



Water interactions leading to high-impact compound events: multiple stakeholder perspectives

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Multiple change pressures from human activities and from climate variability and change affect water systems on land and at the coast and sea. Changes in these water systems in turn affect and feedback to multiple societal and ecosystem conditions and risks, e.g., for: water security and safety; food and energy security; human, animal and ecosystem health; and drought, flood and general climate-change mitigation/adaptation. Compound events with high societal and ecosystem impacts may result from various combinations of these water-related pressures and interactions. As a starting contribution to the European COST Action DAMOCLES, this study addresses the questions of: Which water-related compound events are most relevant for stakeholders? How much is currently known, by scientists and various stakeholders, about the multiple underlying variables and their inter-linkages for these events? What novel approaches can be used to ensure continuous stakeholder engagement?

Using a “source-to-sea water-link” case study in the Baltic region, specifically the relatively well-studied Swedish Norrström drainage basin and its adjacent and surrounding coastal areas and associated marine basin of the Baltic Sea, we apply a participatory approach to conceptual model building, involving relevant stakeholders for the land, coast and sea aspects of linked water-related pressures, changes and impacts, and their interactions. Use of this participatory approach can increase understanding of how stakeholders from different sectors view and think about these interactions, and facilitate collaborative exploration of cross-sectoral cooperation opportunities for research, applications and innovations regarding water-related high-impact compound events. As a main part of the study and its approach application, six workshops have been held with stakeholders from different land, coast and sea sectors. In these, mind maps and causal loop diagrams have been co-created by the involved stakeholders and scientists for key land-coast-sea interactions under climate change and socio-economic developments to identify associated connections among sectors with potential high social and environmental impacts. A main aim of this co-creation process is to identify and eventually model and quantify the main dynamic cause-effect links for these interactions and impacts. We here report and analyze the resulting mind maps and causal loop diagrams, and their similarities and differences, as co-created in the sector workshops based on their different focus themes and stakeholder perspectives. In synthesis, we also discuss the causal loop diagram implications for further systems modelling and quantification of key water-related compound events and their impacts.