

Knowledge Gaps and Policy Needs to Tackle Loss and Damage



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Cover photo: Roy Gilham / iStock. Mozambican villagers waiting for assistance at a collapsed bridge in the aftermath of Cyclone Freddy (March 2023 - Mandimba, Mozambique)

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About the WASP and Policy Briefs

- The Science for Adaptation Policy Brief Series is a UN-led World Adaptation Science Programme (WASP) initiative. The briefs target researchers, policymakers and practitioners to help them successfully bridge the science-policy-action gap.
- The WASP is overseen by eight international organisations: the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environment Programme (UNEP), the World Meteorological Organization (WMO), the Intergovernmental Panel on Climate Change (IPCC), the Green Climate Fund (GCF), the Global Environment Facility (GEF), the United Nations University (UNU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Secretariat of the WASP is hosted at UNEP, Nairobi, Kenya.
- WASP's mission is to ensure researchers, policymakers and practitioners have the best scientific knowledge and capacity necessary to undertake effective climate adaptation policy and action.

Background of loss and damage from climate change

Loss and damage practitioners suggest that “...loss and damage refers to adverse effects of climate-related stressors that have not been or cannot be avoided through mitigation and adaptation efforts” (Van der Geest and Warner 2015). Despite the lack of an internationally agreed definition, IPCC highlights that climate-related impacts and projected risks, including losses and damages, can be both economic and non-economic (Birkmann et al. 2022).

The concept of loss and damage was formally recognized under the UNFCCC process in 2013 by establishment of the Warsaw International Mechanism for Loss and Damage associated with climate change impacts. While the 2015 Paris Agreement's Article 8 covers terms regarding climate change-related loss and damage, decision 1/CP.21, paragraph 51, clarifies that it does not establish liability or compensation.¹ Establishing the Fund for responding to Loss and Damage at COP27 in 2022 was a positive step. The following year in Dubai, COP28 further defined the Fund for responding to Loss and Damage with a recommendation on its operationalization and governing instruments. Although there is a consensus among climate actors that loss and damage is a priority for all countries, loss and damage remains a contentious policy issue, given associated calls from developing countries for compensation from developed countries. The developing country's position stems from historical and geographic circumstances: developing countries are the least

1. <https://unfccc.int/documents/9064>.

Key messages

1. Climate change results in substantial loss and damage to societies and natural systems when it is not mitigated by reducing greenhouse gas emissions or averted through adaptation. Loss of life, extinction of species and ecosystem destruction are a few of the irreversible repercussions already attributed to unabated climate change. Many categories of ruinous consequences have not yet been sufficiently documented.
2. These consequences will continue, requiring urgent actions to avert, minimize and address future loss and damage triggered by climate change. To reduce risks of further climate-related harm to humans and our environment, urgent action is required to reduce and contain greenhouse gas emissions in parallel with appropriate adaptation.
3. Understanding the drivers that produce loss and damage and the associated potential solutions can provide crucial guidance for climate action. Possible solutions to the threat of loss and damage include local to global efforts to mitigate greenhouse gas emissions and adapt to slow- and rapid-onset climate hazards. They include establishing and enhancing early warning systems, disaster risk reduction implementation, and other specific responses that reduce harm to human and natural systems.
4. The nature of loss and damage can be dynamic or locked in. In the case of the former, climate responses and development choices determine the extent of harm and what can be avoided. In the case of the latter, both soft and hard adaptation limits will persist, independent of future pathways. Both dimensions must be considered for any long-term strategic planning, including cooperation at the global level and actions on the ground.
5. In addition to addressing existing adaptation gaps, there is an urgent need to evaluate adaptation limits. Such evaluations would entail identifying ecosystems, regions, societies, and particular at-risk groups for whom adaptation limits have been reached or are likely to be reached soon and accelerating actions for addressing loss and damage in geographic hotspots and priority populations.
6. Non-economic loss and damage is an important dimension of climate-related destruction, making up a significant proportion of the costs associated with climate change. Despite growing empirical evidence of many forms of intangible harm – including threats to heritage, culture, identity, health and wellbeing, and Indigenous peoples – beyond individual case studies, systematic and comparative assessments of non-economic loss and damage remain difficult. This constraint hampers addressing adaptation limits and mainstreaming proven climate mitigation and adaptation responses into development processes so that economic and non-economic loss and damage can be avoided or minimized.

responsible for climate change, but they are where climate impacts hit hardest and capacities to implement mitigation and adaptation actions are lowest.

