Executive summary/Key messages

- Climate change is driving transformational changes to the environment, causing losses to biodiversity and ecosystem services, such as water quantity and quality, food production, and carbon sequestration, territory, and cultural heritage.
- The engagement of all relevant actors and affected people through effective cooperation at international, regional, national and local levels is a critical part of addressing these losses effectively and sustainably.
- When exploring NELs of biodiversity and ecosystem services, it is important to understand that such losses do not occur to ecosystems and people separately, but that they occur to an interlinked socio-ecological system, and can cascade to losses that become risk multipliers.
- Losses of biodiversity and ecosystem services inevitably result in impacts to society, including livelihoods, security, health and well-being, habitability, opportunities, dignity and identity.
- A wide spectrum of actions exists to avert, minimize and address NELs of biodiversity and ecosystem services, such as livelihood diversification and implementing nature-based solutions.
- Sea level rise, desertification, glacial retreat, and storm surges, among other climatic changes, are causing the loss of territory (i.e., physical land under the jurisdiction of an agent) and habitability (i.e., habitable land), resulting in cascading impacts on people's wellbeing, identity, cultural heritage, social cohesion, and ecosystem services, and ultimately disrupting the ability of people to sustain their lives in the places they call home.
- Actions to address loss of territory and habitability range from providing immediate humanitarian relief (i.e., to meet basic needs of food, water, shelter, safety, education, and health), to protecting and rehabilitating landscapes (i.e., through hard protection measures, nature-based solutions, and hybrid strategies), to permanently relocating communities (i.e., through community-led processes once in-situ adaptation options are exhausted).
- Key lessons emerged for addressing loss of land and other NELs, including the need for: 1) Equitable, effective, and sustainable delivery of finance for humanitarian relief; 2) Protecting and restoring landscapes, especially through nature-based solutions, to protect people-ecology interactions as the foundation of various NELs; 3) Inclusive, participatory, and rights-based mechanisms to address loss of land; 4) Multi-stakeholder partnerships to ensure financial, technical, and institutional support for those affected; 4) Pro-active approaches to create awareness and outreach to equip people in tackling loss of land; and, 5) Improve the security of land tenure to ensure the sustainability of efforts to address various NELs.
- The impacts of climate change on cultural heritage are resulting in losses to tangible immovable and movable heritage, on land and underwater, intangible cultural heritage, and natural heritage that frequently result in multiple cultural losses of different types including the loss of distinctive, and meaningful forms and identity, the loss of accumulated environmental knowledge, the loss of cultural practices in land and water management, and the loss of resilience to climate change impacts and related disasters.
- While the loss of cultural heritage most immediately impacts the local communities of which it is a part, depending on the value of the cultural heritage as well as the extent and significance of its loss, local, national, and global communities may also be impacted – or even all of humanity. Furthermore, the loss of cultural heritage also contributes to loss of cultural diversity at all levels that negatively impacts inclusive sustainable development.

- Actions are needed to recognize cultural heritage as a resource for climate solutions, to enhance cultural resilience, and to strengthen the governance and safeguarding of cultural heritage of all types including support for local communities to protect and safeguard their cultural heritage.

I. Introduction

A. Background

COP 19 (2013) established the Warsaw International Mechanism to address loss and damage associated with the impacts of climate change in developing countries that are particularly vulnerable to the adverse effects of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change at.[1] The Mechanism fulfills this role by undertaking the following functions:[2]

(a) Enhancing knowledge and understanding of comprehensive risk management approaches to address loss and damage associated with the adverse effects of climate change;
(b) Strengthening dialogue, coordination, coherence and synergies among relevant stakeholders;
(c) Enhancing action and support, including finance, technology and capacity-building, to address loss and damage associated with the adverse effects of climate change so as to enable countries to undertake actions.[3]

The Executive Committee, which comprises twenty representatives from Parties, guides the implementation of the Mechanism through a rolling workplan across five thematic workstreams. The Committee is assisted by five thematic expert groups that co-create knowledge products and undertake activities jointly with the Committee to promote integrated and coherent approaches to loss and damage associated with climate change impacts.

The Expert Group on Non-Economic Losses became operational in 2021. The Plan of Action of the group contributes to implementing the Committee's strategic workstream that aims to enhance cooperation and facilitation in relation to non-economic losses, by strengthening the understanding and technical guidance and enhancing the capacity to address associated loss and damage, in particular at regional and national levels.

Activity 1 of the Plan of Action focuses on stocktaking relevant data, tools and knowledge for anticipating the risks of and responding to non-economic losses. Part of the outputs of this activity is a paper that updates a technical paper published in the context of the work programme on loss and damage in 2013 (FCCC/TP/2013/2).[4] The 2013 technical paper on non-economic losses provided a typology and an overview of eight main types of non-economic losses and their conceptual background, describing them in the context of total cost of climate change, and elaborating on the methods for assessing and managing the risks of non-economic losses, and what they imply for the design of practical actions.

The Executive Committee hopes that the present paper provides the most relevant information based on the latest science to assist developing countries design and implement practical actions, planning and policymaking processes to address key types of non-economic losses.

B. Scope of the paper

The interplay and scales of climate hazards and processes result in various forms of loss and damage, which are often categorized as economic and non-economic losses in the work of the Warsaw International Mechanism for Loss and Damage. Non-economic losses refer to a broad range of losses that are not easily quantifiable in financial terms or commonly traded in markets. These losses are additional to the loss of property, infrastructure, or agricultural production and revenue that can result from the impacts of the adverse effects of climate change. Non-economic losses may affect individuals (e.g. loss of life, health, or mobility), society (e.g. loss of territory, cultural heritage, Indigenous or local

knowledge, languages or societal or cultural identity) or the environment (e.g. loss of biodiversity or ecosystem services).

This paper seeks to provide examples of how countries and communities are responding to key types of non-economic losses including 1) loss of biodiversity and ecosystem services, 2) loss of territory and habitability, and 3) loss of cultural heritage (tangible and intangible). These types of losses are the focus of this paper, however they are not meant to be exhaustive and do not cover all non-economic losses, such as, for example, the loss of health. This paper endeavours to showcase a wide range of examples, being cognizant of regional representation and representation at all levels of action, but does not provide an exhaustive description of examples of actions addressing non-economic losses. The case studies refereed to throughout the paper, along with literature, are selected examples to illustrate the above selected types of non-economic losses and actions taken to address such losses.

The Executive Committee called for submissions of case studies in February 2024 to inform the development of this paper.[5] Twenty-two submissions were received by April 2024 containing information on approaches concerning loss of biodiversity and ecosystem services, loss of territory and habitability, and loss of cultural heritage (tangible and intangible). In addition, the thirty-eight case studies submitted to the Transitional Committee in 2023[6] were analysed. The set of case studies collectively cover the American, African, Asian, European and Pacific regions. In addition, numerous cases were drawn from UNESCO's work on cultural heritage specifically for the analysis on cultural heritage. They present diverse aspects of integrating key non-economic losses considerations in policies and planning, immediate or early response efforts, long-term resilience efforts for irreversible non-economic losses, and engaging those that are at the forefront of climate change. To inform this paper, the case studies were supplemented by complementary desktop research.

C. Aim and structure of the paper

This knowledge product seeks to explore recent understandings of non-economic losses and highlights that there are multiple interlinkages among the selected types of losses. It also seeks to discuss case studies from diverse contexts to share concrete examples and good practices for policy making and practical actions to address losses. Through the emerging good practices, the paper aims to tease out success factors:

(a) For integrating key non-economic losses considerations in policies and planning;
(b) For immediate or early response efforts to address these non-economic losses;
(c) For long-term rehabilitation, recovery, building back better, and resilience efforts to address these non-economic losses;
(d) For facilitating robust measures to mitigate key types of non-economic losses;
(e) For engaging those that are at the forefront of climate change.

This technical paper is structured as follows:

(a) Chapter II focuses on the loss of biodiversity and ecosystem services;
(b) Chapter III focuses on the loss of territory and habitability;
(c) Chapter IV focuses on the loss of cultural heritage;
(d) Chapter V focuses on the way forward.

Each of these chapters provides:

(a) An overview of respective type of non-economic losses in the context of climate change and their interlinkages with other types of non-economic losses;
(b) A spectrum of actions to address respective type of non-economic losses drawing on the case studies and desktop research;
(c) Lessons learned from the respective type of non-economic losses.

II. Loss of biodiversity and ecosystem services

A. Non-economic losses of biodiversity and ecosystem services in the context of climate change and their interlinkages with other non-economic losses

Climate change, together with other stressors, is driving changes that transform ecosystems. These changes are caused by physical factors such as storms, biological responses, such as changing ranges, or both, interacting with stressors from human activities (IPCC, 2022a). Multiple stressors, whether gradual or sudden, can have complex interactive or amplifying impacts on ecosystems (Harris et al., 2018; Zhou et al., 2023). Changes that transform the composition, structure, function, and 'intactness' of ecosystems can mean that ecosystem tipping points are reached, and transformation to a new state occurs, often resulting in the loss of biodiversity and ecosystem services (Selkoe et al., 2015; Pecl et al., 2017; Heinze et al., 2021). Ecosystem change can be gradual or abrupt depending on ecosystem characteristics and key species, and the stressors at play (Ratajczak et al., 2018; Malhi et al., 2022). When the threshold is crossed and the ecosystem has transformed entirely, restoration can be difficult or even impossible (Hillebrand et al., 2020). These risks are expected to grow with accelerating climate change (Parmesan et al., 2022).

Biodiversity changes and losses can emerge because of short-term extreme events such as heatwaves or wildfires, or longer-term habitat changes related to, for example, rising temperatures or precipitation change. Biodiversity loss can refer to decreasing numbers (and thus genetic diversity) of certain species, the decrease in the variety of species (species richness) in an ecosystem, or the decrease in ecosystem types (ecosystem diversity) in an area. Impacts on biodiversity can manifest as changes in phenology (e.g., shifting timing of seasonal and life-cycle events), range shifts (i.e., shrinking habitats of high-elevation species), increased mortality and localized extinctions, and the spread of invasive species (e.g., spread into new ranges due to warming, or better adapting to changing conditions than native species) and diseases (e.g., through population growth of disease-spreading species, increased host susceptibility due to stress and enhanced pathogen transmission) (Panetta et al., 2018; Roman-Pacaios and Wiens, 2020; IPCC, 2022a;). The loss of species richness and diversity is likely to affect the ecosystem's overall resilience to climate change (Hutchisun et al., 2018).

Non-economic losses of biodiversity and ecosystem services associated with climate change can affect ecosystem functions, structure, and their resilience. This results in impacts on ecosystem services, which are the benefits that humans receive or derive from ecosystems. Intact ecosystems provide so-called "provisioning services", such as food, freshwater and raw materials; "regulating services" like moderation of extreme events and air regulation; "supporting services", which include genetic diversity and habitats for species; as well as "cultural services" with places that serve as inspiration, with aesthetic value and recreational benefits amongst other (TEEB, 2010). For example, a mangrove ecosystem provides food (fish) and timber. It is estimated that a hectare of mangrove contributes an annual USD $33-58 thousand to the national economies of developing countries, a majority of which comes from fisheries and wood (Earth.org, 2022). Additionally, mangroves provide regulating services, for instance through their carbon storage, but also by serving as buffer against extreme events. Mangroves are known to reduce wave energy, erosion, and storm surge water levels (Spalding et al., 2014). Furthermore, being a biodiversity hotspot, mangroves provide habitat services, maintaining genetic diversity and hosting numerous niches for species habitats. Finally, mangroves provide cultural services including sites for recreation, aesthetic experiences and eco-tourism, as well as forming cultural identity and cultural heritage – all of which are important for the well-being of communities.

Being essential for the well-being of people, the loss of ecosystem services has direct impacts on society. The cascading effects that non-economic losses of biodiversity and ecosystem services associated with climate change (NELs-BES) have on people and livelihoods is well documented, highlighting how losses to the ecological system cannot be separated from the interlinked social system. When exploring NELs-BES, it is in fact important that loss does not occur to ecosystems and

people separately, but to an interlinked socio-ecological system with embedded cultural, social, and ecological structures that form the foundation of identity, wellbeing, way of life, worldviews, and self-esteem (Movono et al., 2017; Yazzie et al., 2019; McNamara et al., 2021). For example, the loss of provisioning services like flood impacts a community's food supply, with especially bad effects on subsistence farmers and those whose livelihoods depend on selling the supply. In Saint Vincent and the Grenadines, arable lands were flooded, which resulted in the loss of food products for own consumption and loss of income generated from sales on the local market (The Government of Saint Vincent and the Grenadines, 2016). The loss of regulating services such as the moderation of extreme events can reduce people's protection to extreme events. In Kerala, floods and landslides caused the removal of a hill's vegetation cover and top soil, which in turn reduced the hill's capacity to absorb rainwater and to mitigate landslides (The Government of Kerala, 2018). The loss of cultural services, too, has direct consequences on humans. In Laos, for instance, sacred forests were lost due to heavy summer rains and flooding. This caused disruptions in the social well-being and cohesion of some ethnic groups (The Government of Lao People's Democratic Republic, 2018).

NELs-BES materialise into losses to the socio-ecological system, which are shown in Figure 1. NELs-BES directly materialize into losses to security, livelihoods, and health and wellbeing, which further cascade into losses of habitability and opportunity. Ultimately, these losses all affect dignity and identity (Tschakert 2019; Eberle, 2020; Eberle et al., 2023). In these categories, the subject of loss are humans, ecosystems and species. The following explains how NELs-BES result in these loss categories:

- **Security**, as in the feeling of being secure, can emerge as a result of food and water insecurity, degraded social cohesion, the absence of safety nets, the ongoing presence of risk and financial instability – all of which can emerge as a result of ecosystem services loss (Eberle, 2020). Loss of security in the presence of risk can worsen when protective measures or infrastructure are missing or damaged. A case study from the Coral Restoration Consortium illustrated how climate-induced adverse impacts on coral reefs, such as bleaching, reduce their capacity to provide important protective functions, implying a loss of security from hazards as a result of environmental NELs (Coral Restoration Consortium, 2023).
- **Livelihoods** are the physical goods and sense of purpose humans receive from ecosystems, which allow them to sustain their life (Eberle, 2020). As climate change induces NELs-BES, livelihoods relying on these can no longer be sustained. The deprivation of these essential resources and the erosion of the meaningful connections to nature translates into the loss of livelihoods. A case study from the Solomon Islands demonstrates how heat waves associated with climate change increasingly damage coral reefs, promote eutrophication, and consequently lead to declining fish stocks. Since food supply, income and cultural identity of fishing communities directly depend on fish as goods provided by ecosystems, their dwindling directly mediates loss of human livelihoods (Unitarian Universalist Service Committee, 2024).
- **Health and wellbeing** comprise a comfortable state at the physical, mental and social level. NELs-BES can have impacts on health and well-being, deteriorating the physical and mental well-being, the increase of disease, as well as the overall deterioration in the quality of life (Eberle, 2020). Climate-driven ecosystem degradation can threaten physical health through food insecurity, poor nutrition, and water insecurity, and mental health through changing ecosystems, inability to meet basic needs, and loss of sense of place (Sattler et al., 2018; Benjamin et al., 2019; IPCC, 2022a). Well-being is also disrupted through the NELs-BES sustaining livelihoods and providing a source of income that ensures well-being of people. In Bangladesh, for example, loss of financial stability resulting from crop loss induced by various hazards reportedly affected mental health and people's ability to pay for health care (van Shie and Ranon, 2014).
- **Habitability** is understood as physical goods and services humans receive from the environment, as well as aesthetic and cultural appeal that creates an environment people can and want to live in (Eberle, 2020). In Vanuatu, many coastal and mountainous regions become uninhabitable as a consequence of climate-induced degradation of environmental resources, such as food,

fresh water or materials, such as timber, and ecosystems not being able to sustain human lives. The loss of livelihoods has often forced indigenous communities to leave ancestral land (ref case study). The loss of habitability, which can result from the loss of security, e.g. as food provisioning may become insecure, as well as the loss of livelihoods or health and well-being, may induce displacement, contribute to migration decisions or the need for planned relocation. For instance, in Bangladesh, loss of ecosystem services from sea level rise and salinity intrusion results in considerable displacement of people every year.

