

NATURE-BASED SOLUTIONS AND HUMAN MOBILITY

CONCEPTUAL AND OPERATIONAL FRAMEWORK



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This paper was prepared by Lorenzo Guadagno, Consultant for the Climate Mobility Innovation Lab. It aims to clarify the conceptual linkages between human mobility, environmental change and risk, and nature-based solutions (NbS), and to identify entry points for NbS across different mobility and immobility scenarios, as well as across related programmes in diverse contexts in Africa, Asia and the Pacific.

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1

INTRODUCTION AND RATIONALE: HUMAN MOBILITY, THE ENVIRONMENT AND NATURE-BASED SOLUTIONS

1. INTRODUCTION AND RATIONALE: HUMAN MOBILITY, THE ENVIRONMENT AND NATURE-BASED SOLUTIONS

Human mobility and the environment are linked through a complex and dynamic nexus. Decisions to move or remain in place are integral to how individuals and communities manage and cope with both everyday risks and acute shocks and stresses shaped by environmental change. Mobility and immobility also underpin strategies to access natural resources and broader livelihood opportunities that depend on ecosystem services. Patterns of population movement and distribution, in turn, influence environmental pressures and ecosystem health.

Unpacking this nexus therefore requires examining how ecosystem degradation, climate change impacts, natural hazards, and related disasters act as drivers or triggers of population movements, either by directly threatening the lives and assets of people living in high-risk areas, or by influencing socio-economic and political processes that determine people's need and ability to move. It also entails analyzing how environmental shocks and stresses can constrain mobility, resulting in involuntary immobility or disrupting established patterns of population movement. Simultaneously, it requires understanding how mobility can enable more sustainable use of fragile ecosystems, reduce environmental pressures in the areas where people live, and allow them to diversify their resource base, strengthen their livelihoods, and pursue long-term well-being. Lastly, it involves

assessing the degree to which population movements may themselves drive or exacerbate environmental degradation, thereby undermining sustainable prospects for whole communities and societies.

A comprehensive perspective on this nexus must therefore consider both the environmental drivers of mobility and immobility and the environmental outcomes of (im)mobility decisions and patterns — that is, all the complex and interconnected ways in which population movements affect the environment that underpins human development and well-being.

Nature-based Solutions (NbS) offer an effective approach to addressing the multiple intersections within the mobility and environment nexus. NbS encompass all “actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”.¹

Measures like the restoration of rivers and mangroves, the conservation of forests, the sustainable management of drylands, or the development of green infrastructure in urban environments can all contribute to both addressing the socio-environmental challenges shaping human mobility and improving the socio-environmental outcomes of population movements over time, across places and scales.²

¹ This definition was adopted at the 2016 IUCN World Conservation Congress with the [Resolution 6.069 \(WCC-2016-Res-069\)](#).

² This paper specifically looks at NbS for their potential to address local societal issues by producing positive change on local ecosystems, thereby improving human mobility outcomes. As such, it does not cover the climate change mitigation benefits of NbS.

NbS have the potential to be deployed and implemented in the places in which people live and want to stay, as well as at all stages of migration, displacement, and planned relocation projects and trajectories. They represent a set of effective options to solve urgent human mobility challenges and harness the positive potential of population movements. Ultimately, they can support positive well-being outcomes for people on the move and other communities, while generating co-benefits for ecosystem health and long-term sustainability.

- NbS can be integrated into strategies that protect and enhance ecosystems to reduce disaster risk, slow or reverse environmental degradation, and support climate change adaptation. In so doing, they can help extend the ‘habitability threshold’³ of areas at risk. This helps to counter the adverse environmental drivers of migration and enables people to stay in place voluntarily.
- NbS can help create conditions that encourage or enable sustainable return and reintegration in areas affected by disasters, environmental degradation, and climate change.
- NbS can be options to reduce the environmental impacts associated with population movements, as well as the environmental risks faced by mobile populations in areas of destination.
- NbS can generate both direct and indirect benefits (e.g. food and water security, livelihood sustainability) for mobile and sedentary people, thereby reducing resource-related drivers of social tension among communities.
- NbS can help protect and restore ecosystems in areas experiencing population outflows and related demographic change, including by

leveraging the human and financial resources (e.g. remittances) that are made available through migration projects, and maintaining people’s connections to places of origin.

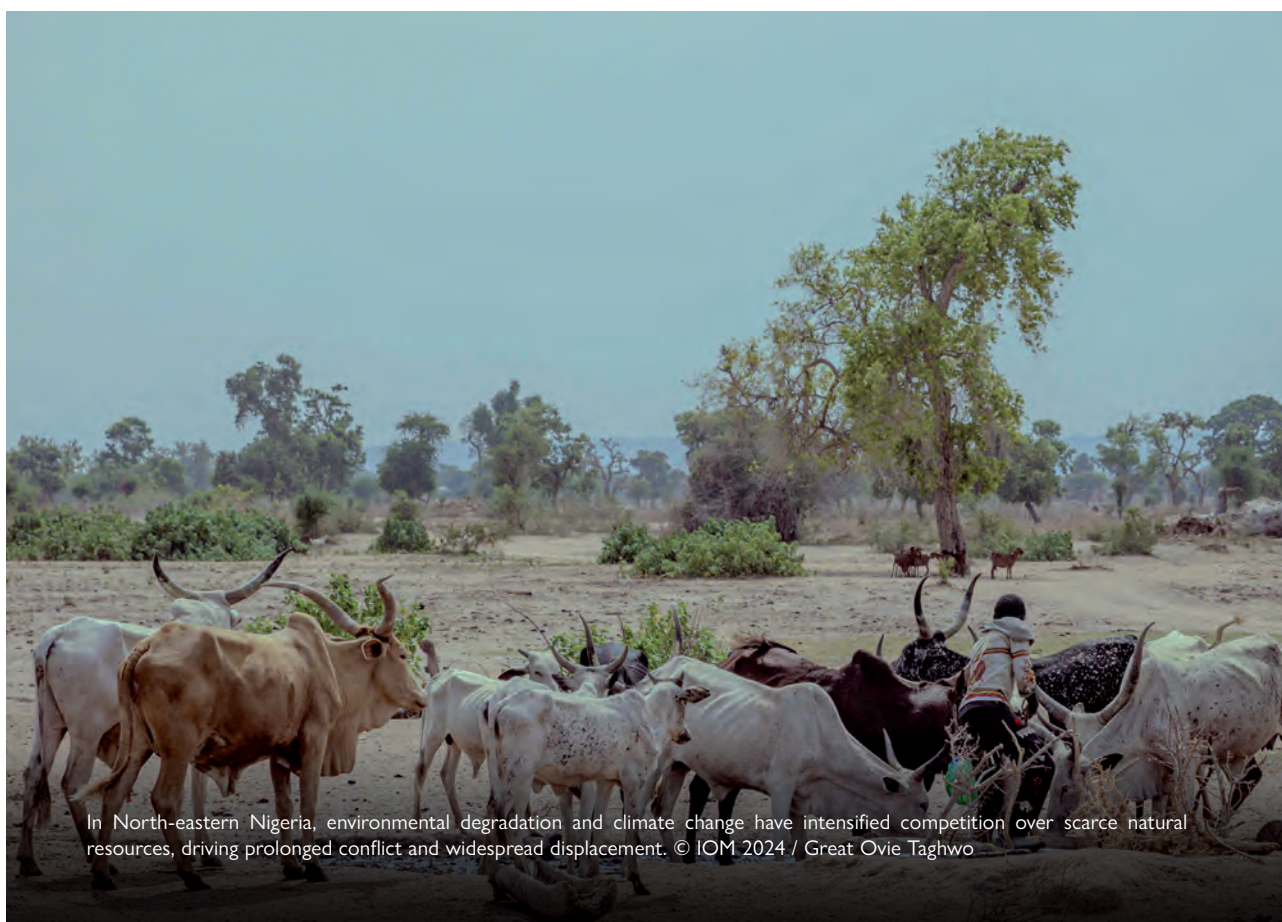
- NbS can help create environmental conditions that protect or enable traditional forms of mobility (e.g. pastoralism) that are key to the sustainable management of fragile ecosystems, as well as to the lifestyle and culture of relevant communities.
- NbS can be opportunities to leverage the presence, knowledge, and skills of incoming migrants, supporting inclusive economic practices and social structures.
- NbS can be integrated in the design and implementation of planned relocation processes to help ensure the availability of ecosystem services in areas of destination and support the sustainable integration of relocated populations.

There are, however, limits to the effectiveness and viability of NbS, especially in locations facing irreversible environmental change (e.g. low-lying atolls threatened by locked-in sea level rise) or acute risks that need to be addressed urgently. However, a reflection on NbS should be integral to a diverse array of efforts focusing on human mobility and the environment. Leveraging their potential in a comprehensive manner contributes to the achievement of IOM’s objectives on migration, environment, and climate change, as formulated in its Institutional Strategy on Migration, Environment and Climate Change 2021–2030,⁴ and its Climate Mobility Roadmap.⁵ Identifying and implementing solutions for people to stay, for people to move, and for people on the move requires looking at NbS across areas of work, and in very diverse operational contexts.

³ Read more on the “Assessing human habitability and migration” on the NSF Public Access Repository (PAR) website.

⁴ IOM, *Institutional Strategy on Migration, Environment and Climate Change 2021–2030* (2021).

⁵ IOM, *Climate Mobility Road Map: IOM MECC 2021–2030 Strategy* (2024).



1.1 Objectives of this paper

This paper aims to help operationalize NbS as an approach to work on different facets of the human mobility-environment nexus for practitioners by:

- 1 Clarifying the conceptual linkages between human mobility, environmental change and risks, and NbS;
- 2 Identifying entry points for NbS in different mobility and immobility scenarios and in different types of related programmes;
- 3 Synthesizing evidence on how NbS have been used in practice to shape mobility outcomes across ecosystems; and
- 4 Proposing some practical options to align NbS standards and implementation with human mobility priorities, needs and risks.

In bringing together these perspectives, it complements existing guidance on both NbS and climate mobility

(e.g. IUCN standards and IOM documents on migration and the environment).

Its specific added value lies in: (i) offering a structured typology of mobility-related NbS entry points; (ii) synthesizing field evidence across regions and ecosystems; and (iii) proposing concrete standards and indicators to integrate mobility into NbS design, implementation, and monitoring and evaluation (M&E).

While this paper has a global scope and builds on a global set of case studies and evidence, its findings and recommendations will be particularly relevant for specific geographies in which the human mobility-environment-NbS nexus is most visible. These might include (low-lying) Small Island Developing States (SIDS), arid and semi-arid areas, and mountainous regions — all of which are facing immediate, urgent impacts due to environmental degradation and climate change. Specific attention to such geographies throughout this paper is also warranted by ongoing operational efforts by IOM and its partners.

2

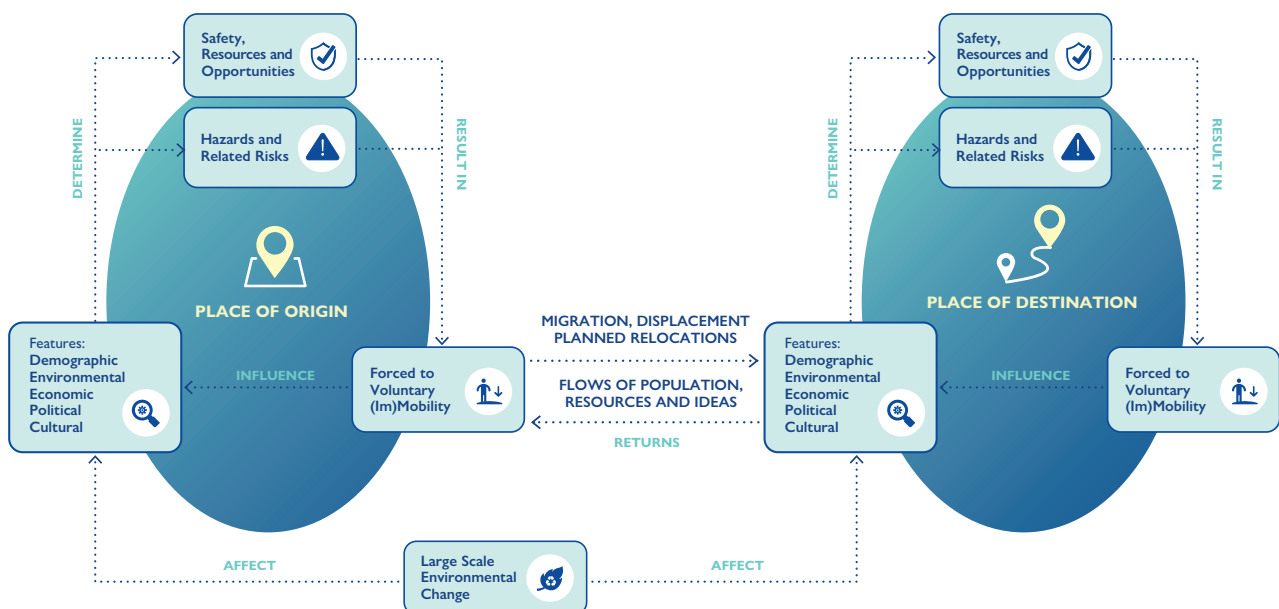
ARTICULATING THE NEXUS BETWEEN HUMAN MOBILITY AND THE ENVIRONMENT: KEY SOCIETAL ISSUES

2. ARTICULATING THE NEXUS BETWEEN HUMAN MOBILITY AND THE ENVIRONMENT: KEY SOCIETAL ISSUES

Articulating the nexus between human mobility and the environment requires understanding how environmental conditions and change influence people's mobility decisions, how population movements affect the environment, and what *outcomes* these interactions produce on people and communities. These complex feedback mechanisms are influenced by the features of local ecosystems and societies, and are mediated by a

diversity of social, political, demographic, cultural, and economic factors that contribute to determining whether, why, and how people move — and to shaping the diverse, interconnected outcomes of their movements.⁶ As such, this nexus cannot be fully explored without understanding staying and moving as *translocal*⁷ and *diachronic*⁸ processes, which produce a diversity of positive and negative outcomes for different people and groups.⁹

Figure 1. Human mobility and its translocal environmental implications



Source: Author's own elaboration.

⁶ Read more about the “The effect of environmental change on human migration” on the University of Oxford Climate Research Network website.

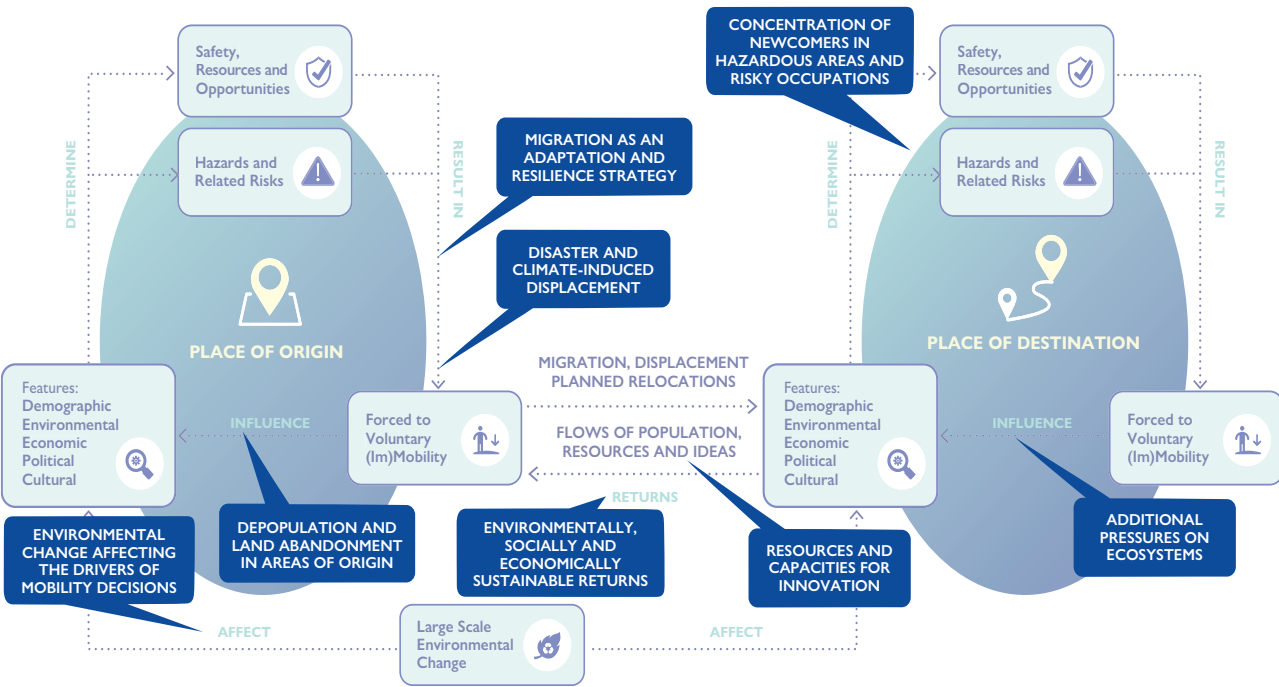
⁷ Translocal processes are all dynamics that have simultaneous social and environmental consequences in different areas. Migration or displacement, for instance, changes the demographic composition of different areas, thereby affecting environmental variables (e.g. pressures on ecosystems, land-use) and socio-economic dynamics (e.g. availability of labor, culture) in places of origin and places of destination.

⁸ Diachronic processes are dynamics that produce outcomes over different periods. Migration and displacement, for instance, immediately shape the distribution of people and communities, which has short- and long-term impacts on the environment (e.g. through ecosystem pressures that can have immediate and long-lasting impacts) and society (e.g. triggering cultural changes that can play out over generations).

⁹ More information on the [website](#).

land and natural resources, gender norms, or barriers faced by persons with disabilities are particularly important, as they influence both mobility decisions and NbS implementation and outcomes. On the other hand, this approach highlights the *outcomes* of population movements — that is, the consequences of such movements in terms of population distribution; access to resources and opportunities; and changes in well-being, resilience, and risk for different groups.¹⁰ Based on this conceptualization, Figure 2 identifies the key environmental implications of human mobility, which are then further elaborated in [Table 1](#).

Figure 2. Key environmental dynamics of human mobility



Source: Author's own elaboration.

¹⁰ This paper will refer to (*human mobility*) outcomes as the impacts of moving or staying on people's well-being and development, not as the fact that people might move or stay in place. As such, it will refer to positive and negative outcomes to identify enhancements or reductions in people's access to resources, opportunities, and well-being and resilience that might stem from moving or staying.

Table 1. Key environmental implications of human mobility dynamics.