The UNFCCC process is still working on scoping loss and damage, including relevant measurable criteria. This lack of clarity hampers the effective implementation of policies and actions. The complexities of differential vulnerabilities, adaptive capacities and responsibilities in the broader context of climate justice and equity further complicate the debate surrounding loss and damage.

Loss and damage falls into two categories: economic and non-economic. Economic loss and damage (ELD) includes harm to infrastructure, assets and services with established market value, such as property, agricultural yields and equipment (Mathew and Akter 2015; McNamara and Jackson 2019; Tschakert et al. 2019). Non-economic loss and damage (NELD) encompasses harm with no market value, effects that are hard to quantify and often go unnoticed by the outside world. These devastating effects include injury; illnesses and loss of life; deterioration of mental health; losses of biodiversity, ecosystem services, territory, national and cultural identity; disappearance of cultural and natural heritage, Indigenous and traditional knowledge, sense of place and belonging, dignity, and any other aspects that people value and wish to protect in their lives and communities (Fankhauser and Dietz 2014; Tschakert et al. 2019). Categories of ELD and NELD are essential for a more thorough understanding of the full range of impacts of climate change on humans and nature, both tangible and intangible. They are also critical for establishing what potential compensation measures could be commensurate with what is lost or damaged.

Generally, pre-emptive solutions to loss and damage already exist as mitigation, adaptation, and disaster risk reduction measures. Within the context of climate change, greenhouse gas emissions mitigation, together with effective adaptation, will diminish future climate change impacts and, theoretically, the resulting loss and damage. However, because of the extended long-time frame for abating some processes after achieving mitigation targets, such as millennial time scales for reversing sea level rise (Solomon et al. 2009, Clark et al. 2016), additional and immediate measures, including adaptation, are necessary to minimize and address loss and damage. Therefore, how we contribute and respond to climate change challenges directly affects loss and damage. Referring to GHG mitigation as all-encompassing relief from climate change impacts would sideline the urgent questions around the politics of adaptation and adaptation justice (Mikulewicz 2020; Juhola et al. 2022). Incorporating justice into climate

policy requires the global community to strengthen climate change adaptation and disaster risk reduction measures, ensure equitable and resilient development pathways, and minimize and address loss and damage in the immediate, medium and longer timescales. Climate-induced losses and damages affect women and girls disproportionately because of existing socioeconomic disparities, cultural discrimination, and unequal access to resources and decision-making power (Birkmann et al. 2022).

Effective and feasible climate change responses - both mitigation and adaptation - are increasingly recognized as critical to minimizing loss and damage. Research efforts to assess economic and non-economic loss and damage across different spatial and temporal scales of adaptive actions and under different climate scenarios and pathways have been limited. While there is a general agreement that loss and damage resulting from inadequate mitigation and adaptation actions exceed adaptation capacities, including everyday adaptation limits (Henrique and Tschakert 2022), loss and damage can also occur because of biophysical and institutional lock-ins that constrain climate change response options. Craik (2021) highlighted the importance of understanding risks from experimental or deficient responses to climate change as potential drivers of loss and damage (Simpson et al. 2021; Andrews et al. 2023). However, there is limited agreement among climate scholars and policymakers regarding the boundaries marking climate change adaptation, development initiatives that reduce vulnerabilities while enhancing capacities, and avoidance of and responses to loss and damage (Mechler et al. 2019; Amaechina et al. 2022). In addition, it is critical to integrate gender-sensitive approaches into adaptation and mitigation strategies. These approaches include ensuring women's participation in decision-making processes; providing equitable access to resources, services, and benefits; and recognizing and addressing women's specific needs and priorities in climate policies and programs.²

Additionally, the IPCC's Sixth Assessment Report from Working Group II on Impacts, Adaptation and Vulnerability clearly illustrates that while keeping global warming near 1.5°C above pre-industrial levels would substantially limit or avert projected losses and damages, it would not eliminate them all (Birkmann et al. 2022). Therefore, experts, practitioners and stakeholders recognize the great and urgent need for more fine-grained, systematic, and comparable knowledge and capacity to guide and support loss and damage policies and actions across scales, particularly in most vulnerable countries and among high-risk populations (United Nations Environment Programme 2023).

2. <https://unfccc.int/sites/default/files/resource/6-ExCom%20WIM%20Brief%20NEW%20%2B.pdf>.

