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Multi-hazard risk assessment of critical infrastructure at the global scale

Sadhana Nirandjan, Elco E. Koks, Jasper Verschuur, Oliver E.J. Wing, Hans de Moel, Jeroen C.J.H. Aerts, and Philip J. Ward

Global critical infrastructure at risk

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Risk framework

Hazard: the threatening event (including its probability and geographical extent)

Exposure: the elements (e.g., people, buildings) in the area that could be affected

Vulnerability: the (lack of) resistance of the exposed elements to the hazard

Risk = Hazard x Exposure x Vulnerability

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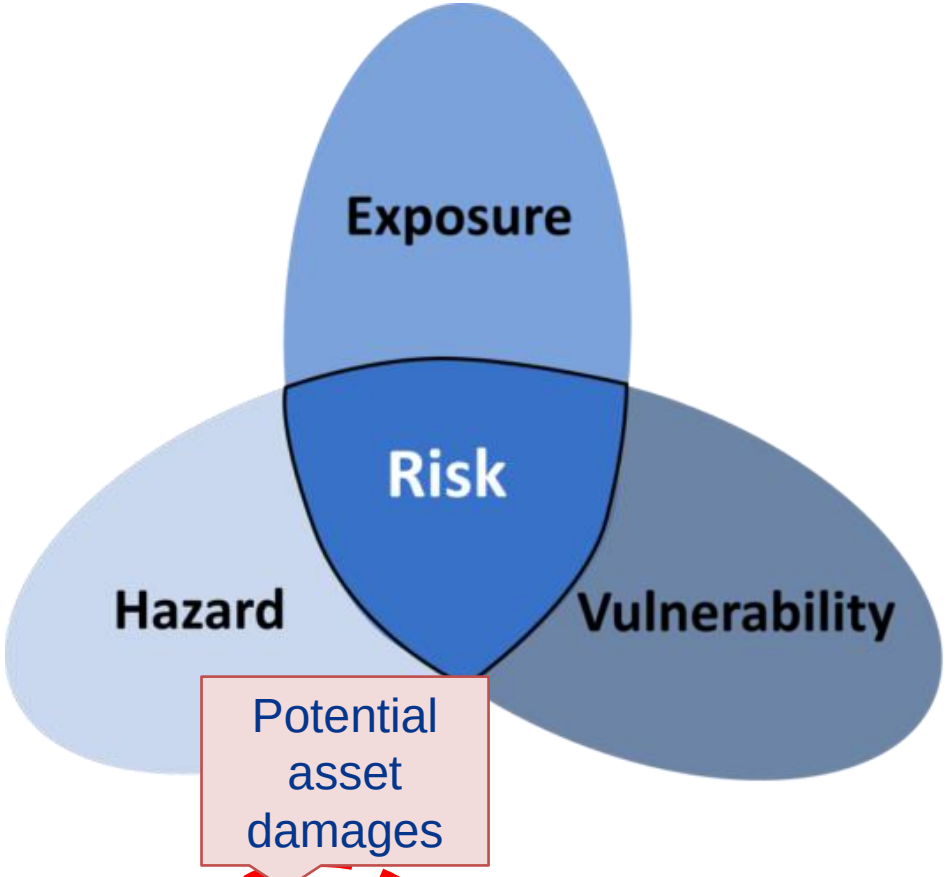

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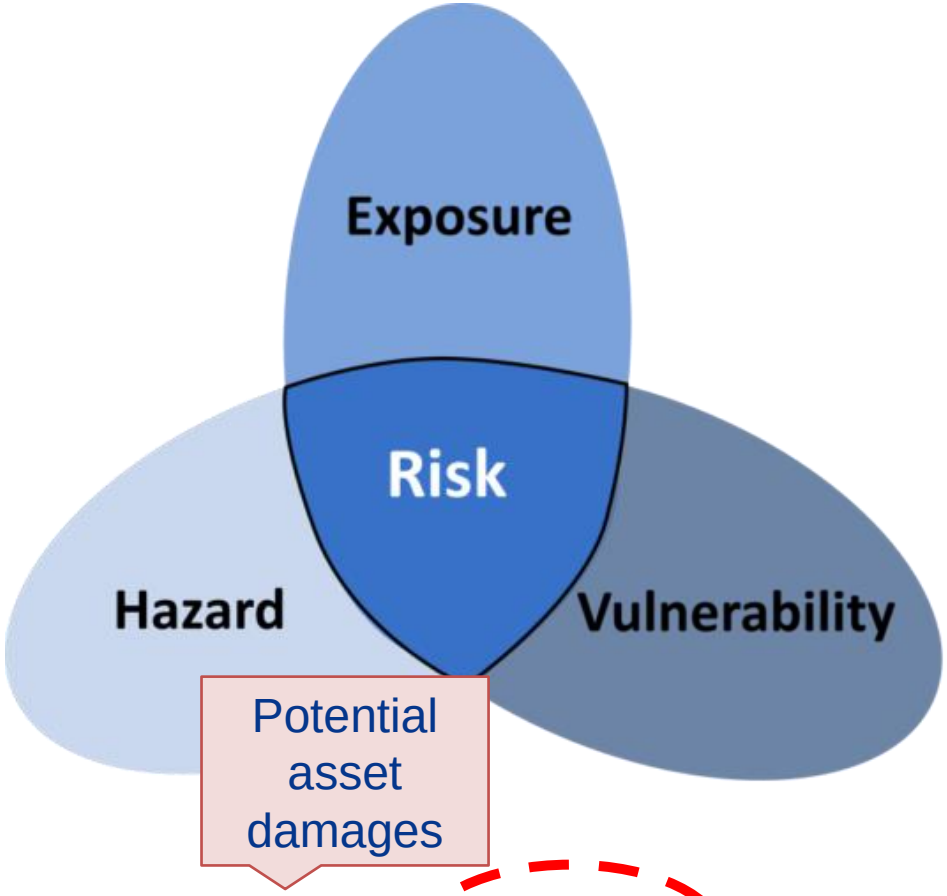

