Prioritization of hazards for risk and resilience management through elicitation of expert judgement

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Abstract

Risk assessment in communities or regions typically relies on the determination of hazard scenarios and an evaluation of their impact on local systems and structures. One of the challenges of risk assessment for infrastructure operators is how to identify the most critical scenarios that are likely to represent unacceptable risks to such assets in a given time frame. This study develops a novel approach for prioritizing hazards for the risk assessment of infrastructure. Central to the proposed methodology is an expert elicitation technique termed paired comparison which is based on a formal mathematical technique for quantifying the range and variance in the judgements of a group of stakeholders. The methodology is applied here to identify and rank natural and operational hazard scenarios that could cause serious disruption or have disastrous effects to the infrastructure in the transnational Øresund region over a period of five years. The application highlighted substantial divergences of views among the stakeholders on identifying a single 'most critical' natural or operational hazard scenario. Despite these differences, it was possible to flag up certain cases as critical among the natural hazard scenarios, and others among the operational hazards.

Full Text

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Figures

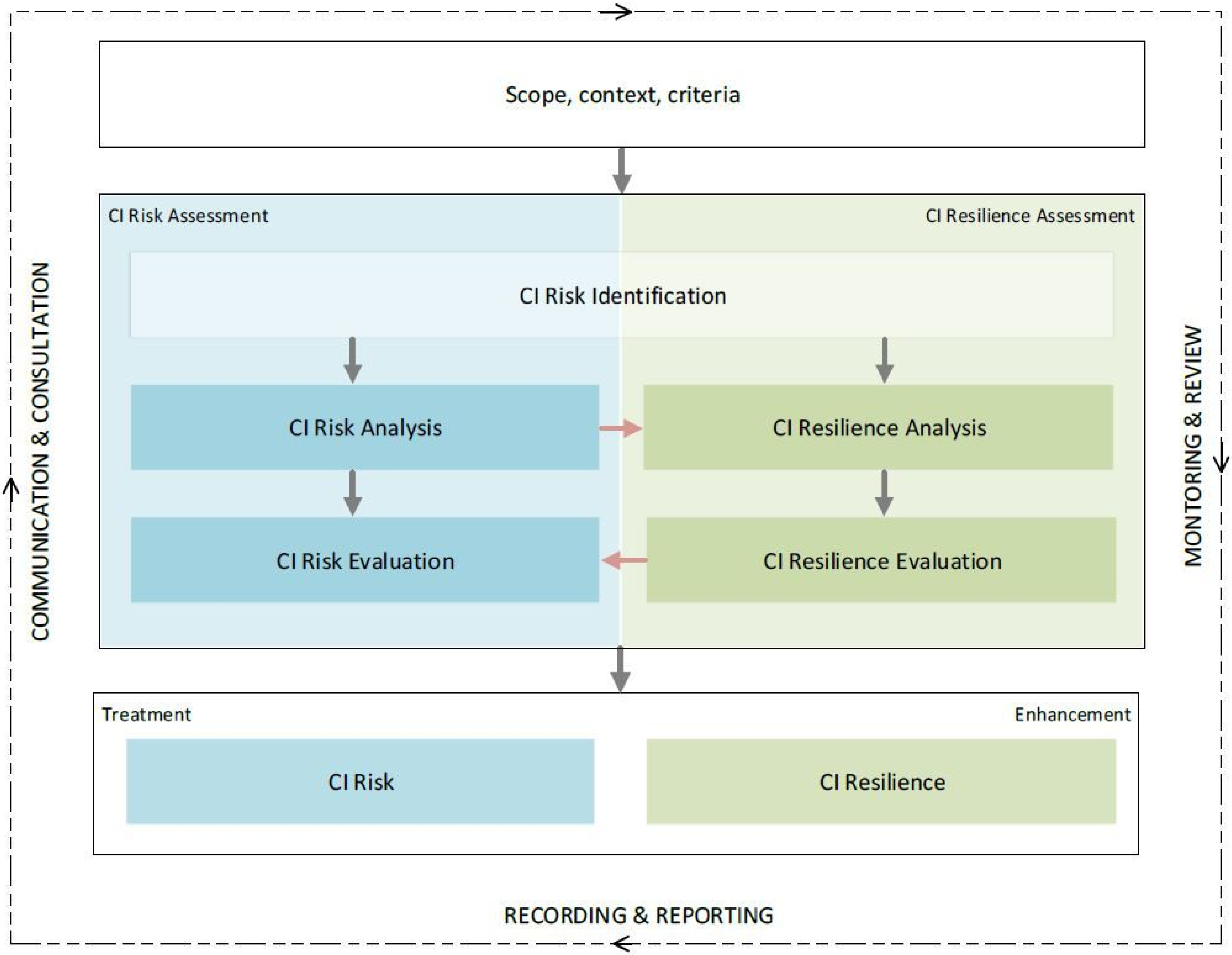

Figure 1

Critical infrastructure resilience framework developed as part of the IMPROVER project (Rød, Lange et 78 al. 2020).