- **Opportunities** refer to possibilities for advancement of society in the future that the environment provides, including knowledge, learning, inspiration, pride and genetic diversity (Movono et al., 2017; Eberle et al., 2023). By losing livelihood prospects – such as those in Vanuatu who lost fishing livelihoods due to outmigration from submerging islands, or pastoralism in Kenya which became unviable due to droughts – future generations lose opportunities linked to their heritage and eco-literacy. Further, the Nature's Contribution to People (NCP) approach of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) specifically refers to the "maintenance of options" (NCP18) through the ability of ecosystems, habitats, species, or genotypes to maintain human options for ensuring a high quality of life in the future (IPBES, 2019). The latest global NCP assessment of the platform underlines that genetic diversity is declining, which erodes future opportunities, such as the discovery of new medical resources.
- **Dignity** is the state or quality of being worthy of honor or respect and can include agency, mobility, sovereignty, identity etc. (Eberle, 2020) NELs-BES and resulting impacts on any of the previously mentioned impacts can ultimately damage the dignity of people. For example, the loss of livelihood as a result of NELs-BES may induce migration and force migrants to live in informal settlements, far from the circumstances they were used to live in. Similarly, the loss of natural heritage such as sacred groves can deeply affect the dignity of people, stripping away cultural identity, spiritual connection, economic resources, social cohesion, and exacerbating issues of environmental justice.

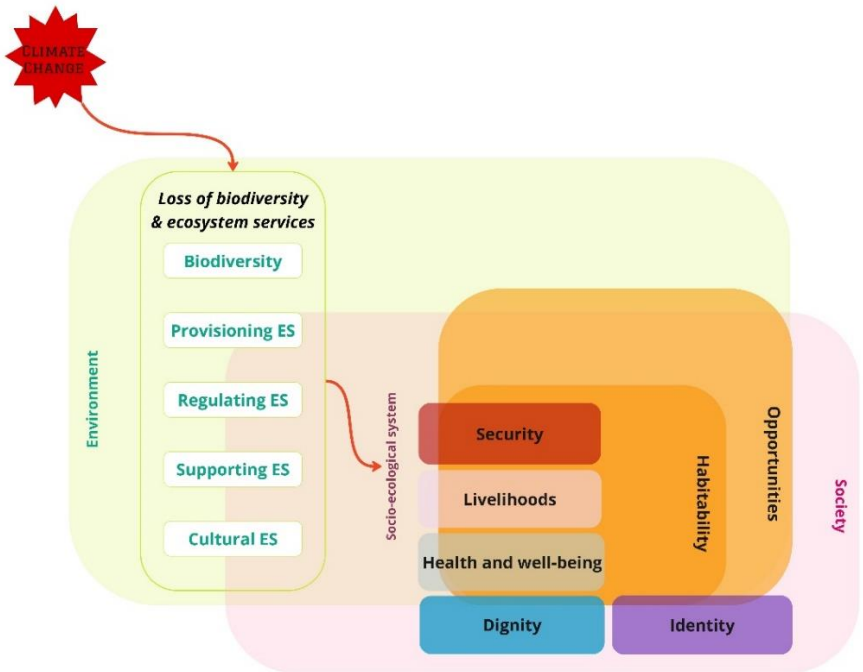

Figure 1: Illustration of NELs-BES and their associated impacts on the socio-ecological system (authors).

- **Identity,** or the feeling of being someone (Eberle, 2020), can be affected for example when livelihoods are destroyed, territory, homes or sacred places are lost and the sense of place damaged, when heritage, e.g. place-based traditions or customs are lost, or when culture, e.g.

gathering places or sources of inspiration are lost. In the Gambia, for example, the loss of traditional crops rendered non-viable by changed weather patterns, and the loss of ancient shade-providing trees in village centers and markets, resulted in the loss of cultural heritage, communal identity and historical knowledge (UNCDF, 2024). Camara-Leret et al. (2019) refers to the impact of climate change on 'biocultural heritage', illustrating how climate change diminishes the wellbeing and cultural integrity of Indigenous peoples by causing local extinctions of wild foods, medicines and ritual foods. Other studies have also documented the extensive losses to Indigenous and traditional knowledge related to weather forecasting, agriculture, medicine, and culturally significant species as a result of NELs-BES (Nankaya et al., 2020).

Losses can interact with existing social inequalities to have disproportionate impacts. NELs-BES may in fact unequally affect women, potentially exacerbating existing gender inequalities and social norms. In Vanuatu, for example, women rely on the coral, sea grass, and mangrove ecosystems for their livelihoods, spiritual, customary, and social protection purposes. Their loss and associated loss of family income disproportionately affects Vanuatu girls, who can no longer go to school as families with limited income will only pay school fees for eldest sons (Waiwai et al., 2023).

What makes NELs-BES even more critical is that they often overlap, cascade, or act as risk multipliers (i.e., one loss creating the risk for further losses, or a strategy to respond to one loss causes another loss) (Westoby et al., 2021). Furthermore, the loss of ecosystem services aggravates the risk to climate-related disasters, as the loss of provisioning, cultural, and supporting services increases vulnerability to climate-related hazards and the loss of regulating services degrades capacities to mitigate climate-related risks (Walz et al., 2021; IPCC, 2022a).

The experience of loss is unlikely to neatly and independently affect one loss type at a time. For example, drought in the Gambia has rendered traditional crops non-viable, destroying livelihoods of rural communities. This has fuelled irregular migration, which together with the loss of the crop lead to loss of cultural heritage. At the same time, the drought has threatened traditional way of life, with the loss of ancient shade-providing trees having social and cultural impacts.

In this way, it is perhaps more useful to imagine that each loss has different aspects and multiple ways that they hold value for people (McShane, 2017), so the experience of loss is rarely a single loss alone. Figure 2 illustrates the cascading and interacting impacts of a climate change induced storm on a coastal forest. The coastal land itself may be lost from a storm surge and erosion, representing a loss of physical land, sense of place, and supporting ecosystem services. Losing the mangrove forest may also mean a loss of hazard protection in the form of wave energy dispersal and erosion control as types of regulating ES. The coastal forest could also have represented an important sacred site, meaning that people would have lost tangible, immovable heritage. Ecologically, many species would lose their habitat in the event, resulting in a loss of biodiversity and perhaps natural heritage/cultural ecosystem services in the form of culturally important species or an aesthetic landscape. The cultural knowledge of the environment as well as the cultural practices and beliefs around specific species and their natural rhythms would also be lost. These species may also have been the foundation of livelihood opportunities for people, such as through fishing or foraging, and their loss would mean a loss of provisioning ecosystem services, tangible cultural heritage in the form of traditional livelihood practices as well as self-determination as livelihood opportunities are undermined. This example highlights the ways that a "single" loss, such as that of a coastal forest, is likely to affect an entire socio-ecological system, resulting in a multitude of diverse NELs which will be different for each community and person.

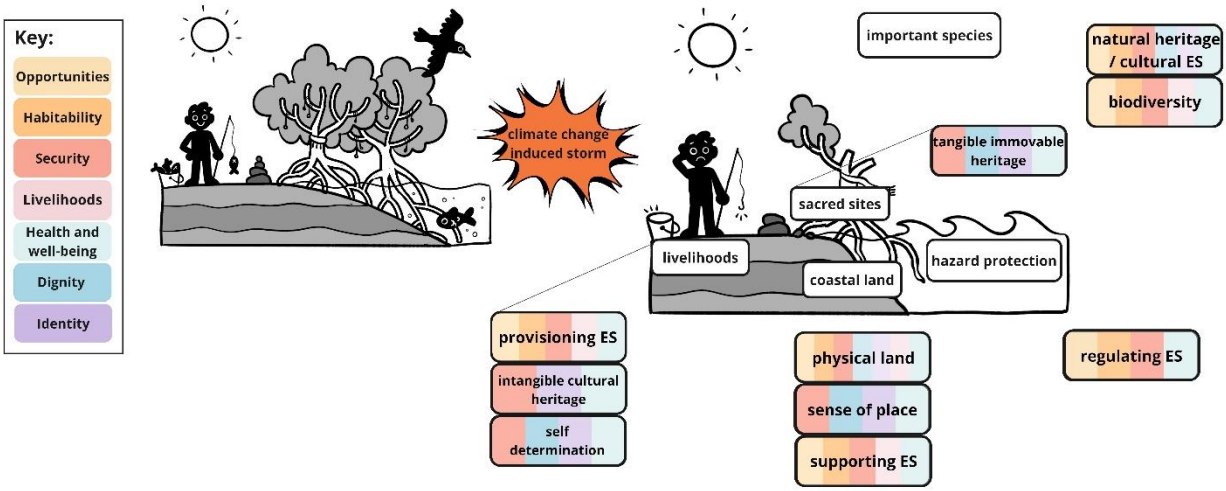

Figure 2: Examples of how a single loss can represent many other losses at the same time (authors).

Both Figure 1 and 2 show the complexity, interlinkages and cascade of losses resulting from NELs-BES, highlighting the importance of understanding and addressing NELs systematically.

B. Spectrum of actions to address loss of biodiversity and ecosystem services

The Intergovernmental Panel on Climate Change (IPCC) finds that NELs are not yet sufficiently addressed by governmental, institutional and financial arrangements, putting particularly developing countries at a disadvantage (IPCC, 2022b). Consequently, there is an urgent need to advance actions that help to avert, minimize and address NELs, including NELs-BES, especially to avoid reaching the limits of climate change adaptation and addressing its impacts. It is important to not only address NELs-BES, but to enhance efforts to avert and minimize them, given that they are interlinked and have cascading impacts on the entire socio-ecological system. Only when reducing NELs-BES overall, detrimental flow-on effects can be avoided. Working directly with ecosystems is of great relevance here, as this can not only help minimizing NELs-BES from climatic changes, but sustaining healthy ecosystems can directly avert NELs-BES. Actions to address are needed when NELs-BES cannot be averted or minimized. The following chapter lays out which actions to address exists and are key in the context of NELs-BES.

Types of actions to address NELs-BES

Actions to address NELs-BES and their cascading impacts can be categorised into the following seven key actions, which are described in more details below: (i) applying comprehensive risk management approaches (ii) enhancing monitoring of and reporting on NELs-BES, (iii) establishing financial mechanisms appropriate to compensate for NELs-BES, (iv) adapting and diversifying livelihoods, (v) developing community capacity to cope with and adapt to NELs-BES, (vi) implementing Nature-based Solutions and (vii) integrating actions to address NELs-BES into policies and planning.

Applying comprehensive risk management approaches

Comprehensive risk management approaches offer multiple entry points for addressing NELs, including through emergency preparedness; response measures and measures to enhance recovery, rehabilitation and building back better; universal social protection systems with portable benefits; and transformational approaches (UNFCCC, n.d.). Response options are prioritised based on collective and individual value trade-offs and what is considered acceptable, tolerable or intolerable (Tschakert et al., 2017; Henrique et al., 2022). Therefore, the first step of response is to i understand what people value, and therefore what is at risk of being lost (van Schie et al., 2023). A values-based approach can

help us better understand the limits to adaptation, and what risks are acceptable, tolerable and intolerable, and how individuals, communities and societies may wish to concentrate efforts in risk reduction, risk transfer, adaptation and restoration to address NELs (Tschakert et al., 2017). This can also be useful in helping to understand the drivers of NELs that go beyond climate change. For this, identifying structural issues that make people prone to experiencing NELs, such as social or ethnic inequalities, is important. Ideally, responses repair what has been lost, such as restoring ecosystems, and address the root cause of the NELs to avoid further cascading losses. Sometimes, it is not possible to repair what is lost, so actions can be taken to replace them or find alternatives, such as relocation programs or building a well after a stream dries up. Further, there are actions to compensate for losses that can neither be repaired nor replaced immediately, such as providing cash transfers to pay for lost assets. Social protection can also serve to support for livelihood loss due to e.g. inability to work. In both instances, there may still be some losses in the form of emotional/spiritual damage or distress, and in some cases, a loss can never be repaired or replaced (such as the loss of a life). Often in these cases, the acknowledgement of loss, through for example memorials, can be a powerful means to address feelings and heal. It must be noted that challenges may arise in addressing risks associated to slow-onset events, as phases such as response and repair may not be explicit.