As countries are preparing new Loss and Damage funding frameworks to strengthen their efforts in averting, minimizing and addressing the challenges, it is relevant to highlight some opportunities and obstacles involved in operationalizing loss and damage solutions and building on adaptation efforts underway. This World Adaptation Science Programme Science Adaptation Policy Brief contributes to the goal of operationalizing loss and damage solutions and guiding global policies on the issues by identifying potential areas where science can readily support loss and damage solutions. This brief seeks to answer the following questions:

1. What is the current state of knowledge and the status of recognition of loss and damage in national policy documents?
2. What are the key science gaps obstructing the effective implementation of measures to avert, minimize and address loss and damage associated with the adverse effects of climate change?
3. What are the policy gaps and possible mechanisms to better address observed and projected loss and damage?

Progress in understanding, averting, minimizing and addressing loss and damage

The current state of knowledge on loss and damage

To identify the current state of knowledge on loss and damage, we discuss two categories of

evidence: economic and non-economic loss and damage. This section offers a structured summary of loss and damage needs to map specific gaps for action and research to orient policy decisions.

Box 1: Progress of the mainstreaming of loss and damage in climate change strategies

Loss and damage first appeared in the UN climate negotiations in 1991 when Vanuatu – on behalf of the Alliance of Small Island States (AOSIS) – proposed to create an insurance scheme for countries dealing with rising sea levels. Then, the term was mentioned in UN texts during the 2007 international climate negotiations in Bali.

Loss and damage gained momentum in 2013 when Parties to the UNFCCC agreed to establish the Warsaw International Mechanism for Loss and Damage associated with climate change impacts to facilitate dialogue, fill knowledge gaps, and enhance action and support to address loss and damage in developing countries.

At the 25th Conference of the Parties to the UNFCCC (COP25) in Madrid in 2019, representatives agreed to establish the Santiago Network on Loss and Damage to catalyze knowledge exchange and technical support among developing countries. The functions of the network were defined at COP26 in Glasgow in 2021. At this COP, Parties agreed to establish a dialogue “to discuss the arrangements for funding of activities to avert, minimize and address loss and

damage associated with the adverse impacts of climate change.”

In 2022, at COP27, the conference decided on the institutional structure of a Fund for responding to Loss and Damage to assist developing countries. A transitional committee was mandated to work on the operationalization of the Fund. The work of this committee revealed tensions between developed and developing countries caused by problematic questions such as the identification of beneficiaries and contributors of the Fund for responding to Loss and Damage, whether or not it is compulsory to contribute to the Fund, and the location of this Fund.

The process culminated at COP28 in Dubai with the adoption of the transitional committee’s recommendation on operationalizing the Fund for responding to Loss and Damage and its governing instruments. The Fund for responding to Loss and Damage will be governed and supervised by a Board and supported by an independent secretariat hosted by the World Bank for at least four years. Many unsolved questions remain about the Fund’s structure, resource mobilization processes, and mechanisms to accelerate money transfer to countries in need.

Adapted from Liao et al. (2022) and Gabbatiss and Dunne (2023).

Economic loss and damage, its assessments and estimates

Climate-related impacts have led to significant economic loss and damage, particularly in vulnerable developing island nations, and these are likely to be further exacerbated under warmer climate change conditions and by complex social interactions in terms of gender, race, ethnicity and other inequalities. For example, cyclones are projected to increase in intensity and destructiveness, with projected damages increasing accordingly. Researchers estimate that the total residual climate-related economic loss and damage faced by developing countries range from \$290-580 billion by 2030, \$551 billion-1.016 trillion by 2040, and \$1.132–1.741 trillion by 2050 (Markandya and González-Eguino 2019; Bhandari et al. 2022).

There are several methodological and practical challenges to undertaking economic assessments of loss and damage, particularly at the local level. These challenges include difficulty monetizing options because benefits are often more challenging to estimate than costs and dealing with imperfect markets due to distorted input prices that are not uniform. Finally, the difficulty in capturing autonomous mitigation or adaptation activities that households or companies undertake, as reported in economic models, is relevant for predicting future climate risks and estimates of potential loss and damage (Li et al. 2014). These challenges are further aggravated by the lack of data for more rigorous analysis, increasing the results' uncertainty. For example, economic data from different sources on climate change and adaptation are available at various spatial levels, and it is difficult to reconcile all these data across these levels. Furthermore, there are challenges at the conceptual level, particularly in distinguishing between climate-related losses and damages from inadequate development plans and practices in economic models.