HUMAN MOBILITY DYNAMICS	KEY ENVIRONMENTAL IMPLICATIONS
Economic, environmental, political, and social conditions and processes underpin every decision to move or stay in place.	Local and global environmental changes modify the conditions in which mobility decisions are made. The adverse effects of these changes result in more constrained mobility decisions (i.e., displacement or forced immobility).
People's mobility decisions are influenced by safety and risk considerations, including as they relate to natural hazards and disasters.	Natural hazards and related disasters, environmental degradation, and the adverse effects of climate change can be the triggers of population displacement.
Safe, sustainable environmental conditions are key to supporting sustainable return and reintegration of displaced persons and migrants to their areas of origin.	Environmental degradation and the risk of disasters or climate change impacts hinder return and reintegration, resulting in more protracted displacement, or undermine the sustainability of reintegration following people's return.
Population distribution and movement determine demand for and use of natural resources and ecosystem services.	The inflow of displaced persons, migrants, and returnees leads to additional environmental pressures in receiving areas.
Population distribution contributes to shaping people's exposure to environmental hazards.	Population movements may lead to demographic growth in hazardous areas of destination. This is particularly significant when newcomers are left with little alternative but to concentrate in high-risk areas and occupations.
The presence of skilled workers is essential to maintain some specific ecosystems (e.g. in cultural landscapes).	Depopulation in areas of origin of population flows can result in the loss of manpower, knowledge, and skills, reduce maintenance of ecosystems, and lead to environmental degradation.
People and communities migrate to better manage pressures on ecosystems and access natural resources, thereby minimizing environmental risks and coping with environmental shocks and stresses.	Lack of access to essential natural resources hinders migration as an adaptation or resilience strategy.
Population movements enable the circulation of material resources, ideas, and practices.	Transfers of financial, material, and social remittances can change patterns of use of natural resources and ecosystem services.
Population inflows stimulate innovation and support the offer of labor and skills.	The arrival of newcomers can help adopt and implement innovative practices, changing the use of and demand for natural resources and ecosystem services.

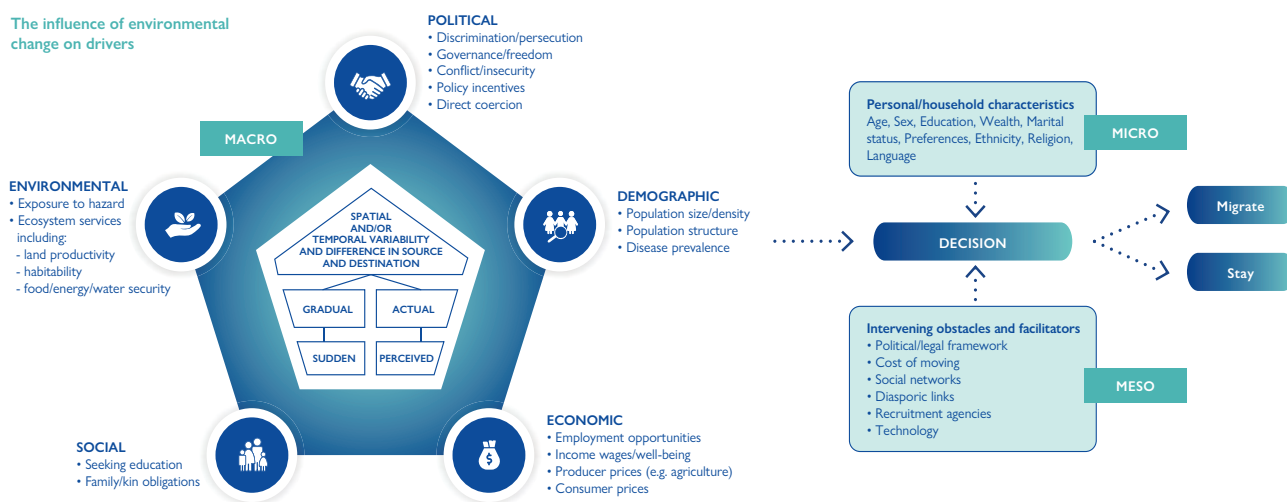
2.1 Areas of Origin

Staying in place and moving are the outcome of the interplay of diverse conditions that shape people's ability to live safely and find sufficient opportunities in a given location, as well as their exposure to hazards and levels of risk. Social, environmental, political, demographic, and economic factors determine whether people can stay in place or need to move elsewhere, and whether such movement occurs in a more or less planned, safe, and dignified manner.¹¹ Environmental factors may act as the immediate trigger for mobility decisions (e.g. for people leaving in the face of a sudden-onset hazard threatening their lives), against a backdrop of socially and politically determined conditions of vulnerability, risk, and resilience. But they can also be underlying, longer-term drivers of economic, demographic, social, or political

pressures that may shape involuntary immobility, migration, displacement, or planned relocations (e.g. in the case of creeping environmental degradation that threatens the viability of livelihoods or the stability of local communities) (Figure 3).

Regardless of the form that they take (more forced and unplanned displacement, more voluntary migration, or resettlement of whole communities through planned relocation schemes) outgoing population flows will have environmental, demographic, and social consequences in the places people are leaving, leading to reduced human presence and use of ecosystems. In some cases, such impacts are largely positive, enabling the conservation of scarce resources, and the recovery of biodiversity.¹² In other cases, however, depopulation and abandonment of land might also lead to the degradation of ecosystems.

Figure 3. The conceptual framework that has been used in this project, showing the 'drivers' of migration and the influence of environmental change



Source: Foresight report.

¹¹ The Government Office for Science, *Foresight: Migration and Global Environmental Change* (2011).

¹² See more on *Where the Rain Falls* (WtRF).



Farahnaz, a female counsellor deployed to Paktika province, Afghanistan. © IOM 2022 / Léo Torréton

Text box 1. Nature-based Solutions and the Gendered Dimensions of Human Mobility

Gender is a key lens to interpret the patterns and outcomes of human mobility, and must be integrated in all relevant programming, including in NbS design and implementation. In many communities, women are the primary users and managers of local natural resources — collecting food and fuel, and harvesting local products for income. This gives them deep ecological knowledge of local ecosystems, species health, and degradation trends — but it also ties their livelihood and community roles to assets and resources that are extremely dependent on climate change. Women, their groups, and organizations often play a central role in promoting ecosystem management practices (e.g. seed collection and storage, nursery management, transplanting, and monitoring), making them key actors in long-term environmental stewardship. NbS implementation often provides a way to enhance their leadership, by allowing for expanded livelihood and income opportunities, which are critical for household resilience in the face of environmental change.

All these elements are particularly important in the context of migration and displacement, especially in contexts in which moving and staying are heavily gendered, (often with men leaving and women having to assume an even larger burden within the household). Integrating women in decision-making on NbS is essential to effectively addressing social challenges: it allows programs to reduce gender-differentiated vulnerabilities, promote women's agency and empowerment, and benefit whole households and communities through the transmission of knowledge among generations, social cohesion, diversified incomes, and risk reduction, adaptation, and resilience that are both socially equitable and ecologically effective.

2.2 Areas of Destination

All population movements also have environmental implications in places of destination, where incoming people put additional pressures on ecosystems through increased use of land, water, and natural resources — either through direct consumption or through demand for other goods and services that have an environmental footprint.¹³ Especially when large-scale, unplanned or not properly managed, such processes have the potential to lead to the more or less rapid degradation of ecosystems — a phenomenon that is equally visible in and around formal and informal displacement sites, informal settlements receiving large numbers of migrants, and areas of destination of relocated communities. This can have short- and long-term impacts on the sustainability of communities of destination, for instance reducing the availability of natural resources, income opportunities, and services, undermining mental health¹⁴ or increasing the occurrence of hazards, and can lead to further social consequences, also resulting in tensions, conflict over resources, and instability.¹⁵

Moreover, the inflow of population often leads to the concentration of large numbers of particularly vulnerable people in high-risk areas, as newcomers tend to settle in the most unsafe locations and engage in the most hazardous occupations.¹⁶ Similar dynamics are observed along migration routes, including in transit sites, as well as after people return to their place of origin. In the context of return and reintegration, in particular, the ability of displaced persons and migrants to go back is often contingent on the improvement of local environmental conditions. At the same time, such movements can generate renewed pressures on ecosystems that were already weakened by previous environmental shocks and stresses.¹⁷

2.3 Implications of Interconnections and Circulation

Population movements also underpin a wide range of exchanges of financial resources, ideas, and practices that influence further environmental outcomes. These population flows and transfers of material and immaterial remittances (i.e. skills, ideas, know-how) can increase the availability of additional resources for investment, alter people's engagement in traditional ecosystem management practices and governance structures, and encourage the adoption of non-traditional and innovative livelihood activities and approaches. Together, these economic and cultural changes shape agriculture, construction, water, and natural resource management with direct and indirect impacts on ecosystems — generating new pressures and risks of degradation, as well as opportunities for more sustainable management and use.¹⁸

¹³ More information is available [here](#).

¹⁴ Read more about "Nature and mental health: An ecosystem service perspective" on the Science website.

¹⁵ Brown, O. and Madar, S., *The intersection of mobility, environmental and climate change, and conflict in the East and Horn of Africa* (2025).

¹⁶ Read more on the [website](#).

¹⁷ More information is available [here](#).

¹⁸ More information is available [here](#).

Text box 2. Natural Hazards, Human Mobility, Cascading Disaster Risks and Nature-based Solutions

The lens of cascading hazards and risks is particularly useful for investigating the nexus between the environment and human mobility, and for identifying an operating space on NbS in human mobility programming. From a disaster risk science perspective, human mobility should not be understood merely as a linear response to environmental degradation or climate change, but rather as an outcome embedded in cascading and compounding risk processes. Existing research shows that climate change and ecosystem degradation often act as background stressors that reshape hazard regimes and vulnerability patterns, while specific natural hazards—such as floods, landslides, debris flows, storms, and droughts—more commonly function as direct triggers of displacement. The interaction of natural hazards with local and global environmental changes generates cascading effects that amplify impacts over time and space.^a In many high-risk settings, population movements are not driven by a single hazardous event, but emerge through a disaster-chain process in which a primary hazard triggers secondary hazards, disrupts livelihood systems and critical infrastructure, progressively erodes coping capacity, and ultimately leads to forced, repeated, or protracted mobility.^b On the other hand, population movements contribute to environmental and social dynamics that shape both the direct and indirect impacts of a given event, can erode vulnerability, multiply exposure, and increase the likelihood and occurrence of further hazards. They are therefore part and parcel of similar disaster-chain processes, through which an initial hazard results in further risks and disasters.^c

Based on this interpretative framework, NbS play differentiated and context-dependent roles along disaster chains, as will be further expanded in Section 4. They may attenuate hazard intensity, interrupt the propagation of secondary hazards, reduce exposure and social–ecological vulnerability, or stabilize post-disaster environmental conditions that would otherwise reproduce risk and mobility pressures. Explicitly embedding NbS within a cascading disaster risk perspective shifts the analytical focus from generalized notions of resilience toward more specific outcomes, such as reducing the probability of hazard-triggered displacement, limiting secondary or repeated mobility driven by risk accumulation, reducing the conditions of risks that can be produced through population movements, and promoting positive outcomes from migration, relocations, and returns. This perspective also helps to clarify both the potential and the limits of NbS in human mobility governance, particularly in high-hazard and compound-risk contexts where gradual environmental change and local risk creation processes intersect, shaping mobility trajectories.

^a Read more about “Understanding Compound, Interconnected, Interacting, and Cascading Risks: A Holistic Framework”.

^b Read more about “Compound, Cascading, or Complex Disasters: What’s in a Name?”.

^c Read more about “How do population movements fit within the framework of systemic risk?”.

3

NATURE-BASED SOLUTIONS AND THEIR RELEVANCE FOR HUMAN MOBILITY AND THE ENVIRONMENT

3. NATURE-BASED SOLUTIONS AND THEIR RELEVANCE FOR HUMAN MOBILITY AND THE ENVIRONMENT

3.1 What are Nature-based Solutions

NbS have been initially defined by IUCN as all measures that “protect, sustainably manage, and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits”.¹⁹ In 2022, the United Nations Environment Assembly formally defined them as “actions to protect, conserve, restore, sustainably use, and manage natural or modified terrestrial, freshwater, coastal, and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits”.²⁰

Both these definitions encompass measures that focus on ecosystems to deliver multiple benefits, by supporting climate change mitigation, adaptation/risk reduction, cultural preservation, physical and psychological health, livelihood security, and community stabilization. As such, they can also be deployed to improve environmental and social conditions that shape human mobility and its outcomes.

NbS are generally understood as measures that provide a cost-effective, adaptable, and durable solution to societal challenges. Overall, they include a diversity of (partly overlapping) approaches,²¹ such as:

- **Ecological restoration:** the process of restoring ecosystems and conserving biodiversity at different scales (from specific sites to whole ecosystems and landscapes).
E.g. reforestation/revegetation to counter deforestation and soil degradation, eradication of invasive species and reintroduction of indigenous ones, restoration of river basins.
- **Ecological engineering:** the design of resilient, sustainable ecosystems (from local to global levels), typically to maximize the benefits drawn for human communities.²²
E.g. the introduction of particular plant or animal species to achieve conservation or restoration objectives.
- **Ecosystem-based mitigation:** the sustainable management, conservation, and restoration of ecosystems to maintain and improve carbon sinks and contribute to reducing emissions of greenhouse gases.
E.g. afforestation/reforestation or avoided deforestation, the conservation or restoration of peatlands.
- **Ecosystem-based adaptation and disaster risk reduction (DRR):** the sustainable management, conservation, and restoration of ecosystems to minimize the impacts of hazardous events and of climate change, and to support resilience outcomes.

¹⁹ Cohen-Shacham, E., Walters, G., Janzen, C. and Maginnis, S., *Nature-based Solutions to address global societal challenges* (2016).

²⁰ More information is available [here](#).

²¹ International Union for Conservation of Nature (IUCN), *Nature-based solutions to address global societal challenges* (2016).

²² More information is available [here](#).

E.g. the replanting of forest with climate-tolerant species, the restoration of rivers to prevent the impacts of flooding, and the conservation of coastal ecosystems to reduce the impacts of storms.

- **Green/blue/natural infrastructure:** includes the design and establishment of networks of natural and semi-natural areas and facilities to enable natural services that provide services similar to those provided by “grey” infrastructure.

E.g. urban greenery (including on roofs and walls) to absorb water and reduce heat, rain gardens to facilitate the infiltration of rainwater, wetlands to facilitate wastewater treatment.

- **Ecosystem-based management approaches:** the sustainable management of protected areas and natural resources through approaches that reconcile their use by communities with long term biodiversity benefits.

E.g. sustainable management of water resources, ecosystem-based management of fisheries.

According to the NbS definitions given above, such actions can be categorized into three main approaches to implementation — notably aiming to protect, restore, or manage ecosystems (as defined and illustrated in Table 2).²³

Table 2. Categories and examples of NbS

NBS APPROACH	DEFINITION	EXAMPLES
Protection	Actions that aim to preserve and enhance ecosystem services through protection and conservation measures.	• Protecting mangroves in coastal areas to enhance coastal resilience. • Instituting terrestrial or marine protected area networks. • Area-based environmental conservation initiatives.
Restoration	Actions that rehabilitate, enhance, or restore degraded ecosystems to recover ecological function and improve the provision of services.	• Ecological engineering (green roofs, green walls, etc.) • Forest landscape restoration
Management	Actions that involve high-level intervention, including the creation or establishment of new ecosystems.	• Integrated water resources management • Integrated coastal zone management • Agroforestry, silvopasture, or smart aquaculture

²³ More information is available [here](#).

In this paper, the term is used with full recognition that many real-world applications blend a diversity of measures, each primarily focusing on ecosystems, society, engineered solutions, and/or policies. However, the paper also recognizes that not all environmentally positive actions fit the definition of ‘Nature-based Solutions’. A possible way of categorizing relevant measures includes:

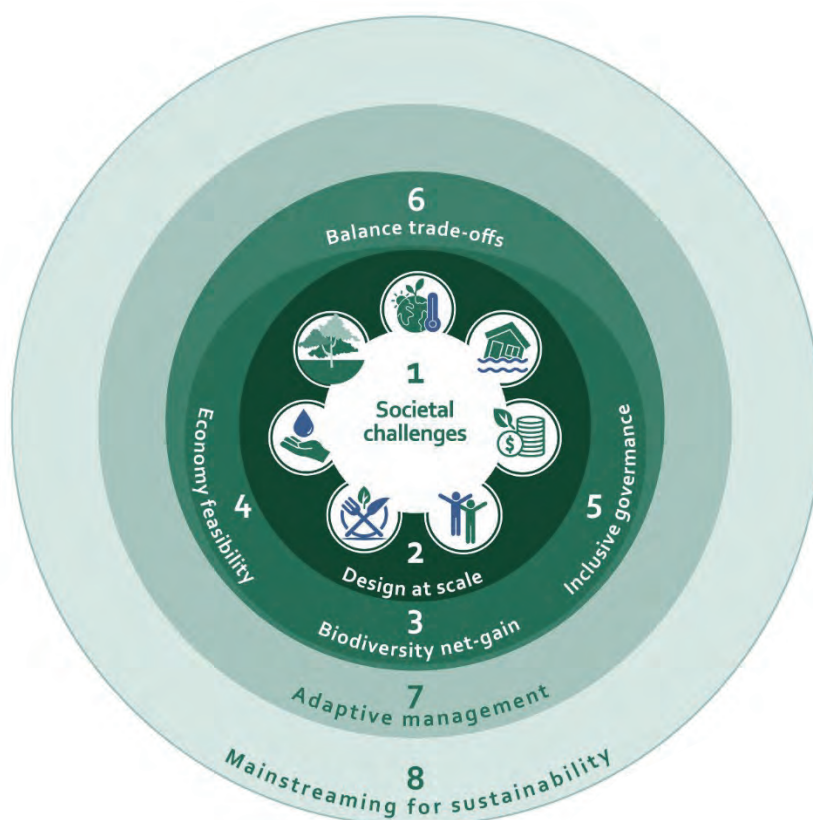
1. **NbS interventions:** approaches that explicitly address a societal challenge (e.g. DRR, food security, habitability), rely primarily on ecosystem functions, and aim to generate measurable biodiversity/ecosystem gains while improving human well-being. These tend to be program-level or landscape-level interventions and are implemented in full accordance with IUCN’s Global Standard for Nature-based Solutions (e.g. watershed restoration, coastal ecosystem rehabilitation, community agroforestry systems, integrated ridge-to-reef restoration).
2. **NbS-compatible practices:** individual techniques, management systems, farming methods, conservation activities, or engineering measures that contribute to an NbS (e.g. mulching, rainwater harvesting, composting, dune stabilization techniques, soil conservation trenches). These practices directly benefit ecosystems. They are important building blocks but do not constitute NbS on their own unless they sit within a broader intervention that demonstrates social and ecological benefits.
3. **Other practices that promote environmental sustainability:** measures that promote positive but broad environmental objectives that may indirectly benefit local ecosystems (e.g. use of solar panels or stoves to promote reduced emissions or use of local resources, waste recycling, behavioral change, sustainable consumption). Such activities may be integrated in NbS implementation

(e.g. combining solar power with agroforestry) and may underpin the effectiveness and long-term sustainability of NbS by addressing the root causes and human drivers of ecosystem degradation (e.g. use of fuel-efficient stoves to reduce pressure on local resources and enable forest conservation, or waste recycling to reduce pollution and enable restoration of wetlands). This category includes an extensive and diverse range of supporting or enabling activities which are, however, not the primary object of analysis in this paper.