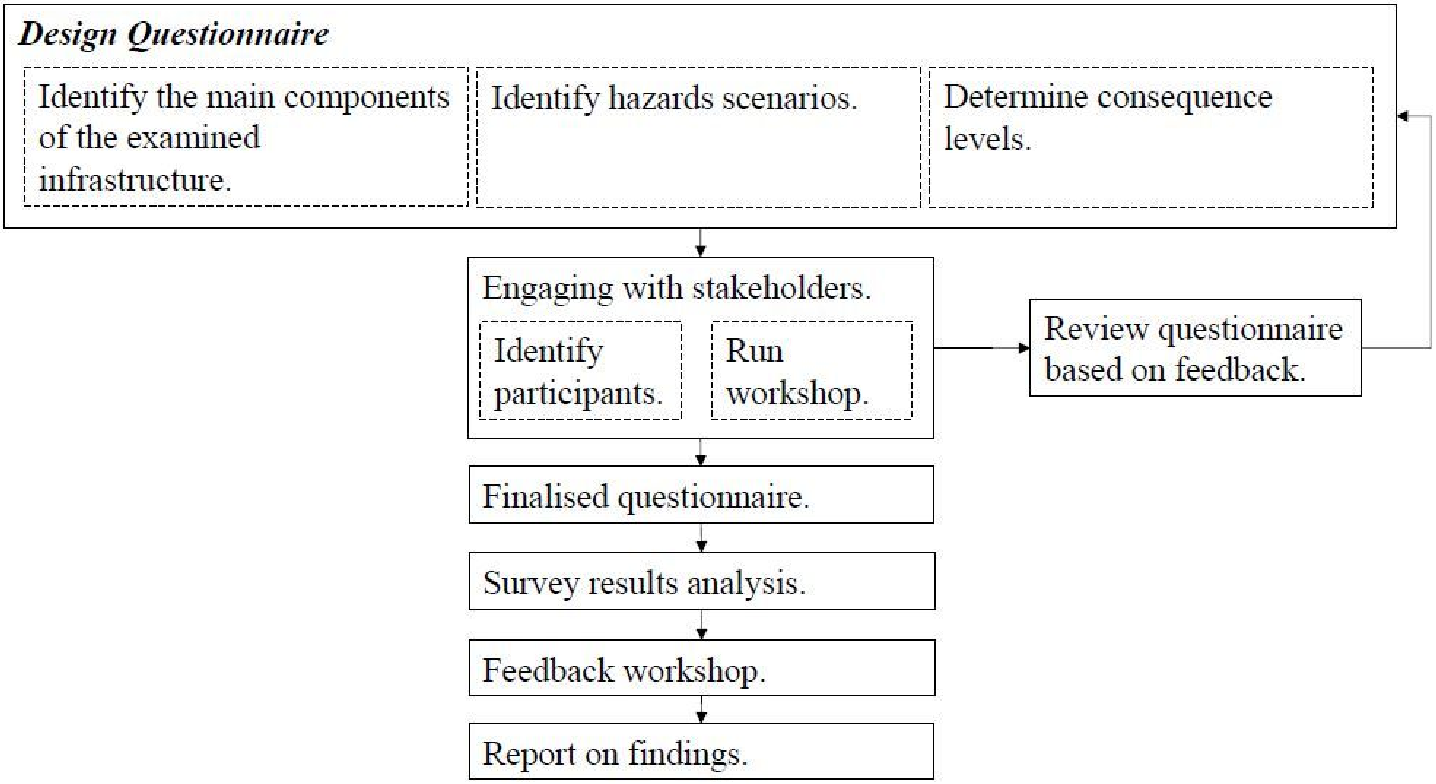

Figure 2

Framework of methodology to identify suitable hazard scenario for assessing the resilience of critical infrastructure.

