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VIEWPOINT

Non-economic losses from climate change: opportunities for policy-oriented research

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The concept of non-economic losses (NELs) has recently emerged in the context of negotiations on loss and damage under the United Nations Framework Convention on Climate Change (UNFCCC). NELs are losses of values that are not commonly traded in markets but bear high relevance for those affected. Examples include loss of life, biodiversity and cultural heritage. The ongoing institutionalization of approaches to loss and damage under the UNFCCC offers great opportunities to provide a sound information base for policy- and decision-making on NELs. Available expertise to meet the emerging knowledge needs includes insights into relevant indicators, and adequate means of integrating NELs into decision-making processes that seek to reduce losses ex-ante. Further research is needed to identify or develop appropriate responses to NELs ex-post. Here, historical analogues of loss and practices of remembrance and recognition can provide valuable insights. Opportunities for engagement exist at the UNFCCC's science-policy interface. These include participation and active engagement at open meetings under the UNFCCC to advance exchange on applied research that is framed around policy-relevant questions on NELs as well as interaction with the expert group on NELs that was set up under the designated policy body to work on loss and damage under the UNFCCC, i.e. the Warsaw International Mechanism.

Keywords: climate change; climate policy; loss and damage; UNFCCC; values; science-policy interface; ethics of risk

The concept of non-economic losses (NELs) provides an umbrella term for climate change-related losses of items that are not traded in markets. Indeed, non-market losses might be a more adequate definition, which has however not been adopted in the policy process. A technical paper commissioned by the United Nations Framework Convention on Climate Change (UNFCCC) identifies eight categories of NELs: Life, human health, human mobility, territory, biodiversity, ecosystem services, indigenous knowledge and cultural heritage (Fankhauser, Dietz, & Gradwell, 2014). Further categories include sense of place and social cohesion (Morrissey & Oliver-Smith, 2013). NELs can result from climate impacts directly, for example, when sea-level rise leads to a loss of territory and sense of place, or indirectly, for example, when climate-related declines in crop yields result in adverse effects on food security and human health. Moreover, adaptation and mitigation measures can lead to NELs, notwithstanding their objective to avoid or minimize adverse impacts from climate change. For instance, if populations are denied access to forest conservation areas, they are likely to suffer losses of territory, sense of place, ecosystem services or cultural heritage (Hein et al., 2016).

NELs pertain to both intrinsic and instrumental values (Serdeczny, Waters, & Chan, 2016b). Human life, for example, is mostly considered to be of intrinsic value. The loss of indigenous knowledge or cultural heritage has been observed to correlate with loss of social cohesion and a decreasing resilience to climate change, indicating the instrumental value of these losses (Morrissey & Oliver-Smith, 2013). Despite their value, NELs are hardly captured in economic assessments of climate change impacts such as, for example, the US assessment of the social cost of carbon (United States Environmental Protection Agency, 2015). Thus, they go unnoticed and remain unaddressed in overall risk analyses and policy-making. To some extent, this may be explained by a governance context that has long been dominated by liberal economic, market-based approaches to dealing with climate change (Newell & Paterson, 2010). Consequently, climate change impacts that manifest as NELs pose a formidable challenge for policy-makers. Hence, a dedicated effort among researchers to broker policy-relevant knowledge on NELs is most timely to inform the ongoing institutionalization of national and international responses to NELs.

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So far, there are a few review reports that explicitly focus on NELs, including a technical paper commissioned by the UNFCCC (Fankhauser et al., 2014) and a policy paper (Morrissey & Oliver-Smith, 2013) published under the Loss and Damage in Vulnerable Countries Initiative (Kreft, Warner, Harmeling, & Roberts, 2013). An empirical case study on NELs was conducted in Bangladesh, applying focus group discussions and interviews with key informants (Andrei, Rabbani, & Khan, 2015). Based on a mixed methods approach, a series of case studies on loss and damage in nine vulnerable countries found NELs to be of significant concern as costs of coping with climate change that cannot be regained (Warner & van der Geest, 2013). For example, ancient ruins were destroyed in the context of adaptation to sea level rise in Micronesia (Monnerau & Abraham, 2013). A recent study comparing the reporting of NELs in Bangladesh and Japan shows that in both countries particularly NELs related to health are taken into account. The authors conclude that unified national guidelines including practical indicators are essential for reflecting NELs in disaster databases, statistics and reports (Chiba, Shaw, & Prabhakar, 2017). Overall, however, research explicitly focussing on NELs is still rare (Serdeczny, Waters, & Chan, 2016a). Yet, a rich body of relevant research exists across a range of disciplines (e.g. Adger, Barnett, Chapin, & Ellemor, 2011; Kirsch, 2001; Tschakert, Tutu, & Alcaro, 2013). The available scholarship may be tapped for addressing some of the imminent policy questions as outlined below.

