



## The Appropriate Level of Evidence in Climate Services

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In this presentation, we propose a framework guiding the use of climate services. Debates on climate services discuss the product of climate information ('usable' knowledge, cf. Lemos et al. 2012) and the process of its production ('co-production of knowledge', cf. Bremer & Meisch 2017). Both approaches centre on scientific climate information but take 'users' into account. We explore a related aspect focusing on stakeholders' use of climate information: the appropriate level of evidence to inform decisions.

Due to uncertainties in climate information, appropriate decision principles for climate decisions require methods to assess which possibilities should be considered (Betz 2016). Specifically, the lack of experience with future climate change makes it unclear what level of evidence is required to act today for certain climate impacts. Based on illustrative examples on climate adaptation, we present an argumentative framework to assess the appropriate evidential standard for considering certain possibilities by focusing on the following two criteria:

a. The (societal and environmental) severity of climate hazards varies depending on a range of circumstantial factors. Other things being equal, a decision maker is more inclined to respond when consequences are potentially greater. Thus, if consequences are large, the appropriate evidential threshold for climate information to support action is lower than for decisions relating to less severe impacts. For example, flood prevention action for a chemical plant might be warranted even if the evidence of an increase in the probability and severity of floods is ambiguous. As the severity of a hazard is judged from a decision maker's perspective, her risk preferences will implicitly influence this assessment.

b. Other things being equal, climate information's appropriate level of evidence supporting decisions decreases when action implementation is straightforward, including when decisions are easily adaptable or reversible. For example, seasonal precipitation shifts in Central Europe might call for changes in the allocation of water use rights. However, changing this policy will likely be conflict-riddled and time-consuming. A higher level of evidence of climate information is appropriate in this case.

However, the appropriate level of evidence by criteria (a) and (b) can conflict. For example, when the severity of potential impacts calls for a lower level of evidence, and the difficulty of policy design and implementation suggests adopting a higher evidence standard. In such cases, argumentative tools can broaden the scope of decision options, including delaying action and requesting further research. Our framework of the appropriate level of evidence in climate services centres thus on real-world issues and decision-makers' risk preferences, while linking these discussions to available climate information. We argue that our framework allows climate scientists to discuss the limitations of their findings more honestly, and places decision-making power firmly with policy-makers.