Advancing Gender-Responsive and Socially Inclusive Practices in Nature-Based Solutions for Adaptation

A compendium of case studies

NCAI REPORT

IISD | Nature for Climate Adaptation Initiative

In partnership with Canada

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Nature for Climate Adaptation Initiative

The Nature for Climate Adaptation Initiative (NCAI) seeks to increase the knowledge and capacity of civil society to design and deliver nature-based climate solutions (NBCS) that are socially inclusive, gender responsive, and that enhance biodiversity and ecosystem resilience to change.

Advancing Gender-Responsive and Socially Inclusive Practices in Nature-Based Solutions for Adaptation: A compendium of case studies

February 2025

Written by Nicole Jang, Calais Caswell, Sarah McIvor (International Institute for Environment and Development), and Tanya Ball (Dena Kayeh Institute)

Photo: iStock

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Introduction

Nature-based solutions (NbS) for adaptation projects are increasingly being looked at worldwide as a means of helping communities and ecosystems adapt to climate change. When implemented with environmental and social safeguards, NbS for adaptation can provide multiple benefits to society and biodiversity (Lo & Rawluk, 2023). While there is an increased push for NbS projects around the globe, a gap in evidence exists on projects that promote gender equality and social inclusion (GESI) outcomes. Designing NbS for adaptation projects to be responsive to differences in intersecting identity factors,[1] such as gender, age, sexuality, socio-economic status, Indigeneity, and ability, is important. Considering these factors can help build the adaptive capacity of equity-deserving groups[2] to climate change, enable these groups to participate in adaptation planning and decision making, and strengthen the resilience of their local ecosystems (Caswell & Jang, 2024; Dazé & Terton, 2021; Intergovernmental Panel on Climate Change, 2022).

Box 1. What are NbS for adaptation?

NbS for adaptation, also referred to as "ecosystem-based adaptation" (EbA), are a suite of actions to protect, conserve, restore, sustainably use, and manage natural ecosystems to strengthen the resilience of ecosystems, biodiversity, and communities to the impacts of climate change.

They are specifically oriented toward managing current and future climate risks and enhancing biodiversity and ecological resilience.

They target and benefit particular groups and their livelihoods based on risk or vulnerability assessments.

They include "nature-based" measures integrating ecosystem processes, e.g., flood water storage through wetlands.

They take into consideration local, environmental, economic, and social contexts, including traditions and culture.

Source: Lo et al., 2022.

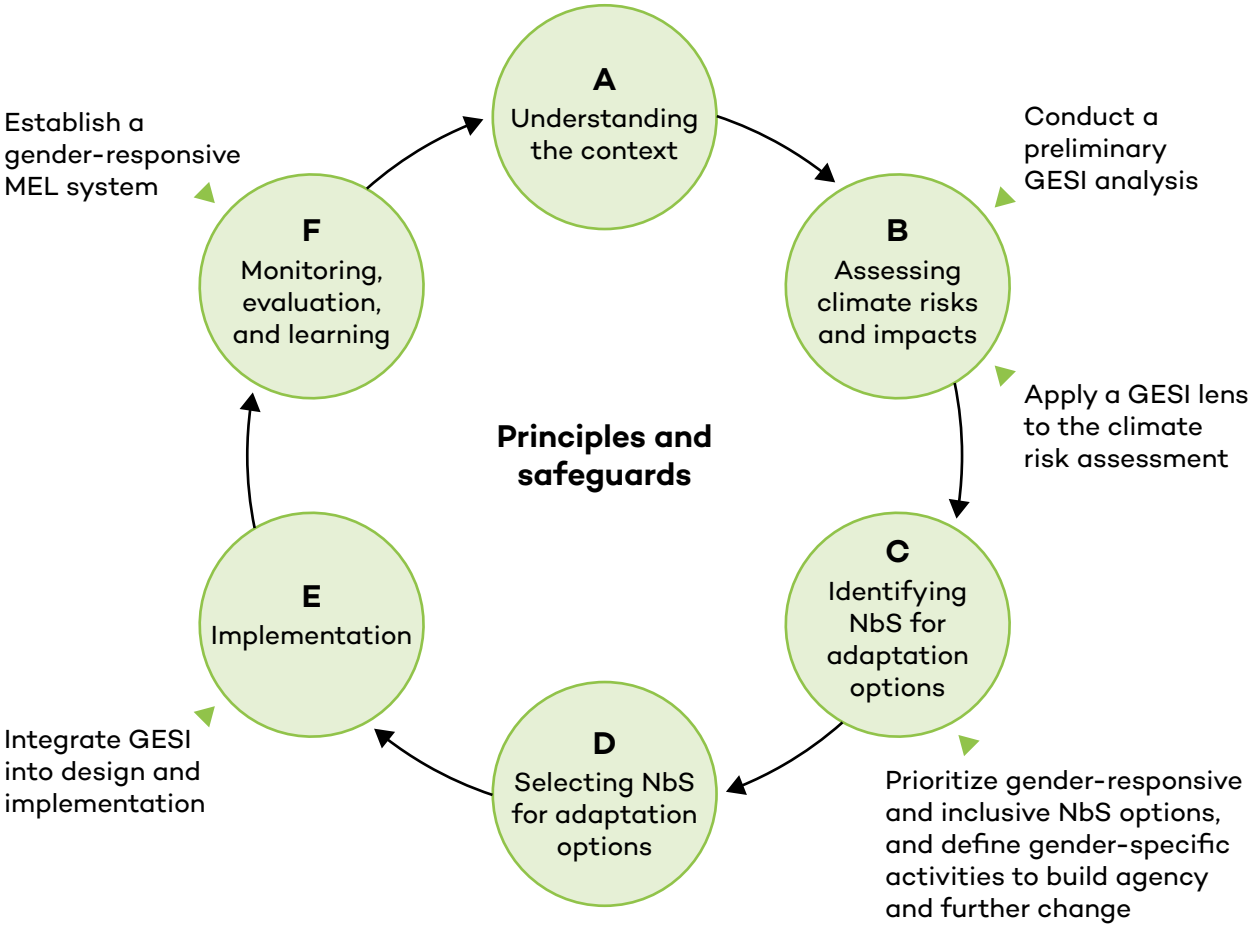
[1] This term is used to describe the multiple social categorizations that comprise an individual's identity and how they interact to form unique experiences of advantage and disadvantage (Caswell & Jang, 2024).