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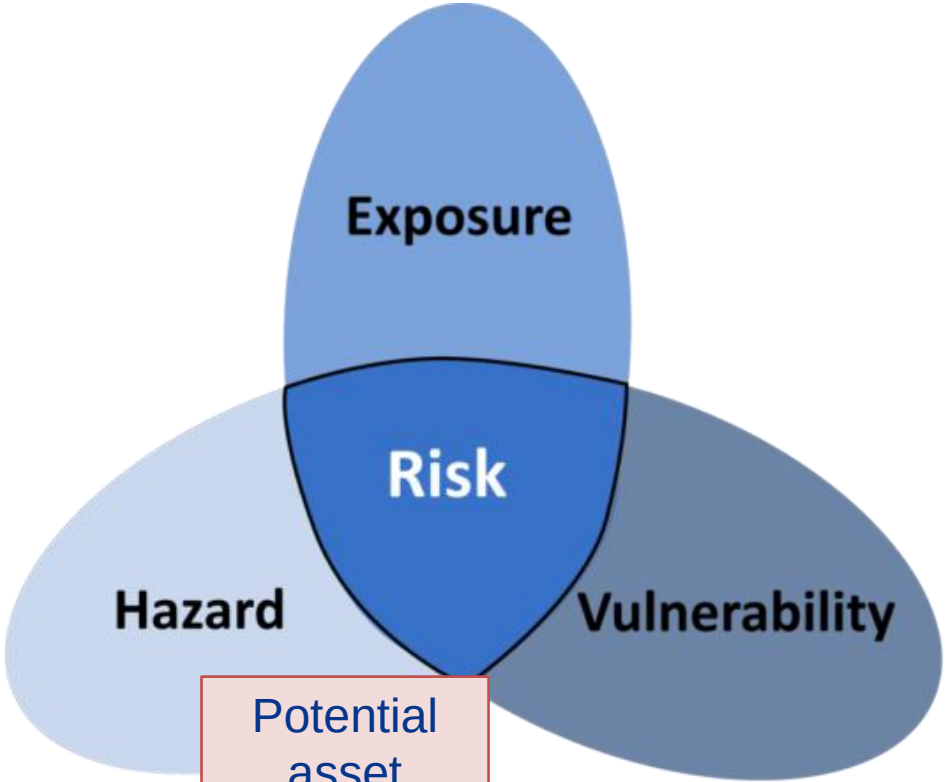

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Potential asset damages

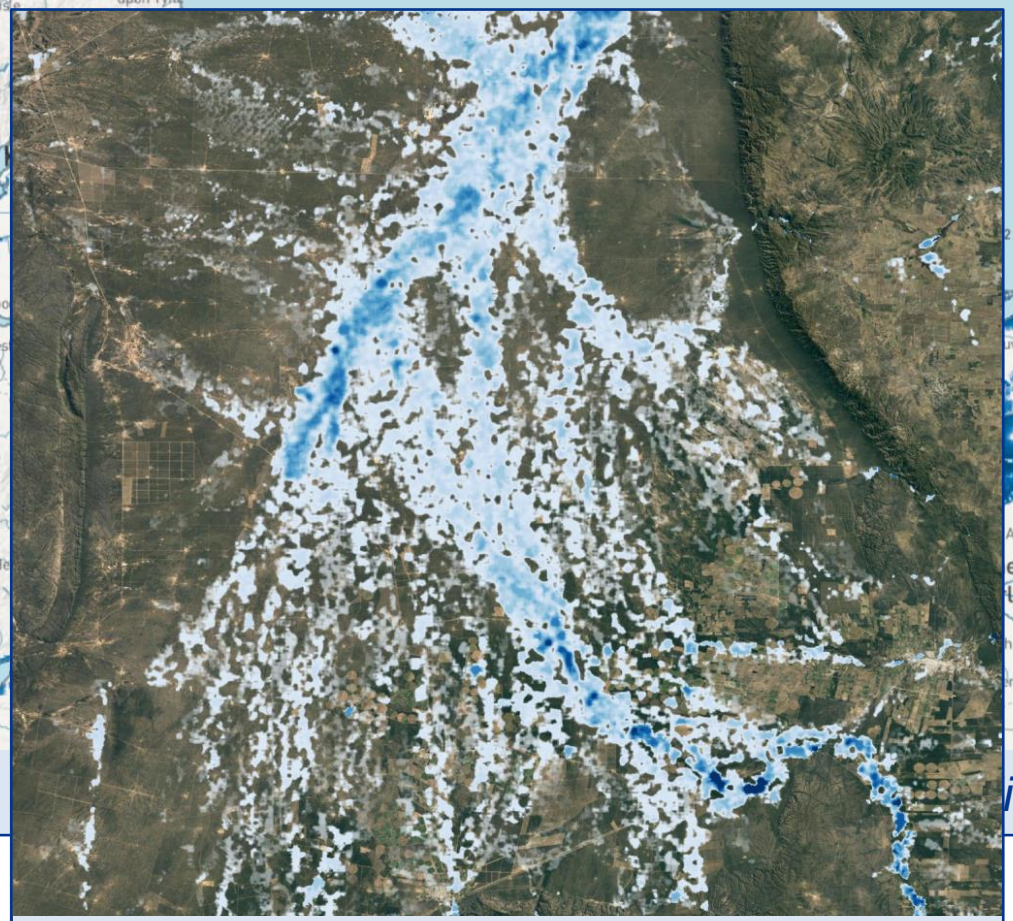
Risk = Hazard x Exposure x Vulnerability