Non-economic loss and damage, its assessments and estimates

Evidence shows that a substantial proportion of climate-related losses and damages are non-economic consequences (Serdeczny et al. 2016; McNamara and Jackson 2019; Tschakert et al. 2019; Clissold et al. 2023). Despite the experience of non-economic loss and damage across populations, regions, and systems, our understanding of these diverse tangible and intangible non-market harms is incomplete. Several reasons contribute to this lack of knowledge.

While some data are collected on economic loss and damage under other initiatives that could be used across issues, such as the data monitor for the Sendai Framework for Disaster Risk Reduction, comparable data for non-economic loss and damage are largely missing. The scope of such non-economic loss and damage can be dynamic and context- and place-specific, with many differentiations across populations about what they consider as damage or loss based on their values and priorities. Across these different populations, non-economic loss and damage is not easily commensurable, challenging assessment attempts for local adaptation planning and international policy settings that expect standardized protocols for recognizing loss and damage. To date, governments have preferred quantifiable entries for ease of decision-making, and monetary assessment is the easiest approach to guide funding allocations for adaptive measures.

Although current NELD assessments are far from satisfactory, there has been substantial progress in recognizing the importance of non-economic loss and damage and in developing appropriate methods for assessing the non-economic dimensions (Preston 2017; Tschakert et al. 2019; Janzen et al. 2021; McNamara and Jackson 2019). These improvements have come from the active engagement of experts from diverse fields, including biophysical, social, heritage and natural resources sciences. Progress has also been driven by the development of more detailed frameworks that incorporate values-driven angles to loss and damage, their dynamic nature, and distinctions between acceptable and intolerable losses across populations and given current and projected climatic conditions (Tschakert et al. 2017; Dorkenoo et al. 2022; Tschakert and Neef 2022; Jackson 2023).

Progress also entails assessing what trade-offs people make to negotiate options and protect what matters most in their lives and livelihoods (Henrique and Tschakert 2022). Assessing trade-offs is particularly acute for communities belonging to low-lying atoll islands that face hard limits to local adaptation opportunities; loss of sovereignty and culture; and eventual displacement, migration, and relocation from sea level rise (Yates et al. 2023).

It is also important to recognize that the broader consequences of climate-related losses and damages to cultural heritage and identity – memory, ancestry and memorialization – are less understood and more difficult to quantify (Simpson et al. 2022; Thorn et al. 2021). The loss of a homeland is not only a loss of physical infrastructure. It is also the loss of social and cultural values that determine people's identities (Gullino and Larcher 2013; Simpson et al. 2022). Our understanding of non-economic loss and damage remains incomplete.

Box 2: Effects of climate-related loss and damage on biodiversity and ecosystem services

Nature's ecosystems and biodiversity are vital for human existence (Watson et al. 2019). Biodiversity and ecosystem services are considered non-economic resources, which does not mean their loss is felt only in non-economic terms. Economic harms related to biodiversity loss include loss of crop productivity, reduced food and nutrition security, loss of income and reduced opportunities for trade in organic products. In addition, biodiversity loss increases future vulnerability to climate change, exacerbating loss and damage (Roe et al. 2023).

Losses and damages to biodiversity and ecosystem services are so far rarely assessed. Janzen et al. (2021) find that most reviewed scientific literature and Post-Disaster Needs Assessments rely on extrapolating values from existing literature instead of assessing actual loss and damage after a disaster. This disconnect means that ecosystem service losses are often estimated based on the land use in the affected area in combination with available scientific knowledge of ecosystem services provided by those land-use types. To enhance the consideration of biodiversity and

ecosystem services in loss and damage assessments, we need to identify critical ecosystems essential for disaster risk reduction and adaptation, including those considered ecosystem-based adaptation measures, and establish a baseline for these ecosystems and their services so that changes to their status are measurable (Janzen et al. 2021). Finally, further coordination between data synthesis entities across national and international levels would also help to use available data. For instance, Sustainable Development Goal 6's 6.1 indicator tracks changes in the extent of water-related ecosystems. Target 8 of the Ramsar Convention aims at complete national wetland inventories, while the Aichi Biodiversity Target 5 of the Convention on Biological Diversity monitored natural habitats, including wetlands. In case a country would identify wetlands as a critically important element of its adaptation and Disaster Risk Reduction strategy, it could establish baselines for wetlands and their services along with restoration, protection and monitoring efforts to track changes in their status along with the Sendai Framework Monitor (Sebesvari et al. 2019).

