues through proactive dialogue with end-user stakeholders responsible for delivering change

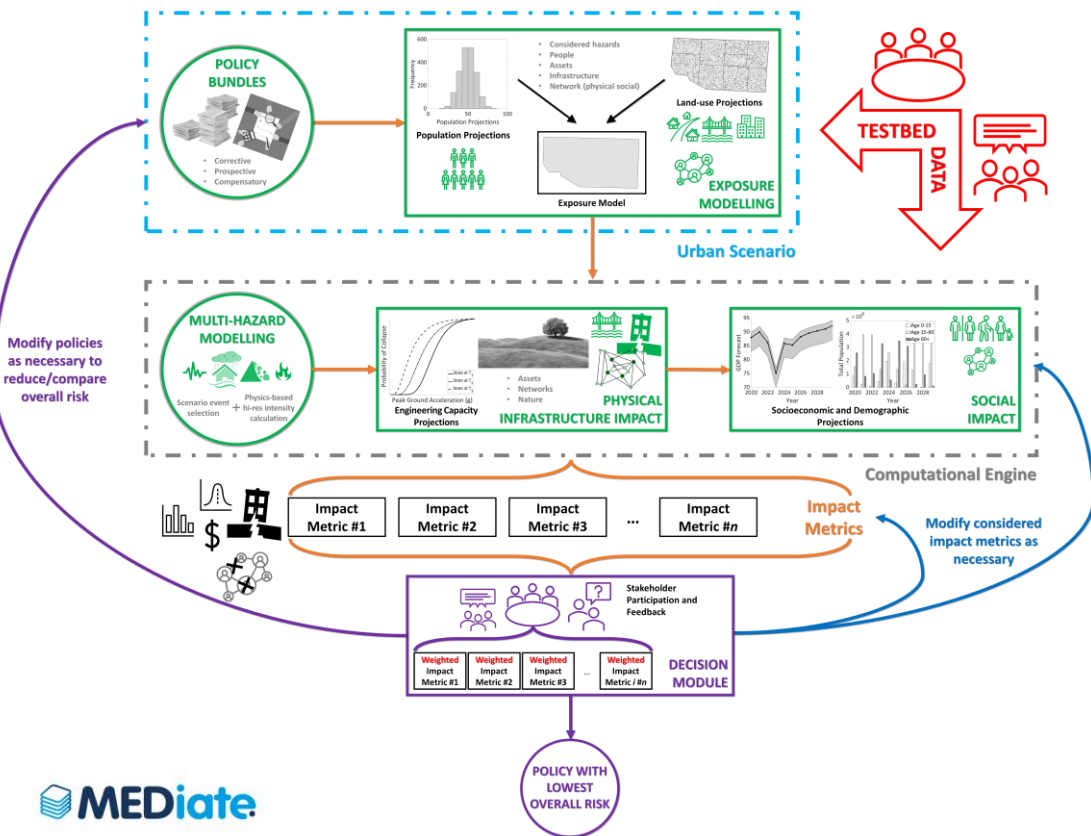
- Plan, Act, Observe, Reflect stages over a number of cycles
- Stakeholders are viewed as active participants in the research process, rather than objects to be studied