Flooding, earthquakes, landslides and cyclones

Hazard datasets

Coastal flooding

Hazard datasets



Fluvial flooding

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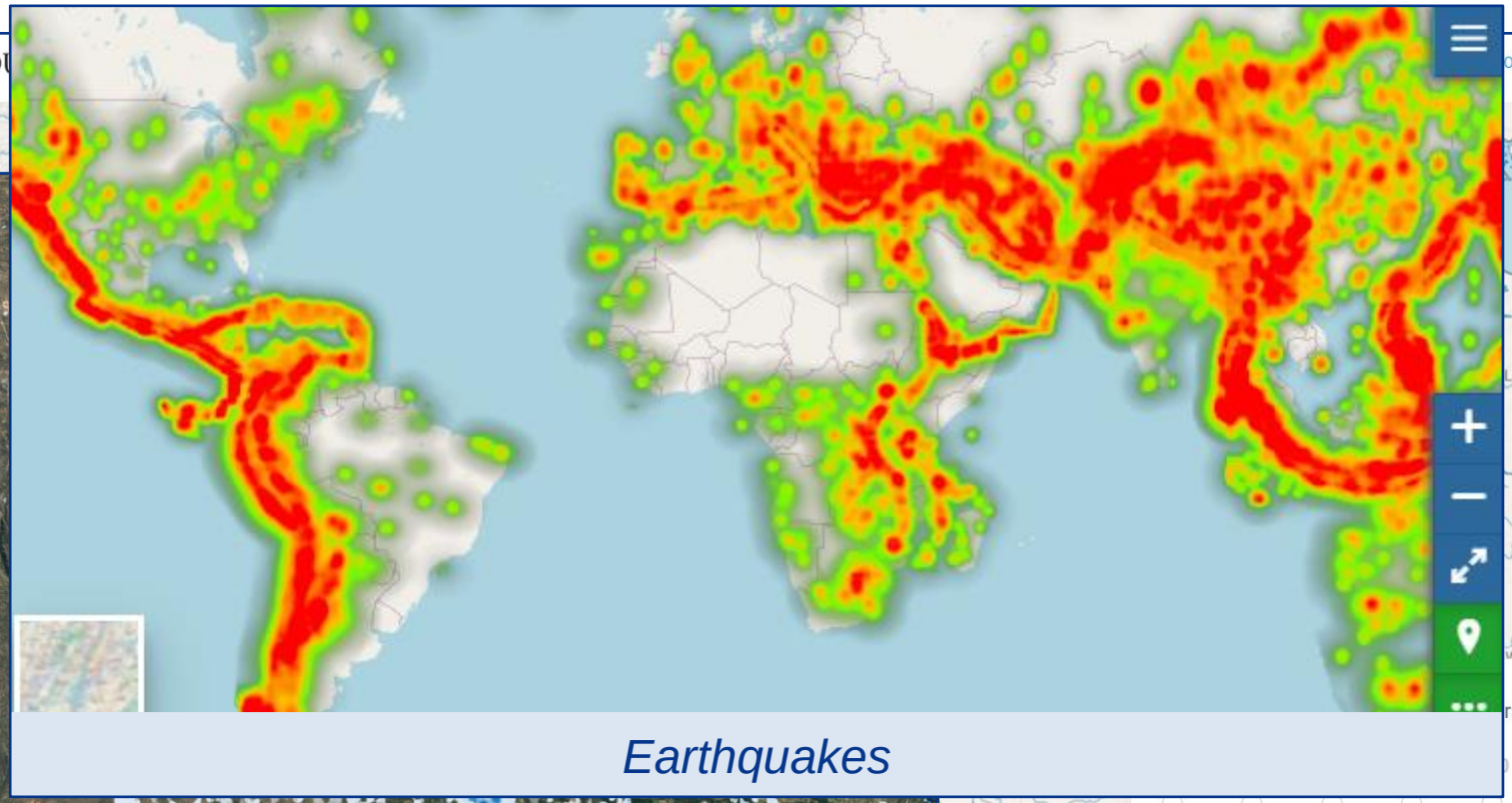
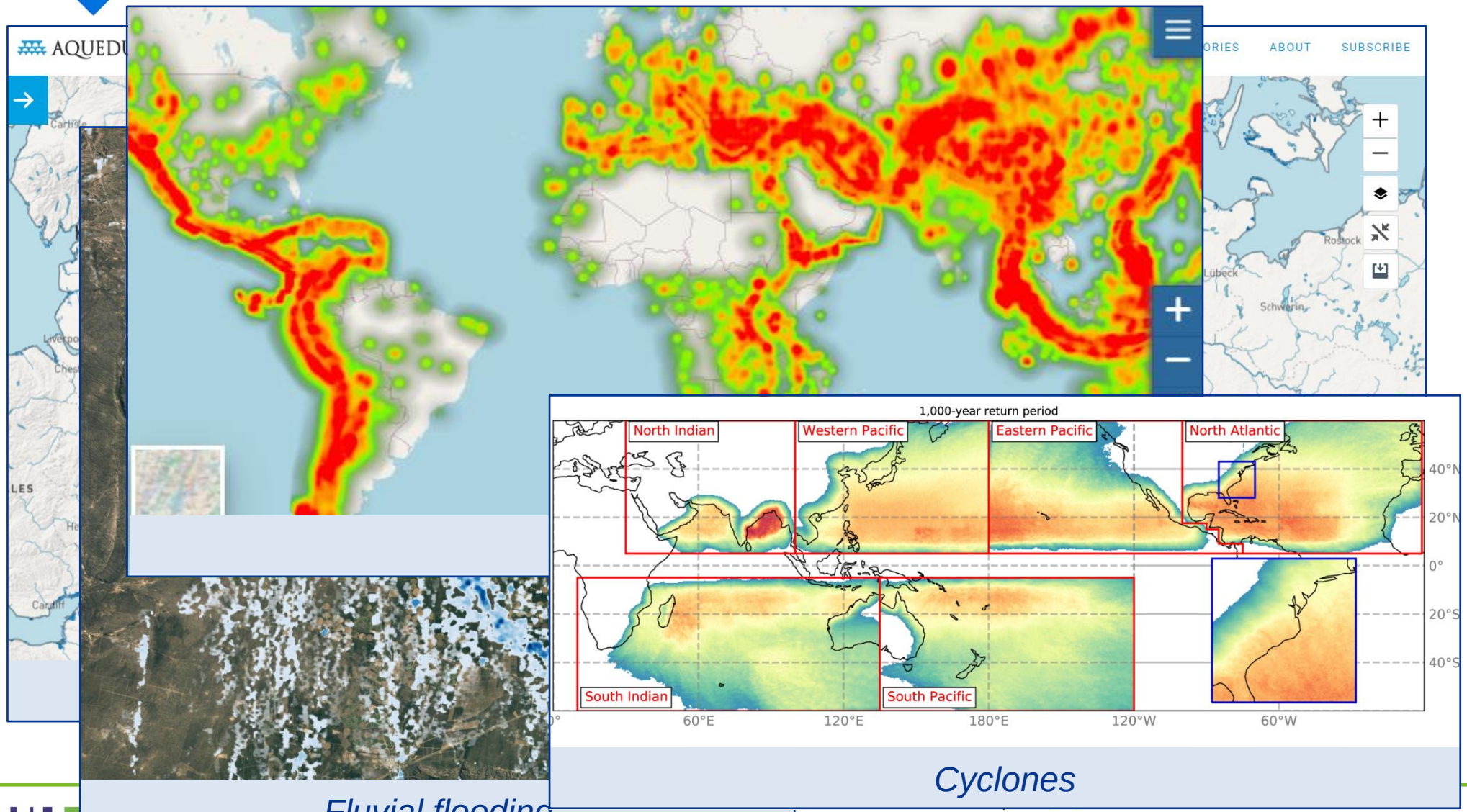
Hazard datasets