Politically, the concept of NELs entered international climate negotiations as a relevant area of work in the context of the so-called loss and damage work programme that was established under the UNFCCC at its sixteenth conference of the parties (COP-16) in Cancun in 2010 (UNFCCC, 2011). Starting in 2012, a number of regional workshops set out to identify approaches to loss and damage, the results of which led to a subsequent decision at COP-18 in Doha. This included a reference to enhancing further work on NELs (UNFCCC, 2012). Ultimately, the loss and damage work programme led to the establishment of the Warsaw International Mechanism for Loss and Damage Associated with Climate Change (WIM), together with an Executive Committee, at COP-19 in Warsaw in 2013 (UNFCCC, 2013). The WIM's functions, indicating the work that will be undertaken in the coming years, are to enhance the understanding of comprehensive risk management approaches to address loss and damage, to strengthen dialogue, coordination, coherence and synergies among relevant stakeholders, and to enhance action and support, including finance, technology and capacity-building to address loss and damage (UNFCCC, 2012). In this context, the issue of NELs has been explicitly included in the initial workplan of the WIM Executive Committee (UNFCCC, 2014).

The meaning ascribed to loss and damage, and understandings of how to approach it, differ across actors

(Boyd, James, & Jones, 2016). Early proponents of loss and damage refer to it as the impacts of climate change that can no longer be or have not been avoided through mitigation or adaptation (Verheyen & Roderick, 2008). Such unavoidable losses were associated with calls for a compensatory mechanism (Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, 1991). Throughout international climate negotiations this meaning was broadened to include notions of risk and insurance (Vanhala & Hestbaek, 2016). Since its inclusion in the Paris Agreement, the scope of approaches was further broadened, from measures to *address* loss and damage to measures to *avert, minimize and address* loss and damage, indicating the weakening of controversial notions around unavoidable or unavoids losses (Serdeczny, 2017). The contested notion of compensation has thus been effectively circumvented, even as the questions of responsibility persist in debates about fair burden-sharing of loss and damage (e.g. Wallimann-Helmer, 2015). Specific measures on NELs remain to be defined. Mirroring the wider debate on loss and damage (e.g. Huq, Roberts, & Fenton, 2013) approaches can be distinguished as either aiming to reduce the risk of avoidable NELs to occur *ex ante* or as responding to unavoids NELs *ex post*. In the following, some of the emerging research needs are described and relevant linkages to existing bodies of knowledge identified.

For the *ex-ante* assessment and integration of NELs into decision-making, conceptual literature and case studies are available. The aforementioned studies on NELs provide a first but explicitly non-exhaustive list of categories of highly context-dependent NELs. This begs the question of relevant indicators. Here, the available conceptual literature on indicators of well-being can provide insights, for example, for the design of pilot studies or guidelines on measuring NELs (e.g. Sen, 2008). In terms of methods for integration of NELs into decision-making, a host of methods has been suggested, including environmental impact assessments, economic valuation, multi-criteria decision analysis and qualitative approaches (Fankhauser et al., 2014). Here, a systematic understanding of the data requirements for decision-making towards different planning purposes in the context of climate change policies would be helpful. For example, while economic valuation appears to be the method of choice for the integration of NELs into risk-cost-benefit analyses – say in order to decide whether to invest into in-situ adaptation or into relocation as a response to climate change – qualitative data might be more adequate for purposes of designing relocation policies such as to minimize NELs.