[2] This term is used to describe those that face discrimination and denial of rights based on racialization, being Indigenous, or having a disability, among other factors—are increasingly demanding a voice in adaptation decision making.

About the Case Studies

To address this gap in evidence, two case studies have been developed as a supplement to a technical brief, *Mainstreaming Gender Equality and Social Inclusion in Nature-based Solutions for Climate Change Adaptation* (Caswell & Jang, 2024) developed under the Nature for Climate Adaptation Initiative (NCAI) (Box 2). The technical brief provides a set of recommendations to help plan, design, and implement NbS for adaptation that are gender responsive and socially inclusive. It also identifies entry points and provides advice on how to mainstream GESI at each step of the project design and implementation cycle (Figure 1). The supporting case studies presented here provide practical examples of integrating GESI considerations at various stages of implementing NbS for adaptation.

Figure 1. NbS for adaptation project design and implementation cycle



Source: Adapted from CBD, 2019.

Case Study 1 showcases a gender-responsive and socially inclusive approach to climate-resilience planning for small-scale cooperatives in Zanzibar. The case study demonstrates how understanding the gendered context of operations and governance structures (Step A), assessing

climate risks using a GESI lens (Step B), and identifying and selecting options with inclusivity in mind (Steps C & D) can enhance the efficacy and sustainability of NbS for adaptation.

Case Study 2 provides a practical example of socially inclusive implementation (Step E) and MEL (Step F) as part of an Indigenous Guardians program that seeks to incorporate Traditional Knowledge and practices into land and wildlife management to better adapt to a changing climate in Canada.

Each case study includes an overview of the local context and climate risks, how the project considered the need for climate change adaptation and integrated gender-responsive and socially inclusive practices, and lessons learned. The case studies were developed through interviews with project implementers and by reviewing relevant reports and documents.

Box 2. About the NCAI

The NCAI strengthens the knowledge and capacity of civil society organizations to design and implement NbS for climate change adaptation through three key tools:

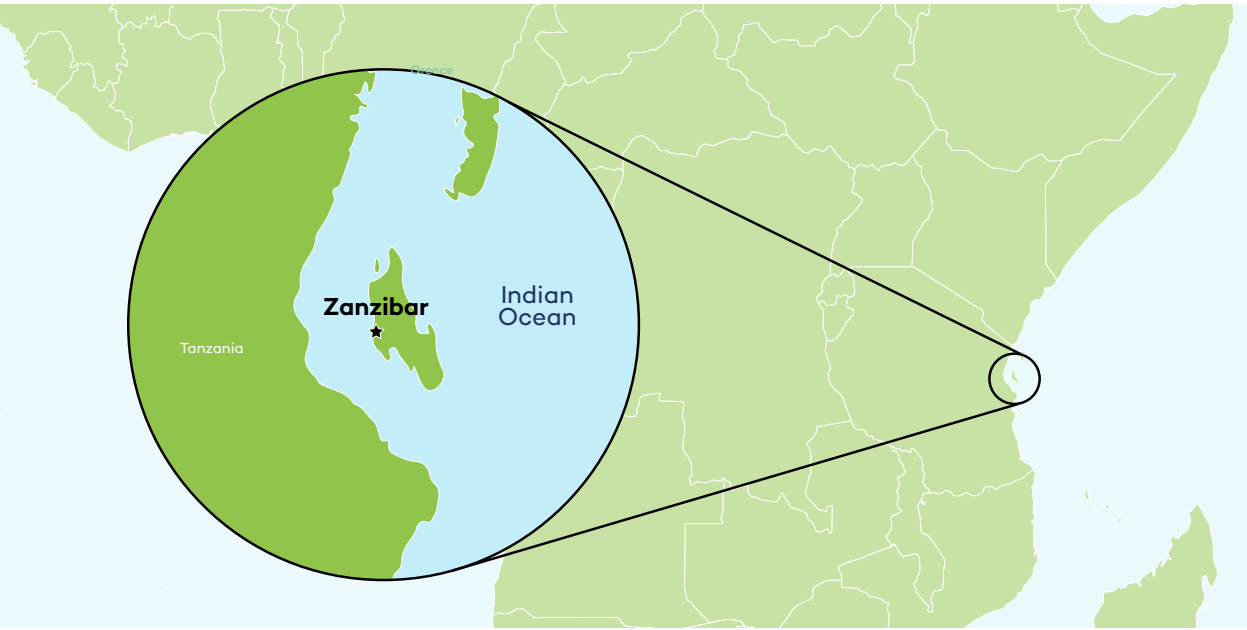
- a self-paced, accessible course developed in partnership with the Deutsche Gesellschaft für Internationale Zusammenarbeit and IUCN, the International Union for Conservation of Nature;
- an online learning space with technical guidance, resources, case studies, and events focused on gender equality, social inclusion, and biodiversity co-benefits; and
- targeted virtual and in-person learning exchange opportunities that foster a community of practice around NbS for adaptation.

Through the sharing of promising practices and lessons learned, the case studies seek to inform and inspire adaptation practitioners and planners to help ensure that gender-responsive and socially inclusive practices are integrated throughout the lifetime of a project. These practitioners and planners include technical support staff, civil society organizations, and researchers who are (or will be) directly involved in NbS for adaptation projects, such as those under Global Affairs Canada's Partnering for Climate program.

Case Study 1:
Gender-Responsive and Socially Inclusive Climate-Resilience Planning for Sustainable Livelihoods in Zanzibar

Project at a glance	
Implementing organizations	International Institute for Environment and Development (IIED), Zanzibar Climate Change Alliance, and the Pamoja Youth Initiative
Funder	Climate Justice Resilience Fund
Project focal areas	Three small-scale cooperatives in Zanzibar
Climate stressors	Warming sea surface temperatures, increasing frequency and intensity of droughts and floods, stronger winds, and hotter average temperatures
Target groups	Young men, young women, older men and older women
Timeline	2018–2020

Figure 2. Map of Zanzibar



Source: Authors.