Enhancing monitoring of and reporting on NELs-BES

Monitoring and reporting on NELs-BES is key to understanding and consequently to implementing actions to avert, minimize or address them. Prerequisite for this is the existence of data and monitoring frameworks for NELs in general and NELs-BES in particular, which are, however, often lacking. A regular measurement of ecosystems extend, condition and service provision is yet to be established in the majority of countries (Vysna et al. 2021). Therefore, data on biodiversity, ecosystems and their services are often patchy or completely missing. Such data would, however, be crucial as baseline against which to understand, monitor and assess changes in ecosystems associated with climate change. Accordingly, scientists call for the establishment of ecosystem inventories and the collection of baseline data (Janzen et al. 2021). To accommodate the need for resources required for such extensive monitoring and reporting, suggestions on how to integrate this into existing frameworks exist. One proposal is to monitor NELs-BES under the System of Environmental-Economic Accounting (SEEA), as this already provides a frame for monitoring the environment (UNDRR, 2023). The integration of NELs-BES into SEEA remains challenging considering the monetary and non-monetary value of ecosystem services is not in the scope of traditional economic reporting systems and therefore difficult to capture adequately. Another study on non-economic losses of ecosystem services found entry points for reporting these losses in the Sendai Framework monitor (Walz et al. 2021). The authors suggest that ecosystems can be considered as critical green or blue infrastructure, which provide basic services to society through their ecosystem services, which is why they could be integrated into Sendai indicators D-4 and D-8. This would, however, require that countries consistently report on ecosystems as green infrastructure, which is not being done yet. Regarding biodiversity, the headline indicators established under the Kunming-Montreal Global Biodiversity Framework could serve as entry point to collect baseline data and therefore to monitor changes in and losses of biodiversity. As the Convention on Biological Diversity (CBD) urges Parties to include the introduced headline indicators when updating their NBSAPs to track progress of their commitments, this could be an opportunity for collecting data relevant for monitoring NELs-BES (Decision 15/6, CBD, 2022). As the capacity for biodiversity monitoring is found to be currently unevenly distributed across the globe, Leadley et al. (2022) call for investments to advance local and national capacities to collect new data. One further, promising development is the establishment of a new disaster losses and damages tracking system by the United Nations Office for Disaster Risk Reduction (UNDRR). It seeks to better reflect on complex, direct, indirect and cascading impacts and to include evolving methods to assess losses and damages (UNDRR, n.d.), which could be an entry point for integrating NELs-BES. While not under the above-mentioned frameworks, there are concrete national and regional examples of how to advance NELs-BES monitoring. In the Philippines, a research initiative worked with local fishermen to develop markers to detect NELs (Manila Observatory, 2024). Markers included the complete

discoloration of corals, which acted as an indicator for coral bleaching, the deaths of coral reefs and the loss of their protective functions. Alternatively, changes in fish catches acted as indication of rising water temperatures that result in species range shifts and changes in or losses of food provision for fisher communities. Such local and everyday indicators that capture ecosystem conditions are relevant for monitoring NELs-BES, and improving understandings of NELs and their cascading impacts, which should then inform targeted action to address these losses.

Establishing financial mechanisms appropriate to compensate for NELs-BES

Financial mechanisms to address NELs-BES include loans, grants or insurances that provide compensation for certain losses (Durand et al., 2016). While there exists a great variety of such mechanisms, the Parties of the UNFCCC agreed on establishing a loss and damage fund as a unified instrument. This new funding arrangement aims at assisting developing countries that are particularly vulnerable to the adverse effects of climate change in responding to loss and damage at COP27 in 2023 (Decision 2/CP27, UNFCCC, 2023). The establishment of the fund marks a pivotal point in addressing NELs and can serve as a starting point for building similar initiatives at national scales. The government of Vanuatu is already in the process of establishing a National Loss and Damage Fund to support and enable rapid, equitable and contextualized disbursements to affected individuals and groups, such as small-scale fisher, whose food security and livelihoods are affected when fish stocks decline due to climate change (Waiwai et al., 2023). And despite the appropriate criticism of current financial mechanisms, in some circumstances, such monetary interventions can still help repair or replace what was lost. In Bangladesh, for example, the loss of freshwater provisioning was compensated through grants to construct deep-water tube wells, which restored access to safe drinking water (Water Justice Fund, n.d.). Another example is the R4 Rural Resilience Initiative, which was developed from the Ethiopian Horn of Africa Risk Transfer for Adaptation (HARITA) program. This program was jointly developed by Oxfam America, the Relief Society of Tigray, and Swiss Re and included an “insurance-for-work” program. It allowed cash-poor farmers to pay their crop insurance premiums through labour contributions to community-identified projects aimed at reducing risks, such as land restoration efforts (Oxfam America, 2013). By engaging in activities like catchment treatment, gully reclamation, and compost production, farmers enhanced their own resilience by profiting from the protection of the crop-insurance and enhancing the resilience of the ecosystems they depend on.

Ultimately, it must be ensured that any financial mechanism established to address NELs-BES is inclusive, granting access for marginalized and vulnerable groups. Some initiatives such as the Water Justice Fund, for example, ensure that women and girls, as a marginalized group, are participating in grant utilization decision-making, helping to address their needs in compensating for losses (Water Justice Fund, n.d.). Importantly, financial mechanisms should further apply environmental safeguards to prevent unintended harm to ecosystem services and biodiversity, for example to prevent natural resources being overexploited to compensate for losses.

Adapting and diversifying livelihoods

Another type of action to address NELs-BES is adaptation of livelihood strategies. The IPCC (2022a) cautions that such livelihood changes are highly dynamic and often remain reactive to the current risk and loss, which can pose the risk of maladaptive shifts, for example towards intensification of farming leading to deforestation. Nevertheless, adapting livelihood strategies can evidently be an efficient action to respond to NELs-BES. Examples from Kenya and the Solomon Islands (Unitarian Universalist Service Committee, 2024; Secretariat of the Platform on Disaster Displacement and the Global Network of Civil Society Organisations for Disaster Reduction, 2024) show different, small-scale interventions, such as adjusting agricultural practices to mitigate climate impacts on agroecosystems and developing water harvesting techniques to sustain freshwater supply. In Vanuatu, fishermen are adapting to the loss of coral reef fish by introducing backyard tilapia farming (Waiwai et al., 2023). Such adaptation measures are particularly relevant for communities whose livelihoods directly

depend on ecosystems and their services, such as small-scale fisher who depend on the provision of climate-sensitive marine resources for securing food and income. Livelihood strategies can also be diversified to reduce the dependency on the livelihood that is impacted by NELs-BES. For instance, in Kenya, women diversify their livelihoods to reduce their dependency on ecosystems. These practices often focus on women as the main recipient of capacity building initiatives and investments, to also support empowerment and gender equity (Secretariat of the Platform on Disaster Displacement and the Global Network of Civil Society Organisations for Disaster Reduction, 2024).

Developing community capacities to cope with and adapt to NELs-BES

Developing community capacities is also key to accelerating action to address NELs-BES and their cascading impacts on communities. McNamara et al. (2021) found that, in the context of Pacific small Island states, people affected by NELs-BES strongly prefer education and training to increase their capacity to reduce the risk of and to enable coping with and adapting to these losses. Such capacity development can include training programs in community-led coastal and marine resource protection, as it is provided in Vanuatu (Waiwai et al., 2023; Stephens et al., 2023), which can enhance sustainable ecosystem management and thereby reduce NELs-BES. Developing capacity strengthens the agency of communities to actively avert, minimize and address NELs-BES and to not just passively face the impacts of climate change.

Implementing Nature-based Solutions

The aforementioned actions can reduce or compensate for the cascading impacts of NELs-BES. Implementing Nature-based Solutions (NbS) to restore and conserve ecosystems, however, has the potential to actually avert or minimize the losses. When adhering to the global standards for NbS of the International Union for the Conservation of Nature (IUCN, 2020), the implementation of NbS, specifically through ecosystem-based adaptation and ecosystem-based disaster risk reduction, can therefore be considered the most effective actions in the context of NELs-BES. These approaches use the sustainable management of ecosystems to maintain their protective capacities (Sudmeier-Rieux et al., 2021; Walz et al., 2021) and reduce the overall risks – current and future – of climatic and non-climatic hazards (Estrella and Saalismaa, 2013; McVittie et al., 2018; SCBD, 2009). In Egypt, for example, local practices include reed fencing to promote the formation of sand dunes that reduce flood impacts (ESCWA, 2024). In Vanuatu, coral transplantations and restoration of beach forests and mangrove zones are being used to mitigate storm and flood impacts (Waiwai et al., 2023). Such approaches do not only provide adaptation and risk reduction benefits, but also support biodiversity conservation and ecosystem integrity (Key et al., 2022). This contributes to increasing the capacity of ecosystems to cope with and adapt to climatic stressor and to continuously provide ecosystem services, thereby minimizing NELs-BES even in the face of climate change impacts. Implementing financial mechanisms to ensure the long-term protection of ecosystems and their services can further advance the contribution of NbS to avert, minimize and address NEL-BES. In Mexico and Hawaii, for example, funding mechanisms have been established to insure coral reefs for their critical ecosystem service of dissipating wave energy and mitigating storm hazards. When a wind speed threshold is exceeded during a storm event, funding is released to repair reef damage and to re-establish the protective capacities of the reef (Coral Restauration Consortium, 2023). Despite evidence for the effectiveness of NbS and their contribution to build climate resilience of vulnerable communities and the ecosystems they depend on, only 1.4% of global climate finance is invested in these solutions. Therefore, the Partnership on Ecosystems for Disaster Risk Reduction (PEDRR) called for upscaling investments in NbS, specifically to address NELs in the light of the previous UNFCCC COP27 in 2023 (PEDRR and FEBA, 2023). Further, the IUCN global standards demand to mainstream NbS into jurisdiction to ensure they are continuously supported by national policies and plans in the long-term (IUCN, 2022).

Integrating actions to address NELs-BES in policies and planning

Ultimately, integrating NELs-BES into policies and planning and creating a more enabling environment is key to promote actions that avert, minimize and address them. NELs-BES can, for example, be mainstreamed into national efforts to combat climate change and its impacts. Vanuatu built this case through their Nationally Determined Contributions, and their commitment to expand calls for finance to address loss, including intangible and non-economic impacts, and assess and quantify NELs, particularly through Post Disaster Needs Assessments (PDNAs) (Waiwai et al., 2023). This approach is unique, considering that only a minority of PDNAs report on loss of ecosystem services, and they rarely provide disaggregated values, which limits understanding (Janzen et al., 2021). The approach of Vanuatu to embed the assessment of NELs in policy, including those of ecosystem services, can serve as a blueprint for other states to do the same. To facilitate uptake of this approach, however, data and capacity constraints need to be addressed first. Many countries have capacity constraints to collect baseline data needed to assess NELs (Jeggle et al., 2018). This issue is reflected in the limited institutionalization of tracking systems at a national level. Further, many countries are only able to conduct PDNAs when they are externally supported in this, so using these plans to upscale reporting on NELs-BES would require continuous assistance of affected countries that do not have any monitoring capacities themselves.

C. Lessons learned from losses to biodiversity and ecosystem services

Lesson 1: The multiple dimensions of NELs-BES are not made visible in an adequate manner yet

NELs-BES are often still considered in silos, although ample evidence on the cascading impacts of NELs-BES on the entire socio-ecological system exists. While science has often emphasized the important role biodiversity, ecosystems and their services play for human live, health, and well-being (MEA 2005; IPBES, 2019; IPCC, 2022a), their importance still appears to be unrecognized or neglected in some instances. This hinders accelerating efforts to conserve and restore ecosystems and therefore to avert, minimize and address NELs-BES.

Lesson 2: It is essential to raise awareness on these losses considering the perspectives particularly of affected communities.

This chapter builds on local case studies submitted to the NELs Expert Group to communicate local experiences with NELs-BES and practices to increase the coping and adaptive capacities of affected communities to deal with climate change and its impacts. Considering such local examples can help understand the materialized cascading impacts of NELs-BES and to design context-specific actions that build on existing knowledge and best practices. This is why it is also essential to engage with multiple actors to respond efficiently and inclusively to NELs-BES. Including local communities in restoration actions, for example, is key to ensuring the implementation of measures on the ground that are mindful of local needs. Other, often marginalized groups, such as women, Indigenous communities, persons with disabilities or youth also need to be included (Water Justice Fund, n.d.). The perspectives of these actors must be integrated into policy formulation, planning and implementation, not only to reduce their vulnerabilities to NELs-BES but also to formulate and apply social safeguards in actions to address these losses. It is also key to integrate these perspectives when developing financial mechanisms appropriate to address NELs to ensure, for example, that poor households have access to insurance schemes and grants, or that women and girls have decision power in how funds directed to communities should be used.

Lesson 3: Monitoring and reporting is essential to develop and implement actions to avert, minimize and address NELs-BES.

Monitoring and reporting on ecosystem services and biodiversity is crucial, as it can reveal the multifold benefits that ecosystems provide, and the damaging effects to the socio-ecological system that NELs-BES have. Increased monitoring and reporting efforts require more funding to enhance institutional data collection capacities (Jeggle et al., 2018; Vysna et al. 2021). There further is the need

to establish ecosystem inventories to have baseline data against which changes in ecosystem services and biodiversity can be tracked (Janzen et al, 2021). Key challenges in this context concern financing, but also questions on valuing ecosystem services and biodiversity for NELs-BES reporting. While some provisioning ecosystem services can be expressed in monetary terms, such as crop yield, others, for example regulation of extreme events, cultural services such as inspiration through nature, and biodiversity itself are intangible and cannot be valued the same way (Bartkowski et al. 2015; IPBES, 2019). Another challenge remains in the context of slow onset events. Many insurance schemes require that a specific threshold is passed (e.g., wind speed during a hurricane) to initiate pay-outs to compensate for losses, but slow onset events, such as droughts or sea-level rise, do not have a clearly identifiable trigger. Consequently, affected communities receive limited or no monetary remedy, even though they experience losses, including NELs-BES. Continuously monitoring ecosystem services and biodiversity against a baseline could help track such changes, and in combination with financial mechanisms specifically targeted at slow-onset event address this challenge.

Lesson 4: Not only the losses related to NELs-BES are interlinked, but so should be the solutions to tackle them.

Since NELs-BES cascade into multifold adverse impacts, it is not sufficient to only manage those losses that have already materialized. It is important to design and implement actions to avert and minimize NELs-BES in the first place, including through tackling the root causes of climate chance. In this context, NbS can be a powerful tool, as they offer the opportunity to manage ecosystems in a way that they enable mitigation, adaptation and disaster risk reduction, which minimizes the risk of NELs-BES from occurring. At the same time, NbS can increase the resilience of ecosystems, and as healthy and resilient ecosystems are less susceptible to climate pressures, this can help averting NELs-BES. It is important to acknowledge that how ecosystems are managed can change their susceptibility to experience losses associated with climate change. Unsustainable management of forest ecosystems by overexploiting timber can make these ecosystems more susceptible to the impacts of short-term events or longer-term climatic changes, while forest restoration with native tree species contributes to continued provision of ecosystem services and maintained biodiversity. Consequently, developing and implementing appropriate solutions that follow the IUCN global standards for NbS is essential to address NELs-BES. Here, also future climate projections should be considered to ensure that NbS are adaptive and effective in the long-term, even under changing climatic conditions (Gómez Martín et al., 2021). Being mindful of this during NbS design can avoid maladaptation through inappropriate NbS and therefore the occurrence of further NELs-BES.