3.2 Context-specificity and Standardized Approaches

NbS approaches are varied and very context-specific. Their viability and relevance depend on the features of the ecosystems in which they are implemented and on the societal issues that they are designed to solve. This makes it complicated to provide a comprehensive catalogue of the options and approaches available for action across ecosystems, sectors, and mobility contexts. Instead, a set of principles and standards has been developed to guide the design, verification, implementation, evaluation, and scaling-up of NbS. Adherence to these standards helps ensure that responses to societal challenges are effective and sustainable, maximize the potential benefits of NbS while instituting safeguards against potential drawbacks and unintended negative social impacts. For actors working primarily on human mobility, these standards offer an important reference point for determining when ‘environmental’ or ‘resilience’ projects qualify as NbS, and for fully integrating relevant objectives in the design, implementation, and monitoring of human mobility programs.

Figure 4. The 8 NbS Standards



Source: Eva Setsaas' elaboration of IUCN's Global Standards.

Among the most used sets of standards in this domain are the “IUCN Global Standards for Nature-based Solutions” (see also Figure 4 for a visual overview),²⁴ which comprise the following items:

1. NbS effectively address societal challenges:

NbS should help address the most pressing societal challenges for the most vulnerable beneficiaries in an evidence-based and measurable manner.

2. Design of NbS is informed by scale:

Successful NbS account for the interactions between environmental and socio-economic systems and for the impacts of interventions across sectors and sites.

3. NbS result in a net gain to biodiversity and ecosystem integrity:

NbS should address local prevailing drivers of environmental degradation, and produce clear, measurable benefits for the conservation of local ecosystems, averting indirect negative consequences on nature.

4. NbS are economically viable:

Potential and realized economic impacts (both positive and negative) should be forecasted and documented in order to justify the choice of NbS over other solutions and to identify potentially viable options for their financing.

²⁴ More information is available [here](#).

5. NbS are based on inclusive, transparent, and empowering governance processes:

NbS should be designed and implemented through participative processes that involve and empower all individuals and groups that could benefit or otherwise be affected (directly or indirectly) by the implementation of a measure, including when such consequences are felt across boundaries.

6. NbS equitably balance trade-offs between achievement of their primary goals and the continued provision of multiple benefits:

All costs and benefits of NbS, and associated trade-offs (including in terms of access to land and resources) should be acknowledged and accounted for, and safeguards and appropriate corrective actions should be established to minimize adverse consequences.

7. NbS are managed adaptively, based on evidence:

NbS should be implemented through strategic approaches that include constant M&E to ensure that they deliver the expected benefits, and can be improved by integrating further learnings and evidence.

8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context:

The design, implementation, and M&E of NbS should be leveraged to trigger institutional change and facilitate the reform of policies and regulations, and to enable contributions to national and global development objectives.

3.3 Relevance of Nature-based Solutions at Different Stages of Human Mobility Trajectories

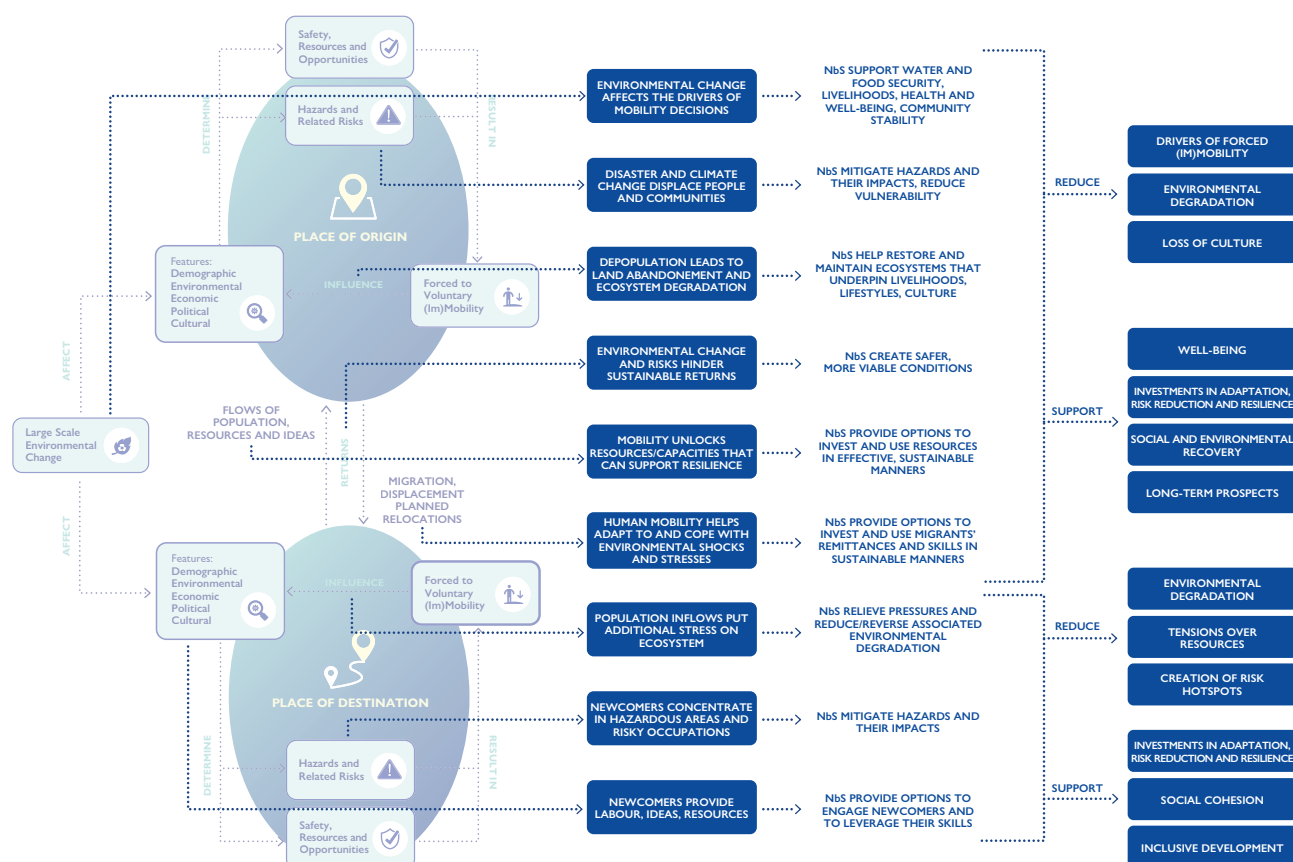
Different NbS can be relevant in addressing the diverse societal challenges associated with human mobility, across different stages of mobility and within different ecosystems. For instance, many forms of ecosystem-based DRR and climate change adaptation (CCA) can help reduce the environmental pressures that contribute to migration, displacement, and relocation. The development of green infrastructure can be integrated into interventions that manage population inflow to avoid ecosystem degradation in urban and peri-urban areas that are receiving large inflows of migrants and displaced persons. Financial resources and know-how enabled by population circulation can support the adoption of the innovative practices required for the implementation of ecological engineering programs.

Table 3 provides a detailed overview of the relevance of NbS in addressing challenges and leveraging the opportunities at the intersections of human mobility and the environment identified in Section 2. The roles and relevance of NbS across these domains are illustrated in Figure 5.

Table 3. Relevance of Nbs for different areas of work on human mobility and the environment

MOBILITY-RELATED SOCIO-ENVIRONMENTAL ISSUES	RELEVANCE OF NBS	KEY ROLE OF NBS
Environmental conditions and change affect economic, political, and social conditions that act as adverse drivers of mobility.	NbS can protect and enhance natural capital, supporting water, food, and livelihood security, protecting and restoring land, and improving overall health and well-being outcomes for communities that face environmental, social, and political migration pressures.	Livelihood security, sustainable resource management, social cohesion, and protection of cultural ties
Natural hazards and climate change impacts can trigger population displacement.	NbS for DRR and CCA can help mitigate hazards and their impacts and address the vulnerability of people and assets, thereby reducing displacement risk.	Risk reduction
Environmental degradation and disaster/climate risk hinder the return of displaced persons to areas of origin.	NbS can help restore ecosystems and support recovery, creating conditions to support reintegration and durable solutions for returnees.	Risk reduction, environmental recovery, social cohesion, and support for cultural ties
The inflow of displaced persons, migrants, and returnees leads to additional environmental pressures.	NbS can help relieve environmental pressures and slow down/reverse environmental degradation by protecting and restoring local natural capital and ecosystem services affected by unsustainable demand for goods and services. This creates a set of direct and indirect economic, social, and environmental benefits for incoming populations and their host communities that can underpin social cohesion and reduce tensions over resources and inter-communal violence.	Livelihood security, sustainable resource management, environmental recovery, and social cohesion
Demographic growth in areas of destination concentrates newcomers in high-risk areas and occupations.	NbS can help mitigate hazards and their impacts in locations and productive sectors where migrants and displaced persons are concentrated.	Risk reduction, livelihood opportunities, enhanced resources, and support for mental health
Depopulation of areas of origin leads to reduced pressures on ecosystems, as well as loss of knowledge and skills, reduced maintenance of ecosystems, and environmental degradation.	NbS can help better manage, maintain or restore ecosystems that could otherwise lose their ability to provide services to communities staying in place.	Livelihood security, sustainable resource management, environmental recovery, and support for cultural values
Lack of access to essential natural resources hinders migration as an adaptation strategy.	NbS can help ensure the availability of key resources at all stages of population movements, enabling safe and orderly movements that protect people and do not result in overuse of resources and related conflicts.	Livelihood security, sustainable resource management, social cohesion, and physical and mental health
Transfers of remittances, skills, knowledge, and ideas from migrants and returnees change practices.	NbS can provide viable avenues to invest remittances and promote job creation across sectors (construction, rural development, agribusiness, green jobs) in ways that protect the environment and enhance ecosystem services, especially if supported through related capacity building.	Risk reduction and livelihood security
Arrival of newcomers stimulates innovation and supports the offer of labor and skills.	NbS can be supported through the labor of incoming migrants, who might bring a specific set of knowledge, skills, and practices, contributing to innovative approaches in places of destination.	Risk reduction, livelihood security, resource management, environmental recovery, and social cohesion

Figure 5. Synthesis of NbS and their contributions to positive outcomes of human mobility



Source: Author's own elaboration.

More generally, NbS present specific elements of interest that make them particularly suitable to support positive mobility outcomes:

1. NbS address societal challenges such as disaster risk, environmental degradation, or climate change through interventions that also protect and increase biodiversity, promote water, food, and livelihood security, enhance access to opportunities and amenities, and improve living conditions and prospects for diverse groups in target areas. They have the potential to holistically (and effectively) enhance the social, economic, and political conditions in which human mobility decisions are made, and in which people move — promoting better overall mobility outcomes in places of origin and destination for both people moving and staying.

2. The direct and indirect benefits of NbS can be shared among different groups within target communities, including different people who may be forced to move, immobile people, displaced persons, and migrants, and members of host communities and other communities affected by their movement. NbS can be flexibly deployed to address a wide range of societal issues linked with human mobility: from tackling immediate triggers and long-term factors shaping human mobility decisions to improving overall stability, well-being, and development for people, communities, and societies.

3. Their design and implementation rely on participatory processes that promote dialogue and cohesion across and within communities and may help address tensions surrounding the movement of populations and their environmental impacts.

4. Their relative affordability and cost-effectiveness also mean that they can often be more realistically implemented in contexts characterized by widely different levels of development and wealth — while providing benefits that may be bankable in the short and long term and could stimulate interest among private sector actors and other private investors for risk reduction programming.
5. Their implementation often requires diverse efforts that also promote synergies with other projects and initiatives (across, for instance, the CCA/DRR, relief and recovery, livelihoods and labor, health, building and infrastructure sectors). NbS work best when they are part of a set of complementary measures that also integrate technology, policy, and capacity-building work — and that are supported by adequate coordination systems. Such holistic approaches are consistent with the multi-sectoral efforts needed to respond to the needs of people on the move.
6. Lastly, NbS need to be designed, and can be implemented, through ecosystem- and landscape-wide approaches that comprise a set of coordinated and integrated multi-sited interventions. Such approaches can simultaneously address diverse impacts of different forms of human mobility across multiple locations.



In Trinidad and Tobago, Venezuelan migrants and local host communities engage in vertical hydroponics training. © IOM 2024 / Gema Cortes

4

EXPLORING OPERATIONAL APPROACHES TO NATURE-BASED SOLUTIONS AND HUMAN MOBILITY

4. EXPLORING OPERATIONAL APPROACHES TO NATURE-BASED SOLUTIONS AND HUMAN MOBILITY

This section explores in more detail the ways in which NbS can be deployed as part of human-mobility-focused interventions (at different stages of mobility trajectories, in areas of origin and destination of population movements). It organizes operational examples of NbS and human mobility around nine clusters of mobility-related areas of work. These areas of work are articulated around the issues and opportunities identified in [Section 3](#), spanning from addressing environmental determinants of mobility in areas of origin to leveraging the circulation of remittances and skills that population movements enable. Each subsection follows a common structure: (i) a brief framing of the mobility–environment issue NbS can address; (ii) an overview of the relevance of NbS and of potential entry points for relevant programming; and (iii) illustrative field examples. This structure is intended to help practitioners rapidly identify relevant approaches for their context and draw on comparable experiences from other regions. An overview of the approaches available to respond to different challenges in different biomes is provided in [Table 4](#).

Each section draws on evidence from the implementation of practices in the field that are either explicitly described as “NbS” in relevant literature or that are designed to meet several of the IUCN standards listed in [Section 3.2](#). A full analysis of the adherence of each example of work to the full set of standards could not be performed for this paper — so the paper aims to provide as comprehensive a perspective as possible on working with nature in different human mobility contexts.

Many of the projects listed in the sections below are explicitly designed to contribute (primarily or directly) to more positive human mobility outcomes. However, it should be noted that all NbS, including those designed to address other societal issues, and even environmental projects that have little to no explicit societal objectives, can have human mobility consequences, as they will affect the drivers of mobility decisions and the conditions in which movements take place. A fully integrated approach to NbS and human mobility requires embedding human mobility considerations and concepts in NbS design, implementation, and evaluation, as discussed in [Section 5](#).

Table 4. Synthesis of NbS approaches available to address different societal challenges in different biomes

TYPE OF BIOME	ECOLOGICAL ISSUE	HUMAN IMPACTS	KEY SOCIETAL CHALLENGES	EXAMPLES OF RELEVANT APPROACHES
Coastal areas	Erosion and loss of land, coastal flooding, including due to storms and storm surges	Coastal development, sand mining, construction of dams upstream, local deforestation, climate change-induced sea-level rise	Inhabitability of ecosystems, livelihood insecurity, disaster risk	Conservation and restoration of coastal wetlands, intertidal flats, and marshes
				Conservation and restoration of dunes through nourishment
				Conservation and restoration of mangroves
				Conservation and restoration of coral reefs, oyster beds, and seagrass forests
				Construction of artificial reefs
				Retreat of hard flood mitigation structures and their protection through conserved or restored habitats
Drylands	Land degradation, soil erosion, drought, and desertification	Overfishing and overexploitation of ecosystems, deforestation	Loss of livelihood and cultural systems	Protection and restoration of fish nurseries
				Restoration of coral reefs, mangroves
	Reduction in water quality	Pollution, eutrophication	Health risks, livelihood insecurity	Use of shellfish for water purification
				Agroforestry to reduce soil temperature and evaporation, reduce water runoff, and increase soil moisture and organic components in soil
				Water harvesting techniques (e.g., half-moons, swales and bioswales, ponds)
				Contour bunds
Rivers	Sandstorms	Deforestation, intensive agro-pastoral practices, climate change	Inhabitability of ecosystems, livelihood insecurity, disaster risk, loss of cultural systems	Developing or managing underground water storage
				Low tillage agricultural practices
				Mulching, composting
	Loss of ecosystem services, reducing agricultural productivity and resilience	Poor agricultural and land management practices and loss of vegetation cover	Disaster risk, livelihood insecurity	Establishment of shelterbelts as windbreak and to mitigate the impacts of sandstorms and reduce the risks of respiratory diseases
				Use of climate-resistant crops
				Permaculture, biodiverse agriculture and agroforestry
Rivers	Harmful flooding	Climate change, biodiversity loss	Food and livelihood insecurity	Creation of seed banks and adoption of climate and drought-resilient varieties
				Protection and restoration of upstream forests to encourage water infiltration
	Altered, unsustainable environmental flows	Watershed forest loss, overextraction of water	Water security, disaster risk	Stabilization of riverbanks through greening
				Renaturation of riverbanks and riverbeds to enable meandering and slow water runoff
				Retreat of buildings and infrastructure (including flood protection infrastructure) away from the floodplain
				Planting of native, flood-tolerant vegetation
Rivers	Riverbank erosion, siltation	Riparian buffer zone loss, river training and accelerated flow, sand mining	Inhabitability of ecosystems, livelihood insecurity, disaster risk	Creating floodplains for water retention (and recreation)