Climate Change Risks and Impacts in Zanzibar

Zanzibar is an archipelago in the Indian Ocean, made up of two large islands (Unguja and Pemba) and several small ones off the coast of mainland Tanzania. The archipelago contains a wealth of marine and terrestrial biodiversity, including coral reefs, closed canopy and mangrove forests, and notable endemic species like the Zanzibar red colobus monkey (Revolutionary Government of Zanzibar, 2013; Wildlife Conservation Society Tanzania, n.d.). It is home to

approximately 1.9 million people (United Republic of Tanzania et al., 2022), most of whom work in the agricultural sector (United States Agency for International Development, 2019).

In addition to supporting a high population and a vast amount of biodiversity, Zanzibar is highly vulnerable to the impacts of climate change. Impacts already being observed include higher average temperatures, increased rainfall variability, stronger winds, and an increased number of extreme weather events (Abdalla et al., 2023; Omar, 2020; Revolutionary Government of Zanzibar, 2013). Flooding and droughts are of particular concern, as the intensity of El Niño and La Niña events are amplified by climate change, resulting in significant socio-economic, infrastructural, and ecological damage to the region (Revolutionary Government of Zanzibar, 2013; United Republic of Tanzania, 2021). In 2005, approximately 10,000 people were directly impacted by severe flooding in the region, and in 2023, over 3,500 Zanzibaris were at risk of being displaced by nationwide floods triggered by El Niño (International Federation of Red Cross and Red Crescent Societies, 2024; Katamba, 2023; World Bank, 2016). Additionally, in 2006, a major drought caused by La Niña conditions led to food shortages and significant crop and livestock declines (Revolutionary Government of Zanzibar, 2013; Xinhua, 2006).

The health and functionality of Zanzibar's marine and coastal ecosystems are also at risk. The region is seeing increasing wave heights, warming sea surface temperatures, and sea level rise. These changes have led to coastal erosion and reduced crop yields of cultivated red seaweed species, and when paired with ocean acidification, have resulted in increased occurrences of coral reef bleaching (Omar, 2020; Queiros et al., 2024). This is of great concern, as many people depend on the islands' coastal and marine resources and ecosystem services for their livelihoods and well-being.

The climate hazards and stressors that Zanzibar faces are expected to persist or increase in the future. Temperatures are projected to further increase by 1.3 to 2°C by 2050 and 2 to 4°C by 2100, relative to a baseline period of 1961-2000, and sea levels are projected to rise by 0.2 to 1 metre by 2100 (Revolutionary Government of Zanzibar, 2013). To reduce the vulnerability of Zanzibar's people and ecosystems to the impacts of climate change, it is crucial to implement effective and sustainable adaptation measures.

Importance of GESI Considerations in Climate Adaptation Initiatives

To help Zanzibaris adapt to the impacts of climate change, the Devolved Climate Finance (DCF) mechanism was launched. It is an alliance of government and non-government institutions to promote community-prioritized investment for climate adaptation (IIED, 2017). This mechanism was established in Tanzania in 2014 with the purpose of investing in local communities to strengthen enabling conditions for sustainable and climate-resilient livelihoods (DCF Alliance, 2019). In Zanzibar, it was used locally to help procure assets for three grassroots cooperatives focused on seaweed, lime, and honey production (Greene et al., 2020).

The cooperatives were chosen due to the climate-sensitive nature of their operations. For example, the seaweed cooperative identified a decline in the productivity of key seaweed species, such as the *Euchema* and *Kappaphycus* genera species. These seaweeds are in decline throughout Tanzania due to warmer temperatures in the shallow waters where they are found (Queiros et al., 2024). To address this, the cooperative used the DCF funding to obtain new boats and seeds to establish a seaweed farm in deeper, cooler waters. Similarly, the lime cooperative used the funding to obtain watering equipment to adapt to droughts, while the honey cooperative used the funding to obtain materials to create beehives that were better suited for hotter temperatures (Greene et al., 2020). These sustainable livelihood options not only provide cooperative members with economic benefits, but they also provide adaptation and biodiversity benefits to their communities. For example, in addition to storing carbon, seaweed can play a critical role in buffering coasts against storm surges and tackling ocean acidification (Vernick, 2024). Similarly, honey production sustains bee populations as key pollinators that help to maintain local biodiversity and ecosystem balance (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2016).

While the DCF mechanism provided the cooperatives with tools to adapt to a changing climate, MEL of the climate adaptation investments revealed that a lack of recognition of the barriers that youth and women face in influencing decision making resulted in little to no input from these groups on funded activities (Greene et al., 2020). In turn, the distribution of benefits from the adaptation investments was inequitable, even though research and other initiatives in the region have shown that sustainable alternative livelihood options, such as seaweed and honey production, may hold significant promise as enablers of gender equality and women's economic empowerment (African People and Wildlife, 2024; United Nations Trade & Development, 2024). For example, because women and girls had little influence in deciding how to use the funds in the seaweed cooperative, their inability to swim and thus engage in deep-water seaweed farming was overlooked. This was of great concern, as many Zanzibari women living in coastal areas depend on seaweed farming for their livelihoods (Hassan & Othman, 2019; Omar, 2020; Revolutionary Government of Zanzibar, 2013).

As a result, IIED, in collaboration with local partners and communities, sought to improve the effectiveness of the DCF mechanism through the Strengthening Women and Youth Voices for Climate Action in Tanzania project. The project was supported by the Climate Justice Resilience Fund and aimed to integrate GESI considerations into existing adaptation actions by working with cooperatives to understand the gendered context of their operations and governance structures (Step A in the NbS for adaptation project design and implementation cycle), assess climate risks and impacts with a GESI lens (Step B), and identify and select options to enhance the sustainability and inclusivity of their practices (Steps C & D). The project underscores the importance of accounting for gender and social inequalities in NbS for adaptation initiatives. It also aligned development practice with national plans and priorities, including the United Republic of Tanzania's National Strategy for Mainstreaming Gender in Climate Change (United Republic of Tanzania, 2013) and commitment in the Zanzibar Climate Change Strategy

(Revolutionary Government of Zanzibar, 2013) to address gender and distributional inequalities in climate action, respectively.