III. Loss of territory and habitability

A. Non-economic losses of territory and habitability in the context of climate change and their interlinkages with other non-economic losses

This section focuses on *the loss of territory* (i.e., physical land under the jurisdiction of a politically organized collective) and *loss of habitability* (i.e., habitable land that is no longer able to support and sustain human life). At their core, the loss of territory and loss of habitability involves the *loss of land*, either as physical land or habitable land, due to climate change hazards such as sea level rise, desertification, glacial retreat, flooding, storm surges, and coastal erosion (Ekoh et al., 2023; Wündisch, 2019; Table 1).

Table 1: Examples of slow-onset hazards that contribute to loss of territory and habitability (IDMC, 2017)

Hazard	Examples of impacts on loss of territory and loss of habitability
Sea level rise	• Causes the salinisation of soils and reduced crop yields in cultivated areas, the lowering of the quality of drinking water from salinity intrusion into coastal aquifers, reduced fish production and the loss of territory through inundation

	• Damage to ecosystems contributes to the weakening of protections against floods, storms, tsunamis and typhoons, leaving populations more exposed to the risks of displacement • Slow-onset events can progressively decrease the habitability of an area until a tipping point is reached. For example, with surrounding sea levels rising, it has been predicted that Kiribati will become uninhabitable in 30 to 60 years
Desertification	• Contributes to food and nutritional insecurity by generating losses in agricultural productivity and income. It decreases both the quantity and quality of water, thus reducing the availability to meet WASH as well as production needs • Can act as a threat multiplier for drought. Repeated, severe droughts may force people to abandon their pastoralist or agro-pastoralist lifestyle as it becomes unviable • Can lead to loss of territory through the encroachment of sand dunes. For example, an estimated 23 ha of land are lost to desertification per minute, with subsequent losses to homes, fields and livelihoods
Glacial retreat	• Rising temperatures and pollution can cause glaciers to melt and retreat which can decrease the level of river flows, cause glacial-lake outburst flooding or permafrost melt, affecting the resources that are relied on by global mountain populations • Polar regions are altered by permafrost melt, which is causing the sinking of the earth's surface, or subsidence, as well as coastal erosion

As a normative concept, territory describes a place under the jurisdiction of a territorial agent, which is a politically organized collective that has a degree of self-determination because of the jurisdictional right. A loss of territory causes the people under the jurisdiction of which the territory falls to experience a reduction in the ability to derive a level of political self-determination in their place (Mancilla and Baard, 2023; Wündisch, 2019). The loss of entire territories, which threatens the right to exist, has been discussed in the context of small island nation states such as the Maldives, Tuvalu, and Kiribati (Mancilla and Baard, 2023), yet partial loss of territory will be far more pervasive (Wündisch, 2019). For example, in Uganda, the River Semliki is widening and changing course due to flooding and changing weather patterns, meaning local farmers' lands are being lost across the country border to the Democratic Republic of Congo (Case study, Uganda, 2024). For countries like Bangladesh, 18% of coastland may be inundated by 2080, adding further pressure to the 13.3 million people that are already likely to be displaced internally as a result of partial territory loss by 2050 (Khan et al., 2021). Similarly, in Kenya, the Ilchamus residents of Kokwa Island have also been losing land from lake rising due to increased rain (Case study, Kenya, 2024).

Although most discourse has been focused on loss at a state level, non-state collectives can also experience territory loss (Mancilla and Baard, 2023). Indigenous Torres Strait Islanders in Australia, for example, are facing sea level rise, and increased coastal erosion and storm frequency in many of their low-lying coral cays, which threatens lives physically and culturally (Australian Human Rights Commission, 2008). For example, Boigu Island, which is a low-lying mud island inundated by the sea during high tides and storm surges, faces a significant limit to livelihood sustainment due to the limited availability of elevated land above the level of coastal flooding (McNamara et al., 2017).

The loss of land is also linked to the loss of habitability, which can be understood as the ability of a place to support human life (i.e., by providing protection from hazards and assuring adequate space, food, and water) and provide economic opportunities which contribute to health and wellbeing (Bennett et al., 2019; Duvat et al., 2020; Spencer et al., 2023). This is critical to consider, as it is likely that the consequences of compounding physical changes on living conditions will make many coastal areas uninhabitable long before global sea level rise causes permanent inundation and loss of territory (Duvat et al., 2022). Along Arctic and Alaskan coasts, for example, permafrost thawing and sea ice loss,

and temporary and permanent flooding due to more ice-free open water and diminished coastal protection threaten community livelihoods, basic subsistence, coastal settlements and infrastructure through shoreline retreat and inland collapse (Albert et al., 2017; Archer et al., 2017; Spencer et al., 2023).

Uninhabitable landscapes as a result of hazards such as drought, saltwater intrusion, land degradation, permafrost thawing, sea ice loss, or desertification, affect life-plans that are bound to that place (Draper, 2023; Mancilla and Baard, 2023), and can degrade the feeling of control that agents have over their territory by affecting access to its resources (Mancilla and Baard, 2023). The availability of sufficient and safe land, along with access to freshwater, food supply, safe settlements and infrastructure, and sustainable economic activities, have been identified as the five habitability pillars which are directly affected by climate change impacts (Duvat et al., 2020). Habitable land is considered the 'major habitability pillar', critical to settlements and infrastructure, freshwater and food supply, economic activities, and natural vegetation development in habitability systems such as atoll islands and Arctic coasts (Duvat et al., 2020; Spencer et al., 2023). Irreversible changes to land and/or the overshoot of land-related thresholds is critical to understand for determining climate risk severity in these low-lying coastal settlements (Duvat et al., 2020; Spencer et al., 2023).

The link between loss of land (i.e., loss of territory and/or habitability) and human mobility is well established. As areas gradually become less habitable and land is lost, increased human mobility can be expected as a response, in the form of displacement, migration, and planned relocation. Displacement as a result of slow-onset climate change processes such as desertification and sea level rise, however, which can result in a loss of territory and habitability, can be more difficult to identify than those resulting from a sudden-onset disaster such as flooding or storms (Internal Displacement Monitoring Centre, 2017). Since the 1970s, over 400 planned relocations have been identified across 78 countries (Bower and Weerasinghe, 2021; IOM, 2022). Various case studies from multiple contexts have demonstrated the link between land loss and human mobility:

- In the case of Bangladesh, for example, the loss of physical territory has caused extensive internal displacement over time. Given its location in the largest delta in the world, an immense number of rivers flow through the country, which is important for people's livelihoods. Land loss, through riverbank erosion, is common, forcing people to move and rebuild their lives (Ayeb-Karlsson et al., 2016). As a local from Singpur explained: *"I experienced the extreme effect of riverbank erosion in 2010 when 25 houses [in the village] went under water over a night. Several crop fields were also damaged. We lost everything./…/We never managed to overcome the damages of this disaster. Now we are close to being landless people"* (Ayeb-Karlsson et al., 2016: 685).
- In Fiji, Tropical Cyclone Yasa caused extensive land instability, affecting the safety and structure of homes throughout Nabavatu village. More than half of all households were displaced and sought refuge for years in a 'tent village' while they waited to be permanently relocated to a new community site (Case study, Fiji and Solomon Islands, 2024).
- In the north of Ghana, the scarcity of fertile land and resulting low crop yields and unreliable harvests as a result of high rainfall variability and droughts were seen as contributing environmental push factors for migration to urban centers, causing a "figurative and literal desiccation of self and place in these landscapes" (Tschakert et al., 2013: 24).

The case studies and literature have demonstrated how the loss of territory and/or habitability has a cascading and multiplier effect (i.e., one loss creating the risk for further losses), causing harm to many aspects of a socio-ecological system (Westoby et al., 2021). Some examples of these loss interlinkages between loss of territory and habitability, and wellbeing and identity, cultural heritage, community and social cohesion, and biodiversity and ecosystem services are explored below (Figure 1).

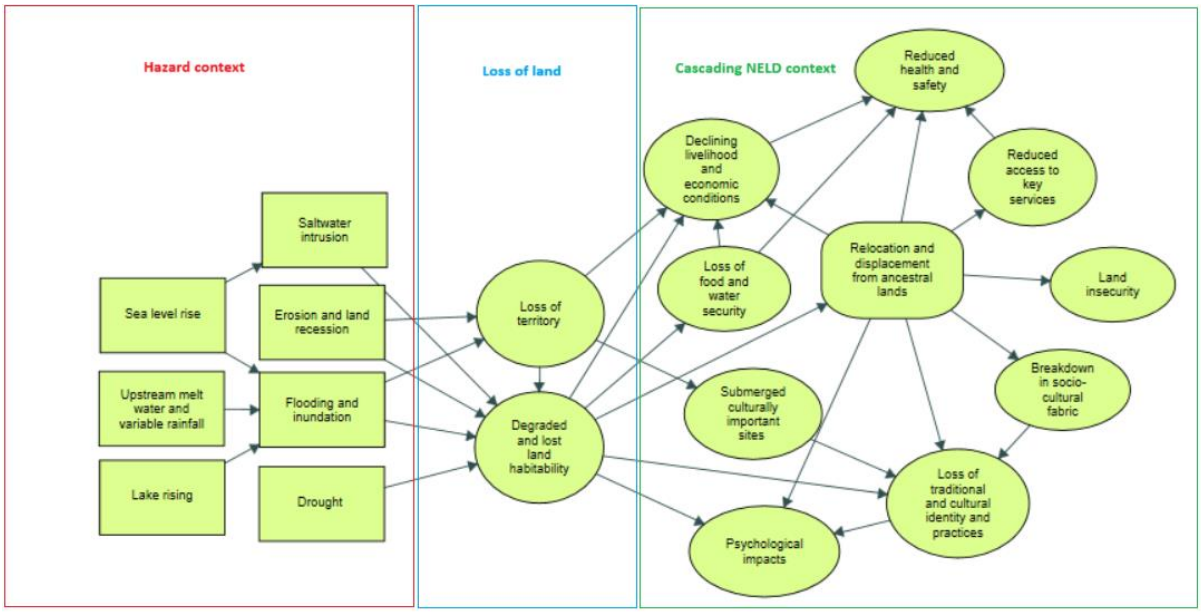

Figure 1: Some examples of cascading impacts of loss of territory and habitability to a socio-ecological system, as drawn from the case studies provided to the UNFCCC

Deep-rooted cultural and spiritual attachments to land mean that place can be an extension of 'self' in contexts such as the Pacific Islands (Gharbaoui and Blocher, 2018). Campbell (2019) suggests that loss of territory and/or habitability due to climate change can risk material, social, and cultural security, and ultimately 'ontological security', which relates to a "feeling of continuity in one's life that is based on a sense of belonging and confidence in one's identity", which is difficult to re-establish and impossible to compensate (Campbell, 2019: 4). Villagers in Vunidogola in Fiji, for example, were relocated after in-situ risk reduction initiatives proved ineffective against seawater inundation, and even though they were able to move within customary land boundaries, the villagers still experienced significant psychological stress and the loss of identity and belonging (Edwards, 2014). The connection to the land and the environment, traditions and customs associated with the land are significant for a Fijian community, forming part of their identity (Barnett et al., 2022). Similar degradations in identity have been illustrated in the experience of the Sena people in Maseya, Malawi who faced loss of territory and relocation to smaller plots of land with little space for cultivation. This separated them from their traditional identity as custodians of land and pastoralists, resulting in losses in their sense of belonging and confidence in identity: "*Here we are just like children without land and we are not even respected. We feel empty and helpless. I personally feel as if I am walking naked*" (Case study, Malawi, 2024).

In terms of interconnections with cultural heritage, the loss of territory and/or habitability is intimately tied with the loss of tangible and intangible cultural heritage, because the disconnection from land affects people-environment interactions, which can result in weakened knowledge transference and changed ways of being. Inundation and coastal erosion, which can lead to territory loss, can, for example, result in the direct loss of cultural sites and sacred places (McNamara et al., 2021). In Sese village and Togoru settlement, in Fiji, for example, the loss of sacred burial grounds has threatened cultural, spiritual, and kin-based relations and connections to ancestors (Nand et al., 2024; Yee and McNamara, 2023). Such losses are intolerable given the immense importance of burial grounds to Fijian people, playing a crucial role in the cultural, social, and spiritual fabric of community (Vave et al., 2023). As a local from Togoru settlement expressed: *"Our loved ones who have passed away – when we bury them, we say 'sili vakarua' ('bath twice') because one is the bath before they are put in the coffin, and they bath again after they are buried as the waves come in and enter the new burial site. This is just traumatising for us…"* (Yee and McNamara, 2023: 99). Similarly, increased coastal erosion on the island of Kosrae in the Federated States of Micronesia is affecting the burial rituals and

practices of residents (Monnereau and Abraham, 2013). The loss of these burial grounds has triggered other cascading impacts on people's wellbeing, cultural traditions and heritage, and social and family cohesion.

Losing land, either through inundation or displacement, can also mean the loss of the "place of practicing our custom songs and dances" – that is, the places that give rise to intangible cultural heritage, and then also self-esteem and identity (Campbell 2019; McNamara et al., 2021: 1242; Movono et al., 2017). For the Sena people in Maseya, Malawi, for example, the loss of territory and relocation to smaller plots of land has meant that cultural practices that affirm group identity are no longer practised. The practice of 'Gowero', for example, is becoming lost due to the lack of space to celebrate the tradition: "*This is our tradition, but with limited land which we have, we cannot do this anymore. There are reasons why our forefathers introduced this which now we can no longer honour and we have failed them*" (Case study, Malawi, 2024).

The physical loss of territory and resulting displacement or relocation can also affect social cohesion by "decimat[ing] tribal/extended family networks that were custodian to traditional titles, family lands etc" (McNamara et al., 2021: 8). Relocation and displacement can mean that families and communities become geographically fragmented, social traditions and connections are lost due to increased exposure to outside influences, and communal ways of life are lost due to the non-traditional set up of new villages and housing (Albert et al., 2018; Nand et al., 2024). The displacement of locals in Nabavatu village in Fiji as a result of extensive land instability from Tropical Cyclone Yasa, for example, meant that half of all households sought refuge in a 'tent village', where strained communal unity and tensions between those in the old and new/displaced site emerged (Case study, Fiji and Solomon Islands, 2024). Other community-driven relocations in the Solomon Islands and Alaska showed related issues, such as a reduced sense of community and degraded community life through the inability to continue annual gatherings and traditions (Albert et al., 2018).

Lastly, the loss of land is also intricately linked with the loss of biodiversity and ecosystem services, especially through the loss of habitability. The loss of land, as a 'major habitability pillar', can have cascading impacts on ecosystem services such as freshwater and food provision. In the island atoll context, for example, land area loss can reduce fresh groundwater availability and cause salinization, and the extent and quality of arable land for food (Duvat et al., 2020). Similarly, in Assasuni Upazila in Bangladesh where residents endure 5-6 months of inundation in saline water annually, which is exacerbated by sea level rise, an increasingly significant amount of land and groundwater are becoming saline, and iron and arsenic contaminated (Case study, Bangladesh, 2024). Another example from Cedeño in Honduras demonstrates how inundation and loss of territory can result in cascading losses to marine ecosystem services as the inundation of a shrimp processing factory resulted in the contamination of local waters and reduced access to safe food supply for local fisher people who were having to travel further offshore (Case study, Honduras, 2024).