Earthquakes

Fluvial flooding

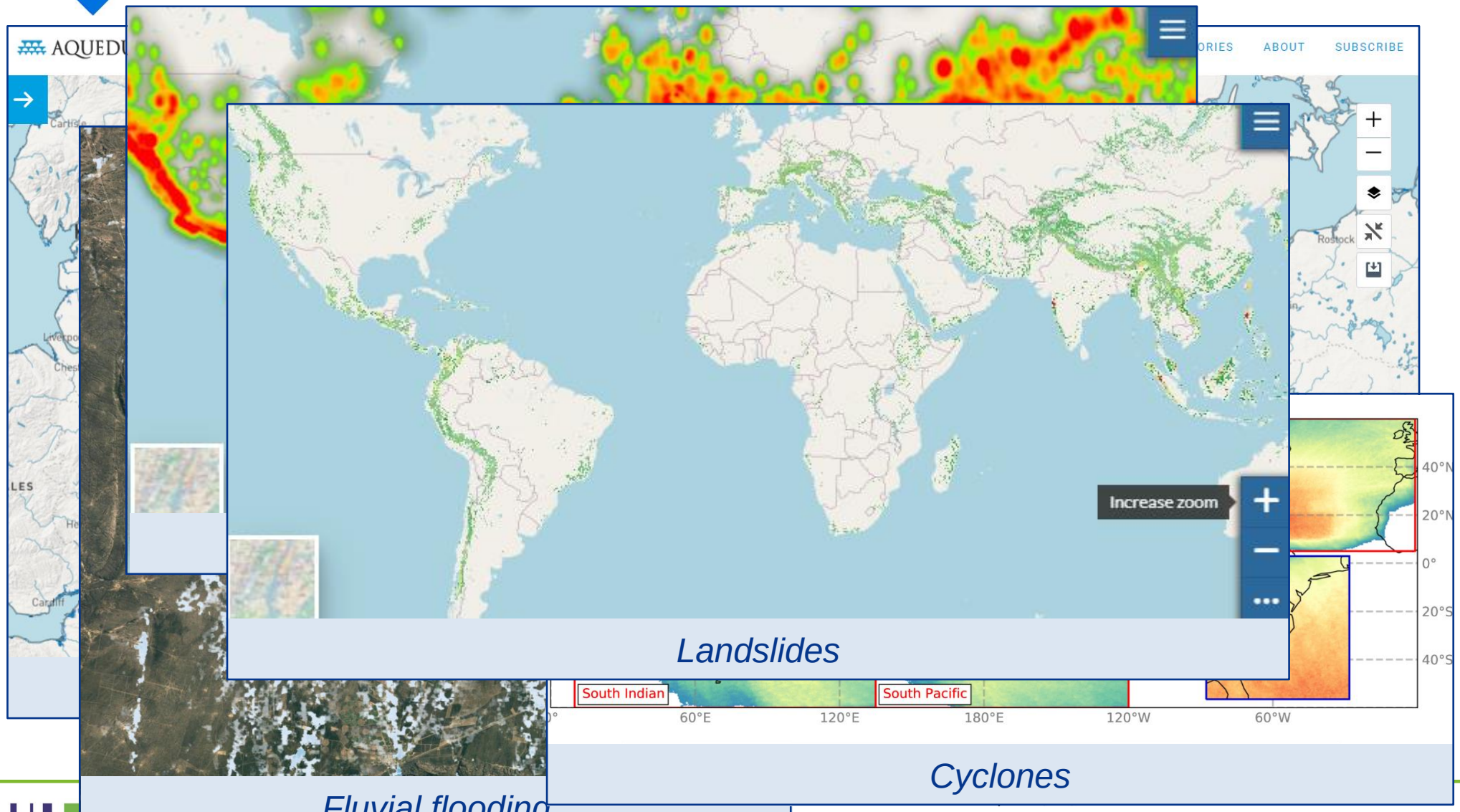
Hazard datasets



Fluvial flooding

Cyclones

Hazard datasets



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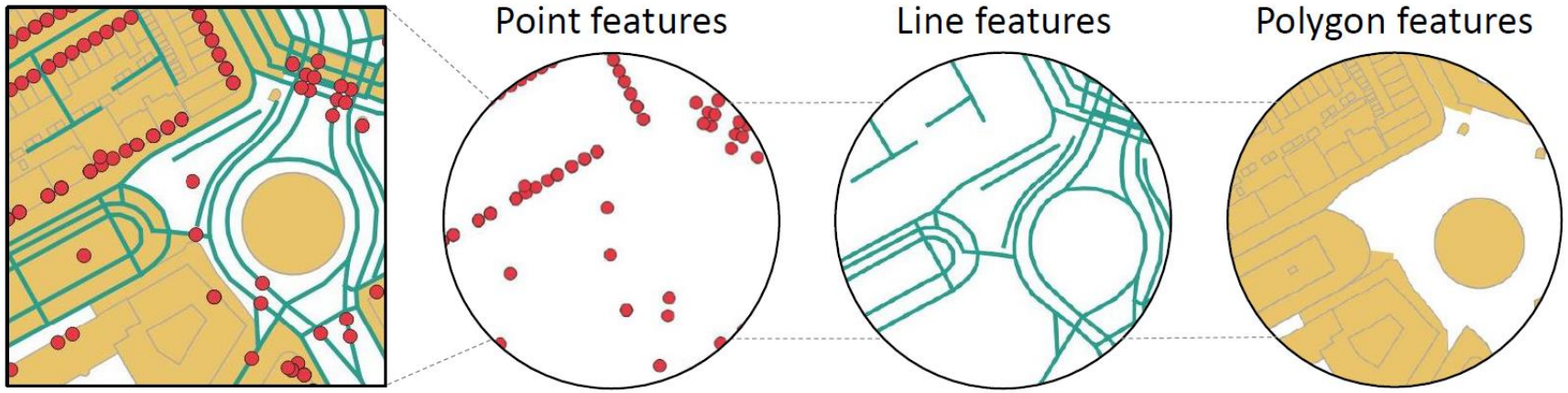
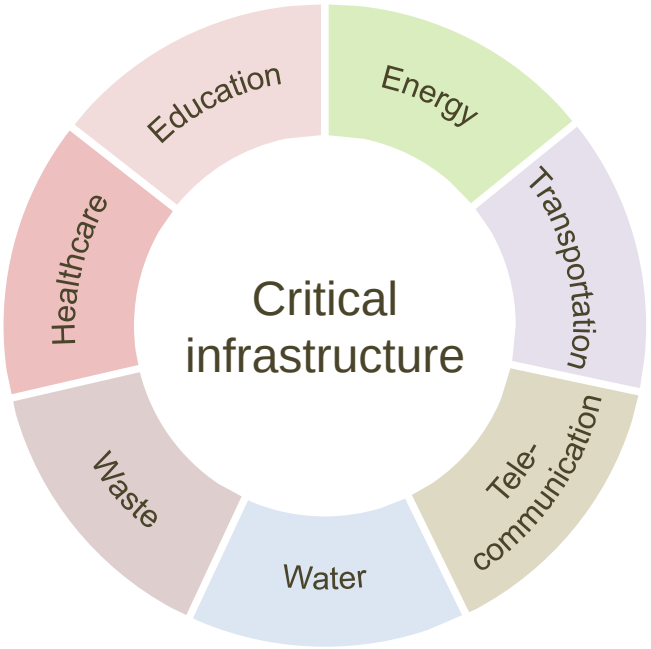
OpenStreetMap