TYPE OF BIOME	ECOLOGICAL ISSUE	HUMAN IMPACTS	KEY SOCIETAL CHALLENGES	EXAMPLES OF RELEVANT APPROACHES
Mountains	Land degradation, soil erosion, landslides	Deforestation, reduced maintenance of cultural landscapes, development of infrastructure	Disaster risk, livelihood insecurity	Slope stabilization through reforestation (esp. deep-rooted plants) and greening (deep-rooted grasses). Development and maintenance of terraces to reduce runoff, landslide risk, and create space for the cultivation of food crops Micro-infrastructure for slope stabilization (e.g., contour lines, fascine drains, vegetated gabion walls, check dams, living smiles, fences).
	Loss of biodiverse pastoral landscape	Reduced maintenance of cultural landscapes	Loss of livelihood and cultural systems	Targeted felling of trees to leave space for mountain pastures
Forest	Soil erosion, land degradation	Deforestation	Disaster risk, livelihood insecurity, loss of livelihoods and cultural systems	Conservation and restoration of forests Protection and management of forested areas
	Ecosystem degradation	Unplanned anthropogenic wildfires	Disaster risk	Use of prescribed/controlled burns (Re) Introduction of fire-tolerant species
Intensive land-use biomes, such as urban built-up and camps)	Loss of regulating ecosystem services, causing heating	Inappropriate building practices, loss of vegetation	Inhabitability, health risks, water insecurity	Select a site based on climatic features Green roofs and green façades for thermal insulation and water infiltration Planting trees South/West of houses for shading and cooling Develop/establish green public spaces Develop green urban corridors Rainwater harvesting at the building level
	Urban floods, landslides, erosion	Inappropriate building practices, loss of vegetation	Disaster risk, water insecurity	Select sites based on climatic features Maintaining local natural drainage paths Reforestation, revegetation and terracing of slopes Maintaining, restoring or constructing water retention areas (e.g., ponds) and micro-infrastructure (e.g., swales, infiltration ditches) Permeable pavements Daylighting of streams
	Land degradation	Overuse of resources	Inhabitability, scarcity of key resources, conflict	Ensure sustainable extraction of building materials through a management process for clay, soil, sand, and wood.
	Forest ecosystem degradation and loss	Deforestation	Disaster risk, livelihood insecurity, personal insecurity (e.g. women providing wood)	Encourage the use of rapidly renewing natural resources (e.g., bamboo) Develop green areas to act as windbreaks
	Reduced water quality, reduced freshwater ecosystem health	Wastewater discharge, pollution	Health risks, water insecurity	Protect, restore, or create wetlands and green infrastructure for wastewater treatment
	Loss of ecosystem services, reducing food productivity, and resilience	Land conversion	Food insecurity	Use space around dwellings/homes for vegetable gardens, fruit trees, fish ponds Composting of chicken waste Create urban food gardens, floating farms
	Reduced ecological regulation and/or increased presence of harmful and invasive species	Urbanization, loss of local regulating species	Health security	Biological controls (e.g., introduction of wild predators, fish in ponds) to control/eliminate insects

4.1 Addressing the Environmental Determinants of Social, Economic, and Political Drivers of Human Mobility in Places of Origin

The economic, social, political, and demographic attributes of communities and societies are shaped by environmental conditions. Ecosystems underpin livelihood systems and cultures, supplying essential resources and energy and providing critical ecosystem services that support human activity, including pollination, soil fertility, and water purification. Environmental change, including climate change, can therefore profoundly transform societies, by altering the very foundations of their demographic patterns, social structures, institutions, and economies.

As these factors are also the key drivers of any human mobility decision, environmental change reshapes pressures and choices faced by individuals and households, influencing patterns of migration, displacement, and planned relocation. For instance, in West Africa, biodiversity loss and environmental degradation have contributed to declining fish stocks, forcing fishing communities in Senegal and Ghana to relocate inland or seek seasonal work abroad.²⁵ Similarly, in the Amazon, deforestation and biodiversity loss have reduced the availability of ecosystem services and food for Indigenous Peoples, driving displacement from ancestral lands, and causing loss of connection to culture.²⁶

A diversity of NbS can be deployed in different contexts and ecosystems to enhance natural capital, support water, food, and livelihood security, protect and restore land, and improve overall health and well-being outcomes for people and communities.

In general, their implementation has the potential to induce better human mobility outcomes by minimizing the adverse drivers of human mobility and expanding people's freedom of choice when it comes to mobility decisions. This does not necessarily mean that overall population flows will be reduced from a given area, but rather that migration will happen in a less constrained manner and will typically produce more significant benefits for migrants and their communities.

The improvement of human mobility outcomes is not necessarily an explicit objective of many of the relevant projects and activities, which are instead designed primarily to achieve more direct improvements in basic living conditions or broader sustainable social and environmental outcomes. Positive migration outcomes are not necessarily evaluated by such activities either (whether in the form of reduced displacement or improved conditions for people on the move, their families, and communities). However, positive human mobility outcomes will still be one of the predictable results of improving overall conditions. Moreover, in some cases, migration and displacement considerations will be used to target such interventions, for instance in the many cases in which NbS are deployed in areas that have experienced or may experience significant outmigration or displacement.

²⁵ UNEP, *Spreading Risks: Coastal Migration and Biodiversity Loss in West Africa* (2022).

²⁶ IPCC, *AR6 Working Group II Report: Impacts, Adaptation and Vulnerability*, Chapters 8 and 14 (2022).



Mangrove forest at Black Sand Beach in Trat, Thailand. (Royalty-free)

Empowering communities to address environmental challenges in Kenya



In Mombasa County (Kenya) Big Ship Organization, a community-based entity, works to restore degraded urban and peri-urban forests and coastal ecosystems. These areas are the typical destinations of fishermen from coastal communities, that are being pushed toward cities as their traditional livelihoods become unviable due to rising sea temperatures, coral bleaching, overfishing, and the degradation of fishing stocks. In response to these challenges and in collaboration with the Kenya Forestry Service, Big Ship supported the “Adopt a Site” initiative, providing training and support to representatives of local communities, including newly-arrived migrants, to participate in the restoration of forests and mangroves, thereby benefiting from their direct (employment) and indirect (well-being, amenities, availability of natural resources) outcomes.

Source: Big Ship, [Environmental Challenges in Urban Areas](#) (2023).

Facilitating agroecological transition in Benin



In Benin, cotton is the main source of income for a large community of farmers. However, intensive techniques have led to land degradation and crop failure. This has reduced the attractiveness of agricultural livelihoods for rural youth, who migrate in search of alternative livelihood opportunities.

The project “Projet d'appui à la Transition Agro-écologique dans les Zones Cotonnières du Bénin – TAZCO” seeks to restore degraded soils and preserve the natural resources upon which small-scale family farmers are dependent, reinforce the resilience of the sector to climate change, and improve the working conditions of farmers. It adopts sustainable land management techniques, targeting: i) youth from cotton farms who lack the economic means to combat desertification and to benefit from farm modernization; ii) unemployed youth who might seek to migrate to find other opportunities; and iii) educated youth in search of employment opportunities.

Sustainable techniques for water and soil conservation, coupled with agroforestry and changes in animal husbandry have enabled the restoration and protection of degraded land. These interventions have reduced soil erosion, increased agricultural productivity, and helped ease tension between farmers and herders, thereby improving local livelihoods and creating more viable prospects for youth to remain in place.

Source: IOM, [Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification](#) (2019).

Addressing Climate- and Environment-Induced Mobility in ASALs in Kenya



Turkana and Garissa Counties (Kenya) are among the areas most affected by recent droughts and are recognized hotspots of climate mobility in Kenya. In response to local challenges, IOM worked to improve sustainable water access and build resilience among climate-affected communities. These areas have been heavily affected by the spread of Mathenge, a thorny shrub introduced in the 1970s to combat desertification and provide fuelwood and fodder in arid regions. While initially beneficial for soil conservation and drought resilience, the plant has since become highly invasive, spreading rapidly across counties like Baringo, Garissa, and Turkana, with significant negative impacts on ecosystems and livelihoods.

IOM supported communities in transforming areas overrun by Mathenge into productive farm gardens, where climate-smart agriculture practices were introduced to diversify livelihoods. To address this challenge, Mathenge trees were repurposed to fence the gardens, providing a productive and sustainable use for the invasive species. Additionally, IOM established a briquette production facility in Garissa, enabling communities to convert Mathenge into clean energy sources and further supporting alternative, environmentally friendly livelihood opportunities.

Source: IOM project database.

Improving water availability in Rajasthan, India



In warm dry areas of Rajasthan, India, large-scale watershed restoration programs have improved water availability and soil productivity. In areas that receive significant amounts of water exclusively during the monsoon season, encouraging water retention and infiltration is key to ensuring year-round benefits for local communities. For decades, local communities have been digging interconnected networks of retention ponds and canals through the Chauka system, which is based on the development of a series of pits that facilitate percolation. This leads to increased grass coverage, soil moisture and fertility, availability of water for irrigated agriculture, diversification of crops, and enhancement of incomes. It also creates the environmental conditions for reforestation, which has the added benefit of reducing surface temperatures in areas severely affected by heatwaves. By improving environmental and economic conditions, these projects have also successfully affected human mobility, providing people with viable local livelihoods.

Source: Millison, A., [How Farmers Reshaped a Region and Solved Drought](#) (2024).

Supporting Farmer-Managed Natural Regeneration (FMNR) in West Africa



Global and regional climate scenarios suggest that drylands in West Africa are becoming increasingly arid, resulting in deforestation, soil degradation, and desertification, and putting stress on local agricultural production, and increasingly pushing rural populations toward poverty and deprivation. In the face of these pressures, migration (traditionally featured in the form of planned, seasonal movements), increasingly becomes a manifestation of distress and a permanent occurrence. In order to manage some of these pressures, FMNR approaches have been implemented in the region since the 1980s. FMNR includes diverse approaches, such as protecting seedlings and saplings, digging planting pits (zai) to create more fertile soils and retain humidity, and building contour stone bunds to reduce water runoff and encourage infiltration. Such interventions have routinely resulted in improved food security and soil quality, increased availability of firewood and non-timber products, and the slowing or reversal of negative environmental impacts.

Source: Ecosystem and Livelihoods Adaptation Network case study.

Lebanon: Encouraging a multi-level stakeholders approach to sustainable land management



Land degradation and loss of biodiversity in the Qaraoun region, Lebanon, affect thousands of people who depend on local natural resources for their livelihoods and incomes. The area is at high risk of desertification, due to deforestation, overgrazing, inappropriate use of fertilizers, and excessive pressures on resources from unplanned urban settlements. Such impacts are likely to reduce income generation opportunities, and encourage migration to urban areas, especially for the younger generations, in a country that has also received large flows of refugees from the Syrian Arab Republic.

In the face of these challenges, the Government of Lebanon, in partnership with the United Nations Development Programme (UNDP), supported more sustainable land management practices. Interventions include the identification and sustainable management of degraded forests, rangelands, and cropland to restore vital ecosystems and prevent conflicts between land users. More productive ecosystems also supported alternative businesses such as beekeeping, rural tourism, and production of high-value products such as dried fruits, keshk (a local goat dairy product), and grape molasses.

Source: IOM, [Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification](#) (2019).



A migrant worker from Myanmar tends to an agricultural field in Mae Sot, Thailand. Migrant populations frequently fill critical labor gaps in sectors like agriculture and construction, which are often highly exposed to environmental and climate risks.
© IOM 2023 / Muse Mohammed

Empowering communities to improve forest management in Nepal



Land restoration and rehabilitation efforts are most effective when policies support local management of natural resources, while strengthening cooperation between actors and institutions at the international level. Community-based forest management has long proven to be one of the most effective ways to improve the livelihoods of local communities, conserve biodiversity and mitigate climate change.

In Nepal, for example, deforestation resulted from weak forestry policies coupled with agricultural expansion, commercial and household wood extraction, and poorly planned infrastructure development. However, policy reforms emphasizing greater decentralization of forest control to local communities led to significant progress in forest protection and restoration. The 1993 Forest Act created 17,000 autonomous community forest user groups with rights to manage and control access to the forests. Since then, the national forest cover has increased by a fifth, which is one of the fastest rates of forest recovery in the world. Activities in restored forests provide a source of income for communities, while creating local jobs in the forestry sector, hence contributing to averting and minimizing forced migration due to environmental and economic factors.

Source: [Community-based forest management and its role in improving forest conditions in Nepal](#) (2012).



Women-led Mangrove Replantation and Coastal Defense in Fiji



Over the last decade, coastal communities in Ba and Macuata, Fiji, have faced accelerated erosion, saltwater intrusion, degraded fisheries, and increasingly destructive storm surges. These pressures undermined food security and pushed many young people—especially men—to migrate temporarily for work, leaving women to manage household and community resources under worsening climate conditions. Mangrove loss had weakened natural buffers, exposing homes and farmland to repeated flooding. Through the Fiji Women's Environment & Development Initiative and local women's groups, communities launched women-led mangrove restoration, combining traditional knowledge of tidal cycles with technical planting guidelines. Women mobilized communal labor, mapped degraded sites, and monitored seedling survival; their leadership improved the accuracy of site selection because of their daily interaction with fishing grounds and nearshore ecosystems. Over time, restored mangrove belts reduced wave energy and storm damage, revived nursery habitats for fish, and improved household incomes through more stable coastal fisheries. These ecological gains reduced pressure to migrate by strengthening local livelihoods and lowering disaster-related losses. The initiative also shifted gender norms, positioning women as environmental decision-makers and resource stewards, which in turn increased the social cohesion necessary for long-term resilience.

Source: *Climate Crisis, Displacement, and the Right to Stay: Fiji*.

Restoring degraded lands to ensure sustainable livelihoods in Indonesia



The GLACIER (Green Livelihood Access for Central Kalimantan's Inclusive Environmental Response to Climate Change) project was implemented in 2012–2013 by the International Labour Organization (ILO) and UNDP. It was a REDD+ (Reducing Emissions from Deforestation and Forest Degradation in Developing Countries) project seeking to rehabilitate degraded land, restore forest and peatland, and improve community livelihoods in Central Kalimantan, Indonesia.

The project's main objective was to improve access to sustainable livelihoods for local communities, notably through participatory approaches taking into account local conditions and resources, including techniques linked to peatland regeneration. The project's main beneficiaries were women, youth, and persons with disabilities. The project exceeded expectations in meeting its targets, and reforestation and agroforestry activities directly contributed to the rehabilitation and revitalization of degraded land. These activities benefited the livelihoods of local communities and provided alternative sustainable livelihood options, which in turn have the potential to reduce forced migration in search of better opportunities.

Source: ILO, [Green Livelihood Access for Central Kalimantan's Inclusive Environmental Response to Climate Change \(GLACIER\)](#).

The Green Belt Movement in Kenya



The Green Belt Movement (GBM) is an environmental organization that empowers communities, particularly women, to conserve the environment and improve livelihoods, reducing drivers of forced migration in the process. The movement was initiated in 1977 by Professor Wangari Maathai under the auspices of the National Council of Women of Kenya (NCWK) to respond to the needs of rural Kenyan women who reported that their streams were drying up, their food supply was less secure, and that they had to walk increasingly long distances to obtain wood for fuel and fencing, with increased burdens and risks. GBM encourages women to work together to grow seedlings and plant trees to reduce soil loss, improve water infiltration and enhance the local availability of wood. It also creates income opportunities and empowers women and school graduates in their own communities, while promoting environmental awareness and supporting long-term well-being outcomes for whole communities.

Source: [Green Belt Movement](#).

Managing fisheries to promote livelihood resilience in the Pacific



The MiCOAST project is an initiative funded by the KIWA Initiative and implemented by OneReef Worldwide Stewardship. It aims to address the impacts of declining fish stocks, habitat degradation, pollution, and climate change on fisheries in Micronesia, the Marshall Islands, Nauru, and Palau, which support livelihoods, food security, cultural values, and well-being of hundreds of thousands of local residents, reducing the drivers of outmigration. The project empowers coastal fishers and other community members, traditional and local government authorities, and community organizations to collaboratively identify and shape climate-resilient measures and improve the management of coastal ecosystems. It supports sustainable fisheries practices, introducing climate-smart measures and strengthening marine protected areas. By leveraging the IUCN Global Standard for NbS, it also supports the upscaling of effective responses and the integration of relevant principles in local policies.

Source: [MiCvoast](#).



In village halls across the Pacific, Nature-based Solutions take shape through dialogue, local knowledge and collective decision-making. Community voices remain central to how these solutions are designed and sustained. © Ludovic Branlant SPC

IOM's environmental rehabilitation for peacebuilding in Somalia



IOM Somalia's Environmental Peacebuilding (EP) programme promotes sustainable peace through integrated approaches to natural resource management, environmental rehabilitation, inclusive governance, and community dialogue in fragile and conflict-affected areas. The program builds on assessments of environmental and conflict risks, supporting community-led natural resource management plans, interventions to restore degraded riverbanks and rangelands, and the strengthening of local governance mechanisms to mediate disputes—particularly between herders and farmers.

More specifically, the program adopts regenerative agriculture techniques and is complemented by the establishment of seed banks and networks, including a flagship government-endorsed seed bank at the City University of Mogadishu, with the objective of enhancing food security, biodiversity, and community-led stewardship of climate-resilient seeds. By actively engaging youth and women in environmental governance and sustainable livelihoods, the program supports preparedness, fosters inclusive recovery, and reinforces the role of communities and institutions as co-owners of peace, resilience, and sustainability.

Source: IOM project database.

Promoting resilience of pastoral communities in Morocco



Two pastoral communities in Azilal province, Morocco, located in a mountainous region of the High Atlas and dependent on high-altitude forests, benefited from a CCA project aiming to provide a stable ecological foundation for their livelihood system in the face of climate change. The two douars (villages) of approximately 2,000 people are surrounded by the region's endemic tree species. In response to the impacts of climate change on the intensification of temperature and droughts, the project introduced climate-resistant fodder and rehabilitated the hardy *Juniperus thurifera* tree, while implementing sustainable collective resource management structures at the local level.

Source: UNDP, CBA Morocco: Resiliency through Sustainable Farming/Forestry Strategies in Azilal Province (Zakoura).

4.2 Reducing Disaster and Climate Risks in Places of Origin

Sudden- and slow-onset disasters are major drivers of new displacements globally, posing immediate and long-term threats that force people to flee in order to save their lives and seek more sustainable prospects. NbS, including ecosystem-based DRR and CCA, can be effective approaches to reduce disaster and climate risks through a wide range of interventions that often mitigate hazards while providing co-benefits that strengthen community resilience. Many of these initiatives, for instance, generate local employment opportunities for people across different skill and education levels, providing immediate benefits for household incomes.

NbS for risk reduction can be implemented as standalone interventions or integrated into broader programs that include more traditional measures (e.g. hard infrastructure for hazard mitigation, inclusive early warning systems and preparedness, and

insurance schemes). The palette of options available is inherently context-specific and depends on local ecosystem characteristics and the types of hazards communities face. The benefits of such programs may be particularly pronounced in settings characterized by high hazard exposure but low hard-infrastructure density (e.g. rural floodplains, coastal fishing villages). In these high-vulnerability, low-coping-capacity locations, relatively modest ecological investments can yield disproportionate gains in safety and habitability compared to expensive grey infrastructure.