The availability of sufficient and safe land can also be dependent on a series of ecosystem services. Adequate land, for example, is dependent on the quality of soil on the available land area, which is then also critical for food provision. The persistence of land, especially in coastal areas, can also be dependent on supporting ecosystems such as reef ecosystems that provide the island with sediment and reduce wave energy reaching the coastline, or mangroves, seagrass and natural strandline vegetation that stabilize shoreline systems and limit erosion and marine flooding (Duvat et al., 2020). Ecosystem degradation and a loss of ecosystem services can also lead to the loss of or detachment from land and territory through relocation as people are forced to move due to an inability to meet basic needs (i.e., food and water insecurity) and losses to their sense of place, affecting their capacity to derive a level of political self-determination from that place (Benjamin et al., 2019; 2021; Sattler et al., 2018).

B. Spectrum of actions to address loss of territory and habitability

A series of immediate/early and long-term initiatives and adaptation efforts have been adopted in the face of losses to territory and habitability. These responses are often dependent on the type of hazard and cascading impacts experienced by a community. Disaster risk reduction plans, climate change adaptation and mitigation strategies, and supporting the livelihoods and human capital of vulnerable groups can play a role in strengthening capacities to cope with changes and migrate safely, and also prevent or delay displacement as the ultimate impact of loss of territory and/or habitable land (Internal Displacement Monitoring Centre, 2017). Below we focus on the strategies of humanitarian relief, landscape protection and restoration, and planned relocation.

Humanitarian relief

Providing relief, the immediate support provided to minimise suffering and meet basic human needs, emerged as a key component of addressing the loss of territory and habitable land. These actions are taken directly before, during, or immediately after a disaster to save lives, reduce health impacts, ensure public safety, and meet basic subsistence needs. Humanitarian relief is especially needed where loss of territory and habitable land leads to displacement, and the concomitant cascading NEL impact. People displaced by loss of territory and habitable land, and their communities of origin and refuge, face different impacts on their livelihoods, health, security, housing conditions, social life, education and environment (IDMC, 2017).

Temporary shelters can involve evacuation buildings within a village, to areas linked to a customary land tenure system, or temporary settlements set up elsewhere by external agencies for those in high-risk areas *(*Case study, Kenya and Fiji, 2024; Albert et al., 2018). Humanitarian relief is then needed to address the disconnection from land, water and food sources, community and shelter as a result of displacement. The indigenous Sena tribe of Maseya, for example, faced significant food insecurity after being relocated as they were left with little space for cultivation (Case study, Malawi, 2024). Beyond food, water, shelter and livelihoods, security and safety are also important. In Singh, Pakistan, for example, Oxfam with its local partners established safe spaces and healthy learning environments for flood affected displaced women and girls (Case study, Pakistan, 2024).

Funding for localised and community-level humanitarian relief of loss and damage is also critical, especially in ways that build on existing local capacity and is operationally efficient and scalable. Too often, insurance is not a viable option for vulnerable communities who are then left with minimal resources to address losses (Case study, Vanuatu, 2024). Two examples for deploying funding to communities facing loss and damage include:

1. The Climate Bridge Fund (CBF) in Bangladesh which disperses funding to local civil society organisations (CSOs) to support adaptation activities for communities who have been displaced and communities who are at risk of being displaced by the climate crisis. It has been used as a mechanism to support loss and damage by funding activities such a livelihoods development, psychological counselling, developing climate-resilient infrastructure and delivering health and educational services. Although an important potential model for how humanitarian relief can be operationalised, challenges have included that there is significantly more demand than can be deployed (e.g., CBF received 102 applications but was only able to fund 4 in 2020, or received 110 and funded 18 in 2021), and that some projects took longer to implement to prove their potential to generate sustainable impact. Future projections were also not always adequately taken into account, the Secretariat observed challenges in differentiating between development and climate-adaptation activities, and local CSOs faced challenges from local authorities in selecting project locations and participations (Case study, Bangladesh, 2024).
2. The UN Capital Development Fund launched a micro-insurance product in Vanuatu which was designed to protect climate vulnerable populations such as the poor, women and girls, Ni-Vanuatu families, and people with disabilities against adverse financial impacts of extreme

weather hazards. It provides a quick injection of relief funds within 10-14 days following a disaster.

A case study from Sri Lanka has also illustrated how disseminating support through existing community structures is not always equitable and inclusive. Farmer and irrigation societies in Sri Lanka are often used as the main mechanism through which government-led support is channelled, yet land ownership is a key criterion for memberships, meaning those without official land tenure, such as low-income groups and women, were excluded from land titling, humanitarian relief and relocation benefits, or support on adaptation and mitigation measures: "We have been occupying these lands for over three generations, but…We don't receive any extension services or technical support related to climate mitigation or adaption from the Agrarian Services Department. This is because they don't recognize us as farmers as we don't own this land. We are unable to register for crop insurance or drought relief for the same reason. The State refusing to formalize our ownership and watch our farming communities deteriorate in the face of extreme drought is now a question of our dignity and worth as small-scale food producers" (Case study, Sri Lanka, 2024).

For those from high-risk areas where conditions do not improve or worsen, displacement may become indefinite. Too often, temporary displacement is an initial trigger for the delivery of aid but is not followed by a continuity of support and compensation for climate-driven loss and damage to territory (Case study, Sri Lanka and Kenya, 2024). Financing of loss of land must, therefore, be able to tackle the short-term humanitarian needs of affected communities by finding suitable lands for temporary shelters but also long-term needs relating to permanent relocation (see below section; IDMC, 2017; Oxfam, 2023). One thousand climate-displaced Indigenous Ilchamus people from Baringo County in Kenya, for example, have been residing in an initially temporary internally displaced persons camp with limited long-term access to humanitarian services and protection programming, including in terms of shelter and livelihoods (Case study, Kenya, 2024). Similarly, half of all households in Nabavatu village in Fiji were living in temporary tent shelters for years after most community structures were identified as being in the 'red zone' after flood inundation risk assessments (Case study, Fiji, 2024).

Protecting and rehabilitating landscapes

Initiatives focused on protecting and rehabilitating landscapes aim to avert and minimize future or continued loss of territory and habitability through, where possible, recovering what has been lost so far or protecting what has not yet been lost by increasing the resilience of ecosystems and reducing their exposure to hazards such as erosion, flooding or inundation. Protection and restoration responses can be focused on hard structures (e.g., locally built ad hoc defences using available material to the construction of planned seawalls or revetments), nature-based solutions, or hybrid solutions (Table 2). The rehabilitation of degraded land can also provide land and livelihood opportunities for relocated populations (Displacement Solutions, 2023). The efficacy of these approaches is a function of many factors, including cost, governance and social acceptability (Chausson et al., 2020; Martin et al., 2021; Woroniecki, 2013).

Hard protection measures have proved ineffective in the long-term in several contexts (Albert et al., 2018; Charan et al., 2017; Piggott-McKellar et al., 2020) due to issues such as overlooking underlying socio-economic and other contextual drivers of vulnerability (Piggott-McKellar et al., 2020). In Vunidogoloa in Fiji, for example, traditional responses of disaster relief and thousands of dollars spent on the construction of sea walls was no longer protecting the village, and relocation became the only cogent solution to safeguard inhabitants (Charan et al., 2017; Edwards, 2012). Some highly engineered urban islands such as Singapore or Hulhumale, however, have been transformed in ways that their landforms (and water systems, food systems, housing and social systems) will probably sustain their habitability through a changing climate (Brown et al., 2020).

Nature-based solutions aim to achieve resilience outcomes using biophysical processes to respond to the changes in conditions affected by climate change, which are often more culturally and environmentally appropriate in rural areas (Barnett et al., 2022; Piggott-McKellar et al., 2020).

Comprehensive scientific and broadly accepted standards for nature-based solutions are needed to put them on an equal footing (i.e., in terms of indemnity and public liability risks to implementing agencies and investors) with the standards that support contemporary engineering approaches such as seawalls, revetments and sand nourishment in coastal areas (Barnett et al., 2022). They also require further co-produced research to understand efficacy and impact and can be difficult in areas where hard protection has degraded natural coastal processes (Barnett et al., 2022; Duvat and Magnan, 2019). There is a growing need for options that combine traditional practices with modern solutions enabled by advances in environmental science and engineering (Barnett et al., 2022).

Table 2: Some examples of measures used for protection against loss of land or restoring habitability (Case study, Bhutan, Nepal and Egypt, 2024; Case study, Mali and Niger, 2024; Barnett et al., 2022; Cauchi et al., 2021; Feagin et al., 2015; Ferrario et al., 2014; Harris et al., 2018; Morris et al., 2018; Piggot-McKellar et al., 2020; Siegel, 2019)

Hard structures	Nature-based solutions	Hybrid solutions
• In the Netherlands, sea dikes and revetments are used to protect coastlines from flooding and erosion and support coastal protection defences for sand dunes. • Sea walls have been implemented in communities on Vanua Levu Island, Fiji to safeguard communities against coastal pressures, albeit proving ineffective. • Anti-salt dykes in Senegal have been used to reclaim land for rice cultivation. • In Bhutan and Nepal, risks of glacial outbursts have been reduced through artificial lake management systems that drain water through siphon pipes, outlet channels, controlling breaching or pumping, and river stabilisation through gabion revetment and bioengineering.	• In Kiribati, a type of natural fence known as *te buibui,* made with branches and trunks and held together with sand coir is built on the shore as a barrier against the wind and seawater, while also trapping sediment. • Mangrove planting in lagoons has been used in Funafuti, Tuvalu to address saline intrusion and prevent further erosion, while also providing opportunities for aquaculture activities. • Communities in Mali and Niger whose landscapes were transformed by land degradation have been undertaking composting and fertilizing techniques to increase soil fertility, assisted natural regeneration, and rehabilitation of degraded land through bio and mechanical techniques. • For atoll areas, nature-based solutions for reefs, lagoons and land have been identified to address the challenge of habitability. This includes (i) coral reef protection and restoration (e.g., through outplanting on reefs or assisting coral recruitment) which can reduce the risk of extreme events by dissipating wave energy and contributing to the production of sediments for shoreline protection, (ii) mangrove planting or protection to facilitate sedimentation that raises the level of land at pace with sea level rise, mitigates wave damage from storms and prevents erosion and saline intrusion where conditions are suitable, (iii) marine-based aquaculture infrastructure in lagoons such as long-line culture of shellfish and seaweeds that can attenuate wave energy to assist coastal armouring as a mitigation solution to coastal hazards, and (iv) the protection, enhancement and restoration of littoral vegetation to enhance sediment accretion and attenuate wave energy and increase soil cohesion to reduce erosion.	• In Bangladesh, communities have developed a combination of embankments by planting vetiver grass and trees while also constructing village defence walls and dykes to protect against sea-level rise and coastal erosion. • In New South Wales, Australia, a seawall coastal defence is complemented by establishing vegetation (e.g., mangroves and seagrass or artificial or shellfish reef) directly in front of them, and preserving landward vegetation to manage wave energy, tidal flooding and storm surges. • For coastal communities such as those in the Nile Delta, groynes and breakwaters, and nature-based solutions such as reed fencing and clay core dikes are being used for beach restoration, encouraging the development of sand dunes and reducing flood impacts.

Permanent community relocation

Planned relocations in the context of climate change refer to the coordinated, permanent movement of people from places that are, or soon will be, affected by acute climate impacts and associated land

loss (Gini et al., 2024). Relocation has been labelled as an impact of climate change and a failure of adaptation (Campbell, 2008), but also a positive opportunity when guided by appropriate evidence-based policy (Black et al., 2011). It can be a forced or voluntary movement of communities to safer areas when in-situ adaptation options are exhausted. In Malawi, for example, five communities were relocated from their territories in 2023 in response to flooding (Case study, Malawi, 2024). In 2014, 676 coastal communities in Fiji were identified as needing relocation based on climate change projections − 42 of which will require relocation in this decade, 17 of which are prioritized for relocation as soon as possible, and six of which have already been partially or completely relocated (Case study, Fiji, 2024).

The literature has identified various facilitators and inhibitors of the relocation process, and the concerns and benefits associated with the outcomes to livelihood capital as important for guiding future relocation efforts (Table 3). It is undeniably costly in many ways and is often considered as a last resort for vulnerable communities addressing loss of territory and habitability (McNamara and Jacot des Combes, 2015). For Vunidogoloa village in Fiji, for example, plans to relocate had begun in 1956 but was not implemented until 2006 due to a profound spiritual predicament and the reluctance of some villagers (especially elders) to leave their ancestral grounds/boundaries: "Initially relocating was not an option to us at all but climate change came like an enemy that chased us away by taking our land, taking our food, taking everything" (Charan et al., 2017: 25).

Table 3: Summary of findings from relocated communities in terms of process and outcome of relocation (Albert et al., 2018; Charan et al., 2017; Displacement Solutions, 2023; Nurse et al., 2014; Yee et al., 2024)

Process	**Facilitators of relocation**	**Inhibitors of relocation**
	• Customary land tenure • Adequate resources, including finances • Decision-making framework • Identification of relocation site • Understanding risk • Institutional support • Community and household-level decision-making • Multi-sectoral and participatory approach	• Complex multi-stakeholder planning • Lack of available land and disputes over land rights • Legislative issues and extensive community consultations complicate processes and can result in delays • Relocation site subject to future climate hazards • Lack of governance and funding • Traditional and emotional attachment to 'place', kinship, cultural connections and loss of livelihoods • Traditional values and awareness, which can lead to refusal to leave
Outcome	**Benefits of relocation**	**Concerns and challenges of relocation**
	• Access to fertile soils and increased subsistence food production • Improved and safer infrastructure/climate-proofed housing • Space for expansion • Sense of security and safety from hazards • Maintained community unit where possible • Long-term land security	• Fractured community • Exacerbation of existing inequalities related to land, income, and gender, and access to resources • Reduced involvement in cultural events • Reduced access to infrastructure • Access to sanitation • Reduced access to traditional resources (marine or terrestrial) • Loss of livelihoods • Loss of identity and culture • Reduced access to services (e.g., church, education) • Emotional and mental health impacts as a result of the above and lack of support

Many relocation initiatives to date have been either ad-hoc due to governance gaps (i.e., lack of governance framework and lack of government agency funding, expertise or capacity to facilitate

relocation) or government-mandated. Local communities from highly exposed areas such as Fiji, the Solomon Islands and Alaska have proved profoundly resourceful and resilient in the face of relocation, basing movements and decisions on customary tenure and traditional knowledge, yet relocation can occur at the family level, resulting in the fracturing of a single community into small hamlets (Albert et al., 2018; Charan et al., 2017). Meanwhile, studies have demonstrated how government-mandated relocations can remove options and reduce choices for local communities, resulting in the eroded efficacy of traditional practices, undermined traditional structures and community coherence, and reduced viability of traditional livelihoods (Albert et al., 2018). The literature is, therefore, increasingly emphasising the importance of developing government frameworks that can draw on and resource the decision-making authority and strength of community-led approaches to relocation. Equally important is incorporating sociocultural parameters in policy, in-depth consultations and community outreach programs, and a cross-sectoral and participatory approach inclusive of various stakeholders, while also providing a mechanism for communities to stay intact (Albert et al., 2018; Charan et al., 2017; McNamara and Jacot des Combes, 2015; Case study, Malawi, 2024; Case study, Oxfam, 2023).