A Gender-Responsive and Socially Inclusive Approach to Planning and Decision Making for Climate Adaptation

The main output of the project was the Pamoja Voices Climate-Resilience Planning Toolkit. Two versions of the toolkit were developed—one tailored to local cooperatives and the other to rural communities (see Box 3). This case study focuses on the former, which helps small-scale cooperatives apply a gender-responsive and socially inclusive approach to their climate adaptation planning and decision-making processes. The title of the toolkit, Pamoja Voices, draws from the Swahili word for "together" to encompass the purpose of the project to bring together diverse voices for climate action (McIvor et al., 2020). It was co-developed by IIED and local partners, the Zanzibar Climate Change Alliance and Pamoja Youth Initiative, with direction from members of the three cooperatives and representatives from the Government of Zanzibar's Cooperatives Development department. For enhanced accessibility, the toolkit was published in English and Swahili. It consists of four participatory exercises that can be carried out over 2 to 3 days (McIvor et al., 2020):

- a participatory analysis that collects and analyzes disaggregated data regarding the cooperative's operations, where members identify roles, responsibilities, priorities, challenges, and possible solutions to challenges for different genders and age groups in the cooperative;
- a climate risk assessment, where members of the same gender and similar age identify climate risks and impacts to their work and reflect on current short- and long-term adaptation strategies;
- the development of a cooperative action plan, where the collective identifies and selects climate adaptation options that are more gender responsive and socially inclusive, based on findings from the previous two exercises; and
- governance analysis, where members examine the gender and age composition of their current governance structures and leadership positions and collectively determine a desired composition for the future and steps they can take to achieve it. This governance analysis is important to ensuring more equitable decision making regarding natural resources management, as often the conditions for cooperative membership do not promote women's inclusion (Duguid & Weber, 2016).

Box 3. The Pamoja Voices Climate-Resilience Planning Toolkits

Two versions of the Pamoja Voices Climate-Resilience Planning Toolkit were developed through the Strengthening Women and Youth Voices for Climate Action in Tanzania project. Each toolkit provides users with a step-by-step guide for conducting participatory activities.

The version of the toolkit profiled in this case study, Pamoja Voices Toolkit for Local Cooperatives, was developed specifically for community-scale producer cooperatives and the organizations and governments that support them, but can also be used by donors, practitioners, and researchers to guide gender-responsive and socially inclusive approaches to community-level climate risk assessments and resilience planning.

The other version of the toolkit, Pamoja Voices Toolkit for Rural Communities, was developed by IIED, the Monduli Women's Forum, Hakikazi Catalyst, and the Pastoral Women's Council in collaboration with rural communities in the Arusha district in mainland Tanzania. It was designed to be used by communities whose livelihoods centre around rainfed agriculture and livestock farming, non-governmental organizations looking to design projects that support rural communities, and local governments involved in climate-resilience planning.

To ensure the toolkit could be tailored to the local context, it was tested with the cooperatives in February 2018 (IIED, 2020). Each cooperative selected 40 members—approximately 10 older men, 10 younger men, 10 older women, and 10 younger women—to participate in a pilot session. Feedback from each session was used to inform the final version of the toolkit. The first two exercises (participatory analysis and climate risk assessment) utilized focus group discussions, with participants separated by gender and age, to allow them to feel comfortable voicing their unique challenges, experiences, opinions, and priorities. The third and fourth exercises (developing a cooperative action plan and governance analysis) consisted of facilitated plenary sessions, where people were encouraged to listen and reflect on other groups' findings to develop an agreed-upon climate action plan and governance structure that was inclusive and sustainable. This method proved to be beneficial, as the facilitators made space for voices that are typically not heard during planning and decision-making processes, and all members were given the opportunity to share, listen, and reflect.

Though findings varied across cooperatives, a general observation made was that people were often unaware of other groups' challenges. Therefore, several challenges were solvable from within the cooperative. For example, many youths expressed their lack of knowledge and skills to be able to fully partake in day-to-day activities. To address this problem, the older members agreed to train and share knowledge with the youth (McIvor et al., 2020). Another issue raised was that women were late or not showing up to crucial planning and decision-making meetings. The men assumed that the women were not interested; however, women were often late or absent because they were attending to their domestic responsibilities (S. McIvor, personal communication, July

27, 2023). As a result, it was agreed that more advance notice for meetings would be given in the future to better support women's attendance, as they could plan their attendance around existing responsibilities. Moreover, young women in the honey cooperative raised safety concerns with beekeeping when visiting forests alone. As others were not aware of this, they sought to explore ways in which they could better protect younger women members, such as by going into the forest in groups for safety (S. McIvor, personal communication, July 27, 2023).

There was a large amount of collective agreement on key climate risks, priorities for climate adaptation, and balanced governance structures in the cooperatives. They realized that many of their shorter-term strategies to deal with climate impacts were unsustainable, and longer-term adaptation strategies were needed. Based on solutions proposed in the plenary discussion, the lime cooperative was able to adopt a new NbS for adaptation practice. They agreed to use agroforestry, which is a land management approach that entails the intercropping of tree species, as a means of providing shelter to their crops and seedlings from strong winds rather than replanting crops every time they were blown away (S. McIvor, personal communication, July 27, 2023). Additionally, following the governance analysis, all cooperatives indicated the desire for governance structures that were more balanced in gender and age. They recognized that more balanced structures would not only increase group cohesiveness but also enhance their adaptation strategies, as the inclusion of more perspectives and experiences would better inform their practices and the functioning of the cooperative as a whole. As a first step, the honey cooperative established co-chair and co-vice chair positions for each gender (S. McIvor, personal communication, July 27, 2023).

While the project has concluded, the cooperatives continue to seek out ways in which they can make their adaptation actions more gender-responsive and socially inclusive. For example, to ensure that women are involved in seaweed farming while also adapting to changing sea surface temperatures, the seaweed cooperative has begun to teach women how to swim and is trialling the growth of different types of seaweed that are better able to withstand higher temperatures (Greene, McIvor, & Pertaub, 2020; S. McIvor, personal communication, July 27, 2023).

