



Co-developing interoperable disaster risk management solutions for climate resilience: Innovations in tools, governance, and communication from the DIRECTED Project

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The increasing frequency of extreme climate events necessitates a transition from siloed Disaster Risk Management (DRM) and Climate Change Adaptation (CCA) towards seamlessly integrated, interoperable, and resilient systems. The DIRECTED project addresses this need through two primary pillars of innovation: the Risk-Tandem Framework for improved governance and the Data Fabric platform providing integrated information services. Both innovations are being co-developed with stakeholders in European Real World Labs (RWLs) in Denmark, Italy, Austria, Hungary and Germany.

This presentation highlights the DIRECTED project's innovation process, which combines technical solutions and knowledge co-production processes to support risk governance and strengthen climate resilience. Together, these innovations provide a transferable methodology for creating interoperable disaster risk management solutions that directly benefit first responders, local governments, and policymakers. We reflect on barriers and enablers in our approaches, as well as regional differences in the work with stakeholders in RWLs.

The project's central governance innovation is the Risk-Tandem Framework, an iterative knowledge co-production process that bridges the gap between scientific risk management frameworks, modelling and practitioner needs. This framework has successfully translated complex stakeholder requirements into "user stories", leading to the co-design of tailored

solutions such as cross-institutional emergency meetings, regional climate festivals and integrated emergency exercises.

On the technical front, the Data Fabric has been developed by DIRECTED to achieve interoperability among data, models and information products. It is a modular architecture combining existing with tailored additional open source components. The Data Fabric, which adheres to open standards based on international Open Geospatial Consortium (OGC) specifications, allows for seamless "data-to-model", "model-to-model" and "model-to-information" workflows. The platform combines several hazard and risk models, including CLIMADA, RIM2D, Danube Model, and SaferPlaces, with real-time forecast data from national weather services, e.g., DMI, GeoSphere, DWD, and HERA. The modular, cloud based implementation and open-source licensing invite community contributions and individualised set-ups of the Data Fabric. To support our users in the learning and sustained use of these innovations, guided workshops, e-learning modules, unified taxonomies, artistic communication outputs and virtual reality training have been developed with our stakeholders.