The Fiji Government is the first country in the world to develop a national climate change relocation policy, which follows best practices and provides an important example for other countries. In 2018, it developed the Planned Relocation Guidelines, providing a bold national commitment to social protection for climate-affected communities. This was followed by a Climate Relocation of Communities Trust Fund in 2019 and a Climate Change Act in 2021. The Trust Fund allows combined sources of funding from domestic, private, international, and bilateral means to support the safe and effective relocation of communities who request to relocate, while the Climate Change Act "is the first piece of legislation in the world to create a legislated approach to the organization, governance, and execution of planned relocation as a means to address loss and damage and enable adaptation" (Fiji Government TC submission, 2023, p. 3).

Under the Climate Change Act, an inter-governmental Fijian Taskforce on the Relocation and Displacement of Communities Vulnerable to the Impacts of Climate Change has been established to oversee the Trust Fund, the relocation assessment and implementation arrangements, and to produce and update the Standard Operating Procedures for Relocation. The Procedures, along with the associated Comprehensive Risk and Vulnerability Assessment Framework, outline a consultative, evidence-based and demand-driven process for relocating communities in a safe, orderly, and equitable way. It is a complicated process, involving various stages of consultation, technical assessment and design, and is guided by a close awareness of cultural linkages and values.

The Procedures have been designed and will continue to be updated based on the experiences of relocated communities. The relocation of Cogea village, for example, has emphasised the importance of implementing a thorough relocation plan that integrates local governance, technical and institutional support, inclusivity, and prioritises the preservation of cultural and social integrity (Case study, Fiji, 2024). Nabavatu village has showcased the usefulness of establishing a community-led taskforce to preserve cultural identity and unity, holding traditional communal meetings and discussions with elders, using historical insights which guided the selection of a new site, and prioritizing inclusivity through participatory decision-making and transparency (Case study, Fiji, 2024).

C. Lessons learned from losses to loss of territory and habitability

Experiences of loss of territory and habitability, and the responses to avert, minimise, and address these losses has provided several important lessons for responding to NELs more broadly. Humanitarian relief in the face of displacement can face complexities and tensions in the delivery of finance that require management and alleviation to ensure effective, equitable, and sustainable outcomes in response. For example, there can be challenges in differentiating between development and climate adaptation activities for funding purposes, inability for insurance mechanisms to recognize slow-onset processes due to the lack of defined 'trigger', delays in funding deployment or

inequitable deployment of funding, and the overlooking of future projections (Case study, Bangladesh and Sri Lanka, 2024). For some of the most vulnerable nations, local authorities frequently lack the resources to take actions in ways that align with established decision-making processes and public planning and budgeting cycles which can also create complexities for humanitarian relief dispersal (Case study, LoCAL, 2024). Beyond the need to tackle these issues, it is also important that financing prioritises the short-term *and* long-term humanitarian needs of affected communities (IDMC, 2017; Oxfam, 2023). Further, universal social protection should be a critical part of responding to losses, as its wide coverage ensures effective risk-sharing and the effective deployment of aid regardless of type of hazard (e.g., slow or sudden) or group membership.

The availability and persistence of sufficient and safe land is influenced by a series of services provided by healthy ecosystems such as reefs, mangroves or natural strandline vegetation, which is why the restoration and protection of landscapes, especially through nature-based solutions that are less likely to degrade coastal processes, are an important strategy. Other studies have also found that healthy ecosystems were critical for minimizing and preventing various NELs beyond land, as ecosystems and the 'place' they are in often play a foundational role in various non-economic aspects of people's lives such as health and wellbeing, culture, community, way of life, identity and kinship (McNamara et al., 2021; Westoby et al., 2021). Important is the restoration of people-ecology interactions, especially through nature-based solutions, within the interlinked socio-ecological system which allow people to gain learning, self-esteem, a sense of identity and security (Campbell, 2019; Ford et al., 2020; Movono et al., 2017; Westoby et al., 2021).

Experiences of, and responses to, territory loss have highlighted the criticality of inclusive, participatory, and rights-based mechanisms to address losses (Case study, Oxfam, 2023; Albert et al., 2018; Charan et al., 2017). There are various mechanisms through which communities, as those at the forefront of loss of territory and habitability, are being engaged in the design, implementing, and monitoring of responses, especially in terms of planned relocation. Fiji's policy landscape, for example, prioritizes a demand-driven approach to relocation defined by circumstances at the local level and sensitized to cultural, legal, and societal norms. This inherently necessitates free, prior, and informed consent (including the right to say no to relocation), participatory processes inclusive of all community members, and a blending of traditional and modern tools (i.e., modern risk assessment tools alongside traditional meetings and historical insights for the selection of a new site) (Case study, Fiji, 2024). Although disseminating government support through existing community channels (e.g., farmer and irrigation societies in Sri Lanka or sub-county ward planning committees in Kenya) can be important for local appropriateness, it is important to assess whether these entrench existing inequalities, excluding vulnerable groups such as women or low-income groups. In some contexts, alternative means for delivering support and cognizance of different land tenure systems and territorial rights of communities may therefore be needed to engage those at the forefront of territory and habitability loss (Case study, Oxfam, 2023).

Efforts to engage communities should also be complemented by multi-stakeholder partnerships to ensure financial, technical, and institutional support for them. A multifaceted approach helps leverage both internal community strengths and external resources in efforts to address NELs. Co-production between multiple stakeholders and cross-scale and cross agency partnerships can be key to feasibility in terms of research and assessments, catalysing investments in implementation and institutionalisation and promoting collective solutions that do not exacerbate inequalities and can help overcome implementation challenges (Barnett et al., 2022: 6).

A proactive approach to create awareness amongst citizens to ensure that they are equipped and proactive in tackling the looming dangers is also important. Awareness and community outreach programs by civil organisations and government can ensure people are understanding the causes of the hazards they face, spark behavioural changes that enhances social resilience and enables them to better adapt. Government monitoring of communities that are particularly vulnerable and raising awareness at the initial detection of vulnerability is also important to ensure that community

members actively search for options to adapt rather than be caught unaware until the full effects of climate change come to bear on them (Charan et al., 2017).

Experiences with land loss and associated responses has also highlighted the importance of enhancing the security of land tenure as a key criterion for the longevity and sustainability of all efforts to address NELs, as the length of their operations often depends on the continued availability of the lands on which they are implemented (Case study, Oxfam, 2023; Displacement Solutions, 2023).

IV. Loss of cultural heritage

A. Non-economic losses of cultural heritage in the context of climate change and their interlinkages with other NELs

Understanding Cultural Heritage and its Significance

UNESCO, the only UN agency with a mandate on culture, defines cultural heritage as artefacts, monuments, groups of buildings and sites, and museums, expressing a diversity of values including symbolic, historic, artistic, aesthetic, ethnological or anthropological, scientific and social. It includes tangible heritage (movable, immovable, and underwater), intangible cultural heritage (ICH) embedded into cultural, and natural heritage artefacts, sites or monuments (UNESCO, 1972, 1978, 2001a, 2003, 2023a). The 1972 UNESCO Convention on Protection of the World's Cultural and Natural Heritage (World Heritage Convention) includes archaeological sites, monuments, ensembles of buildings, historic cities, vernacular settlements, historic routes, industrial heritage, natural heritage, mixed heritage, and cultural landscapes (UNESCO, 2023a). Intangible cultural heritage includes traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe, or the knowledge and skills to produce traditional crafts (UNESCO, 2003).

Cultural heritage may have significance to the local communities of which it is a part, but also be of provincial or national significance, or be of value to all of humanity as is the case of UNESCO World Heritage properties that are recognized for their Outstanding Universal Value[1] (UNESCO, 2023a). There are also cultural landscapes that are inscribed on the UNESCO World Heritage List which combine the "works of nature and people" (UNESCO, 2023a), reflecting the relationship between people and their natural environment. This diversity of heritage expresses the diversity of people, geographies, knowledges, practices, and histories. As such, historic places are an immense source of knowledge and solutions for future generations. Cultural and natural heritage sites are repositories of knowledge on climate change over time and resources for climate solutions. Furthermore, cultural heritage and its plural forms contribute to cultural diversity[2], from the local to the global level.

Extreme weather events and climate related disasters are becoming increasingly common so that States Parties report that World Heritage sites have to contend with storms, flooding, drought and desertification, and wildfires, that they either did not experience before or did not experience with the same frequency. States Parties reporting on UNESCO World Heritage properties (UNESCO, n.d.-a), including the State of Conservation reporting (UNESCO, n.d.-b) for World Heritage properties[3], and

[1] Outstanding Universal Value means cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity.

[2] Cultural diversity, besides including all aspects of cultural heritage described above, includes all aspects of culture, namely its distinctive spiritual, material, intellectual and emotional features, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs (UNESCO, 2001b). The diversity of human cultures includes the wealth of languages, ideas, beliefs, kinship systems, customs, tools, artistic works, rituals and other expressions they collectively embody (UNESCO, 2009b).

[3] The state of conservation refers to the condition and preservation status of World Heritage properties, including the threats they have faced or are currently facing, for the protection of their Outstanding Universal Value as monitored and reported through a comprehensive system of reports and decisions by the World Heritage Committee.

multiple studies in recent years have all confirmed that both cultural and natural heritage, including World Heritage properties, are impacted by anthropogenic climate change. In fact, out of the 1223 properties inscribed on the UNESCO World Heritage List (UNESCO, n.d.-c), climate change threatens a third of natural and one in six cultural heritage sites (World Heritage Centre, 2021). The intensity and impact of extreme weather events is also increasing. Changes in the temperature of oceanic waters (NASA, n.d.) which in turn have impacted marine ecosystems as evident in the mass bleaching of World Heritage -listed reefs, including those inscribed on the UNESCO World Heritage List, in the last three decades. Climate-related hazards and in particular wildfires have become one of the biggest threats to World Heritage forests. World Heritage properties lost 3.5 million hectares of forest (more than the area of Belgium) between 2001 and 2020, and forests in at least 10 World Heritage properties have become carbon sources (emitted more carbon than they absorbed) (UNESCO, WRI, IUCN, 2021). The disappearance of glaciers will impact mountain people's lives and livelihoods, including cultural, religious and recreational practices that have been recognized in the UNESCO List of the Intangible Cultural Heritage of Humanity, such as the pilgrimage to the sanctuary of the Lord of Qoyllurit'i, or the Snow Star Festival in Peru and alpinism (UNESCO, 2011a, 2019a). According to a UNESCO and IUCN study on World Heritage glaciers (UNESCO, IUCN, 2022), the glaciers in one-third of World Heritage glacierized sites will disappear by 2050, regardless of the climate scenario applied, and glaciers in around half of all sites could almost entirely disappear by 2100, in a business-as-usual emissions scenario. While these losses have been documented for UNESCO World Heritage sites, the loss of forests, marine reefs and glaciers are evidently also a loss of biodiversity and ecosystems as well as a loss of territory demonstrating the intricate interlinkages of different types of NELS.

Nearly a third of World Heritage properties are cities (UNESCO, n.d.-c), and 70% of cultural assets are concentrated in urban areas (UNESCO, n.d.-d) where climate change impacts are further exacerbated by compounding urban stressors, including development pressure, land use changes, air pollution, and unsustainable resource management. Rising sea levels, ocean acidification, and warming temperatures endanger cultural heritage in coastal areas including underwater cultural heritage like sunken cities, prehistoric sites, shipwrecks, unexplored archaeological remains and UNESCO World Heritage cities like Venice and its Lagoon, the Medina of Tunis, the Historic City of Trogir, and other cultural sites such as Gorham Cave Complex (Reimann et al., 2018).

As cultural heritage sites, artefacts, and elements have many different values and meanings, the loss of cultural heritage could result in different types of impacts. Frequently, given the multiple values and meanings of cultural heritage, the losses too, are experienced as multiple and overlapping losses. Moreover, the loss of cultural heritage is a loss at multiple levels: a loss for the local communities who belong to the historic place, or to whom the tangible moveable heritage or intangible cultural heritage element belongs, and at the same time, a larger national or regional loss or a loss to humanity at large. Below is an overview of different types of losses resulting from the loss of cultural heritage.

Loss of cultural heritage forms

The loss of distinctive and meaningful places, structures, forms, and landscapes that may be significant in themselves as also the loss of distinctive intangible cultural heritage elements and their practice. For instance, the 15th century Tomb of Askia in northern Mali is inscribed on the UNESCO World Heritage List for the way local traditions have adapted to create an architectural structure unique across the West African Sahel. The site faces sandy winds, heavy rains, flooding, and repeated water erosion (UNESCO, n.d.-e). Similarly, the Sanké mon, a collective fishing rite of the Sanké in Mali, a practice deeply rooted in community and tradition, faces threats from the adverse effects of drought and desertification on the lake (UNESCO, 2009a). The loss of such distinctive cultural heritage forms and elements threatened by climate change impacts would be enormous losses for the local community but equally for the Sahel region, for Africa and for all of humanity as they are identified and safeguarded as UNESCO heritage of humanity.

Loss of cultural heritage for expression of socio-cultural identity

As built heritage, artifacts, and intangible cultural heritage elements express the identity of the society to which they belong, the loss of a cultural heritage form or element diminishes the ability of a community to express their identity. This might be the case for Indigenous Peoples who identify certain forms for practices. But it could also be a larger group of people as in the example above of the Tomb of Askia. When a cultural heritage is of regional, national, or international significance, the loss of such a cultural heritage form could be a loss for national or regional identity. For instance, in the Coffee Cultural Landscape of Colombia, the strong community focus on coffee production in all aspects of life produced a cultural identity, which finds its physical expression in the cultural patterns of coffee farming. Yet climate change threatens coffee production and communities' livelihoods and sense of identity (UNESCO, n.d.-f). As the Coffee Cultural Landscape of Colombia is inscribed on the UNESCO World Heritage List, the loss would also be for all of humanity.