Lessons Learned

"[GESI practices] are vital. It is no longer the option, but it must be the norm" (S. McIvor, personal communication, July 27, 2023).

Key considerations for those looking to implement NbS for adaptation projects that integrate GESI considerations, based on lessons learned from the development and implementation of the Pamoja Voices toolkit, include (S. McIvor, personal communication, July 27, 2023):

Adopt a Community-Led and Flexible Approach

The successful design and application of the toolkit depended on adopting a community-led and flexible approach to climate adaptation planning and decision-making processes. A community-

Women working at a seaweed farm.

led approach involves working closely with local communities to learn about what works for them and co-designing and implementing NbS for adaptation that best fit their needs while also aligning with the best available climate science. All members of the communities should feel comfortable sharing their ideas and feel a sense of ownership over the project. In this case study, the community provided direction from the beginning on what the final product should look like: a step-by-step guide that was accessible to all and available in Swahili. They also took part in testing the draft exercises and sharing feedback on improvements. This was essential for their ownership of the tool and its sustainability.

An adequate amount of time should be allotted to engage in such discussions with communities from the outset. Having more time for community consultation and co-creation also ensures a more gender-responsive approach, as women often experience greater time scarcity due to competing domestic responsibilities, and men may travel out of their communities for work. A longer timeline for this process will result in more meaningful and engaged collaboration from community members overall. In general, collaborating and engaging with communities for NbS for adaptation projects is essential to avoid maladaptation and gain approval.

Being flexible means adjusting activities, as needed, to capture communities' guidance and feedback for improvement. For example, although the climate risk assessment was envisioned to be a narrative writing activity, in one application of the toolkit, the community preferred drawing pictures as a better method to convey climate risks, as education levels varied among cooperative members. This resulted in a more socially inclusive process that accommodated various learning styles and literacy levels.

Figure 3. A participatory community climate risk assessment exercise

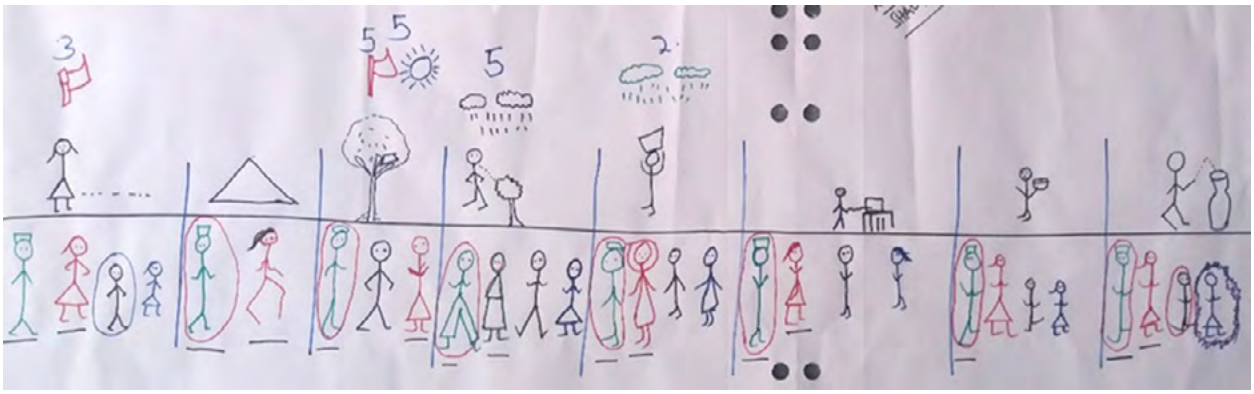


Photo credit: IIED.

Host Separate Focus Group Discussions for Different Gender and Social Groups

Gender and social differences influence people's climate vulnerabilities and capacities to adapt; therefore, it is important to create safe spaces for different community members to share their priorities and experiences. Consider intersecting identity factors that exist in the community, such as gender, age, sexuality, education, socio-economic status, ethnicity, and ability, and how they impact people's opportunities and barriers to participate when facilitating focus groups for the assessment of climate risks or identification of NbS for adaptation options. Additionally, working with existing community groups, such as cooperatives, is helpful as they provide local, established spaces where these participatory discussions can be held.

These discussions provide an opportunity to hear diverse voices and perspectives that may not be present in typical decision-making processes. In this project, community members were divided into focus groups based on their gender and age. However, exploring the inclusion of more identities is possible and would be beneficial to further unpack more of the unique climate change risks and adaptation challenges faced by individuals within the community.

Prioritize Having Strong Local Partners and Facilitators

Many NbS for adaptation projects are coordinated by international organizations, requiring strong partnerships with local organizations. Partnerships with local organizations help to ensure that NbS for adaptation projects appropriately consider the local context and local knowledge. Engaging local facilitators was integral to the successful design and implementation of the toolkit, as well as the establishment of the cooperatives' climate action plans and selection of adaptation strategies. As members of local climate organizations, the facilitators who were selected to lead the participatory exercises in the toolkit were well-versed in cultural norms and local knowledge, were able to conduct sessions in Swahili, and knew how to respectfully engage with local communities.

Additionally, the facilitators helped create safe spaces for community members to feel comfortable sharing their experiences and opinions. The facilitators—one man and one woman, both youth—were praised for their friendliness, approachability, humbleness, and flexibility. They actively made sure that different voices were being heard and respected during group discussions.

Invest in Gender-Responsive, Socially Inclusive, and Community-Led MEL

Although the project was able to successfully integrate GESI considerations into the cooperatives' climate action plans and selection of climate adaptation options, the project was unable to continue tracking the impact of these activities on the local cooperatives due to time constraints and limited funding after the project was completed. When engaging local community groups in NbS for adaptation programming, it is important to allocate sufficient funding and time for capacity strengthening on MEL so that these groups can continue tracking their progress and documenting successes to ensure project sustainability.