- Source for high-detailed data
- Global coverage
- Wide range of thematic themes



Nirandjan, S., Koks, E.E., Ward, P.J. *et al.* (2022). A spatially-explicit harmonized global dataset of critical infrastructure. *Sci Data* 9, 150.

Categorization of critical infrastructure



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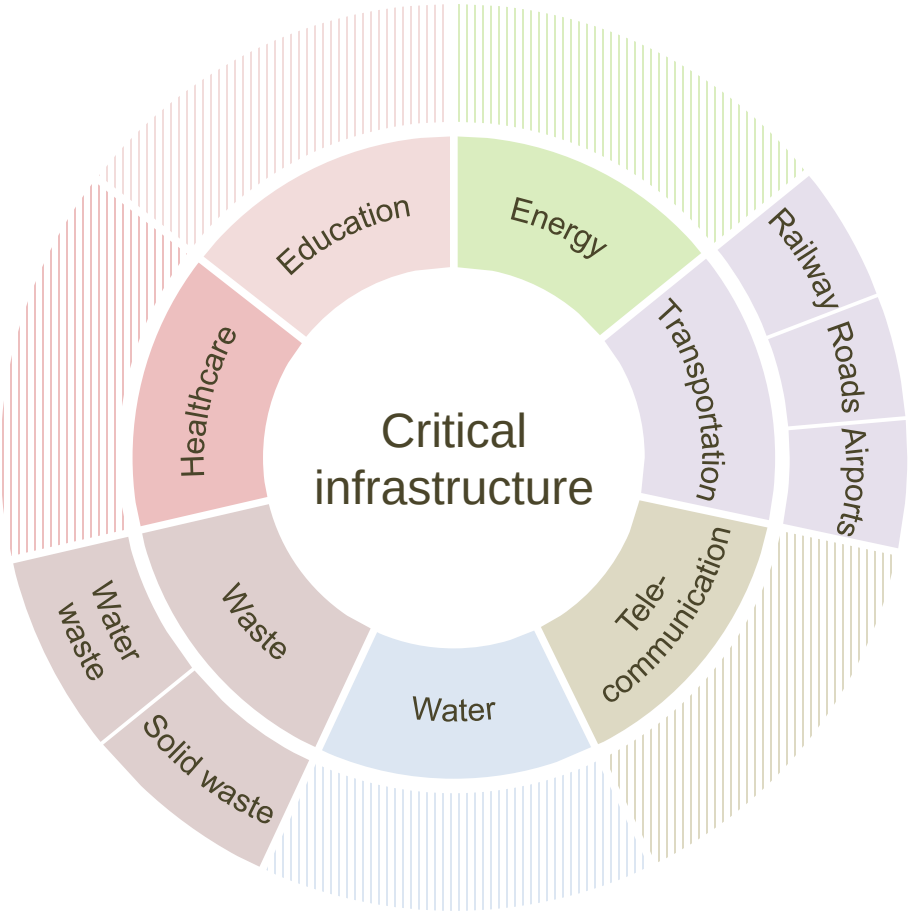

