Review of the NCCRA's cascading risk methodology

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Context

This review was undertaken in December 2025 as part of a service contract for an independent international evaluation of the NCCRA's cascading risk methodology. The assessment draws upon documentation supplied by the Climate Change Commission, including the principal methodology document and supplementary materials. In conducting this review, I have applied expertise acquired through engagement with European and German Climate Risk Assessments, contributions to methodological guidelines for risk assessments, and participation in the scoping process for IPCC AR7 WG2.

Overall evaluation

Firstly, I concur with the observation in the main document that "cascading climate risk assessment is an emerging area of research, and there is not yet a globally consistent best practice approach or methodology to considering cascading risks in national climate risk assessments". The evolving and relatively undeveloped nature of cascading risk assessment (CRA) methods is evident in the NCCRA's selection of approaches, which involved piloting several techniques before settling on a methodology that is both operational and pragmatic. The NCCRA's explicit recognition of the significance of cascading risk and its integration into the assessment process is already highly appreciated.

The current approach to cascading risk assessment is methodologically robust, offering a clear framework for analysing complex interdependencies. Its focus on the interplay between primary and downstream risks provides valuable insights for national policy development. By systematically addressing the relationships between risks, the method ensures that critical factors are not overlooked. One main suggestion is to further elevate the finding from the cascading risk assessment within prioritisation and key findings. Overall, the approach lays a strong foundation for comprehensive and integrated risk analysis in line with the current state-of-the-art in national and transnational climate risk assessments.

Specific comments and recommendations

The commission undertook and tested 4 different methodological approaches for a consideration of complex risks:

a) the completion of a risk analysis template for a specific cascading risk in the built environment domain;
b) commissioning of causal loop diagrams to illustrate two particular cascades;
c) commissioning additional advice on cascading risk archetypes;
d) developing a method to factor indirect and cascading relationships between risks into the scoring and prioritisation of risks.

It appears that only method d) was implemented across all sectors of the NCCRA, making it the sole approach with a direct influence on the overall assessment outcomes and risk prioritisation. Methods a) to c) were experimental in nature; however, they offer significant scientific value. Further development may be needed to translate these approaches into substantive outputs, as outlined in the recommendations.

Comments on a) the completion of a risk analysis template for a specific cascading risk in the built environment domain

- My first comment would be that the limitation of cascading risks *in* a single domain is already a restriction. Cascading risks related to the built-environment domain are including by your own definition risks to other domains such as health or economy.
- The approach to *exclude any further cascades outside of infrastructure networks, for example, into human economic or governance domains* might be pragmatic from an operational perspective, but concepts how to combine this with cascading risks across domains would be required.
- Consequently, the decision to exclude this approach from the operational assessment at the risk severity scoring stage is understandable.

Comments on b) commissioning of causal loop diagrams to illustrate two particular cascades

In this experimental approach, applied to two domains, there is clear innovation. Certain findings could be elevated to the high-level key messages of the NCCRA.

- Methodologically, the co-production of results through workshops involving subject matter experts from industry and academia is a strength. Despite not being fully aligned with the process used for individual risk assessments, I recommend utilising expert workshops across all risk types, whether cascading, direct, or indirect.
- The causal-loop diagrams are simultaneously insightful and confusing. Currently, their inconsistent and non-standardised representation, where even similar elements across domains are not harmonised, limits their clarity. Future work should adopt more

standardised and risk-specific frameworks, such as those found in established impact chain methodologies for climate risk assessment[1].

- The focus on feedback loops, particularly those that may amplify risks within the social domain, is promising.
- Notably, findings such as "the reductions in infrastructure service levels can directly undermine individual and community wellbeing, subsequently affecting social cohesion", should be promoted to high-level key messages. Such insights support a systemic perspective on risk and justify measures that strengthen both technical and social system resilience, including social policy interventions.
- It is advisable to assess whether additional findings on feedback loops from this consultancy could inform or reinforce key messages regarding the interconnectivity of risks and the need for cross-domain strategies.

Comments on c) commissioning additional advice on cascading risk archetypes

This contribution consists of a brief memorandum, extending to six pages.

- While I am generally supportive of the initiative to identify "archetypes", I find that the archetypes presented here are rather broad in nature.
- Specifically, the first two archetypes, a "too much" cascade (repair) and a "too little" cascade (contestation), are not mutually exclusive in practice. For example, an event such as "too much precipitation" could place excessive strain on a system that is already characterised by "too little" resources allocated to risk management.
- The final archetype, described as a "baseline shift (irreversible change)", closely aligns with established risk concepts such as "overload scenarios" and "adaptation limits". Emphasising this category of risks and their propagation mechanisms is essential, as it highlights the need for more transformative adaptation strategies. However, I am uncertain whether this necessitates the introduction of an additional archetype-based approach.
- In my view, employing archetypes to illustrate recurring patterns that result in complex risks and instances of ineffective risk mitigation and management is a constructive methodology. Nonetheless, I would recommend refining this approach by incorporating tangible elements of systems, such as critical infrastructure, risk management frameworks, or aspects of social cohesion, rather than relying solely on three overarching principles that cannot be readily translated into practical actions.

Comments on d) developing a method to factor indirect and cascading relationships between risks into the scoring and prioritisation of risks

- The selected approach is pragmatic and operational, enabling comprehensive coverage of all domains and key risks through a consistent methodology. This consistency also facilitates potential integration into broader risk evaluation and prioritisation frameworks, which is a distinct advantage.
- The central question, "how does mitigation of Risk A affect Risk B?", is appropriate and relevant.

[1] https://doi.org/10.1007/978-3-030-86211-4_25

- A limitation of the current method is that cascading risks are assessed only in pairs, which prevents the development of extended cascading risk chains. Rather than relying on tables with pair-wise relationships, which are limited to capturing only single-level cascades, the use of impact chains is recommended. Impact chains can illustrate connections more clearly, which is useful for expert evaluation, and they enable the consideration of multiple levels of dependencies.
- While the delayed consideration of cascading risks in the process of NCCRA is understandable, it restricts the opportunity for deeper integration of cascading risks into the analysis. For example, policy analysis cannot be fully informed by the outcomes of cascading risk assessments, which would be important for policy gaps related to the mitigation of cascading risks.
- It is suggested that the cascading risk attribute, currently an additional element in the risk assessment table, should become more prominent in risk prioritisation and the formulation of key findings. This is particularly important as cascading risks may represent significant blind spots or underappreciated factors for national policymakers.
- Furthermore, the fact that a mitigation of specific key risks within primary systems (such as ecosystems) could reduce multiple downstream risks along the impact chain, potentially may influencing the prioritisation of key risks beyond their immediate severity or preparedness scores.

Further recommendations for future assessments

- Future iterations of the NCCRA could more explicitly incorporate cascading risks within policy analysis. Deeply embedded cascades that affect economic or social domains typically require broader policy responses, often centred on national strategies.
- The kaupapa-Māori approach inherently acknowledges the interconnectedness of people, culture, and the natural environment. Collaborating with Māori researchers could facilitate the development of a more holistic approach for considering cascading risks in subsequent iterations.
- It is advisable to enhance the depth and participatory nature of expert involvement from both scientific and practical fields during the evidence-gathering and evaluation phases. This would strengthen the analysis of both domain-specific and cascading risks.

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