Beware: Better early warning and responsible effect handling

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The prediction of the timing and extent of natural hazards, as well as the impacts they generate (which turn such a hazard into a disaster) is a field of rising importance, but with many unanswered questions. As a society we struggle to take account of how rapidly risks are changing in a warming climate, and we often fail to forecast compounding impact of different hazards. We haven't solved the problem yet on how to include and model the increasing complexity and multi-sectorial nature of the consequences, with cascading impacts through sectors and regions, including impacts aggravated by misguided human responses.

The fundamental problem is that the present scientific basis for early warning systems and (climate) event attribution is relatively weak. This varies per hazard and can be rooted in lack of data or data uncertainty, but also in insufficient understanding of the interacting and cascading underlying (physical) processes. We can build operational Early Warning Systems, as is presently being done at the Dutch Meteorological Service (KNMI) and a few other national weather services, but the complex interdisciplinary scientific questions, although fundamental for a reliable functioning, have hardly been addressed so far. Furthermore, the scientific challenge is exponentially amplified once compound events are considered, or early warning concepts are applied in the Global South.

The innovative science therefore hinges on two major aspects. The first aspect is addressing the deeper scientific questions that relate to our understanding of hazardous processes and establishing relations and models that form the fundament for reliable prediction. The second aspect is to develop techniques and approaches to incorporate climate considerations into decision-making processes and in the design of interventions such as early warning systems and anticipatory actions.

It will advance our ability for early warning and early action across time and spatial scales, specifically related to the influence of humans on climate related hazards. The gaps in our understanding of these triggering events and their cascading effects provide the basis for our challenge to improve our knowledge on the current impact of climatic extremes, to anticipate future weather, and to connect such changing hazards to changing impacts. This insight then allows us to evaluate risk management options on short and longer timescales, extending from early warning to systematic changes, especially in the face of limits to adaptation.

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