NELs bring up questions of appropriate tools for *exante* decision-making under uncertainty. An assessment of NELs for planning purposes will always remain uncertain: The complexities of social interactions and preferences compound the uncertainties associated with localized

climate projections. They will hardly allow sound probabilistic estimates to serve as a basis for decision-making. Yet, it is plausible to assume that greenhouse gas emissions do expose entire communities to the risk of losing values that are vital to their persistence and way of living and that call for action. There is an additional moral dimension to NELs: In many cases, those exposed to the risks associated with NEL will not be involved in the decision-making processes that influence these risks for better or for worse. This reflects a pervasive characteristic of climate governance pertaining to structural imbalances between those who are considered responsible, those who are likely to pay for action, and those who bear the costs of either actions or inaction (Bulkeley & Newell, 2015). Yet, it is particularly striking in the case of losses that result from lack of ambitious mitigation action and that cannot be avoided or minimized through adaptation measures, such as the loss of coral reefs. What is more, often those exposed to risks do not benefit from the actions or outputs, such as job creation or economic growth, that are supposed to legitimate taking these risks.

In order to increase transparency in decision-making processes that address or may result in NELs, further research thus ought to include perspectives from the ethics of risk (e.g. Hansson, 2013). Valuable contributions would include a critical discussion on NELs as uncertain risks or certain harms as well as analyses of the value assumptions underlying climate risk assessments, including due consideration of distributive effects. The moral dimensions of risk imposition with multiple or aggregate causes also merit further attention in light of NELs and associated uncertainties in causation (e.g. Hayenhjelm & Wolff, 2012). Moreover, NELs touch on important questions of procedural justice, such as how to determine how occurrences of NELs may be recognized, acknowledged and addressed within an international setting. Issues like these require greater scholarly attention for equity concerns in climate governance more generally (Klinsky et al., 2016).

Drawing on research from diverse fields may also yield relevant insights on how to address NELs ex-post, that is to address impacts rather than risks. A first step required in designing adequate responses is an improved understanding of the values that are lost, including their functions for personal and social well-being (Wallimann-Helmer, 2015). Where possible, the functions of lost non-economic values will need to be restored, which in turn requires the identification of feasible measures of doing so. Research in the fields of cultural anthropology, environmental psychology and human geography promises productive insights and may provide instructive cues to climate governance research (e.g. Marshall, 2010; Tschakert et al., 2013). Yet, some NELs will prove irreversible and irreplaceable as their specific value is beyond restoring. The loss of burial grounds of ancestors due to sea-level rise offers an example of such losses (Morrissey & Oliver-Smith, 2013).

Irreversibility begs the question of how such losses can be adequately addressed to the satisfaction of those affected (Thompson & Otto, 2015). Here, important insights may be drawn from historical analogues of losses and practices of memorization. Research contributions from such fields as heritage or museum studies might help to identify means of recognition and palliative ways of engaging with losses through designated practices of remembrance (Barnett, Tschakert, Head, & Adger, 2016).

Various modes of engagement at the science-policy interface exist that would allow to channel and integrate relevant scholarship into the policy processes under the UNFCCC. The WIM Executive Committee has thus far proved accessible to inputs from experts and stakeholders and their meetings are open to observers. An expert group on NELs has been established, including members of the Executive Committee and representatives from the research community (UNFCCC, 2016b). Although the expert group has not yet been budgeted to conduct independent work, it establishes a likely tool to provide for exchange at the science-policy interface. For instance, relevant publications or events should be communicated to the expert group, its members could be invited to share information on emerging research needs and to contribute to transdisciplinary research projects on NELs. At this early stage, modalities for outreach and interaction between the expert group and the wider research community have not been established yet, and any such exchange would likely be informal.

Over time, modes of interaction between the policy and the scientific process addressing NELs are likely to institutionalize further. Active engagement with pertinent scholarship can be expected. Indeed, the UNFCCC's last COP in Marrakesh recommended for the WIM Executive Committee to improve its interaction with relevant scientific and technical experts (2016a). Conversely, the research community itself can contribute to enhanced integration of scientific insights into the UNFCCC's policy-making processes, notably by relating specific findings to policy-relevant questions or by conducting innovative research in response to questions that emerge in the policy-context. The task is non-trivial. Accounting for NELs will be an indispensable step, both in research and in policy, towards a comprehensive deliberation of what "dangerous anthropogenic interference with the climate system" (United Nations, 1992) actually means, and how just and adequate responses to climate change impacts may eventually be found. The economic rationale of loss and damage and its international legal intricacies notwithstanding, this remains an inherently political challenge.

Disclosure statement

No potential conflict of interest was reported by the authors.

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