



Defining potential multi-hazard and multi-risk combinations for infrastructure and other economic sectors using empirical pan-European examples

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A new complex world is emerging where a natural hazards event in a certain location, can have significant impacts on a different location either interlinked via economic sectors, infrastructure systems or other social relationships. In the past this was often not able to be quantified, but with increased reporting we are able to define these interactions better than previously.

For a single location, multiple hazards can also occur in tandem, or one after another causing impacts or as a standalone. However, standalone events currently take on a whole new complexity with coronavirus protocols.

Within the course of the EU project NARSIS (New Approach to Reactor Safety Improvements), sites of decommissioned nuclear power plants (NPPs) were investigated for external hazards combinations using a multi-hazard approach which took into account the joint probabilities including operational times and the effects of subsequent events. Here, different external hazards were applied such as tornadoes, lightning, earthquakes, floods and volcanic eruptions in tandem calibrated on historical events.

In this work, we build a pan-European database using the backbone of CATDAT to define multi-hazard events of relevance with overlapping hazard and loss effects including events in 2020 and 2021 with significant effects due to coronavirus in combination with another hazard. We focus on the 1980-2021 time period within this database, although many older events have also been collected.

In the year 2020, numerous events including the Croatian and Greece/Turkey earthquakes, medicanes, bushfires and many flood and storm events showed the complexity of combining multi-hazard protocols concurrently.

The database will be extended within the MYRIAD-EU project in order to inform a multi-risk, multi-

sector, systemic approach to risk management. Using empirical examples of socio-economic effects is one key step to understand the overlaps, and important within the calibration process of any multi-risk model.