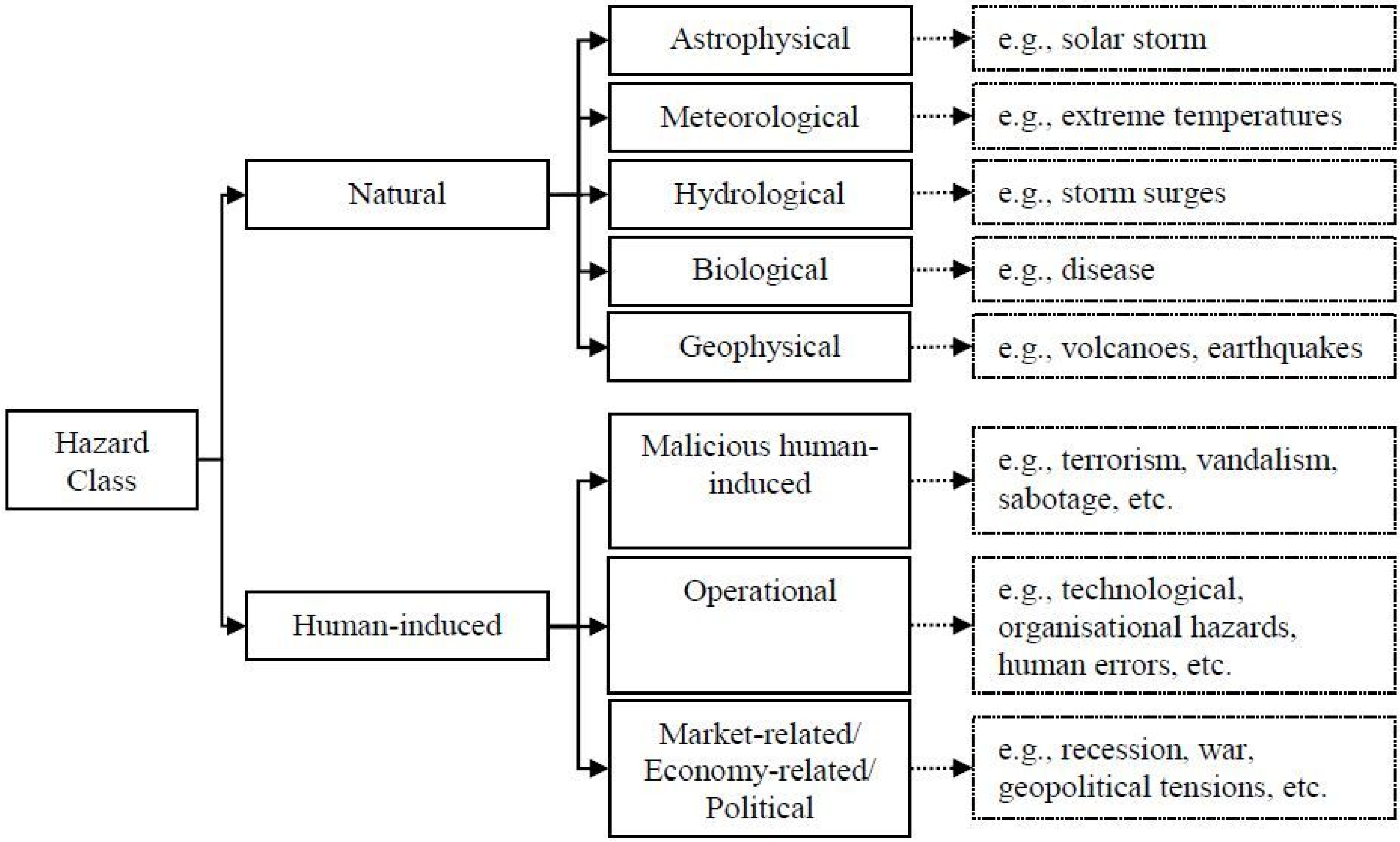

Figure 3

Classification of hazards for the needs of this study.