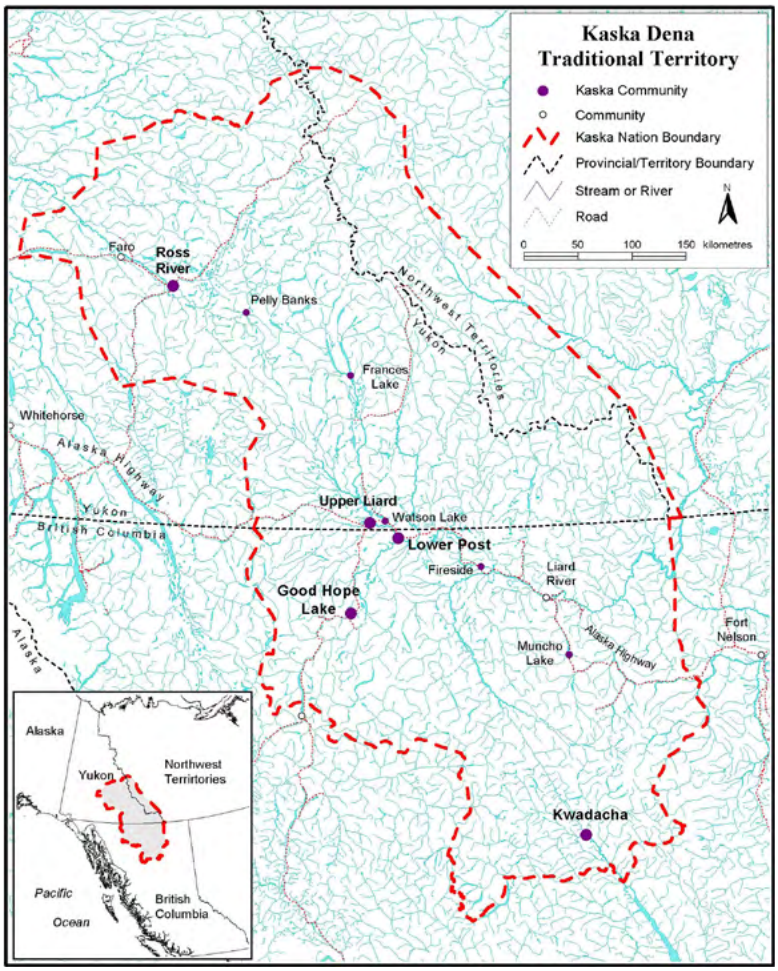
Capacity strengthening on MEL should highlight the importance of collecting and assessing disaggregated data. In this case study, an assessment of the original DCF mechanism revealed that there was insufficient consideration for the barriers that youth and women faced in decision making on adaptation initiatives. Empowering community groups to use MEL to understand the varied impacts of climate change and adaptation actions on different gender and social groups can enable more inclusive decision making on adaptation, more equitable benefit sharing, and continued monitoring of progress even in the absence of funding.

Case Study 2:
Socially Inclusive and Indigenous-Led Land and Wildlife Management and Monitoring in Canada

Kaska Dena Ancestral Territory. (Dane Nan Yé Dāh Network – Kaska Land Guardian Program)

Project at a glance	
Implementing organizations	Dena Kayeh Institute
Funders	Funders vary, but most funding comes from the Government of British Columbia and the Government of Canada.
Project focal areas	Kaska Dena ancestral territory
Climate stressors	Rising temperatures, changes in precipitation, extreme heat events
Target groups	Kaska communities in British Columbia, Canada
Timeline	2015–present

Figure 4. Map of Kaska Dena ancestral territory



Source: Tanya Ball.

Climate Change Risks and Impacts in Kaska Dena Traditional Territory

The Kaska Dena are First Nations people who have existed and inhabited their ancestral territory since time immemorial. Their ancestral territory, outlined in Figure 4, encompasses approximately 240,000 km^2 of land across what is now known as northern British Columbia (B.C.), southeastern Yukon, and a southwestern portion of the Northwest Territories in Canada (Dena Kayeh Institute, 2019; Kaska Dena Council, n.d.-b). It consists of vast stretches of boreal forest, wetlands, lakes, rivers, and expansive mountain ranges (Kaska Dena Council, n.d.-b). This area is home to several culturally significant species, including the Stone sheep, woodland caribou, mountain goat, and moose. These species not only serve as traditional sources of food for the Kaska Dena but caribou and moose hide also provide materials for creating clothing and ceremonial drums (Dena Kayeh Institute, 2019).

While the territory continues to support the Kaska Dena, it is highly vulnerable to the impacts of climate change. Kaska communities have observed rising temperatures and decreased rainfall in the summer, leading to intense heatwaves and increasing wildfires (T. Ball, personal communication, August 31, 2023). These firsthand observations align with broader trends seen across the province, such as record-breaking high temperatures in interior B.C. during the summer of 2021 and annual wildfire seasons (Gifford et al., 2022). The heat is of particular concern because temperatures of 30°C are historically unheard of in the region due to its northerly location (T. Ball, personal communication, August 31, 2023). Wildfires pose a major threat to the Kaska Dena, as they produce massive amounts of smoke that decrease air quality (Gifford et al., 2022); they also destroy infrastructure and displace communities. This was the case in the summer of 2023, when many Kaska community members were forced by wildfires to evacuate for up to 3 weeks, and a few returned to homes damaged by the fires (T. Ball, personal communication, August 1, 2024). Additionally, one fire forced a highway closure due to flames jumping across the road (T. Ball, personal communication, August 31, 2023). Concerns have also been raised over the impacts of climate change on river systems. Streamflow has been significantly lower during the summer months (Bonsai et al., 2019; T. Ball, personal communication, August 31, 2023). As a result, changes to wildlife behaviour and migration patterns have also been noted (T. Ball, personal communication, August 31, 2023).

The effects of climate change on the Kaska Dena ancestral territory are expected to persist and worsen, resulting in drier and hotter summers. Annual temperatures in B.C. are projected to increase by 1.6°C to 5.2°C by 2100, based on low- (RCP 2.6) and high-emissions (RCP 8.5) scenarios, respectively, with a reference period of 1986–2005 (Zhang et al., 2019). Over the same period, changes in seasonal precipitation patterns are predicted to cause prolonged periods of drought in the summer (Gifford et al., 2022). Furthermore, these changes are expected to occur at a quicker rate in northern Canada, where the Kaska Dena ancestral territory is located, than in southern Canada (Dena Kayeh Institute, 2019; Zhang et al., 2019). This will have a considerably negative impact on people, water systems, wildlife, and vegetation (Dena Kayeh Institute, 2019).