Similar to the interventions discussed in Section 5.1, these approaches are rarely designed explicitly to reduce displacement risk. However, they can be strategically targeted to cover high-risk areas where large displacements are expected in the event of a disaster. By preventing and mitigating hazards and addressing underlying vulnerability conditions, such interventions nonetheless contribute significantly to reducing the impacts that trigger disaster- and climate-related displacement.

Building with Nature in Indonesia



The initiative “Building with Nature Indonesia” seeks to build stable coastlines with reduced erosion and flooding risk through an integrated approach combining mangrove restoration, small-scale hard engineering, and sustainable land-use practices. Implemented in Central Java, the intervention aims to enhance coastal security for 70,000 vulnerable people while supporting pathways to sustainable economic development.

Disaster risk in the area is largely driven by the removal of mangrove belts for aquaculture development, unsustainable coastal infrastructure, and excessive groundwater extraction. In response, the initiative supports the construction of permeable dams made of brushwood that capture sediment and create the conditions for the spontaneous regeneration of mangroves. As mangroves recover, they provide protection to the hinterland against flooding and further coastal erosion. This approach is paired with the support for sustainable aquaculture practices, which help free up space for mangrove restoration.

Source: [Building with Nature in Indonesia](#) (2016).

Reducing landslide risk in Haiti



In the heavily degraded landscape of Haiti, severely affected by recurring landslides and floods (often associated with the impacts of hurricanes), IOM carried out extensive DRR efforts through hybrid hazard mitigation programs around urban communities and rural areas, including areas hosting Internally Displaced Persons (IDP) sites, with strong ecosystem-based components. Grey infrastructure was coupled with reforestation, greening of slopes, and sustainable watershed management to provide modular, scalable interventions that can be adapted to site-specific needs. IOM promoted the construction of hundreds of km of small stone check dams and the digging and greening of contour canals and micro-basins to reduce water runoff and soil erosion, and planted millions of trees to further stabilize the soil.

Over the years, activities were carried out in collaboration with the Directorate for Civil Protection and local authorities at the commune and neighborhood levels. Many of these initiatives were labor-intensive and were supported through cash-for-work projects, often employing people displaced as a result of disasters in Haiti, including hurricanes in 2004 and 2008 and following the 2010 earthquake in Port-au-Prince.

Source: IOM, [Compendium of IOM Activities in Disaster Risk Reduction and Resilience](#) (2013).

Strengthening Community Resilience to Flooding in the Lake Tanganyika Basin



In Burundi, IOM is implementing NbS in Ntakangwa Commune, with a specific focus on the most flood-prone areas, where the seasonal overflow of the Kinyankonge River recurrently affects and displaces communities. These interventions adopt an area-based approach to restore degraded ecosystems and protect flood-prone areas, while promoting socio-economic empowerment for vulnerable individuals.

Community members were selected with a women empowerment lens and through a participatory community validation process to take part in a Cash-for-Work (CfW) program. Selected individuals then led the planting of trees and stabilizing grasses on the Kinyankonge River banks to mitigate floods, reduce erosion, and restore soil integrity. Specific NbS measures were identified and validated by local communities, local leaders, and key stakeholders (including the Burundian Red Cross, women's environmental associations, and representatives from CRS and FAO) through a series of community consultations.

Source: IOM, [Restoring Hope and Ecosystems through Nature-Based Solutions in Buterere, Ntakangwa Commune](#).



Mangrove planting is a practical Nature-based Solution, helping restore coastlines while supporting fisheries and strengthening community resilience. © Ludovic Brantant SPC

Enhancing Coastal Protection in Fiji



Fiji's coasts are among the areas most affected by climate change globally, with tens of thousands of people expected to suffer from flooding risk due to sea-level rise and more frequent storms. Sustainable coastal protection is a priority countrywide. Hybrid solutions that strengthen grey infrastructure through NbS have been implemented to this end. Seawalls are paired with and protected by restored coastal habitats and ecological engineering measures (e.g. planting of mangroves and grasses) as a first line of defense against inundation. Grasses are also used to stabilize the seawalls, extending their longevity. The projects are supported through private sector engagement and community participation in planning and implementation.

Source: [Hybrid Nature Based Solution Seawall](#).

Indigenous Women leading mangrove restoration in the Philippines



The communities of Busuanga Island, the Philippines, are vulnerable to recurring typhoons and climate change impacts. The island was designated as a Natural Reserve in 1981; however illegal logging severely decreased mangrove cover. In November 2013, when Typhoon Haiyan hit the island, the remaining mangroves provided little protection against strong waves and wind, and the storm severely damaged houses and assets, leading to significant displacement. The community realized that mangroves could have shielded them from these impacts, so Indigenous women volunteered as citizen scientists to restore mangroves. Since 2014, they have revitalized 159 hectares of bare coastal patches across Busuanga Island. Indigenous men and women are also mobilized to volunteer as coastal guards to ensure the protection of the newly restored mangroves.

The initiative was strengthened through an ordinance banning further mangrove forest clearing. The community also partnered with the Busuanga municipal government to craft a mangrove conservation plan to form part of the municipality's comprehensive land-use plan.

Source: IOM, *Investing in Resilience: Blue Carbon Ecosystems, Communities, and Finance for the Indo-Pacific* (2024).

Women's Union-led Agroforestry for Drought and Flood Resilience in Viet Nam



Communities in Viet Nam's Central Highlands have faced intensifying climate pressures marked by prolonged droughts, erratic rainfall, and severe flash floods, particularly affecting ethnic minority smallholders reliant on coffee, pepper, cassava, and subsistence crops. From the late 2000s onward, rising temperatures and unpredictable monsoon cycles degraded soil fertility, reduced groundwater recharge, triggered landslides on deforested slopes, and destabilized crop yields—pushing households toward income insecurity and seasonal migration to lowland cities. Women here are responsible for seed selection, food crops, home-garden management, and post-harvest care, giving them detailed ecological knowledge of seasonal changes, soil behavior, and crop stress. Beginning around 2014–2016, provincial branches of the Viet Nam Women's Union (VWU) partnered with forestry and agricultural agencies to pilot agroforestry schemes. These initiatives introduced mixed tree–crop systems, contour planting, shade-adapted coffee varieties, and native forest tree integration to restore watershed health and stabilize soils. Through VWU-led training groups, women became leaders in seedling nurseries, slope-stabilization planting, water-saving techniques, and mixed-tree farm management, ensuring long-term maintenance of agroforestry systems. Their participation also enhanced household resilience, as diversified agroforestry plots provided year-round food and income streams, reducing the need for men or youth to migrate for seasonal labor. Importantly, the VWU integrated gender-responsive planning, addressing constraints such as access to land titles, credit, and training—barriers that historically limited women's ability to adopt climate-resilient practices. By elevating women as decision-makers and resource managers, the agroforestry NbS not only strengthened ecological outcomes but also improved equity, reduced livelihood vulnerability, and increased community-wide adaptive capacity. By the early 2020s, these NbS interventions improved drought resilience, reduced flood runoff, expanded soil moisture retention, and diversified incomes—lowering the economic drivers of rural out-migration in climate-stressed districts.

Source: United Nations Convention to Combat Desertification (UNCCD) and United Nations Food and Agriculture Organization (FAO), *Women-led solutions for drought resilience* (2024).

4.3 Enabling Post-crisis Recovery and Sustainable Return and Reintegration by Improving Environmental Conditions

The feasibility and sustainability of return to areas affected by disasters, climate change, and other crises depend fundamentally on local environmental conditions. Return cannot constitute a durable solution in locations exposed to unmanageable disaster and climate risks, undergoing irreversible processes of environmental degradation, or unable to sustain viable livelihoods, essential services, and stable communities. By contrast, restoring or protecting healthy and productive ecosystems can help relieve the pressures that initially triggered displacement or that continue to impede return and reintegration.

NbS can therefore support return and reintegration in a holistic manner, delivering benefits across all elements of durable solutions. By improving environmental

conditions and livelihood opportunities, NbS can make return to areas of origin more viable and desirable for displaced persons and migrants while also addressing conditions that may lead to secondary or repeated displacement. Many such programs generate both immediate and long-term opportunities for employment, entrepreneurship, upskilling, and income generation for returnees. They also support social and psychosocial reintegration and help improve the material and immaterial conditions of both returnees and community members who were not displaced.

A growing number of NbS initiatives explicitly target returnees, with interventions implemented both prior to and following return. These programs aim to create the conditions necessary for reintegration and durable solutions while supporting more sustainable post-crisis development in areas of origin.

CASE STUDIES

Sustainable agriculture in Senegal



Following the 2004 peace agreements that settled the conflict in the Casamance region in southern Senegal, women who returned to their villages of origin established farmers' organizations and networks to support recovery and development. To encourage such bottom-up initiatives, the New Field Foundation developed a program between 2006 and 2012 that awarded community grants to such groups to support the use of sustainable technologies and knowledge in farming. The grants allowed the purchase of seeds, livestock, and basic farming equipment, and the registration of land ownership for collective farming activities. Moreover, they introduced simple machines to lower women's labor burden and new cultivation techniques to protect soil cover. This enabled a transition to a more prosperous, sustainable production model, with greater benefits for women, their children and families, and their whole communities.

Source: Consultative Group on International Agricultural Research (CGIAR), "Three decades after being displaced by conflict, Senegalese communities return to find the climate changed things, too".

Strengthening livelihoods through environmental rehabilitation in Ethiopia



In Ethiopia, disasters and conflict drive frequent, recurring displacement. To facilitate durable return to crisis-affected areas, IOM focused on reversing land degradation and enhancing tree cover to support environmental and socioeconomic resilience. Using an integrated watershed approach, the organization rehabilitated 20 hectares of severely degraded land through soil and water conservation techniques such as hillside terracing, trenches, micro-basins, and the preparation of over 14,000 tree planting pits. These interventions significantly improved soil moisture, reduced erosion, and facilitated the regrowth of vegetation.

A key component of the project was tree planting: over 2,000 fruit and multipurpose seedlings, including apple, mango, avocado, eucalyptus, grevillea, and acacia, were cultivated in a community nursery and distributed to beneficiaries. Returnees and community members from other vulnerable groups were trained on planting and caring for the trees. The planting areas were then protected from grazing and farming, including through the establishment of local watershed management committees. This approach has produced positive impacts on the local ecosystem, while also improving access to water, food, and alternative livelihoods for returnees and other local residents.

Source: EU-IOM Knowledge Management HuB, [Reintegration Assistance Good, Promising and Innovative Practices](#) (2022).

Facilitating Environmental Community Action through Forum Theater in Kenya



Sponsored Arts for Education (S.A.F.E.) Kenya is a Kenyan non-governmental organization that uses theater, film, and education to inspire environmental change. It focuses specifically on Kenya's Kwale County, which has been heavily affected by droughts and floods. The organization stages interactive performances to raise awareness of environmental and social challenges (and related solutions), using local stories and narratives. It then holds planning meetings with communities, which lead to the establishment of training sessions and activities on soil conservation, prevention of erosion, and drought management. Notably, the organization has supported the establishment of nurseries of indigenous climate-resistant trees and the adoption of woodlot farming. The organization also supports the upskilling of community members as forest and agricultural officers to ensure long-term local stewardship of relevant programs, and the sustainability of their benefits.

Source: Sponsored Arts for Education (S.A.F.E.) Kenya, [Facilitating Environmental Community Action Through Forum Theater](#) (2023).

Supporting migrant reintegration through land restoration in Niger



Under the Sustainability, Stability and Security Initiative (3S Initiative), IOM, with the support of the United Nations Convention to Combat Desertification (UNCCD), implemented a community stabilization project focusing on migrant reintegration and countering radicalization in the region through the creation of jobs related to the restoration of degraded lands in Agadez, Niger. The Agadez area is among the most affected by desertification in Niger, and migration is central to its economy: local residents leave for national and international destinations, while local businesses provide catering, transport, and accommodation for migrants in transit. Increasingly strict immigration policies in countries of transit and destination have, however, progressively reduced options to migrate in a safe, orderly, and regular manner.

In response to this challenge, IOM has started conducting training sessions in sustainable land management and sustainable agriculture for returnees, migrants in transit, and former smugglers. These sessions take place in plots allocated by the city of Agadez, which can therefore be restored, improving local conditions and providing further opportunities for local employment and income. Beneficiaries also have access to accommodation, medical care, preparation of travel documents, psychosocial support, recreational activities, and vocational training in business management. Overall, the project aims to provide migrants with alternative options to earn a living and contribute to the development of their areas of origin upon their return.

Source: IOM, [Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification](#) (2019).

Mangrove restoration in Colombia



In Colombia's Caribbean region, 'Guardianes del Mangle' (a local committee of environmental volunteers) has been operating to manage local waste, ensure livelihood security, and promote social cohesion in areas affected by conflict and displacement in past decades. The committee brings together volunteers from local communities of fishermen, victims of violence, displaced persons, and returnees to preserve and restore the local mangroves, while promoting community cohesion and a sense of place for all local residents. Over time, the work has been supported by local authorities and the UN Refugee Agency (UNHCR), and participants have been benefiting from specific resources and capacity building.

Source: Guardianes del Mangle.

Constructed wetlands for wastewater treatment in Iraq



Iraq faces considerable challenges in wastewater management, due to rapid population growth, affected by displacement and returns, climate change, increasing water scarcity, and limited wastewater treatment capacity. In the south of the country, in the Islah region, IOM and the UN Environment Programme (UNEP) are developing constructed wetlands as a nature-based, low-cost, climate-resilient alternative to conventional wastewater treatment systems, requiring reduced maintenance and no highly specialized professionals to operate. The system serves an approximate beneficiary population of 30,000, harnessing natural processes to purify water without external inputs (chemicals or energy), while supporting environmental restoration and local biodiversity and creating benefits for local agriculture and rural livelihoods.

Source: IOM project database.

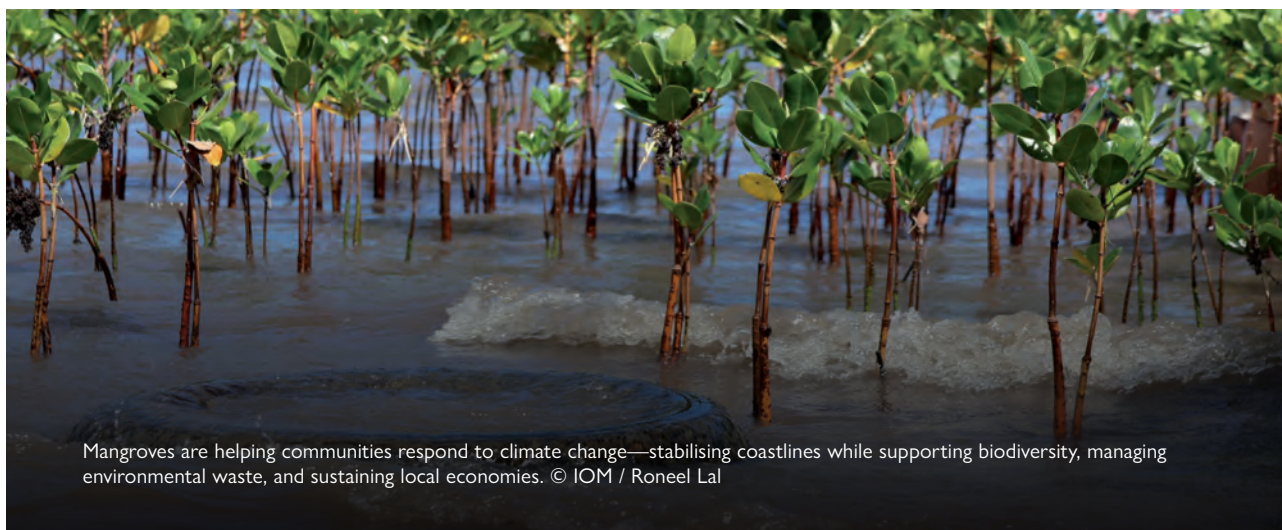
WASH services in communities of return in Sudan and South Sudan



Communities on the border between Sudan and South Sudan have limited or no access to safe water and suffer from inadequate hygiene conditions. These precarious conditions have only been worsened by the return of displaced persons and the arrival of nomadic pastoralists. WASH interventions were essential to enable their sustainable return and reintegration, alleviate pressures on natural resources and community services, and reduce the risk of secondary displacement for local communities.

In response to these challenges, IOM constructed and rehabilitated water points to improve access to safe water, establishing water management committees to sustainably manage relevant resources, and facilitate inter-communal dialogue.

Source: IOM project database.



Mangroves are helping communities respond to climate change—stabilising coastlines while supporting biodiversity, managing environmental waste, and sustaining local economies. © IOM / Roneel Lal

4.4 Reducing and Managing the Pressures on Ecosystems and Natural Resources Due to the Inflow of Migrants and Displaced Persons, and Related Social Consequences

Any population movement translates into demographic shifts, leading to the more or less rapid concentration of people in areas of destination. This phenomenon has environmental implications, as it inevitably leads to an increase in demand for natural resources and pressures on ecosystems that underpin the local provision of other goods and services. Whenever such an increase is not managed properly (which is exceedingly difficult in the case of massive, unplanned movements), it can have tangible biodiversity consequences, notably in the form of rapid environmental degradation (e.g., deforestation, erosion, and loss of topsoil cover, and loss of biodiversity). Such consequences are typically visible in and around displacement camps, migrant transit sites, and rapidly urbanizing areas. They can, however, be present in areas of destination of more dispersed migratory flows, too — or even in the case of planned relocation operations implemented without environmental safeguards.

In some cases, responses to these population flows can trigger or accelerate environmental degradation. This may occur, for instance, when displacement sites are designed or established without due consideration for local hydrological conditions; when displaced persons are compelled to rely on local natural resources, such as wood or soil, for shelter

construction; or when WASH services are provided without adequate attention to the availability of local water resources and the sustainability of their use.

All these environmental impacts can have significant indirect social and economic consequences by increasing the scarcity of local resources (e.g. water, fertile land, wood for fuel and construction) and by undermining the capacity of the local environment to deliver essential services (e.g. wastewater treatment). Such dynamics can erode local living standards for both newcomers and host communities, destabilize livelihood systems and ways of life, and heighten the risk of resource-related conflicts between communities.

Integrating NbS in the response to and management of population flows can help reduce, address, or even reverse environmental pressures. Such approaches can support interventions that safeguard the availability of resources and services for all local population groups while promoting stability and peace through inter- and intra-communal dialogue and shared prosperity. However, contexts featuring rapid, large-scale population inflows are operationally challenging. The arrival of significant numbers of newcomers can strain the capacities of local ecosystems and offset any environmental gains generated by NbS. Moreover, it can also require additional efforts to fully meet the standards of equity, inclusivity, and governance that are key to successful NbS implementation — which may be particularly difficult to coordinate in a humanitarian response context featuring additional humanitarian actors.