How Nationally Determined Contributions and National Adaptation Plans recognize loss and damage

Country-driven climate policies, often defined in Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs), are critical as they comprehensively outline climate actions and strategies, playing a pivotal role in global efforts to combat climate change under the UNFCCC's purview. These policies can empower vulnerable nations to advocate for additional climate finance, technology and capacity-building support, enhancing their ability to address challenges arising from loss and damage and strengthen their resilience against climate-induced adverse effects.

NDCs: General

The concept of loss and damage remains undefined in most NDCs, with only a few countries providing clarification specific to their national context. Most NDCs that address loss and damage focus primarily on physical and economic losses (Fransen et al. 2022).

According to a report on the state of NDCs in 2022, 60 NDCs include descriptions of economic loss and damage, indicating a slight decline from 63 such descriptions in the initial NDCs (Fransen et al. 2022). Fifty NDCs provide details on existing loss and damage costs, and 21 describe future costs. Sixteen out of the 50 NDCs that describe current loss and damage costs were submitted

by Small Island Developing States. These island states also submitted seven of the 21 NDCs outlining future loss and damage costs. These numbers suggest that the most climate-affected countries prioritize loss and damage as a crucial aspect of their NDCs (Fransen et al. 2022).

In NDCs, the information on loss and damage costs often concentrates on specific extreme events, offering only snapshots rather than comprehensive analyses of broader trends. Additionally, few countries effectively use climate change and development scenarios to calculate future loss and damage costs, showing limited consideration of potential challenges. While the number of NDCs explicitly addressing economic loss and damage has slightly decreased, there is a positive trend with more countries focusing on crucial aspects like slow-onset events, human mobility, and the need for financial and capacity-building measures.

NDCs: Least-developed country-specific

Of the 45 least-developed countries (LDCs) that submitted NDCs, 22 per cent addressed loss and damage explicitly, although it is optional. Among the LDCs that address loss and damage, Myanmar, Haiti and Cambodia stand out with comprehensive sections dedicated to the issue, each approaching it with specific actions and proposed funding. Meanwhile, LDCs often use terms like "limits to adaptation" and "unavoidable climate change impacts" in their NDCs. Other than Haiti and Cambodia, LDCs do not outline specific actions or support for managing loss

and damage in their NDCs. As a result, LDCs have limited evidence and information within their NDCs to strengthen their case for support and finance to address loss and damage effectively. Although 22 NDCs acknowledge the vulnerability of women, the gender-specified impact of loss and damage is not adequately addressed in these submissions, indicating a need for more significant consideration of gender-specific vulnerabilities.

NAPs: General

Approximately 49 per cent of the NAP documents submitted to the UNFCCC include references to the concept of loss and damage. Notably, 37 per cent of these NAPs originate from Small Island Developing States. These nations recognize the paramount importance of addressing this issue, considering their heightened vulnerability to the impacts of climate change (Qi et al. 2023).

Slow-onset events are addressed in all NAP documents, with countries highlighting the potential impacts on their environments and biodiversity. Some NAPs include non-economic loss and damage, such as cultural heritage and indigenous knowledge, in the face of climate change as well as human mobility.

NAPs: Least-developed country-specific

Twenty-two out of 46 LDCs have submitted their NAPs to the UNFCCC, with only five countries explicitly mentioning loss and damage in their NAPs. Central African Republic and Kiribati directly refer to loss and damage, while others address it indirectly under adaptation actions (Bharadwaj, et al. 2020). Other highlighted areas in the NAPs include capacity development support, systems improvement, finance, infrastructure development, technology enhancement, and destruction and damage of various assets.

Among the six new submissions since 2022, three NAPs – from Bangladesh, Mozambique and the Democratic Republic of Congo – explicitly mention losses and damages. Bangladesh provides detailed information about the relevant economic consequences of climate-related disasters. Mozambique's NAP highlights the major causes of economic loss and damage in the country, including tropical cyclones, flood events, and droughts. However, a lack of systematic and commensurable records of events and their impacts hampers the country's ability to accurately estimate its losses and implement effective response measures to climate change.

What knowledge, capacity, and policy gaps inhibit operationalizing formal loss and damage response instruments?