Therefore, it is imperative that adaptation measures be implemented to reduce the vulnerability of the Kaska Dena and their ancestral territory to the impacts of climate change.

Importance of Indigenous Land Guardians in Climate Change Adaptation Efforts

Indigenous Peoples have been environmental stewards for millennia. Their stewardship is guided by Traditional Knowledge and practices that are deeply rooted in the local context and have been passed down through generations. "Unlike scientific knowledge, [Traditional Knowledge] is woven into and inseparable from the social and spiritual context of [Indigenous] culture" (Dena Kayeh Institute, 2019, p. 2). Because of this, Indigenous Peoples have a profound connection with their lands and waters and feel a sacred responsibility to care for and protect the environment for future generations (Bulowski, 2022; Land Needs Guardians, n.d.; Lewis, 2023). Their unique expertise and relationship with the environment make them key players in climate adaptation efforts.

An initiative that merges Traditional Knowledge and Western science to address climate change is the Indigenous Guardians program (Land Needs Guardians, n.d.). Through this program, Indigenous Peoples work on a variety of climate adaptation and mitigation efforts within their ancestral territories, including NbS for adaptation interventions, like wetland restoration, sustainable water management, and carbon sequestration projects. Currently, there are more than 170 Indigenous Guardians programs operating across Canada (Environment and Climate Change Canada, 2024; Lewis, 2023).

The Dane Nan Yẽ́ Dāh Network

The Kaska Dena have a network of Land Guardians programs called the Dane Nan Yẽ́ Dāh Network. Dane Nan Yẽ́ Dāh means "people taking care of the land" in the Kaska language. Three Kaska communities in B.C.—the Dease River First Nation in Good Hope Lake, Kwadacha First Nation in Fort Ware, and Daylu Dena Council in Lower Post—manage their own program, which together comprise the Network (Dena Kayeh Institute, 2019). Representatives from each of the communities act as "eyes and ears on the ground" regarding natural resources and land management issues in their communities. It is managed by the Dena Kayeh Institute, a non-profit organization that works on cultural and land stewardship initiatives on behalf of the three Kaska communities in B.C. (Dena Kayeh Institute, n.d.).

The Network was initially formed in 2015 following concerns from Elders and community members about hunting pressures, such as poaching (T. Ball, personal communication, August 31, 2023), and has expanded its focus to also address climate change impacts on the community. For example, the sustainable management of natural resources is fundamental to the Guardians' work, so they share the information they collect with the provincial government to inform natural resources governance in their ancestral territory (T. Ball, personal communication,

Figure 5. The Kaska Land Guardians on a hot springs temperature monitoring excursion

Photo credit: Tanya Ball.

Figure 6. The Kaska Land Guardians at a moose hide camp at Iron Creek

Photo credit: Tanya Ball.

August 31, 2023). The Kaska Land Guardians work on a range of activities that respond to environmental concerns (Step E in the NbS for adaptation project design and implementation cycle), monitor the impacts of climate change on the communities (Step F), and build the capacities of communities to adapt. Some of these activities include (Ball, 2019; T. Ball, personal communication, August 31, 2023)

- **water monitoring**, to examine water health and understand how climate change is impacting water levels. Data collection involves sampling and measuring parameters such as water quality, pH, streamflow, water temperature, dissolved oxygen, water level, and water depth. Because water levels have been alarmingly low in recent years, this activity is a top priority of the Kaska Land Guardians. The Guardians are actively working to establish a baseline for their Nationwide database.
- **wildlife monitoring**, where the numbers, behaviour, and movement of several species of cultural importance, such as moose, caribou, and salmon, are observed and recorded. This information is used to inform wildlife management practices and build the Nation's internal database. For example, the Kaska Land Guardians have created a list of frogs and toads, labelled with both their scientific and Kaska names, that live in their ancestral territory.
- **conducting Traditional Knowledge surveys**, in which Traditional Knowledge from Elders on medicinal plants, burial sites, and other areas and objects of cultural importance is documented.
- **collaborating with non-governmental organizations, neighbouring First Nations, and the provincial government.** In partnership with Ducks Unlimited Canada, the Kaska Land Guardians have created wetland maps that are informed by

Traditional Knowledge, Western science, and field data (Ducks Unlimited Canada, 2022) to inform wetland management within Kaska Dena ancestral territory. By collaborating with the 3Nations Society, they host joint wildlife patrols and trainings for Guardians and coordinate regional efforts. The 3Nations Society is a partnership between the Kaska, Tahltan, and Taku River Tlingit Nations. (3Nations Society, n.d.). The Kaska Land Guardians also work with the provincial government through the Collaborative Stewardship Framework on collaborative approaches to sustainable wildlife management that are guided by both Traditional Knowledge and Western science (Government of B.C., 2021).

A Socially Inclusive Approach to Sustainable Land and Wildlife Management and Monitoring

The Kaska Land Guardians actively seek to engage community members of all ages and social groups in their work. For instance, Kaska Elders play an essential advisory role within the Network. They work closely with the Guardians to inform their practices, such as through teachings on traditional medicines and guidance on conducting Traditional Knowledge surveys. Elders also play a key role in the documentation of climate change, as they have seen firsthand how the environment has changed over time (Ball, 2019). Additionally, one of the Elders has assumed the role of a Land Guardian and provides invaluable insights on wildlife behaviour, accompanies the group on their patrols, and helps to incorporate the Kaska language into surveys (T. Ball, personal communication, August 31, 2023). His extensive knowledge of the land, wildlife, culture, language, and traditional management practices has been and continues to be instrumental to the program's success.

To ensure the preservation of Traditional Knowledge and Kaska Dena culture for future generations, the Guardians prioritize involving and educating youth about their program. They do this by hiring youth during the summer and delivering presentations at schools. These outreach efforts aim to empower youth to participate in environmental stewardship initiatives and strengthen their connection to Kaska Dena culture (T. Ball, personal communication, August 31, 2023). The involvement of both youth and Elders in the implementation of the program helps to foster intergenerational knowledge sharing, build capacities, and enhance sustainable land and wildlife management practices.