CASE STUDIES

Promoting environmental stewardship and social cohesion between host and migrant fishing communities in Kenya



Bahari Hai is a not-for-profit marine conservation organization based in Kilifi County, Kenya. It works with coastal communities (and in partnership with local authorities) to protect the marine environment they depend on for livelihoods and lifestyles, empowering them to be stewards and custodians of local natural resources. Notably, in the Watamu Marine National Park, Bahari Hai has faced increasing pressure on local resources, with tangible biodiversity impacts, due to the inflow of migrant fishermen, pushed north from a combination of climate change and overfishing in other areas.

The organization has engaged migrant and local fishermen to promote participatory solutions for the effective management of fishing stocks. Notably, it organized a 'Fishing Gear Exchange' project to train migrant fishermen and provide them with legal fishing gear that reduces bycatch and the depletion of fish stocks. The organization also supports local communities in identifying and protecting breeding grounds and monitoring local biodiversity. Lastly, the organization supports the development of specific areas as ecotourism sites, providing alternative livelihoods to fishermen and other groups. These initiatives also promote social cohesion among migrant and indigenous groups.

Source: Bahari Hai Organisation, [Promoting Environmental Stewardship and Social Cohesion Between Host and Migrant Fishing Communities](#) (2023).

Promoting nature-based urban design in Aotearoa/New Zealand



The NUWAO (Nature-based Urban Design for Wellbeing and Adaptation in Oceania) project focuses on NbS for expanding urban environments across Aotearoa/New Zealand and Pacific Island cities. It is led by researchers at Te Wānanga Aronui o Tāmaki Makau Rau (AUT) in Auckland and Te Herenga Waka Victoria University in Wellington, funded by a Royal Society of New Zealand Marsden Grant. NUWAO works with urban communities in urban and peri-urban areas, including Lower Hutt (Te Awakairangi) and Ōtepoti (Dunedin), to co-design nature-integrated urban design strategies that enhance climate adaptation, wellbeing, and ecosystem health in towns and cities where ecosystems have been progressively degraded through population growth and urbanization. Relevant lessons and approaches are also applied in other urban areas around the Pacific, including Apia (Samoa), Tarawa (Kiribati), Port Vila and Lenakel (Vanuatu), and Nouméa, Koné, and Lifou (New Caledonia). Across all these contexts, the initiative places Indigenous knowledge at the heart of urban NbS planning and design, supporting climate resilience through green infrastructure, urban green and blue spaces, and community-centered planning.

Source: Nuwao.



Mangroves are one of the Pacific's most effective natural defences—reducing coastal erosion, supporting local communities, and storing carbon where it matters most. © SPC



Reversing deforestation around displacement sites in Cox's Bazar



Deforestation has been one of the most visible impacts of the arrival of Rohingya refugees in the Cox's Bazar area in Bangladesh, with over a million newcomers putting pressure on local forests for fuelwood and construction materials, resulting in the degradation of thousands of hectares of forestland and threatening wildlife, biodiversity, and ecosystems. In response, a diversity of interventions has tried to reverse deforestation and rehabilitate local ecosystems. Since May 2016, the local NGO Community Development Centre (CODEC) has worked to engage local community members in the planting of homestead vegetation such as fruit-bearing trees and the distribution of improved cookstoves that reduce fuelwood consumption by 40 percent (also curbing indoor smoke emissions). This has eased pressure on remaining mangroves in the area, as the demand for fuelwood has declined significantly.

The Food and Agriculture Organization of the United Nations (FAO), instead, has planted millions of trees in and around camps in collaboration with the local Forest Department. The approach aims to stabilize land by promoting the planting of various fast-growing indigenous species. Refugees were involved through a cash-for-work initiative and played a crucial role in supporting land rehabilitation through the planting and care of trees, shrubs, and grasses. Additional measures also included protecting elephants and preventing hazardous interactions with local wildlife.



A community member in Gakenke, Rwanda, participating in an IOM and REMA initiative focused on reforestation and environmental awareness. © IOM 2024 / Wendy Gloria Adhiambo

IOM sustainability programming in Rwanda



In collaboration with the Rwanda Environmental Management Authority (REMA), IOM implemented a sustainable rural development project in areas affected by displacement. The activities focused on the provision of more efficient energy solutions (i.e., improved cooking stoves that reduced overreliance on local fuelwood), reforestation through the planting of indigenous and fruit trees, and community-based environmental awareness. Living conditions of beneficiaries from both the local and mobile groups improved, as did the relationships between the two groups following community involvement and coordination in project design and implementation.

Source: IOM project database.

Promoting clean energy technologies for IDPs in Malawi



IOM implemented a project in Malawi to expand access to clean cooking energy for displaced persons and host communities, aligning with the country's climate mitigation goals. The project promoted the use of biomass briquettes and energy-efficient stoves to reduce forest degradation and support sustainable livelihoods. A production facility, managed by displaced persons, was set up to convert agricultural residues into fuel pellets. The project also built a community-based energy supply chain by training beneficiaries in briquette and stove production, benefiting both displaced persons and host communities through clean energy access, skills development, and reduced social risks for women and youth.

Source: IOM project database.

Promoting the resilience of climate migrants in Madagascar



The project in Madagascar's Menabe region aimed to support the government in protecting biodiversity-rich areas like the Aire Protégée Menabe Antimena (APMA) and enhancing the climate resilience of migrant and host communities. Driven by agricultural potential, mass migration to the region has led to land pressures and deforestation, sparking inter-communal conflict. The project addressed these challenges by restoring degraded land in the Lower Tsiribihina area, building awareness and capacity around the links between migration, climate change, and environmental sustainability, and promoting collaborative conflict resolution and bushfire management. It also fostered social cohesion and joint stewardship of protected areas among migrants and host communities.

Source: IOM, [Strengthening Climate Resilience in Madagascar: Community Dialogues on Protected Area Preservation](#).

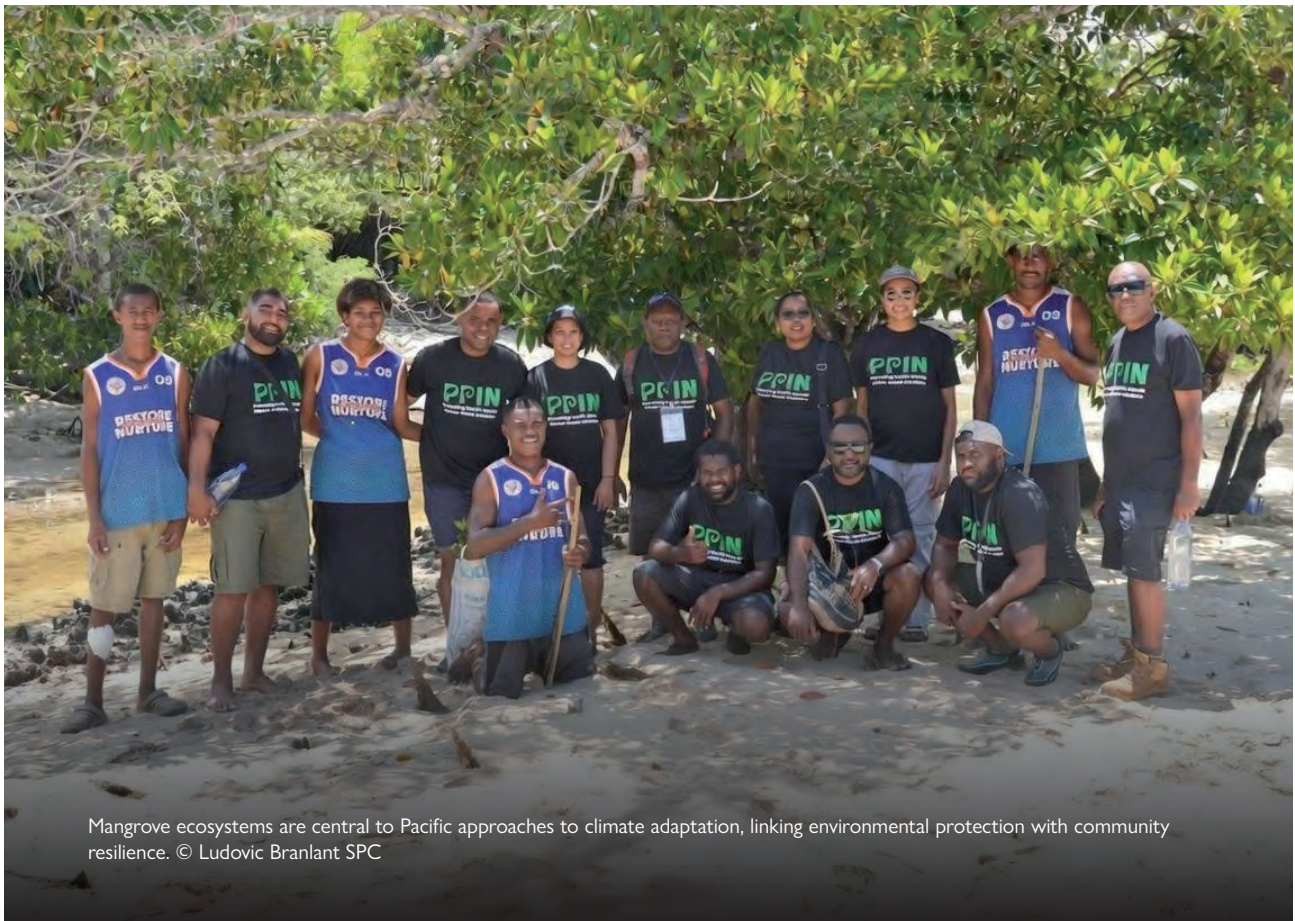
Protecting and rehabilitating land to increase food security in Madagascar



In Southern Androy (Madagascar), drought precipitated underlying food, water, and livelihood insecurity, pushing many people to migrate toward regions where natural resources were available. Boeny, one of the most productive rice regions in the country, is one of the typical destinations of these flows. However, the arrival of migrants has translated into additional pressures on forests, water, and land.

To address this issue, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) implemented the "Protection and Rehabilitation of Land to Increase Food Security" project to support tenure security, land rehabilitation, and conservation. The project established an inventory of land occupation, identified and allocated unregistered and available parcels to meet the needs of different community groups, and introduced interventions to reduce soil erosion and promote the sustainable management of natural resources. This allowed for the simultaneous reduction of the environmental pressures resulting from the arrival of migrants and related demographic growth, and the addressing of drivers of further outward migration.

Source: IOM, [Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification](#) (2019).



Integrated Watershed Management to counter fragmentation of ecosystems in the Pacific



In several countries in the Pacific, the WISH+ (Watershed Interventions for Systems Health Plus) initiative, coordinated by the Wildlife Conservation Society and funded through the KIWA Initiative, applies a holistic, ridge-to-reef approach to strengthen climate resilience, biodiversity conservation, and human health. The program targets areas suffering from biodiversity loss and environmental degradation as a consequence of urbanization and related fragmentation of ecosystems.

WISH+ builds on participatory planning to combine ecosystem-based adaptation measures such as forest and wetland restoration, mangrove, and coral reef protection, and enhanced water management to support improvements in ecosystem and human health and well-being. The initiative produces direct benefits, including livelihood and food security and improved access to clean water, sanitation, and hygiene services, as well as longer-term ones through capacity building, awareness, and education of local populations on sustainable ecosystem management and ecosystem-based risk reduction.

Source: [Promoting Pacific Islands Nature-based Solutions](#).



A migrant worker from Myanmar tends to an agricultural field in Mae Sot, Thailand. Migrant populations frequently fill critical labor gaps in sectors like agriculture and construction, which are often highly exposed to environmental and climate risks. © IOM 2023 / Muse Mohammed

4.5 Reducing Risk in Areas and Sectors where Migrants and Displaced Persons are Concentrated

Due to the specific social, economic, cultural, and administrative challenges they face accessing resources, networks, and opportunities for decent income and housing, newcomers to a given area — including migrants, displaced persons, and relocated communities — often have little choice but to live in particularly hazardous locations, and work in especially hazardous occupations.

Population flows, especially when rapid, unplanned, and unmanaged, often result in the concentration of people and assets in substandard housing within underserved areas that are highly prone to flooding, landslides, fires, and heatwaves. Intensified land-use practices and environmental degradation associated with sudden population inflows further compound these issues, creating conditions for more frequent and severe socio-natural hazards. As a result, disaster and climate risk hotspots emerge in areas of destination, with rapidly growing urban centers being of particular concern.

The nature and location of employment are also key factors shaping people's exposure to natural hazards and their impacts. Migrants and displaced persons

are often overrepresented among the workers in sectors that are particularly affected by both sudden-onset disasters and slow-onset impacts stemming from environmental degradation and climate change — including construction, agriculture, and fisheries — raising specific concerns related to their physical safety and security of livelihoods and incomes.

NbS can be an effective approach to reducing several of these specific risk factors. When integrated into land-use planning and development in areas of destination, NbS can help mitigate hazards and their impacts whilst protecting all residents, including migrants and displaced persons. They should also be considered as part of planned relocation schemes, supporting sustainable resettlement of communities in areas of destination. NbS can further be considered in workplace arrangements to improve living conditions for the whole workforce — particularly in the hazardous sectors in which migrants and displaced persons are often concentrated. Their cost-effectiveness makes NbS a viable solution in all development contexts — including low-income and informal settlements in developing countries. Concurrently, their multifunctional nature allows them to reduce immediate risks while supporting longer-term sustainable living and livelihoods.

CASE STUDIES

Nature-based Solutions in Nairobi's Kibera slum



Sixty percent of Nairobi's population lives in informal settlements, including in inner-city areas such as Kibera, one of Africa's largest settlements, which has rapidly expanded through both internal growth and immigration. Kibera is crossed by the Ngong and Nairobi Rivers, and many of its residents live in flood-prone areas — a situation that has worsened by open sewers that has resulted in deadly disasters over the years. Kibera is also, on average, less forested and significantly warmer than other parts of the city.

NbS have been adopted in the area to reduce disaster and climate risk. The Green Storm Infrastructure Project and the Kibera Public Space Project are examples of such approaches. The former supported the cleaning of rivers and the planting of trees and grasses along riverbanks to reduce riverine flooding. Additional benefits included the reduction of malaria prevalence and the availability of fish for household consumption. The latter established a network of community-designed and managed public spaces to address drainage, sanitation, and flood protection challenges. Together with other initiatives promoting green roofs and walls, as well as vegetable gardens, these activities have led to a perceived reduction in temperatures during heatwaves. Afforestation has also reduced wind strength, helping to protect vulnerable infrastructure.

Source: [Science Direct](#).

Nature-based Solutions in Buenos Aires' Villa 20



Buenos Aires hosts a diversity of unplanned settlements, where societal issues intersect with environmental challenges to put people at risk of floods and heatwaves. The city's housing deficit has led many newcomers to settle in informal settlements, including Villa 20, which is today one of the least forested neighborhoods in the city. NbS have been implemented in the area part of broader efforts toward urban upgrading, supported by both local investments and policies as well as initiatives by external actors, with the objective of addressing the lack of access to recreational spaces, the limited supply of water, and limited local capacity to treat wastewater.

Over the past few years, the area was re-greened through the introduction of native trees and shrubs, and by replacing concrete with permeable pavements. Natural canopies, vertical gardens, and home gardens were installed throughout the settlement, through a plethora of initiatives by community-based organizations, supported by technical capacity building and institutional engagement by local authorities. The benefits of these interventions have included access to amenities, improvement of air quality, improved health, and a reduction of urban heat.

Source: [Science Direct](#).

Ecosystem-based adaptation in United Republic of Tanzania's refugee camps



The United Republic of Tanzania's Kigoma Region hosts a population of approximately 2.4 million, with over 190,000 refugees, mainly concentrated in the Nduta and Nyarugusu camps. The areas around these settlements are being rapidly degraded, leading to disaster risk and sustainability concerns — especially in the face of climate change impacts. In response to these challenges, UNEP is implementing a large ecosystem-based adaptation program, specifically targeting landscapes hosting displaced populations.

Interventions include flood and soil erosion control through an integrated approach that uses green and gray infrastructure to reduce runoff, encourage water infiltration, and protect settlements from floods. Such interventions also support increased water harvesting, storage, and irrigation, reducing dependence on rainfed agriculture and enabling livelihood diversification. Participatory land use plans are developed to promote dialogue and sustainable management of local resources, while agroforestry and afforestation are implemented to preserve and restore local forest ecosystems.

Source: UNEP, [Project Factsheet: Ecosystem-based Adaptation in Tanzania 2024-2029](#).

Nature-based Solutions implementation in informal settlements in Thailand



Internal and international migration to Bangkok has contributed to the city's housing and land scarcity, resulting in the growth of informal settlements. The Baan Mankong Housing Programme aimed to use communal resources to provide formal housing, secure livelihoods, and amenities to local residents through an integrated approach that included NbS. Temperature regulation, recreational activities, and health and well-being benefits were all achieved through the implementation of this program.

Source: Science Direct, [Aligning nature-based solutions and housing policy: A study on stakeholders' perceptions of nature within informal settlement upgrading projects](#).

4.6 Protecting and Restoring Ecosystems in Depopulated Areas of Origin

Population outflows also have significant social and environmental consequences in areas of origin. In some cases, these impacts may be positive for the environment, for instance when demographic change reduces population pressures on local ecosystems. However, the reduced availability of skilled labor and the disengagement of migrant and remittance-receiving households from community-based natural resource management practices can also contribute to ecosystem degradation. This is especially evident in cultural landscapes shaped by centuries or millennia of interaction between communities and their environment, such as mountain pastures, terraced hillslopes, and managed forests. Some of these ecosystems are highly biodiverse and productive, yet may experience rapid degradation

following outmigration and demographic decline if key practices or infrastructure are not maintained. Such degradation not only reduces ecosystem productivity and the capacity of these ecosystems to support the livelihoods and well-being of remaining communities but also leads to biodiversity loss and an increased incidence of natural hazards, including landslides, floods, and fires, as environmental conditions change.

In many cases, these dynamics result in a vicious circle of migration, depopulation, ecosystem degradation, and eventual abandonment, driven by interconnected social, demographic, and environmental factors. NbS that maintain or preserve local ecosystems — while actively engaging local residents, creating livelihood opportunities, and improving future prospects — can help address these complex problems and support the long-term sustainability of livelihoods, lifestyles, and cultural practices in relevant locations.