Knowledge gaps

Ambiguity surrounding loss and damage assessments and responsibilities

Roles and responsibilities for developed and developing countries, private sectors and international organizations need to be clarified to ensure effective and timely policymaking and implementation (Lauwo et al. 2022). Furthermore, research is needed to develop a fair and transparent mechanism for accessing the loss and damage funding and prioritizing the most urgently needed projects in alignment with existing initiatives like the Santiago Network on Loss and Damage.

There is also a gap in understanding the means available for eliciting evidence on losses and damages and addressing their consequences. Research should explore both forecasted and experienced measures and actions taken by governmental and non-governmental entities to reduce and, wherever possible, eliminate sources of loss and damage, including reducing vulnerabilities, sharing best practices and lessons learned so other sectors and regions can benefit, and cross-scalar policy recommendations for addressing these challenges.

Lack of reliable loss and damage estimates that reflect social and ecological values

Research on adaptation limits, cascading harm and acceptable versus intolerable loss is growing (Roberts and Pelling 2021; Westoby et al. 2022; Berkhout and Dow 2023). Yet, we need more information, gained through rigorous and verifiable study, regarding geographical hotspots where hard, irreversible limits to adaptation impede progress. However, consensus exists on a few irreversible trends, such as extinctions, loss of lives and inundation of territory.

There is also an urgent need to assess adaptation gaps and maladaptation at sub-national, national and global levels to generate comparative evidence and deliberate equitable, accessible and appropriate solutions. We face substantial gaps regarding the differential needs, capacities and strategic options for and within social groups based on structural and societal inequalities such as gender, race, ethnicity, disability, class, age and religion. Further gaps obscure our understanding of what trade-offs people can make in the context of intersecting risks, what barriers and thresholds they may encounter, and what the consequences of crossing those thresholds are. Such a

multidimensional and dynamic understanding, including underlying aspects of possibly misplaced power and recognition, is highly relevant, for instance, in the context of harm and benefits associated with climate migration and mobility (Figure 1).

A substantial knowledge gap also exists concerning intersectional vulnerabilities and systemic disadvantages, including pressures from colonialism, racism and patriarchal structures, that vulnerable communities may encounter daily and that limit practical adaptation options. Such systemic marginalization increases the likelihood of populations experiencing additional harm compared to others who face the same climate hazards in similar areas of exposure (Tschakert and Neef 2022; Ayeb-Karlsson 2021). Future research efforts could explore how to articulate gender-transformative dimensions into future loss and damage discourse and decolonizing perspectives as well as distributional, procedural, recognition and restorative justice into the design of the Fund for responding to Loss and Damage and associated policies (Ayeb-Karlsson 2020; Robinson and Carlson 2021; Juhola et al. 2022; Gurung et al. 2023). More research is required to understand barriers and opportunities in channelling climate finance to local communities and vulnerable populations (Pill 2022).

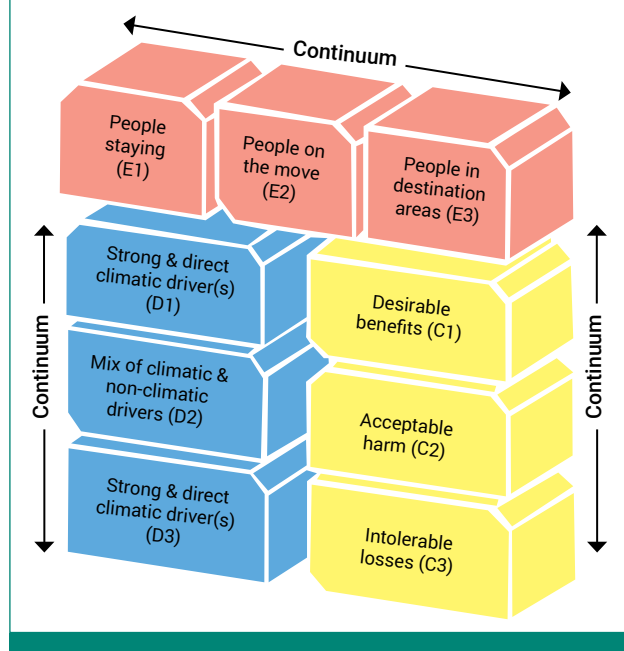
Another significant knowledge gap reveals the lack of thorough examination of how sustainable development principles and approaches influence the practicalities of averting, minimizing and addressing losses and damages or how maladaptation can reinforce or even produce loss and damage (Roberts and Pelling 2021; Huber and Murray 2023). This gap includes a poor understanding of how sustainable development principles interact with loss and damage research, how they affect research outcomes and how to integrate them into policy recommendations effectively. Serious gaps also exist in determining fair and effective payment mechanisms for losses and damages (Adger 2023) and systematic assessment methods for ELD and NELD under different adaptation pathways.