Loss of functional use of cultural heritage

Cultural heritage sites and artefacts usually have a functional use. The loss of a cultural heritage form results in the loss of functions of that site or artefact. From a palace to a funerary site, from a temple to a bridge, from priceless objects of everyday use and ritual, each cultural heritage form has a function that is lost with the loss of that cultural heritage. Depending on the community and if the particular site was the only space for that function, the loss may be of greater or lesser significance for a community.

Loss of cultural/symbolic value of cultural heritage

The cultural or symbolic value of cultural heritage is at the core of its recognition as heritage that is of value to be protected and safeguarded for future generations. This cultural/symbolic value may derive from its historical and social significance, and it is for that reason that it may be included as meaningful in local, provincial, national, or international registers and classification. The loss of cultural heritage forms would thus result in the loss of such cultural/symbolic value that may be of significance for local communities, but it may also be meaningful to national and international communities. An example is the Nubian Monuments from Abu Simbel to Philae in Egypt, which were saved from rising waters of the Nile thanks to an International Campaign that succeeded in relocating the monuments away from the danger of inundation, and at the same time signaled that such an ancient monument is humanity's indivisible heritage (World Heritage Centre, 2022).

Loss of cultural skills related to local resources and construction

Many historical and vernacular buildings and settlements, including those of Indigenous Peoples are constructed with local building materials using traditional knowledge, techniques, and craftsmanship. The loss of such cultural heritage is first and foremost a loss of cultural knowledge, skills, and competencies that have at times been acquired and refined over generations. The transmission of related knowledge and skills is at risk due to climate-driven population displacement, cultural erosion, and degradation of the natural environment, decreasing access to traditional materials, and changing local climatic needs. For instance, in Timbuktu, due to desertification, local tree species used in traditional construction are disappearing, forcing residents to resort to imported materials such as concrete and steel (UNESCO, 2021).

Loss of social value and traditional governance of cultural heritage

Cultural heritage sites and elements also carry social value including traditional systems of governance of the heritage with communities living in and around them that own, manage, and safeguard the heritage. For instance, the World Heritage site East Rennell in the Solomon Islands is under customary ownership and management by Indigenous Peoples, and their ancestral lands as well as food/livelihoods security in the World Heritage site are increasingly affected by climate change and associated disasters which require urgent action (UNESCO, n.d.-g). Similarly, the Maasai community in Kenya have three interconnected male rites of passage Enkipaata, Eunoto and Olng'esherr that educate young men about their future role in Maasai society and transmit social values and traditional

knowledge. However, with changes in the climatic conditions of the area where frequent drought has claimed the lives of many cattle and impoverished many Maasai, the donations of cattle for the rituals have seen a downward trend and thus negatively affect their enactment, threatening the long-term endurance of these traditional rites (UNESCO, 2018). Another example from Cameroon shows how climate change threatens the viability of sacred sites on the Lobé River, the performance of Nguon festivals in the Bamoun community, and the timing of Ngondo cult practices essential for the transmission of intangible cultural heritage. Aimed at promoting dialogue, harmony and peace, the rituals are over 600 years old, and serve as a source of social cohesion and resilience and as a means of upholding values such as accountability, freedom of expression and humility (UNESCO, 2023b). The compounding effect of these losses and a breakdown in the traditional governance of culture result in diminished social cohesion and greater possibilities for conflict, in particular for Indigenous Peoples.

Loss of a source of inspiration and innovation

Cultural heritage is a well-spring for innovation, design, and problem solving. Whether it represents significant artistic value or a singular innovation, or it represents generations of accumulated competency for everyday skills such as constructing houses, the loss of cultural heritage is a loss of artistic inspiration and innovation – for local communities as much as for the global community.

Loss of cultural knowledge, including Indigenous knowledge and practices, and ways of living with nature

Both tangible and intangible cultural heritage is often linked to and rooted in specific places or landscapes (including seascapes). Such cultural uses and practices may be disrupted when access to places for practices and rituals is lost or restricted or when places rich in environmental knowledge and skills are lost or transformed. For instance, the Wet Tropics of Queensland World Heritage site in Australia has been home to one of the world's oldest living cultures, that have lived on ancestral land and derived traditions from it: Rainforest Aboriginal People who have lived in the area for at least 40,000 years, including through major environmental change (Pannell, 2008). They have developed a specialized and distinctive cultural heritage including food gathering, processing, and land management techniques through use of fire that shaped the landscape, including animal and plant species' composition and distribution. Their culture speaks to the complex adaptive capacity of humans to merge their cultural and social systems with biological niches, yet it increasingly threatened by climate change, as warming reduces habitat ranges of local and endemic species (UNESCO, n.d.-h).

NELS may include the loss of detailed knowledge of the environment, including unrecorded knowledge of biological diversity and systems analysis of the interaction of climate, weather, and food systems. For example, World Heritage cultural landscapes are repositories of knowledge on climate change over time, including those of local and Indigenous knowledge holders. Their environment was adapted over time to changing conditions, making them observatories of climate change. The World Heritage property of Rice Terraces of the Philippine Cordilleras in the Philippines is an outstanding example of sustainable land-use resulting from a harmonious interaction between people and their environment and long-standing communal efforts over the last two millennia (UNESCO, n.d.-i). UNESCO's Local and Indigenous Knowledge Systems (LINKS) programme has supported African Indigenous Pastoralists to document seasonal phenomena related to weather, precipitation and climate changes. Indigenous languages encode complex and interlocking information about celestial, atmospheric, terrestrial, plant, insect and animal knowledge, understood through various refined taxonomies and seasonal calendars. Knowledge and terminology can vary even in one language across a landscape, carrying important yet fragile intergenerational knowledge (Roué et al., 2017).

Loss or transformation of natural heritage values of cultural heritage

Cultural heritage is closely related to particular environmental conditions that define them. The loss or transformation of habitats or built structures is a loss in itself, and a loss of habitat but also a loss of spaces for cultural practices and cultural resources as well as social functions. Such losses may range

from the degradation, destruction and disappearance of places, cultural practices and practitioners to slower but equally dangerous processes such as disruption of knowledge transmission, increasing precarity of community livelihoods, and dislocation of populations.

As the foregoing examples of cultural heritage losses clearly indicate, tangible and intangible heritage are intricately interconnected with place – including its territorial, geographical, and environmental dimensions. For countless communities across the world, adapting to living in a place has demanded acquiring and accumulating knowledge of ways to live with the nature of the place connecting their cultural practices and environmental knowledge with their cultural forms and beliefs. Hence the loss of territory and environmental losses impact not only the physical forms of heritage or a sacred space but is above all a debilitating loss of knowledge to aid their recovery from disasters. When agricultural practices, and extraction of building materials are impacted by climate change, it impacts equally the knowledge and practices they are able to transmit to future generations. For instance, the rice terraces and water temples in Bali, Indonesia (UNESCO, n.d.-j), are the focus of a cooperative water management system of canals and weirs, known as *subak,* based on the philosophy of *Tri Hita Karana*, which brings together the realms of the spirit, the human world and nature. This ancient egalitarian farming practice is increasingly threatened by changes in hydrological regimes (ICOMOS, ICCROM, 2015)

Diminished food and water security due to loss of cultural heritage

Land and water management, and agricultural practices are also deeply cultural practices. Food and water provisioning is a vital ecosystem service that is impacted by climate change, including in traditional agricultural landscapes. For instance, it threatens the genetic diversity of crops, including crop species integral to cultural diets of Indigenous communities. Changes in precipitation and extreme weather events like drought impact water availability for local and Indigenous communities and put agricultural traditions at risk. For instance, the World Heritage cultural landscape of the Viñales Valley in Cuba is suffering from the effects of climate change, as water shortages impact traditional methods of agriculture that have been in practice there for centuries (UNESCO, n.d.-k).

The close relationship between place and cultural heritage in many of the foregoing examples demonstrate the irrefutable and intricate interlinkages between the loss of cultural heritage, indigenous knowledge, social/cultural identity, biodiversity and ecosystem services, the loss of territory and the loss of well-being and health.

Loss of adaptive capacity and resilience of communities

A core principle of cultural resilience is the fact that people come together to organize in their communities based on a shared common identity and values (Morrissey and Oliver-Smith, 2013). The loss of objects or practices imbued with cultural significance can threaten the sort of social coordination that holds up resilient communities by disrupting values or the identity connected with them. At the same time, a wealth of traditional knowledge and intangible heritage practices help bolster the resilience of communities in coping with natural disasters and adapting to climate change. For instance, in Kenya's Lamu Old Town, traditional knowledge on weather patterns, sea movement and naturally safe areas during adverse atmospheric conditions, accumulated over the centuries, enhances the community's resilience during extreme weather or disasters. Yet changing weather patterns, excessive spring tides and destruction of mangroves mean traditional knowledge is at risk of losing its functionality (UNESCO, n.d.-l). Thus, the foregoing examples also highlight the significance of cultural heritage loss for diminished cultural resilience on the one hand, which in turn is closely linked to diminished resilience to disasters on the other.

As cultural heritage has many different and overlapping values, the loss of a single cultural heritage site may result in multiple compounded losses of cultural heritage that together lead to a much more significant loss than is apparent by only the loss of a single structure or monument. Furthermore,

heritage places may have multiple types of heritage associated with them that are also lost. For example, a historic monument may be an outstanding monument of artistic value, but it may also have traditional houses around it that are part of its context or setting that respond to peoples' ways of life, as well as artisanal crafts, music, festivals, processions, and other living heritage practices associated with it. There may also be archaeological excavations and material associated with it, as well as art, objects and artefacts of high value. Thus, the losses are further compounded for the local communities in the present as well as for future generations.

Above all, as cultural heritage also contributes to cultural diversity, its loss results in diminished cultural diversity – locally, nationally, and internationally. The protection of cultural heritage and the promotion of cultural pluralism, particularly at a time of armed conflicts and natural disasters that upend the lives of people, contributes to the protection of human rights, conflict prevention and peace-building, weaving of the social fabric and strengthening the resilience of communities.

B. Spectrum of actions to address loss of cultural heritage

The most urgent step needed is for international assessments and bodies to recognize the enormity of the impacts of climate change on cultural heritage as well as to harness the power of cultural heritage to offer solutions to diminish the impacts of climate change. UNESCO is addressing the loss of cultural heritage through a variety of actions, ranging from its own international culture-related conventions, to integrating culture within other important instruments, carrying out studies, developing tools, providing technical assistance on the ground as possible, and providing emergency assistance where possible.

From the foregoing discussions, it is clear that addressing the loss of cultural heritage due to climate change impacts demands multiple lines of response. **i)** Recognizing Cultural Heritage for Advancing Climate Action by recognizing in relevant international agreements as well as in relevant national and local plans the significant risks and impacts of climate change on cultural heritage of all types at the same time that cultural heritage is as a valuable source of climate solutions. **ii)** Assessment of climate change risks for cultural heritage and monitoring of heritage protection. **iii)** Enhance cultural resilience by strengthening the governance of cultural heritage to ensure that all different forms of cultural heritage, tangible, intangible, moveable, and natural heritage, are protected and safeguarded and communities are encouraged to inventory and document all cultural resources. **iv)** Knowledge sharing and building capacities around the impacts of climate change on cultural heritage. **v)** Enhance resilience and preparedness, as well as disaster risk reduction. **vi)** Development of tools, guidance, and good practices for adaptation and mitigation strategies.

Recognizing Cultural Heritage for Advancing Climate Action

At the moment, all major United Nations instruments on the environment and climate call for the inclusion of Indigenous and local knowledge systems in scientific assessments and in policy making. This is elaborated particularly under the UNFCCC Paris Agreement, in Article 7 (UNFCCC, 2016), and further elaborated in the Kunming-Montreal Global Biodiversity Framework (CBD, 2022). However, direct references to all types of cultural heritage, or culture more broadly including the creative sector, are still largely missing in the climate change discourse, making the impacts on cultural heritage or its role in innovating solutions, invisible, and foregoing the solutions which cultural heritage in all its forms offer to address the impact of climate change, including on other sectors and NELS. This is an absence that needs to be urgently addressed by the international community. Once integrated in major international agreements, its inclusion in national and local plans and strategies for climate action and disaster risk reduction needs to follow.

Some international efforts have been made to recognize the role of cultural heritage in climate action but much more is needed at the international, national, and local levels. In November 2023, the updated UNESCO *Policy Document on Climate Action for World Heritage* (*WH Policy Document*)

(UNESCO, 2023c) was adopted by the General Assembly of States Parties to the World Heritage Convention. It represents the lead guiding document on World Heritage and climate change with high-level guidance on enhancing the protection and conservation of the heritage of Outstanding Universal Value of World Heritage through comprehensive adoption of climate action measures, including climate adaptation, mitigation, resilience building, innovation and research.[4]

Organized as part of the thematic initiatives under the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage, as established by its Intergovernmental Committee, UNESCO has launched a reflection on the relationship between safeguarding intangible cultural heritage and climate change. The initiative comprised an expert reflection on the roles and risks for living heritage in the climate emergency, and how it may be leveraged to contribute to climate change adaptation, mitigation and living heritage safeguarding.

Joining forces with the Intergovernmental Panel on Climate Change (IPCC) and the International Council on Monuments and Sites (ICOMOS), UNESCO organized the first-ever International Co-Sponsored Meeting on Culture, Heritage and Climate Change (ICSM CHC) in December 2021, to further integrate culture into the international climate agenda, including in future IPCC assessment reports (ICOMOS, ICSM CHC, n.d.).

Assessing Climate Change Risks and Monitoring Protection of Cultural Heritage

As the *WH Policy Document* has noted, improving the assessment of climate change risks and impacts on cultural heritage is urgent and essential at local, national, and international scales. Methodologies and mechanisms to systematically assess risks and identify potential losses are necessary. However, given the wide range of different types of cultural heritage and their many values, many different types of effective and cost-efficient methodologies are necessary for assessment. Furthermore, as the ICSM CHC report (Morel et al., 2022) has emphasized, the methodologies for measuring risks and vulnerabilities must include a plurality of knowledge systems and scientific analysis integrating the knowledge of local communities and Indigenous Peoples.

As the only UN body with a mandate on culture and as the secretariat of several major Culture Conventions, UNESCO monitors cultural heritage through regular State Party reporting for the different Culture Conventions and Recommendations including the 1972 World Heritage Convention, 2003 Convention on the Safeguarding of Intangible Cultural Heritage, 2011 HUL Recommendation and the 2015 Recommendation concerning the protection and promotion of museums and collections, their diversity and their role in society (UNESCO, 1972, 2003, 2011b, 2015). These periodic monitoring exercises serve to monitor the continued safeguarding of cultural heritage and flag significant threats and potential losses. However, red flags and early warning signs of loss and damage need to be systematically developed and integrated into the periodic monitoring processes.

