Proceedings of the 33rd European Safety and Reliability Conference (ESREL 2023)
Edited by Mário P. Brito, Terje Aven, Piero Baraldi, Marko Čepin and Enrico Zio
 Published by Research Publishing, Singapore.
doi: 10.3850/978-981-18-8071-1_P586-cd

Mitigation of Climate Change. Increased consideration of risk and uncertainty

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To achieve a drastic reduction of emissions and a significant increase in carbon uptake from the atmosphere, the Intergovernmental Panel on Climate Change, IPCC, in 2022, recommended a considerable number of mitigation options whose feasibility and potential are yet to be examined in each context. The IPCC also endorsed an approach to assess the feasibility of mitigation options. We discuss some issues in the IPCC report in 2022 that reflect the need for an increased consideration of risk and uncertainty linked to mitigation options. For example, to account for the uncertainty of a mitigation option, a more detailed specification of mitigation options is required. Concerns are also raised about whether the assumptions involved in specifying mitigation options are systematically assessed. From these issues, it follows that mitigation achievement is potentially compromised.

Keywords: Mitigation, climate risk, risk, uncertainty, feasibility of mitigation, assumptions.

1. Introduction

The need for increased consideration of risk in mitigation is highlighted in the IPCC mitigation report (2022). There is a call for *'Accelerating mitigation (…) [which] will require the integration of broadened assessment frameworks and tools (…)*' and this includes that *'Approaches to risk assessment (…) are complemented by frameworks for probing the challenges in implementing mitigation (…)*' For the IPCC a mitigation option can fail to achieve its intended outcome, or create an adverse outcome elsewhere (IPCC, 2020). This means uncertainty about mitigation outcomes or risk. Next, the IPCC endorsed an approach to assess the 'feasibility' of mitigation options. The approach suggests that the assessment of options can be done by taking into consideration six feasibility dimensions, namely geophysical, environmental-ecological, technological, economic, socio-cultural, and institutional dimensions. The approach has been developed with a special focus on identifying barriers to and enablers of the deployment of mitigation actions and thus assessing their feasibility (IPCC, 2022). Despite these developments, in the following, we identify some issues that show the insufficient importance given in the approach to the risk and uncertainty that mitigation actions may involve.

2. Feasibility assessment approach issues

Aven (2020) has argued that an unambiguous conceptualization of climate risk is required to improve risk understanding and communication. This author has suggested that the climate risk concept has two main components: i) the consequences of activities, C, and ii) the associated uncertainties, U. For example, the consequences may be related to deviations from the goal of global low-emission. Risk is then defined as both the event of the deviation D from the goal and the associated uncertainties U. Uncertainty is therefore a central concept linked to the concept of risk (Aven, 2020). Uncertainty is lack or incomplete knowledge about a quantity or event (SRA, 2018). Such uncertainty can be measured in terms of probability and fully described by examining the credibility of the background knowledge associated with the probability (Aven, 2020). The lack of conceptualization of risk reflected in the IPCC reports has already been highlighted by Aven (2020). Here, we will not touch upon this further. Rather, we elaborate on other implications when using this climate risk conceptualization.

2.1. *Mitigation uncertainty description*

A more obvious and accurate specification of mitigation actions has been suggested by Stern et al. (2022). Mitigation feasibility and mitigation potential are distinguished from each other to fully assess a mitigation action. Based on Stern et al. (2022), we shall define mitigation feasibility as the *probability* that an agent will adopt and then implement a mitigation action. In turn, mitigation potential denotes the *probability* of reduction in the '*[sources] of an environmental change or the associated damage that would result if a mitigation [action] were completely realized or [its objectives] fully achieved*' (Stern et al., 2022). These notions are not explicitly used as such in the IPCC assessment approach. Further, the approach is solely focused on feasibility. However, we add that a mitigation option is not fully specified by assigning a probability. The specification should be informed by the assessment of the credibility of the background knowledge, which includes assumptions associated with the probability, as has been previously suggested by Aven (2020) for the climate risk notion. In total, the uncertainty linked to mitigation actions is currently not fully described in the feasibility assessment approach thus limiting, among other critical tasks, the mitigation options prioritization.

Mitigation actions are mostly unique in relation to the context in which they are going to be set in place. The feasibility and potential of mitigation options can vary across contexts. The context is a significant factor in climate risk mitigation and therefore needs to be explicitly assessed (Stern et al., 2022). To characterise the context, the feasibility assessment approach limits to capture of space, scale, and time factors. Next, the notion of context has never been defined. We, therefore, question whether the IPCC's mitigation options' feasibility assessment approach comprehensively captures the context of a mitigation option.

2.2. *The systematic evaluation of assumptions*

The mitigation actions specification credibility is also to be examined. Assumptions are critical in the case of the prediction of non-observed events or quantities, such as those involved in mitigation actions. The evaluation of assumptions is not new, but their structured and systematic assessment in the form of a risk assessment has been recently suggested (Aven, 2020). Although the IPCC used mitigation scenarios to explore different strategies to meet climate goals, the many assumptions involved are not assessed systematically. The assumptions involved include not only modeling assumptions but also input quantity assumptions, choices by modelers, and many other types of assumptions. Yet, Warszawski et al. (2021) illustrated in some aspects how a systematic revision of scenarios, in conjunction with the consideration of the reasonability of the linked assumptions, can be conducted in the setting of the projections of global temperatures. The reasonability of assumptions is determined using experts' judgment. The systematic assessment of assumptions is an ideal link between the feasibility assessment approach endorsed by the IPCC and the scenario exploration as illustrated by Warszawski et al. (2021).

3. Conclusion

In specifying mitigation actions, we suggest further describing uncertainty and exhausting knowledge about the context of the action. We also put forward a systematic evaluation of assumptions. Ultimately, we expect that undertaking these tasks could potentially enhance risk communication and therefore increase the probability of mitigation.

Acknowledgment

This research is funded by ARCEx partners and the Research Council of Norway (grant number 228107).

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