Capacity gaps

There is a need to strengthen post-disaster assessments and loss and damage databases at the national and sub-national levels. The losses of ecosystem services, social capital, cultural heritage and many other loss categories are often not included in the loss and damage databases at the national and sub-national levels. Even though some Post-Disaster Needs Assessments cover social and environmental aspects to a certain extent, it is more of an exception than a rule. In addition, the current loss and damage databases at the national and international levels prioritize economic harm. There is also a lack of distinction between loss and damage in these Post-Disaster Needs Assessments and loss and damage databases. Such disaggregated data will help researchers produce more informed risk, vulnerability and adaptive capacity assessments, including scrutinizing gender dimensions as part of intersectional inequalities in data related to and aligned with losses and damages. These and other more fine-grained insights will help policymakers and practitioners strengthen loss and damage measures, including informing the ongoing deliberation on the Fund for responding to Loss and Damage agreed to be hosted by the World Bank on an interim basis.

Countries should assess and quantify losses and damages at the national level to prepare for accessing the funding (Boyd et al. 2021). However, not all countries have the necessary data at the relevant scales, supported by sufficient governmental or institutional capacity to address loss and damage consequences within their boundaries. Further, loss and damage architecture is embedded in and across diverse sectors. An integrative loss and damage response system at the national level could help improve the situation. The Global Stocktake under the Paris Agreement, which concluded its first round of assessment at COP28 in Dubai, has been essential to help identify and address current knowledge and capacity gaps in achieving the Paris Agreement goals. There is a risk that countries with less

Figure 1. The dynamic and relational imobility cube designed for the climate crisis – a graphic and conceptual device to story kinopolitical struggles across degrees of climate influences and differential outcomes. Conceptual mobility axes and sub-dimensions (E=experiences, D=drivers, C=consequences). Adapted from Tschakert and Neef (2022) under CC BY 4.0 license.



capacity to conduct a thorough Stocktake will miss many significant facets of policy processes responding to the threats of loss and damage. For instance, slow-onset events may cause the loss of cultural resources or human health - physical, mental, and public health implications - or the loss of species of plants and animals may jeopardize rural and indigenous livelihoods. Addressing this critical gap is crucial to advancing the loss and damage response system at the country level. Agreed channels for accessing technical and financial support to address loss and damage are scarce. Inadequate scientific understanding of loss and damage processes and dynamics, especially the non-economic aspects, and financial resources have hindered action and policy development (Pill 2022; Nand et al. 2023).

Policy gaps

The existing global-level policy mechanisms, such as the Executive Committee of the Warsaw International Mechanism for Loss and Damage and the Santiago Network on Loss and Damage, currently facilitate access to knowledge, resources and technical capacity for addressing losses and damages. While the Warsaw International Mechanism contributes to risk management and strengthens dialogue and coordination to enhance action, the Santiago Network on Loss and Damage is instrumental in catalyzing technical assistance for loss

and damage. The Fund for responding to Loss and Damage completed its transitional committee work before COP28. However, there is still limited translation of global discourses on climate change loss and damage to national-level policymaking and institutional frameworks (Vanhala et al. 2021).

In addition to mainstreaming loss and damage assessments into existing policies, there is a need for policies or mechanisms to avoid ambiguity in practice (Thomas and Benjamin 2018). Loss and damage focus is predominantly treated as a cross-cutting issue in the few policy initiatives underway (Calliari and Vanhala 2022). In most countries, losses and damages are not distinct from adaptation, which may hinder the conversion of such policies into targeted practice (McNamara and Jackson 2019). There are opportunities for aligning and building synergies with key processes such as NDCs, NAPs, the Sustainable Development Goals and the Sendai Framework, but these have not been seized. More attention is needed on multi-scalar and integrated policy and governance perspectives to ensure comprehensive management of loss and damage. That way, existing national systems and institutions can be leveraged to tackle climate-induced loss and damage, complementing and strengthening local actions by communities and governments (Gurung et al. 2023).