Enhancing Cultural Resilience

UNESCO supports the governance of culture by setting international standards to ensure that all different forms of cultural heritage, tangible, intangible, moveable, and natural heritage, are protected and safeguarded and communities are encouraged to inventory and document all cultural resources especially important in the face of the threats of climate change. Each of the UNESCO Culture Conventions and Recommendations call on the States Parties to put in place robust management systems and legislation to safeguard cultural heritage of all types and that recognize and include local communities and Indigenous Peoples. Moreover, UNESCO recognises the value of culture, World Heritage sites, living heritage practices and livelihoods in the cultural and creative industries, and calls on countries, in line with the Declaration of the UNESCO World Conference on Cultural Policies and Sustainable Development - MONDIACULT 2022 (UNESCO, 2022a), to integrate cultural

[4] UNESCO has worked closely with the Advisory Bodies to the World Heritage Committee, the International Council on Monuments and Sites (ICOMOS), the International Union for Conservation of Nature (IUCN), and the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) in the development of this document.

heritage and creativity into international discussions on climate change, and establish culture as the fourth pillar of sustainable development, along the economic, social and environmental pillars.

Knowledge Sharing and Building Capacities

The 2015 Paris Agreement adopted under the UNFCCC, as well as the *WH Policy Document*, recognize the importance of awareness raising, education, and capacity building for climate action. At the same time, the UNESCO Culture Conventions recognize and support awareness raising, education, and capacity building on cultural heritage to ensure their protection, safeguarding and transmission to future generations. As the *WH Policy Document* points out, the capacity building needs to happen at all levels for decision-makers, stakeholders, local communities, users, site managers, and other relevant professionals. With regard to cultural heritage, UNESCO, as well as other partner institutions, have been carrying out capacity building activities in different countries on cultural heritage. Nevertheless, the urgent need and demand for capacity building and knowledge sharing remains enormous and requires international financial support. The need for cultural heritage for climate action is particularly acute for those that are particularly vulnerable to the adverse effects of climate change such as Small Island Developing States (SIDS), and Least Developed Countries (LDCs). Recent work by UNESCO in developing capacity building for safeguarding living heritage in disaster contexts, including the ongoing 3-year project in 5 SIDS - Bahamas, Belize, Fiji, Tonga, Vanuatu (UNESCO, n.d.-m), has provided valuable insights into supporting communities in mobilizing their living heritage for disaster risk reduction and preparedness.

Enhancing Climate Resilience and Advancing Disaster Risk Reduction

Disaster risk at heritage sites is in part a result of their exposure to natural hazards. However, disaster risk is also a result of the inherent vulnerabilities existing at any given site. Cultural heritage has a significant potential for reducing disaster risks that can be harnessed to reduce vulnerabilities, and thus negative impacts on lives, property, and livelihoods, before, during and after a catastrophic event. Heritage plays a crucial role during its recovery phase post disaster, by attracting investment, creating employment, or providing renewable natural resources. The 2007 UNESCO Strategy for Risk Reduction at World Heritage Properties (UNESCO, 2007) aims to strengthen the protection of World Heritage properties and contribute to sustainable development by assisting States Parties to integrate a concern for heritage into their national disaster risk reduction policies, as well as into the management plans for World Heritage properties.

The *Operational Directives* for the Implementation of the Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO, 2022b) stress the role of intangible cultural heritage in strengthening community-based resilience to natural disasters and climate change. Similarly, the Operational Principles and Modalities for Safeguarding Intangible Cultural Heritage in Emergencies (UNESCO, 2019b), underscore the dual role of intangible cultural heritage in all emergencies, including the climate emergency. For instance, in order to address the issue of increased fire risks as a result of climate change to cultural and natural heritage, UNESCO has developed a practical tool on fire risk management and is preparing for a regional training for the Latin America and the Caribbean region.

UNESCO has established different mechanisms to support Member States to protect cultural and natural heritage during and after disasters, to minimize loss and damage of cultural heritage and emergencies, including recovery. For World Heritage properties this includes the World Heritage Fund International Assistance and Emergency Assistance, and the Rapid Response Facility for natural heritage (UNESCO, n.d.-n) that is carried out together with ICCROM, IUCN, and ICOMOS. The UNESCO Heritage Emergency Fund (UNESCO, n.d.-o) is a key financial mechanism to support Member States in preparing for and responding to emergencies affecting culture, including disasters resulting from human-induced and natural hazards and those related to climate change. In addition, ICCROM, IUCN, and ICOMOS each carry out other activities to support disaster risk reduction and recovery for cultural and natural heritage sites.

Development of tools, guidance, and good practices for adaptation and mitigation

UNESCO and the three Advisory Bodies to the World Heritage Committee, ICCROM, ICOMOS and IUCN are developing their first joint toolkit on climate action for World Heritage to support States Parties and site managers to integrate climate change into the management strategies of World Heritage sites.

Following the adoption of the *WH Policy Document*, a guidance to implement it on the ground has been requested by the General Assembly of the 1972 Convention. In addition, ICCROM, IUCN, and ICOMOS offer guidance and tools related to disaster risk management and recovery and reconstruction.[5]

The *Resilient Reefs Initiative*, an initiative that UNESCO partners with, supports four World Heritage reefs, and the communities that depend on them, to adapt to climate change by reducing local threats. A valuable example is the Resilience Strategy developed for the Belize Barrier Reef Reserve System. efforts, and to create an enabling environment for livelihood diversification (UNESCO, n.d.-p).

The *UNESCO Urban Heritage Atlas* (UNESCO, n.d.-d) platform and tool for geo-referenced cultural mapping of the key characteristics of urban heritage, enables inventorying the built heritage characteristics, intangible cultural heritage elements, and natural features that together support the uniqueness and heritage value of historic cities and settlements. Together with the Group on Earth Observation (GEO), and the Greek GEO Office, UNESCO has launched the *Urban Heritage Climate Observatory (UHCO)* applying earth observation tools for World Heritage cities. Other monitoring activities include the *UNESCO eDNA project* (UNESCO, n.d.-q) which helps to measure marine biodiversity and the impacts climate change might have on the distribution patterns of marine life.

The UNESCO *FutureKeepers* campaign (UNESCO, n.d.-r) on the impacts of climate change on natural World Heritage sites, also provide seed support to improve the capacity of World Heritage property managers in developing countries to ensure cultural resilience and safeguarding.

UNESCO is testing mitigation measures against the impacts of changing water currents with underwater cultural heritage. In partnership with UNDP and other partners, UNESCO is currently updating the Post-Disaster Needs Assessment Guide (PDNA) for the Culture Sector and developing a Disaster Recovery Frame Guide for the Culture Sector, which will take into consideration the non-economic losses aspect and provide guidelines for stakeholders.

With a view to knowledge sharing and disseminating good practices and local solutions, UNESCO has developed online tools such as the World Heritage Canopy (UNESCO, n.d.-s), an online platform of innovative practices, featuring more than 65 case studies across all regions which promote the integration of local environmental knowledge and cultural heritage safeguarding and conservation to improve current living conditions in and around heritage sites while reducing their impact on the environment.[6] In addition, UNESCO provides multiple resources, publications and guidance on responding to climate change (UNESCO, n.d.-t).

Despite the many efforts ongoing, more concerted action needs to be taken at the national, sub-regional, and local levels – engaging local communities. This includes actions to include cultural heritage in the national and local plans and strategies for climate action and disaster risk reduction.

C. Lessons learned from loss of cultural heritage

[5] Publications from these organizations include the recent joint ICOMOS-ICCROM Guidance on Post-Disaster and Post-Conflict Recovery and Reconstruction for Heritage Places of Cultural Significance and World Heritage Cultural Properties (ICOMOS, ICCROM, 2023), the ICOMOS The Future of Our Pasts: Engaging Cultural Heritage in Climate Action (ICOMOS, 2019), the IUCN Safe havens: Protected Areas for Disaster Risk Reduction and Climate Change Adaptation (IUCN, 2014), and the seminal resource manual Managing Disaster Risks for World Heritage, developed jointly by UNESCO and all three Advisory Bodies (UNESCO, ICCROM, ICOMOS, IUCN, 2010).

[6] The climate change adaptation and mitigation thematic in the World Heritage Canopy owes special thanks to the support of the Government of the Netherlands.

Protection and safeguarding of cultural heritage is itself a significant contribution to counter climate change impacts and risks. **i)** By reducing carbon emissions, including as evidenced by the UNESCO papers on glaciers, forests, and marine heritage (UNESCO, 2020; UNESCO, WRI, IUCN, 2021; UNESCO, IUCN, 2022) **ii)** As a source and marker of cultural diversity of humankind, expressing plural beliefs and plural ways to adapt to place and the natural habitat **iii)** As a source of environmental knowledge as well as management systems for land, water, and other natural resources. **iv)** As a resource for adaptation and mitigation strategies as the local and accumulated knowledge of generations as well as innovative capacities contribute to adaptation solutions and enhances climate resilience.

Loss of cultural heritage often results in multiple compounded losses at different scales. As cultural heritage is usually anchored or rooted to place, the loss of a specific heritage form may be accompanied by multiple compounded losses including of related artefacts, intangible heritage elements or ecosystems. Furthermore, in addition to being a loss to its local communities, heritage that is of great significance at the national or even the international level results in a loss to all of humanity.

Identification, inventorying, and documentation of cultural heritage is essential for monitoring. Cultural heritage at the local, provincial, and national levels should be documented and their state of conservation and the viability of their safeguarding regularly monitored to protect them. Innovative methodologies and solutions are needed for documentation including with the use of new digital technologies. But in all cases, the identification, inventorying and documentation should include the engagement of local communities and Indigenous Peoples.

Adequate laws and legislation and robust governance systems for safeguarding all types of cultural heritage. UNESCO Conventions such as 1972 World Heritage Convention and the 2003 Intangible Heritage Convention are not only about safeguarding sites and elements recognized as the heritage of humanity, but they provide frameworks for strengthening national, provincial, and local systems of safeguarding all heritage. Cultural resilience is enhanced by raising awareness of local communities of the importance of their cultural heritage and the potential impacts of their loss, engaging them in finding strategies to protect and safeguard cultural heritage including the knowledge and skills inherent in them.

Cultural heritage is vulnerable to climate change impacts but also a resource for solutions. Cultural heritage is increasingly at risk of climate related impacts, but equally, cultural heritage is an invaluable resource environmental knowledge, resilience, and adaptation strategies. On the one hand, multi-disciplinary and inclusive methodologies are needed to assess the risks and vulnerabilities of cultural heritage in order to safeguard the most endangered ones. At the same time, in most societies cultural heritage that has survived through centuries or generations is an invaluable repository of accumulated knowledge that need to be harnessed for local solutions and strategies for adaptation and mitigation including those of local communities and Indigenous Peoples. Knowledge sharing of local solutions that are inclusive, participatory, and rights based would inspire others.

Scientific assessments, policies, and cultural knowledge must come together to mitigate, and respond to climate related disasters and emergencies. Capacity building at all levels is essential to ensure an understanding of climate impacts, preparedness and mitigation measures to minimize the risk of disasters. Comprehensive approaches to disaster risk reduction and climate action must integrate cultural heritage and its potential losses into plans, policies and strategies and empower local communities and Indigenous Peoples to respond in addition to other stakeholders. Moreover, National, provincial, and local disaster risk management plans and climate action plans must integrate cultural heritage protection.

Mobilize national and international partnerships to protect cultural diversity. From technical support to financing, it is important for local, national and global communities to come together to ensure the protection and safeguarding of cultural heritage whose benefits go beyond its immediate

local communities to have national and global significance – whether the value they contribute is grand artistic excellence or innovative local solutions to ecosystem management. Diversity of cultural heritage contributes to cultural diversity essential for stable and peaceful societies that fosters intercultural dialogue and inclusion for all.

V. Conclusion/Way forward

- NELs-BES and all their cascading impacts on the entire socio-ecological system need to be "visible". This requires raising awareness, including the perspectives of local communities and establishing a monitoring system that captures the diverse values of ecosystems, their services, and biodiversity.

- It is not sufficient to address those NELs-BES that have already materialized. It is imperative to enhance actions to avert and minimize NELs-BES, including through appropriate management of ecosystems, for example via the implementation of NbS.

- Thinking of NELs-BES in a silo limits the opportunities to tackle them. The discourse on these losses need to be mainstreamed in various policy areas, and coherent policies to avert, minimize and address NELs-BES in different countries, sectors and aspects of live needs to be developed.

- Loss of territory and habitability is ultimately about the loss of land which is being experienced in numerous places around the world, affecting people's wellbeing, sense of self and identity, cultural practices, and ecosystem services. The loss of land, and the effect this can have on people's lives, needs to be more explicitly recognised in global policy processes and funding schemes.

- There are several ways of responding to loss of land through the delivery of immediate emergency relief to support people's basic needs, rehabilitating and protecting landscapes, and as a last resort, the permanent relocation of communities. All these responses require funding, resources, and support. It is also imperative to continuously monitor these responses to ensure that any other impacts, or NELs, that might emerge can be addressed.

- Experiences of, and responses to, territory loss have highlighted the criticality of inclusive, participatory, and rights-based mechanisms to address losses. There are various mechanisms through which communities, such as those at the forefront of loss of territory and habitability, are being engaged in the design, implementing, and monitoring of responses. It is important to understand existing inequalities in communities, including vulnerable groups such as women or low-income groups. In some contexts, alternative means for delivering support and cognizance of different land tenure systems and territorial rights of communities may therefore be needed to engage those at the forefront of territory and habitability loss.

- Cultural heritage is of many different types from sites to artefacts and living heritage elements, so the losses too, are experienced as multiple and overlapping losses. Moreover, depending on the significance of the cultural heritage, its loss may be loss of its local communities but also nationally, or to all of humanity and interlinked with other NELS including loss of territory, biodiversity and ecosystem losses, as well as the loss of indigenous knowledge and the loss of social/cultural identity.

- Recognition of cultural heritage, its vulnerability, and as a valuable resource for climate resilience and adaptation solutions in international agreements is urgent and essential. Protection and safeguarding of cultural heritage is itself a significant climate action. Reinforcing cultural resilience is urgent and essential including inventorying strengthening governance systems and legislation also engaging local communities and Indigenous Peoples.

- In addition to scientific assessments of climate risks to cultural heritage, multidisciplinary, local, and indigenous knowledge systems must be integrated to mitigate, build resilience, and respond to climate related disasters and emergencies. Furthermore, cultural heritage must be integrated into all national, subregional, and local climate plans and policies as well as those related disaster risk reduction and management.

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