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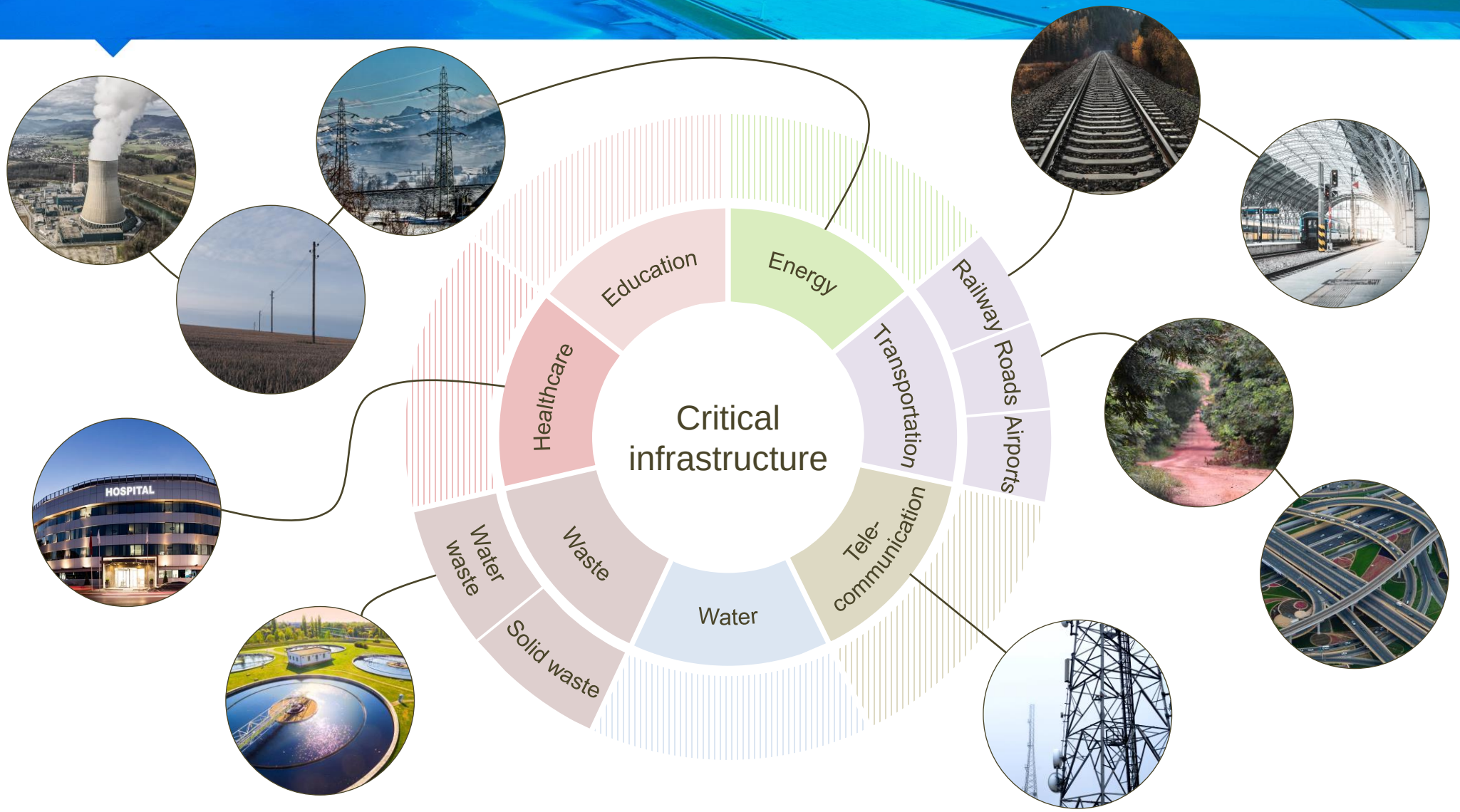

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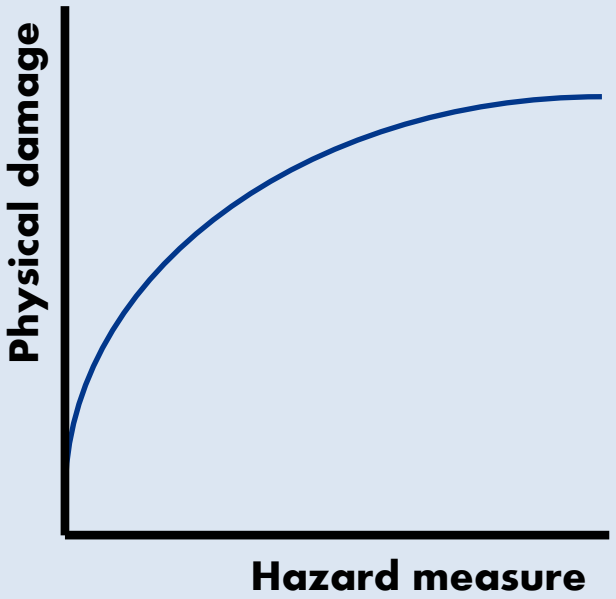
Vulnerability of infrastructure



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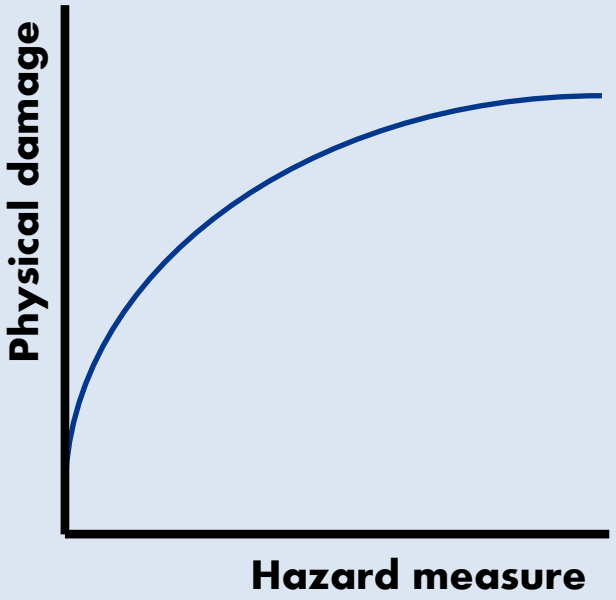