MEDiate PAR Model

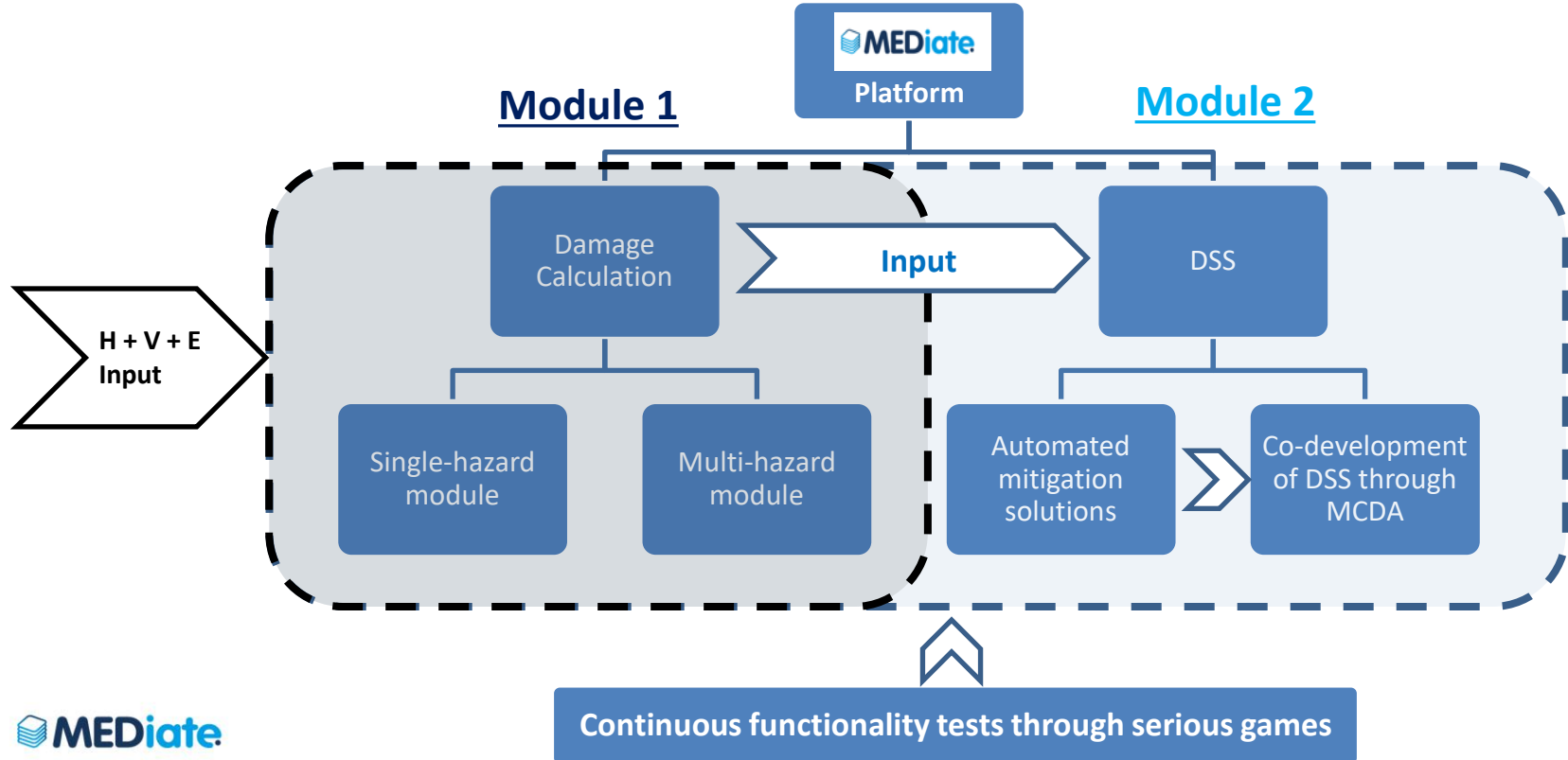


The MEDiate concept/approach



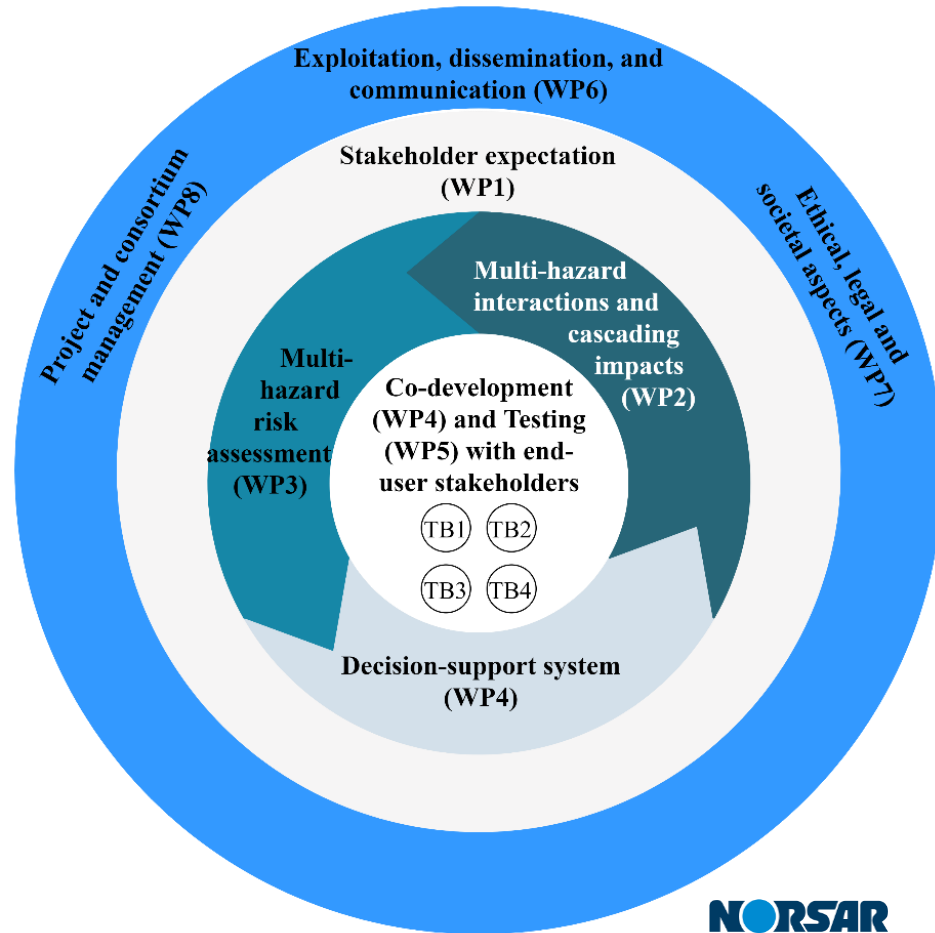
- Model **tomorrow's hazards/exposure/vulnerability** and **dynamic risk** through **multi-scale approaches**;
- Account for **hazard interactions**;
- Include **social vulnerability and resilience metrics/functionality indicators** through **participatory approaches** with local stakeholders;
- Develop/verify/validate/implement high-resolution **physics-based models** of natural hazards and engineering systems;
- Implement **network-type modelling** for interdependent infrastructure/systems;
- Use **scenario-based risk modelling** and **what-if** analysis to test/select **optimal urban actions**
- Rigorous **uncertainty modelling**
- Provide all data and models as **open-source tools**

A risk-informed Decision Support System



Work Plan

- Stakeholder expectation
- Multi-hazard and cascading impacts
- Multi-risk assessments
- Co-design and co-development of the framework for the Decision Support System
- Testing and validation with end-users



Thank you for your attention