

# Facts

KC-FU

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## Managing vulnerabilities to multiple water hazards in Sweden

What risks might cascade from multiple hydro-meteorological hazards in Sweden? How will climate change alter the risk of disastrous domino effects? What are the implications for infrastructures and social groups? What measures are needed to reduce vulnerabilities? HydroHazards will evaluate the damage that could be caused by multiple water hazards and based on this, provide recommendations of policies and actions for mitigation and adaptation.

Impacts from multiple hazards are expected to grow with increased dependency on and vulnerability of Critical Societal Services and Infrastructure (CSSIs). Despite this, risk analyses usually study the likelihood of single events and their impacts but fail to consider the web of connections between them. While the stable welfare society in Sweden and the Nordic countries in general, makes them among the least vulnerable societies in the world, the challenge is whether existing Disaster Risk Reduction (DRR) arrangements can react to changes in society, the economy, and the physical environment due to drivers such as climate change or infrastructure development.

HydroHazards will contribute to Swedish DRR policies and practices with specific focus on the management of multiple water hazards and potential mitigation and adaptation strategies to these. The project will examine how exposure and vulnerability to multiple water hazards lead to different types of cumulative and interactive impacts on CSSIs and populations. As such, the project not only strongly relates to but also complements the Swedish Civil Contingencies Agency's work by investigating multiple water hazards.

### Project Structure

The project applies an interdisciplinary and co-creation approach combining social science with climate-, oceanographical-, and hydrological modeling executed through three Work Packages:

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#### Project Title

Managing vulnerabilities to multiple water hazards in Sweden (HydroHazards)

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## Work Package 1: Assessing Hotspots of Multiple Water Hazards and Exposures

*How do multiple water hazards combine? Which areas and CSSIs are most exposed to multiple water hazards?* Traditionally, the impacts of water extremes are mainly assessed separately, not accounting for the consequences of the combination of two or more events.

However, the combination of two moderate hazards can be significantly worse than a single severe hazard, which motivates further studies to complement single hazard studies.

## Work Package 2: Assessing Differentiated Vulnerabilities

*How do populations perceive their own and CSSIs exposure and vulnerability? How do these perceptions influence their choices of strategies to cope with and adapt to multiple water hazards?* The different vulnerabilities among populations and CSSIs are important to consider in the design of DRR policies and practices. This is especially true in cases where observational evidence is scarce or non-existent on conditions that are likely to occur in a warmer climate and that may increase the likelihood of hazards that are rare today but might become much more commonplace.

## Work Package 3: Risk Scenarios from Impacts of Multiple Water Hazards

*How might scenarios of future multiple water hazards in a future climate look like? What monitoring and response mechanisms are needed to manage these risks? What existing policies and frameworks are addressing these problems, and where do gaps remain?* The importance of considering both past as well as future social contexts and water hazards is particularly relevant in a Swedish case, where evidence suggests that a hazard has traditionally not been considered a disaster unless it has caused severe economic losses or deaths. As a result, there are few historical records of Swedish water-related disasters. This points to the importance of not only looking at hazards or exposure, but to also assess present and future social vulnerabilities for more effective and efficient DRR.

Project Duration

HydroHazards is a 5-year project financed by the Swedish Civil Contingencies Agency and FORMAS, starting January 2020 and ending December 2024.

### Key concepts

**Multiple hydrometeorological hazards** are hazardous events that occur simultaneously, cascadingly or cumulatively. In Sweden, these arise mainly from snowmelt and peak river flow, heavy and persistent large-scale rainfall, small scale cloudbursts, and coastal surges.

**CSSIs** is a collective term that encompasses the activities, facilities, nodes, infrastructures and services that are crucial for maintaining important functions in a society. An infrastructure or service is considered of critical importance if a loss of or a serious disruption to its operations in a short period of time can lead to a serious crisis in society; or if its operations are essential for a crisis to be managed and adverse effects minimized.

**Differentiated vulnerabilities** among social groups or CSSIs are caused by different economic, cultural, and political contexts that cause different impacts depending on for instance age or gender (in the case of social groups).