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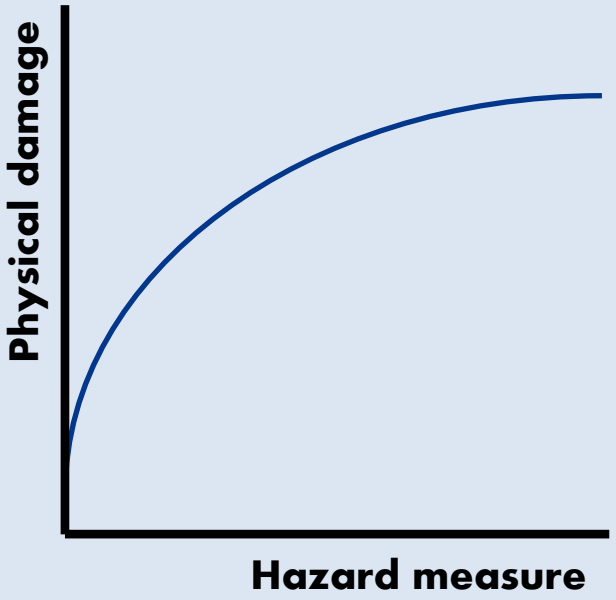

Harmonized database for critical infrastructure vulnerability curves

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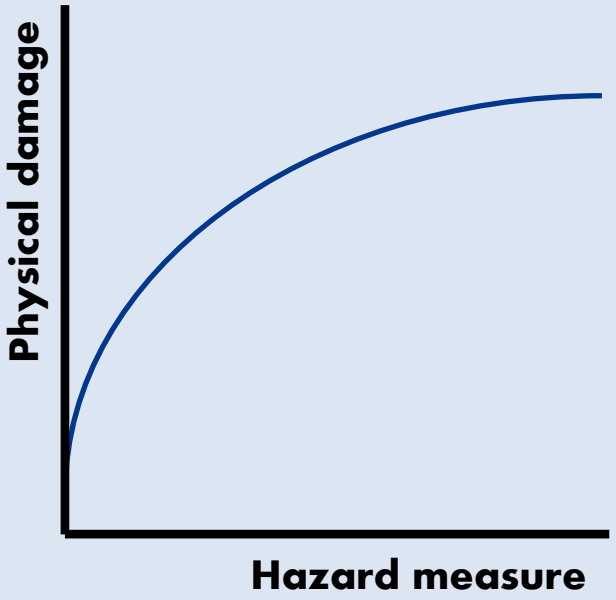

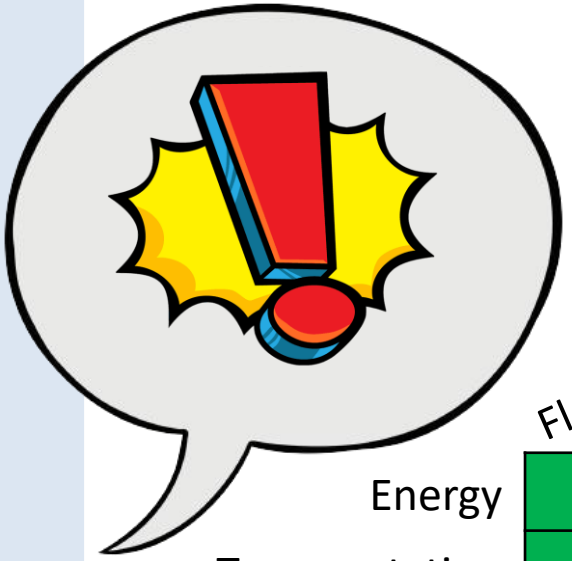

Harmonized database for critical infrastructure vulnerability curves

	Flooding	Earthquakes	Landslides	Cyclones
Energy				
Transportation				
Telecommunication				
Water/waste				
Health/education				

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Thank you!

For more information, please contact:

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Receipt

RECEIPT has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant agreement No. 820712

Appendix slides

Infrastructure types included in the study

System	Subsystem	Infrastructure type
Energy	Power	• Cable • Line • Minor line • Plant • Substation • Power tower • Power pole
Transportation	Railways	• Railway
	Roads	• Motorway • Trunk • Primary • Secondary • Tertiary • Other
	Airports	• Airport (runways and terminals)
Telecommunication	Telecom	• Communication tower • Mast
Waste	Solid waste	• Waste transfer station
	Water waste	• Water waste treatment plant
Water	Water supply	• Water tower • Waster well • Reservoir (covered) • Water works
Health	Healthcare	• Clinic • Doctors • Hospital • Dentist • Pharmacy • Physiotherapist • Alternative • Laboratory • Optometrist • Rehabilitation • Blood donation • Birthing centre
Education	Education	• College • Kindergarten • Library • School • University

List of infrastructure types considered in this study, categorized under ten CI subsystems and seven overarching CI systems. Adapted from: Nirandjan, S., Koks, E.E., Ward, P.J. *et al.* A spatially-explicit harmonized global dataset of critical infrastructure. *Sci Data* **9,** 150 (2022). https://doi.org/10.1038/s41597-022-01218-4

References

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