CASE STUDIES

Reviving oases in Morocco and Tunisia



Oases in Northern Africa are areas of great ecological importance, as well as being traditional centers of economic activity. Overexploitation of natural resources in these areas has led to outmigration, while depopulation and abandonment, in turn, have resulted in further ecosystem degradation and created demographic conditions that challenge the maintenance and restoration of oases. Breaking this vicious circle is crucial both to fight desertification and to provide viable well-being prospects for local populations.

Morocco's project "Oasis Sud" aimed to address social and environmental risks, adopting a bottom-up consultation process to identify the priorities, constraints, and needs of local populations. The project built on traditional practices of water allocation to achieve sustainable water management and introduced new livelihoods through the development of sustainable tourism targeting women and youth.

In Tunisia, the Government adopted a strategy to revive local traditions and jobs, manage natural resources more sustainably, and ultimately reduce and reverse depopulation. Soil rehabilitation initiatives created new livelihood options, in particular for women and youth, such as the production of date honey and date jam.

Source: IOM, [Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification](#) (2019) and Global Environment Facility (GEF), [Revitalising Oasis Agro-ecosystems through a Sustainable, Integrated and Landscape Approach in the Draâ-Tafilalet Region \(OASIL\)](#).

Supporting traditional lifestyles in Lebanon terraced landscapes



Stone terraces are a key feature of traditional Mediterranean agro-silvo-pastoral ecosystems, enabling productive agriculture on hillsides and mountainous areas, including in Lebanon. Outmigration due to conflict and economic reasons, compounded by environmental challenges such as reduced rainfall and productivity, however, has led to the demographic collapse of entire rural communities. This has led to the progressive degradation of these traditional landscapes, some of which are recognized as UNESCO World Heritage sites due to their environmental and cultural value.

In response to these challenges, FAO worked to rehabilitate stone terraces in several areas of Lebanon. In collaboration with local farmers, damaged walls were identified and restored. Restored terraces were then replanted, with the selection of climate-resilient crops, including traditional fruit trees, and the use of agroecological processes. These interventions supported land restoration and livelihood sustainability for landowners and preserved local practices and cultural heritage while creating income opportunities for other community members, with the potential to slow down or reverse outmigration flows.

Source: IOM, [Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification](#) (2019).

Restoring rural ecosystems in Spain



In Spain's drylands, experimental farms have been established in areas abandoned following the establishment of industrial agricultural production that does not require large labor inputs. Relevant landscapes have been progressively degraded in the process. Innovative and traditional techniques have been implemented to restore these ecosystems while establishing viable but more sustainable agricultural production. By breaking soil compaction, establishing networks of interconnected ponds and swales to harvest water, reducing tillage, and using local contours to support biodiversity and promote soil moisture, these farms have managed to increase the availability of organic matter in the soil. Vegetation cover on the ground has also reduced the amount of water and pesticides needed by the plants — and the use of cover crops has further expanded harvests and supported livelihoods.

This has allowed for the re-establishment of more traditional land-use patterns and enabled the reversal of local depopulation processes.

Source: Millison, A., [How an Abandoned Village was Reborn in the Spanish Desert](#) (2025).

4.7 Enabling Migration as an Adaptation Strategy

Population movements are part and parcel of the strategies through which communities manage scarce environmental resources and adapt to climatic and environmental shocks and stresses when they happen. Such movements may take different forms across regions and environments, ranging from the transhumance of pastoralist communities following traditional routes in search of water and grazing grounds, to the rural-to-urban migration undertaken by members of rural households during the off-farm season or in response to disasters. Together, these movements underpin traditional and modern livelihoods systems, lifestyles, and cultures for communities all over the world.

However, as global and local environmental conditions change, human mobility is increasingly constrained by border policies and regulations,

while cultural and economic change pushes people toward sedentarization. Under these conditions, mobility can become more challenging and yield fewer benefits, as people are forced to move under more precarious circumstances to less productive areas with limited access to resources and opportunities, where their arrival intensifies competition with host communities and contributes to social tensions.

NbS can help address some of these challenges, both by restoring and maintaining environmental conditions *en route* that enable and support mobility, as well as by preserving and creating conditions in areas of destination that allow mobility to result in more positive outcomes for both people on the move and host communities.



A portrait of a Mongolian herder named Batbold, who survived a harsh winter through thorough preparation. © IOM 2019 / Sukhbat N.

Promoting sustainable land management in migration-prone areas in West Africa



West Africa is a region traditionally crossed by a diversity of transhumance routes, with humans and animals following seasonal cycles of water and pasture availability. Such movements, however, are now taking place against a backdrop of increasing environmental degradation — manifested through cycles of drought, land degradation, and desertification. In response to these challenges, West African countries (in particular Burkina Faso, Niger, and Senegal) received support to better analyze the nexus between population movements and sustainable land management, integrate it into their sectoral policies, and access finance to invest in relevant areas. The objectives of these investments include improving environmental conditions by slowing down and reversing land degradation, and preserving the sustainability of local livelihoods for both pastoralist and sedentary communities.

Source: Global Mechanism (GM) of the United Nations Convention to Combat Desertification (UNCCD), [West Africa: Promoting sustainable land management in migration-prone areas through innovative financing mechanisms](#).

The Great Green Wall and its peace dividends for nomadic herders and sedentary farmers in Chad



Chad's arid and semi-arid areas have long been populated by both sedentary and nomadic communities, with periods of scarcity routinely resulting in conflict over natural resources. Recently, such issues have been exacerbated by climate change and environmental degradation linked to resource overuse.

Half-moons have been dug for water harvesting and planted with thorny pioneer species. This has led to increased water infiltration and soil moisture, enhanced soil cover, and reduced temperature, sandstorms, and erosion. In just a few years, this model has proven effective in creating rich grasslands and food forests, allowing farmers to thrive through increased availability of food, water, wood for fuel and construction, and fodder (including for commercial purposes). In more mature sites, improved water harvesting has even led to the creation of fishponds, providing further food security and economic benefits.

In order to manage tensions with herders and to protect restored areas from grazing herds, these projects have been preceded by inter-communal processes to map land use. Pastoralists and their herds are kept out of farmland through ditches that mark the boundaries of the sites, but they benefit from increased availability of water and pasture, which are facilitated by increased water infiltration in project sites. The stability of these communities is a major co-benefit of these approaches.

Source: Millison, A., [How Africa's Great Green Wall is Solving an Ancient Conflict](#) (2025).

Protecting pastoralist mobility in Benin



Pastoralism represents one of the most successful livelihood strategies in resource-poor areas of Benin. However, it has become increasingly constrained due to the weakening of traditional governance over communal natural resources, restricted mobility, land fragmentation, sedentarization, and changes in agricultural production methods. This makes pastoralists increasingly vulnerable to resource scarcity, especially when compounded by droughts and other shocks. All interventions that secure access to resources and livelihood opportunities for these communities in places of destination also strengthen their adaptive capacity.



Herding families and their children work tirelessly during calving season amid increasingly long and harsh winters in Mongolia.
© IOM 2016 / Davaanyam D.

In Benin, a country that hosts pastoralists coming from Burkina Faso, Niger, and Nigeria, participatory approaches have been developed to ensure the sustainable management of natural resources, such as water and pasture, in their places of destination. Such approaches have enabled pastoralists to gain recognition despite their status as a marginalized ethnic minority, as well as access to land, resources, and opportunities. This has allowed the local economy and environment to benefit from their presence (e.g., the availability of dairy and meat, increased demand and supply of goods and services, and the provision of manure that can be used to fertilize the soil for cultivation), resulting in positive impacts on inter-communal relationships.

Source: IOM, [Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification](#) (2019).

4.8 Leveraging Material and Immaterial Remittances to Support Positive Environmental and Social Outcomes

The circulation of people — through temporary/seasonal migration, long-term/permanent migration, displacement followed by resettlement, and return — also underpins parallel material and immaterial flows between locations. Places of origin are typically the recipients of these flows, which include financial remittances (mainly money and some goods) and social remittances (ideas, knowledge, and practices). The environmental impacts of these flows can be both

positive and negative, leading either to innovations and investments that reduce pressure on ecosystems, support the sustainability of livelihood practices, and strengthen resilience, or to increased use of land and natural resources.

Encouraging the implementation of NbS by channeling relevant financial resources and promoting the circulation and adoption of appropriate practices can help minimize potential risks while maximizing the resilience and adaptation benefits of remittances. This often requires targeted capacity-building efforts and improved financial inclusion for groups most likely to remain in place, including, in many cases, women.

CASE STUDY

Leveraging diaspora investment for sustainable land management in Burkina Faso, Niger and Senegal



IOM and the UNCCD worked to promote soil conservation and the restoration and rehabilitation of degraded land by increasing investments from diaspora communities in sustainable land management in migration-prone areas. In the three target countries, the organization worked with local communities and authorities to identify opportunities for the diaspora to contribute to sustainable land management activities, supporting mechanisms for awareness raising and the channeling of finance.

Source: IOM, *Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification* (2019).

4.9 Leveraging Newcomers' Presence, Resources, and Ideas to Stimulate Innovation

In places of destination, the arrival of migrants and displaced persons can also generate important benefits, including increased labor availability, innovation and cultural change, and broader socioeconomic vitality. Incoming populations often constitute a workforce with specific skill sets that complement those of local populations and may bring familiarity with different practices and approaches — including in sectors where NbS can be more readily integrated. Their presence and know-how can therefore be leveraged to support innovative adaptation and resilience approaches through the design and implementation of NbS.

CASE STUDIES

Facilitating access to land for migrants and refugees in Uganda



Securing access to land for local communities is often a precondition for sustainable land management. In areas of destination of migrant and refugee flows, this also requires including newcomers in relevant schemes and addressing administrative and legal challenges related to their migration status. Uganda hosts significant numbers of refugees from neighboring countries (Rwanda, Burundi, and the Democratic Republic of the Congo). Since 2006, the country has guaranteed refugees the right to work and access land to support independent livelihood options.

A positive by-product of the implementation of this policy has been the widespread adoption of sustainable land management practices introduced by Rwandan refugees. Communities in the Kabale District, where more than half of the population is composed of immigrants or refugees, have adopted a wide range of sustainable practices (such as grass strips on terraces, water channels in valleys, check dams, and the planting of trees and creepers on bench terraces). The visible positive impacts of such practices have encouraged local community members to replicate them.

Source: IOM, *Addressing the Land Degradation – Migration Nexus: The Role of the United Nations Convention to Combat Desertification* (2019).



A displaced person tends to an irrigated farming plot in Baga Sola, Chad. Providing displaced populations and refugees with access to land, water, and seeds strengthens their livelihoods and enables them to actively contribute to sustainable land management and climate resilience. © IOM 2022 / Andrea Ruffini

Refugees regenerating land in Chad



Chad hosts a significant number of refugees from neighboring countries — over a million arrivals resulting from recent conflicts in Sudan. Faced with ongoing floods, droughts, and desertification, the Government of Chad has decided to involve them in a large-scale sustainable land management project, involving the digging and planting of half-moons to improve water harvesting and restore hundreds of thousands of acres of degraded land. The work of refugees has been supported by schemes to grant them access to land and has produced rapid results, increasing the fertility of local soil, enabling the cultivation of crops and trees that provide wood for fuel and construction. This has improved food security for refugees, generated additional incomes, and reduced conflicts over resources with host communities.

Source: Millison, A., [How Refugees are Greening the Edge of the Sahara](#) (2025).



IOM's MITSA project in Senegal and Cote d'Ivoire



The project was designed to contribute to the recognition of the positive role of agricultural labor migration in the development of NbS and the resilience of urban and peri-urban territories in West and Central Africa. Through a series of local initiatives in the two target countries, IOM aimed to gain a better understanding of the dynamics of agricultural migration in Dakar and Abidjan, and to propose income-generating solutions that respect the environment, as well as dignified and respectful conditions for migrant workers.

In collaboration with local organizations, IOM proposed capacity-building activities on sustainable farming to local and migrant farmers to integrate environmental protection principles into local productive practices. Such interventions (e.g., integrating horticulture with fish farming, poultry farming, and composting) led to a diversification of income sources, and improved water availability and soil fertility. The project also improved access to markets for agricultural produce and to land through the establishment of a food processing unit and the creation of savings and credit cooperatives comprising both local residents and migrants. Local communities of destination benefited from the project through an increased availability of locally produced food.

Source: IOM, MITSA Project.



Healthy mangroves protect shorelines, support food systems, and strengthen resilience to rising seas and storms across coastal communities globally. © SPC

5

INTEGRATING NATURE-BASED SOLUTIONS AND HUMAN MOBILITY: DESIGNING MUTUALLY REINFORCING APPROACHES

5. INTEGRATING NATURE-BASED SOLUTIONS AND HUMAN MOBILITY: DESIGNING MUTUALLY REINFORCING APPROACHES

This section examines potential limitations of NbS and the risks associated with their substandard design and implementation, with particular attention to how these factors may affect human mobility, outcomes, and related operational efforts. It then outlines a set of principles that can help to integrate NbS standards with a human mobility-centered perspective in order to support more effective programming that reduces such risks.

This analysis is relevant both for projects that are explicitly designed to contribute — directly or primarily — to more positive human mobility outcomes and for initiatives that influence human mobility drivers and outcomes more indirectly or implicitly.

5.1 Limitations and Risks of Nature-based Solutions and Their Relevance for Human Mobility and Related Work

NbS are framed as win-win interventions for both people and the environment. However, not all actions to protect, sustainably manage, or restore nature will inherently or automatically generate positive outcomes for people, society, and ecosystems.²⁷ A range of environmental, social, institutional, technological, and economic barriers can inhibit the viability and effectiveness of NbS.²⁸ The global standards

introduced in [Section 3](#) aim to support the design and governance of projects that effectively address societal issues without creating negative externalities. Achieving this objective requires close attention to how NbS affect population movements and their outcomes across places and over time. This section therefore highlights and categorizes key human mobility-related risks and limitations that can undermine the ability of NbS interventions to effectively deliver on intended societal benefits and address these challenges.

5.1.1 *Limitations Intrinsic to the Implementation or Effectiveness of Actions to Protect, Sustainably Manage, and Restore Nature, and Their Unintended Consequences*

- There may be limits to the extent to which NbS can effectively address societal issues associated with rapidly progressing or irreversible environmental challenges (e.g., in areas approaching the limits of adaptation, where ecosystem regenerative capacity and long-term viability may be exceeded potentially rendering the entire areas uninhabitable). Beyond underscoring the need to consider alternative or hybrid responses, these limitations raise complex questions about the cost-effectiveness of *in situ* adaptation for communities whose future scenarios are likely to involve migration, displacement, or relocation, as well as about

²⁷ In this section, a broader terminology is used, referring to “actions to protect, sustainably manage, and restore nature” to highlight that not all such activities actually qualify as “Nature-based solutions” — only those that also solve societal issues do.

²⁸ Science Direct, *The nature-based solution implementation gap: A review of nature-based solution governance barriers and enablers* (2025).

the rights of such communities to remain safely in place for as long as their homes remain inhabitable.

E.g., coastal areas that are immediately threatened by sea-level rise due to “locked-in” warming.

- The full benefits of NbS may only materialize long after their initial establishment, given the often significant time lag between implementation and the ecological maturity of restored and managed ecosystems.²⁹ Many NbS projects require substantial upfront time and labor, as well as ongoing maintenance, before they become self-sustaining. These timelines are not always aligned with the way societal issues (including migration and displacement) unfold — nor with electoral cycles that shape policy and investment priorities.³⁰

E.g., inability to integrate NbS into humanitarian programming to respond to displacement from the very early stages of a crisis rather than as a follow-up concern once related environmental degradation has occurred.

- In densely populated areas, the viability of NbS that require substantial space may be constrained by physical limits,³¹ especially when land is already subject to disputes, informal occupation, or competing claims. Competing land-use priorities and high land values can further pose significant challenges to the implementation of NbS.³²

E.g., inability to implement NbS in informal settlements of destination of rural-to-urban migration.

- Risk perception and a preference for hard infrastructure may lead communities to distrust or reject NbS, resulting in persistent feelings of insecurity even after their implementation. Similarly, institutions may be affected by path dependency, limiting their willingness to move away from established intervention models, and adopt more innovative approaches.

E.g., NbS do not change risk perceptions and therefore do not affect people’s decision to move out of areas at risk.

- Fragmented institutional landscapes, often structured around administrative or thematic silos, can hinder the effective design and implementation of NbS interventions, which instead require broad and inclusive coordination and the active participation of multiple stakeholders.

- The context-specific nature of NbS can limit options available for scaling up or replicating successful solutions and may also constrain the development of integrated approaches across complex landscapes and ecosystems.

- The bankability of different NbS varies widely. Although NbS almost always generate economic co-benefits, these benefits are often distributed across large numbers of community members and can be difficult to quantify, leading to undervaluation.³³ Moreover, perceived costs — such as those associated with long-term maintenance — may alter relevant cost-benefit assessments. As a result, the economic case for NbS can be tenuous, or at least highly variable, depending on the type of intervention.

²⁹ Springer Nature Link, *Barriers and Drivers for Mainstreaming Nature-Based Solutions for Flood Risks: The Case of South Korea* (2021).

³⁰ Multidisciplinary Digital Publishing Institute(MDPI), *Barriers and Levers for the Implantation of Sustainable Nature-Based Solutions in Cities: Insights from France* (2022).

³¹ Springer Nature Link, *Barriers and Drivers for Mainstreaming Nature-Based Solutions for Flood Risks: The Case of South Korea* (2021).

³² Multidisciplinary Digital Publishing Institute(MDPI), *Barriers and Levers for the Implantation of Sustainable Nature-Based Solutions in Cities: Insights from France* (2022).

³³ Ibid.



5.1.2 Potential, Unintended Mobility Consequences or Externalities of Actions to Protect, Sustainably Manage, and Restore Nature

- Actions to protect, sustainably manage, and restore nature may inadvertently create or exacerbate social risks — such as trafficking in persons or gender-based violence — or amplify existing inequalities. Failure to account for the presence of migrants, displaced persons, and other people on the move, and the specific barriers they face, commonly undermines the inclusivity of responses. Such oversights can lead to further exclusion and marginalization, impoverishment, and vulnerability of people

on the move, and may ultimately push affected populations to resort to environmentally unsustainable practices as coping or survival strategies.

E.g., lack of inclusion of mobile groups in participatory procedures leading to ineffective interventions.³⁴

- Actions to protect, sustainably manage, and restore nature may lead to land-use changes and reduce access to land and resources for people and communities, undermining their livelihoods systems, lifestyles, and culture, and potentially resulting in their displacement.