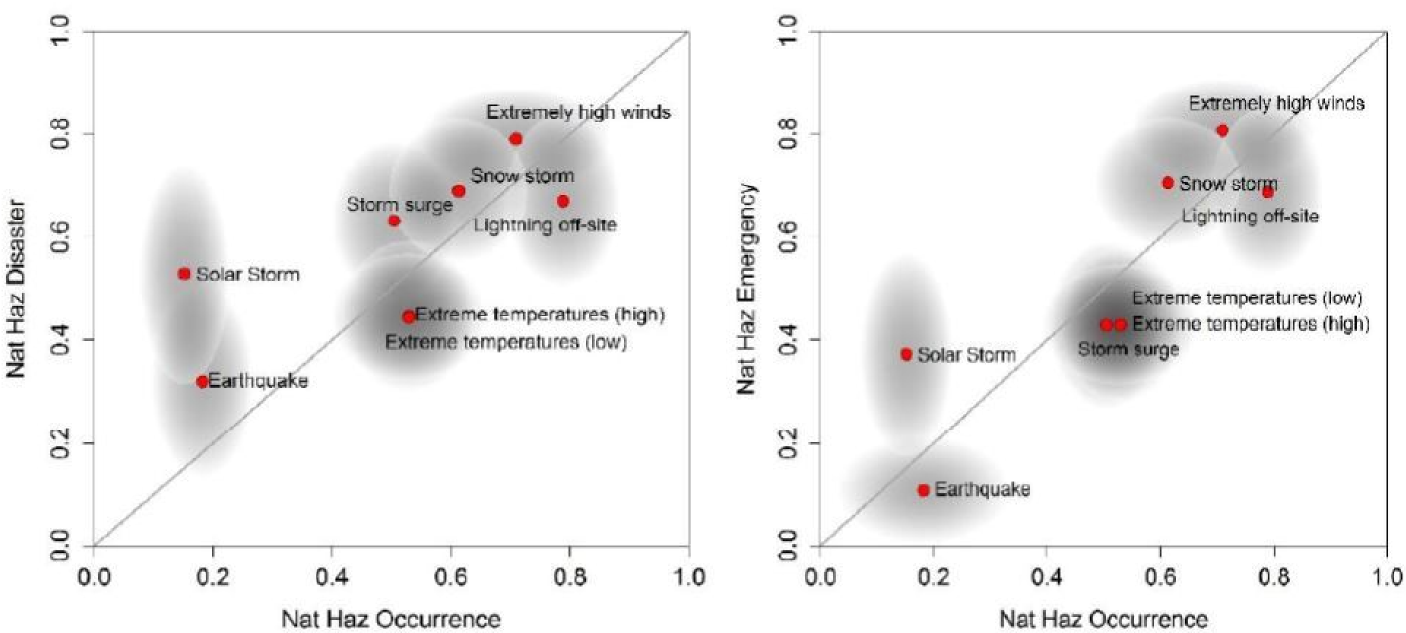

Figure 4

Plots of the rank scores of the natural hazards according to their likelihood to occur in the next 5 years against their likelihood to cause Disaster (left) and Emergency (right) in the Øresund region.

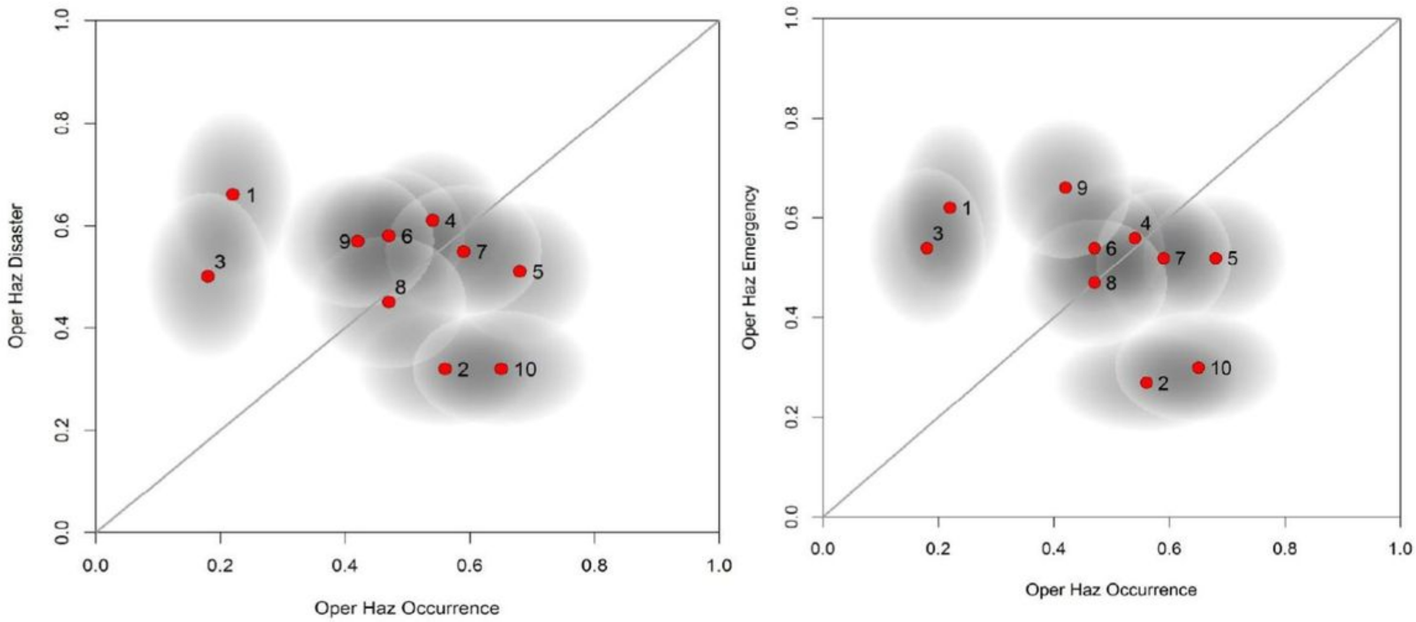

Figure 5

Plots of the rank scores of the selected operational hazards according to their likelihood to occur in the next 5 years against their likelihood to cause disaster (left) and emergency (right) in the Øresund region (see Table 6 for number keys).