Conclusions and ways forward

Scientific understanding of losses, damages and relevant actions has been steadily growing in climate debates from the local to international levels. Recognition of how losses and damages materialize and develop on the ground and in people's everyday lives is also rapidly evolving. These perceptions need to inform science, policies and their interface.

The policy recognition for loss and damage has been increasing, as seen in NAPs, NDCs and other UNFCCC submissions. Still, the same cannot be said for implementing and scaling solutions to avert, minimize and address losses and damages. Significant challenges include the lack of systematic and comparable assessment tools and methodologies, uneven human resource capacity and limited financing.

The domain of loss and damage is dynamic as it affects people's fluid lives, natural ecosystems, multiple and intersecting crises, essential GHG mitigation actions, progress in climate change adaptation and disaster risk reduction, risk assessments, technology and continuously evolving boundaries of adaptation limits. It is essential to recognize that approaches and solutions exist across

a range of climate change and disaster risk reduction experiences to avert minimize, and address loss and damage. These include but are not limited to preparing for and dealing with observed and projected loss and damage through disaster risk management and humanitarian responses, complementing concerted efforts to eradicate multidimensional poverty, and reduce inequalities across and within societies.

Within the solution category, although the emphasis so far has primarily focused on economic effects and how to measure them, the understanding of non-economic loss and damage and how to address them is increasing, thanks to rich insights and rigorous research in the fields of social sciences and ecosystem health. The challenge is identifying and promoting options that can provide synergistic means of addressing economic and non-economic loss and damage across various scales of significance and implementation. It is also important to include gender as a cross-cutting issue alongside other dimensions of inequality—such as age, socioeconomic status, race, ethnicity, and how they intersect—and to integrate sensitive assessments throughout policies and programs related to loss and damage.

From the discussion in this brief, the following essential areas emerge for research and policy actions within the loss and damage aspect of climate response:

Research agenda for effective implementation of loss and damage actions

- Develop/improve risk and vulnerability assessment frameworks to articulate both ELD and NELD dimensions, including national-level Stocktakes and projections regarding when and where hard limits to adaptation are anticipated.
- Fine-tune methods to assess NELD across relevant categories, scales and trade-off decision-making processes, including rich qualitative and mixed methods and drawing from diverse fields of knowledge, including heritage studies, anthropology, human geography, public health and ecology.
- Integrate cross-scalar assessments and emerging evidence into planning and policy processes alongside ELD so that they can be considered together to identify reinforcing patterns. Such integration is paramount to illuminate how values-based NELD assessments compare with the monetization of loss in ELD approaches and where geographic hotspots and social tipping points become overlapping priority areas for action.
- Improve the understanding of response risk – including lack of response, maladaptation and failed mitigation – in generating loss and damage for high-risk sectors and populations and adjust methods to avert and minimize loss and damage driven by such dynamics, if different from hazard-driven loss and damage.

Capacity-building to address loss and damage

- Strengthen the capacity of climate and development actors – such as policymakers, members of non-governmental organizations and social service sectors, community leaders, disaster and emergency

managers, and UNFCCC country negotiators—in using advanced and, where possible, standardized tools and frameworks to assess social, technical and financial needs for addressing loss and damage.

- Provide dedicated support, including capacity-building plans, data, resources, etc., to countries to strengthen their preparedness in addressing loss and damage associated with climate change.
- Ensure support for country and development planning agents to overcome the fragmented Loss and Damage architecture and design integrative and cross-sectoral loss and damage response systems from local to international levels.

Policy considerations to address loss and damage

- Strengthen Post-Disaster Needs Assessments and disaster loss and damage databases to include as many non-economic loss and damage aspects as possible.
- Integrate intersecting perspectives of loss and damage – at a minimum, gender, age, and socioeconomic status – into NDCs.
- Support national adaptation planning as an effective vehicle to scale up activities while identifying synergies with the adaptation.
- Strengthen national-level institutional and support frameworks and coordination, such as between the Ministries of Finance and Ministries of Climate and Environment, to enhance efforts to assess and measure loss and damage at the national level and prepare strategies to address imminent and occurred harm across hotspot areas and most disadvantaged populations and degraded ecosystems.
- Collect and analyse sex or gender disaggregated data and research to better understand the gender-differentiated impacts of climate change and loss and damage on women and men, informing evidence-based policymaking and targeted interventions.³

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