Furthermore, the Kaska Land Guardians have an ongoing initiative that welcomes interested community members to join them in the field. During the excursions, community members are educated about the program's work. For example, in 2019, community members were invited to learn about ecosystem monitoring at Dease Lake (Ball, 2019). The Guardians explained the importance of collecting field data to inform ecosystem-based projects and introduced them to the monitoring equipment and techniques they use. By hosting these sessions with community members, the hope is that they will be motivated to conduct citizen science and contribute to ongoing data-collection efforts. To remove financial barriers and encourage participation, the

initiative provides participants with an honorarium. Given the unique spiritual and cultural relationship that Kaska Dena share with the land, the initiative has fostered stronger connections between community members and their ancestral territory.

It should be noted that historically, knowledge keeping regarding sustainable resource and land management within the Kaska Nation is a tradition that has been shared equally between men and women (T. Ball, personal communication, August 31, 2023). Given the gender-equitable roots of this cultural norm, gender considerations are less prominent in the traditional management practices of the Land Guardians. However, it is important to acknowledge that women lead nearly half the country's Land Guardian programs and that Kaska women have and continue to champion environmental stewardship efforts (Bulowski, 2022). For example, both the Dane Nan Yé Dāh Network and Dena Kayeh Institute are led by women.

Lessons Learned

The following section presents key considerations for those working on similar initiatives or non-Indigenous organizations looking to engage with Indigenous Peoples meaningfully and respectfully in their projects, based on lessons learned thus far from the Dane Nan Yé Dāh Network (T. Ball, personal communication, August 31, 2023):

Collaborate With Like-Minded Groups Working on Similar Initiatives

Before beginning NbS for adaptation initiatives, it is important to recognize and learn from the successes and setbacks of other initiatives that came before. At the outset of the Kaska Land Guardians program, the team met with a neighbouring First Nation, the Taku River Tlingit, who had a longstanding Guardians program. During this meeting, they were able to obtain important information that ultimately helped guide their current practice. The Land Guardians from both Nations, along with Land Guardians from the Tahltan Nation, went on to form a partnership called the 3Nations Society. They now hold joint trainings for their Guardians on subjects such as wilderness first aid and archaeology and coordinate efforts on a regional scale. This partnership has brought about several opportunities for learning, funding, and collaboration, such as through the Collaborative Stewardship Framework, which has strengthened the impact of the Land Guardians' work. This approach underscores the importance of not only consulting but also collaborating with others working on similar initiatives.

Engage With Local Communities in Data Collection and Validation

When collecting data for NbS for adaptation projects, it is crucial to consult with local communities to prevent misinterpretation of the data. Prior to the establishment of the Dane Nan Yé Dāh Network, Kaska communities observed a recurring issue: non-Indigenous individuals would enter their communities, collect data, and leave without engaging with them, which is also known as colonial science or "parachute science" (Odeny & Bosurgi, 2022). Consequently, the communities noticed that the data that had been collected was misinterpreted. To address this

issue, the community started their own data-collection efforts through the establishment of the Network. They also began validating data used by external entities, such as the B.C. government. This enhanced the B.C. government's understanding, as the Guardians cross-referenced data collected from climate monitoring stations, for example, with historically observed trends and Traditional Knowledge. This highlights the necessity of involving local communities in both data-collection and validation processes and demonstrates the benefits that can arise from a community-driven approach to MEL.

It is important to note that relationship building was key to achieving this enhanced understanding. External actors working in or with local communities must allocate sufficient time to meaningfully engage with communities and build trust. Relationship building should happen at the beginning of a project, and these relationships should be sustained throughout.

Identify Trusted Liaisons

Due to a range of factors, not all community members will have the time or capacity to actively participate in a project. To ensure the success of the project, it is recommended that community members be identified as willing to act as trusted liaisons between the community and external entities. This establishes an ongoing channel of communication and allows community members to comfortably voice their opinions or concerns. The Kaska Land Guardians serve as a prime example of this, as they act as intermediaries between their communities and the government and can convey community concerns. Moreover, the Guardians' consistent presence within their communities and territory enables them to be the "eyes and ears on the ground" for both their communities and collaborators.

Involve People of All Ages and Social Groups

It is important to make provisions for the inclusion of all community members in NbS for adaptation projects, given their unique perspectives and experiences. Key to the success of the Dane Nan Yé Dāh Network thus far has been the active engagement of community members of all ages. Working with Elders has not only helped to build the capacities of younger Land Guardians as a key sustainability strategy for this work but also enhanced the Network's practices. Additionally, outreach to youth has helped raise awareness around environmental monitoring and provided a space for intergenerational knowledge sharing. Moreover, the Kaska Land Guardians' initiative, which welcomes community members to join them in their monitoring work within the territory, has produced notable co-benefits. After spending time reconnecting with their culture and land, the Guardians have observed an increase in mental well-being among participants, as well as interest in contributing to Nationwide data-collection efforts. These inclusive efforts exemplify the impact of providing community members with opportunities to participate in and learn about adaptation projects and programs.

Conclusion

The Pamoja Voices Toolkit and the Kaska Land Guardians case studies demonstrate how gender-responsive and socially inclusive approaches can be practically applied in NbS for adaptation projects, through all stages of the project design and implementation cycle. They highlight how the inclusion of diverse voices in project activities and the provision of safe, inclusive spaces for sharing can help enhance operations and improve the effectiveness of NbS for adaptation projects, such as through the inclusion of women and youth in adaptation planning and decision making, or Elders in sustainable land and wildlife management practices. Both case studies exemplify the importance of building trust with community members in NbS for adaptation programming, as well as the need to establish local partnerships and relationships with trusted liaisons and facilitators, particularly those from equity-deserving groups. Finally, the two case studies speak to the benefits of investing in citizen science and community-led, gender-responsive, and socially inclusive MEL processes to better understand the varied impacts of climate change and biodiversity loss on local communities.

Designing NbS for adaptation projects to be responsive to gender and social differences is no longer an option but a necessity. Integrating GESI considerations into adaptation initiatives can help ensure that they do not exclude equity-deserving groups from receiving benefits, as well as encourage relationship building and knowledge sharing among different generations, genders, and social groups.

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