³⁴ ODPI Global, *Participation and inclusion in the Rohingya refugee response in Cox's Bazar, Bangladesh: 'We never speak first'* (2021).

*E.g., conservation projects that result in the direct or indirect removal of people from a certain area, or 'make space for the river' DRR interventions that lead to the forced (albeit in some cases planned) relocation of communities.*³⁵

- The implementation of actions to protect, sustainably manage, and restore nature may increase security, amenities, and overall well-being in specific areas, triggering gentrification processes that can ultimately displace low-income and vulnerable residents, as wealthier populations move in and capture the benefits of newly improved living conditions.

*E.g., "green gentrification" following the upgrading of neighborhoods in urban areas".*³⁶

5.1.3 Risks Posed by Human Mobility to Actions to Protect, Sustainably Manage, and Restore Nature

- Actions to protect, sustainably manage, and restore nature that are designed without adequately accounting for ongoing or future demographic changes may fail due to the effects of population inflows, including shifting demographics and increased pressures on ecosystems. In some cases, population movements may also occur as a consequence of the interventions themselves.

*E.g., land restoration interventions in areas of destination of pastoralists that do not account for the seasonal presence of grazing animals, leading to the failure of revegetation efforts.*³⁷

- The implementation or maintenance of actions to protect, sustainably manage, and restore nature may be undermined by the population outflows from target areas, either because such interventions fail to address other drivers of outmigration or because improved living

conditions increase the capacity of skilled or able-bodied individuals to migrate.

*E.g., land restoration projects that cannot be completed or maintained because of the lack of local skilled labor resulting from seasonal or permanent outmigration.*³⁸

5.2 Incorporating Human Mobility Considerations Into the Design, Implementation, and Monitoring and Evaluation of Nature-based Solutions

If fully operationalized, the standards listed in the previous sections have the potential to reduce the risks and limitations highlighted in [Section 5.1](#). However, this requires ensuring that they are also informed by key human mobility considerations, so that design, implementation, and monitoring of relevant programs comprehensively account for drivers and patterns of human mobility and address the challenges (and leverage the opportunities) that population movements reveal and produce — and ultimately effectively address societal challenges. To this end, human mobility perspectives and implications need to be explicitly integrated into each of the NbS global standards.

1. NbS effectively address societal challenges

Acknowledge forced forms of human mobility and their negative outcomes as integral to the societal challenges NbS must address

Human mobility is both a consequence of environmental degradation, disasters, and the adverse effects of climate change, and a potential driver of additional economic, demographic, environmental, and social pressures. The design and implementation of NbS must therefore factor in displacement and other forms of forced, constrained mobility as challenges to be addressed,

³⁵ Mongabay, [New report details rights abuses in Cambodia's Southern Cardamom REDD+ project](#) (2024).

³⁶ Science Direct, [Countering the effects of urban green gentrification through nature-based solutions: A scoping review](#) (2024).

³⁷ Millison, A., [How Africa's Great Green Wall is Solving an Ancient Conflict](#) (2025).

³⁸ [Read more information here.](#)

and recognize people on the move as among the most vulnerable groups in any society, requiring targeted forms of assistance and empowerment. Concretely, this means that evidence on both potential and realized displacement, the circumstances and needs of people on the move, and the impacts of their movements should be systematically used to inform the prioritization, design, and evaluation of NbS programming.

2. Design of NbS is informed by scale

Reflect the demographic, social, economic, and environmental complexities stemming from human mobility in NbS design and implementation

Human mobility, while shaped by landscapes, ecosystems, and socio-economic systems, also reproduces social and environmental relationships across places and timescales. The comprehensive, landscape- and ecosystem-based perspective NbS need to adopt cannot be fully effective without explicit attention to the dynamic interconnections produced when people move from one place to another, linking places, societies, and ecosystems.

3. NbS result in a net gain to biodiversity and ecosystem integrity

Reduce the negative impacts of human mobility and leverage its potential to produce positive environmental and societal outcomes

Mobility can act as a driver of environmental degradation but can also be integral to how people manage pressures on fragile ecosystems and preserve scarce natural resources. NbS should thus be designed and implemented to minimize the negative environmental impacts of population movements, while simultaneously leveraging their potential to reduce environmental pressures and support ecosystem stewardship.

4. NbS are economically viable

Integrate the economic costs and benefits of human mobility in the design and assessment of NbS

Population movements generate a wide range of direct and indirect economic effects — both positive and negative — that should be anticipated and documented when evaluating the cost-effectiveness of NbS. Leveraging resources made available through migration and remittances is often key to ensuring the economic viability of relevant interventions.

5. NbS are based on inclusive, transparent, and empowering governance processes

Design and implement NbS through participatory processes that are inclusive of migrants and displaced persons

Decision-making processes must be inclusive of all relevant groups with different mobility histories and backgrounds. Migrants and displaced persons should be meaningfully involved in both places of destination and places of origin where they retain connections to the landscape or area. This requires proactively addressing the specific barriers to representation and participation faced by these groups in order to enhance the effectiveness of solutions, prevent and mitigate inter-communal tensions, and ensure that NbS deliver equitable outcomes.

6. NbS equitably balance trade-offs between the achievement of their primary goals and the continued provision of multiple benefits

Specifically anticipate, assess, and balance human mobility impacts of NbS, and their consequences on people, communities, and ecosystems

NbS can have both direct and indirect negative consequences on displacement, migration, relocation, and related outcomes. Specific safeguards should therefore be put in place to prevent mobility-related trade-offs and associated social harms, grounded in rights-based approaches and do-no-harm principles.

7. NbS are managed adaptively, based on evidence

Integrate evolving mobility dynamics into adaptive management models and approaches

NbS implementation should incorporate sufficient flexibility to respond to the profound demographic, socio-economic, and environmental shifts caused by migration, displacement, urbanization, and depopulation in order to ensure their sustained effectiveness over time.

8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context

Promote integrated approaches to human mobility and the environment across policy domains

Work and policy objectives related to environmental sustainability and human mobility are integral to addressing a broad variety of societal issues. Relevant sectoral policies should therefore promote the mainstreaming of considerations and support integrated and more effective approaches and solutions.



In Turkana County, Kenya, community consultations bring together local populations, traditional leaders, and international partners to collaboratively design interventions. © IOM 2022

5.2.1 A Checklist for Incorporating Human Mobility into Nature-based Solutions

The table below can be used as a quick design and review aid by project developers, donors, and implementing partners. It translates each IUCN global NbS standard into a small set of mobility-sensitive questions that can be inserted into project templates, screening tools, and M&E frameworks.

Table 5. Proposed indicators to reflect human mobility considerations in IUCN global NbS standards

IUCN GLOBAL STANDARD	HUMAN MOBILITY INDICATOR
1. NbS effectively address societal challenges	- Design NbS to address human mobility issues identified through transparent and inclusive consultation with local communities and stakeholders. - Document the main human mobility issues faced by society as a foundational input to NbS design. - Assess the effectiveness of NbS based on their human mobility outcomes, including both changes in mobility patterns (e.g., reduced displacement) and improvements in mobility outcomes (e.g., enhanced effectiveness of migration as an adaptation measure).
2. Design of NbS is informed by scale	- Design NbS to account for human mobility as a key dynamic connecting different locations and ecosystems, with potential impacts on the implementation of NbS. - Assess the potential impacts of NbS on human mobility patterns, including effects that extend beyond the intervention site. - Integrate NbS into sectoral policies related to human mobility and the environment.
3. NbS result in a net gain to biodiversity and ecosystem integrity	- Periodically monitor and assess the unintended adverse biodiversity impacts that may arise from population movements resulting from, or influenced by, the implementation of NbS. - Identify and leverage opportunities created by human mobility to support more effective NbS implementation (e.g., remittances, availability of skilled labor).
4. NbS are economically viable	- Account for potential costs arising from human mobility that may result from NbS implementation. - Assess and monitor the direct and indirect human mobility costs and benefits generated or influenced by NbS interventions.
5. NbS are based on inclusive, transparent, and empowering governance processes	- Include all people on the move in decision-making processes on NbS. - Ensure inclusive consultation and participation of all communities that have been, or may be, affected by population movements in the design and implementation of NbS — specifically individuals and groups facing exclusion or marginalization.
6. NbS equitably balance trade-offs between the achievement of their primary goals and the continued provision of multiple benefits	- Explicitly acknowledge the potential human mobility impacts of NbS, including land grabbing, displacement, and gentrification. - Establish safeguards to protect people and communities from being forced to move or relocated against their will from their homes.
7. NbS are managed adaptively, based on evidence	- Monitor human mobility impacts and outcomes of NbS throughout the intervention lifecycle, including effects beyond the immediate intervention site. - Build flexibility into project implementation to address the human mobility consequences of NbS projects and activities.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	- Mainstream environmental and NbS considerations in human mobility planning, and in concrete interventions to manage migration, displacement, and planned relocation. - Integrate human mobility concerns into all policies and plans relevant to environmental protection, ecosystem management, and NbS.

5.3 Conclusion: Nature-based Solutions and Integrated Approaches for Effective Action Across Human Mobility Contexts

Human mobility is both a visible consequence of environmental degradation, disasters, and climate change and a key driver of environmental change across regions and scales. Promoting integrated approaches that address societal issues linked to human mobility while advancing environmental protection, ecosystem management, and the regeneration of natural capital, is a key well-being and sustainability concern. NbS are an important component of the approaches through which these interconnected objectives can be achieved.

To support more integrated approaches to NbS and human mobility, this paper has highlighted approaches and options to shift policy and practice by:

1. Systematically considering and using NbS to support people's options to stay, move, and return in dignity across different ecosystems;
2. Systematically assessing human mobility dynamics when selecting, designing and, implementing NbS; and
3. Integrating mobility-sensitive NbS standards, indicators, and checklists into institutional project cycles.

It is hoped that these contributions will guide IOM and other actors in aligning NbS investments with emerging climate mobility commitments at national, regional, and global levels. More integrated approaches will require multi-stakeholder collaboration across sectors and scales — often spanning administrative and political boundaries — to address some of the most complex issues of our time. They will also require climate, development, and humanitarian finance to be directed toward these operational intersections, challenging silos and boundaries that continue to hinder effective cross-sectoral action.

Such approaches can, however, offer affordable, effective, and comprehensive solutions to environmental and social challenges that threaten the well-being, resilience and stability of people and communities across all regions and development contexts. Going forward, the design, financing, and implementation of this type of work should be fully explored as part of climate action, DRR, and humanitarian response and recovery interventions, as well as broader development efforts across all sectors.



In Cox's Bazar, Bangladesh, communities navigate landscapes shaped by agricultural reliance and environmental vulnerabilities, including floods and bank erosion. © IOM 2016 / Amanda Nero

The background of the entire page is a blue gradient, transitioning from a lighter teal at the top to a darker blue at the bottom. Overlaid on this gradient is a world map. The map is created using a grid of small, light-blue dots. The density of these dots is higher in the landmasses and lower in the oceans, effectively forming the shape of the world's continents. The dots are arranged in a way that gives the map a pixelated or digital appearance.

ANNEXES

ANNEX 1

GLOSSARY

Adaptation

“the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.” (IPCC, 2022a)

Climate change

“A change in the state of the climate that can be identified (such as by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or land use. Note that UNFCCC, in its Article 1, defines, for the purpose of that Convention, climate change as ‘a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods’. UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.” (IPCC, 2021)

Disaster

“A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts.” (UNGA A/71/644)

Disaster risk

“The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society, or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability, and capacity.” (UNDRR, 2017)

Disaster risk reduction

“Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development.” (UNDRR, 2017)

Displacement

The movement of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of, or in order to avoid, the effects of armed conflict, situations of generalized violence, violations of human rights, or natural or human-induced disasters. This may refer to forced movements within a country (internal displacement) or across international borders (cross-border displacement) (adapted from UNHCR E/CN.4/1998/53/Add.2). Disaster displacement typically refers to situations where people are forced or obliged to leave their homes or places of habitual residence as a result of a disaster or in order to avoid the impact of an immediate and foreseeable natural hazard (Nansen Initiative Protection Agenda, 2015).

Ecosystems

“Ecosystems are a dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit.” (CBD, art. 2) They are made up of living components, the abiotic environment, and interactions within and between them. (IUCN, 2024)

Environmental degradation

“The reduction of the capacity of the environment to meet social and ecological objectives and needs... Degradation of the environment can alter the frequency and intensity of natural hazards and increase the vulnerability of communities. The types of human-induced degradation are varied and include land misuse, soil erosion and loss, desertification, wildland fires, loss of biodiversity, deforestation, mangrove destruction, land, water, and air pollution, climate change, sea level rise, and ozone depletion.” (UNISDR, 2009)

Exposure

“The situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas.” (UNDRR, 2017)

Hazard

“A process, phenomenon, or human activity that may cause loss of life, injury, or other health impacts, property damage, social, and economic disruption or environmental degradation.” (UNDRR, 2017)

Human mobility

‘Human mobility’ is a descriptive term that is increasingly used under the UNFCCC processes to collectively refer to the three forms of population movement set out under paragraph 14(f) of the Cancun Agreement (FCCC/CP/2010/7/Add.1, Decision 1/CP.16): (i) Displacement – the primarily forced movement of persons; (ii) Migration — the primarily voluntary movement of persons, (iii) Planned relocation — the process of settling persons or communities in a new location. It is, however, also used to refer more comprehensively to population movements, including tourism, inner-urban movements, commuting, and other temporary or short-term movements of persons for employment-related purposes. (UNFCCC, 2024)

Migration

“The movement of persons away from their place of usual residence, either across an international border or within a State.” (IOM, 2019)

Nature-based solutions

Actions to protect, sustainably manage, and restore natural or modified ecosystems, which address societal challenges (e.g. climate change, food, and water security or natural disasters) effectively and adaptively, while simultaneously providing human well-being and biodiversity benefits. (IUCN, 2016)

Planned relocation

Planned relocation in the context of disasters or environmental degradation, including when due to the effects of climate change, is a planned process in which persons or groups of persons move or are assisted to move away from their homes or place of temporary residence, are settled in a new location, and provided with the conditions for rebuilding their lives (adapted from Brookings, Georgetown, and UNHCR, 2015).

Resilience

“The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.” (UNDRR, 2017)

Trapped populations

Populations inhabiting areas of high risk and thus vulnerable to environmental shocks and impoverishment who want to flee or migrate but are unable to do so. Note: the notion of trapped populations applies in particular to poorer households who may not have the resources to move and whose livelihoods are affected, or to people whose freedom of movement is limited for other reasons (adapted from Foresight, 2011).

Vulnerability

“The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards.” (UNDRR, 2017)

ANNEX 2

KEY RESOURCES FOR IMPLEMENTATION

The resources below are selected to support practitioners working at the NbS–human mobility interface. They include: (i) standards and safeguards for NbS design and verification; (ii) operational guidance and tools for project formulation, participatory processes, and M&E; and (iii) evidence syntheses and case study collections from different regions and ecosystems. This structure is intended to help users quickly identify which documents they can draw on at specific stages of the project cycle.

STANDARDS

- Conservation Measures Partnership (CMP) (2020). *Open Standards for the Practice of Conservation*, Version 4.0. CMP.
- Food and Agriculture Organization (FAO), Society for Ecological Restoration (SER) and IUCN Commission on Ecosystem Management (CEM) (2023). *Standards of Practice to Guide Ecosystem Restoration: A Contribution to the United Nations Decade on Ecosystem Restoration – Summary Report*. FAO, Rome.
- International Union for Conservation of Nature (IUCN) (2020a). *Global Standard for Nature-based Solutions: A User-friendly Framework for the Verification, Design and Scaling up of NbS*. First edition. IUCN, Gland.
- (2020b). *Guidance for Using the IUCN Global Standard for Nature-based Solutions*. First edition. IUCN, Gland.

OPERATIONAL GUIDANCE

- Conservation International (2021). *Guidelines for designing, implementing, and monitoring nature-based solutions for adaptation*. Conservation International, Arlington.
- European Commission (2021). *Evaluating the Impact of Nature-based Solutions: A Handbook for Practitioners*. Publications Office of the European Union, Luxembourg.
- International Institute for Sustainable Development (IISD) (2024). “Implementing Nature-based Solutions projects that support human rights and gender equality, disability, and social inclusion”. Nature-based Climate Action Initiative. Winnipeg.
- International Union for Conservation of Nature IUCN (2016). *Nature-based solutions to address global societal challenges*. IUCN, Gland.
- NATWiP (2022). *Nature-Based Solutions for Water Management in the PeriUrban: Linking Ecological, Social and Economic Dimensions: Handbook*. NATWiP
- Secretariat of the Convention on Biological Diversity (CBD) (2019). *Voluntary Guidelines for the Design and Effective Implementation of Ecosystem-based Approaches to Climate Change Adaptation and Disaster Risk Reduction and Supplementary Information*. Technical Series No. 93. CBD, Montreal.
- Sphere (2023). *Nature-based Solutions for Climate Resilience in Humanitarian Action*. Sphere, Geneva.

- ThinkNature (2019). *Nature-Based Solutions Handbook*. ThinkNature project.
- Urban Nature Labs (2024). *Nature-Based Solutions Implementation Handbook: A Summary for Practitioners*. UNaLab.

CASE STUDY AND OTHER INFORMATION

- Andrew Millison (nd). [Youtube channel](#).
- Conservation Measures Partnership (CMP) (n.d.). “Training”. [Conservation Standards](#).
- International Union for Conservation of Nature (IUCN) (2025). *Applying the IUCN Global Standard for Nature-based Solutions*. IUCN, Gland.
- International Union for Conservation of Nature (IUCN) (2025). *Applying the IUCN Global Standard for Nature-based Solutions*.
- Leal Filho, W. et al. (eds.) (2025). *Handbook of Nature-Based Solutions to Mitigation and Adaptation to Climate Change*. Springer, Cham.
- Norwegian Refugee Council (NRC) (2020). *Regional Resilience Guide: East Africa and Great Lakes Region*. NRC, Nairobi.
- Resilience Design (nd). [Resilience Design](#).
- United Cities and Local Governments (UCLG) (n.d.). *Nature-based Solutions: “How to regenerate nature to make neighborhoods more livable, biodiverse, and resilient to climate change”*.
- United Nations Environment Programme (UNEP) (n.d.). “Investing with nature”.
- UNEP Copenhagen Climate Centre (UNEP-CCC) (2024). *Business models for financing Nature-based Solutions in Urban Climate Action*.
- Witteveen+Bos (n.d.). “Nature Based Solutions”.
- World Bank (2021). *A Catalogue of Nature-Based Solutions for Urban Resilience*. World Bank.



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