

ADAPTATION
AT ALTITUDE

Leave No Mountain Behind: The Synthesis Series

Scaling ecosystem restoration and protection: challenges and promising solutions



Adaptation at Altitude, a collaborative programme launched and co-supported by the Swiss Agency for Development and Cooperation, assists mountain communities and those working with them by improving the knowledge of appropriate climate change adaptation and disaster risk reduction strategies in the mountains, and by transferring that knowledge through science-policy platforms to inform decision-making in national, regional and global policy processes. This synthesis series is an example of that work.

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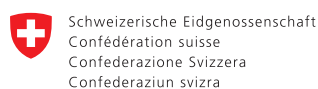
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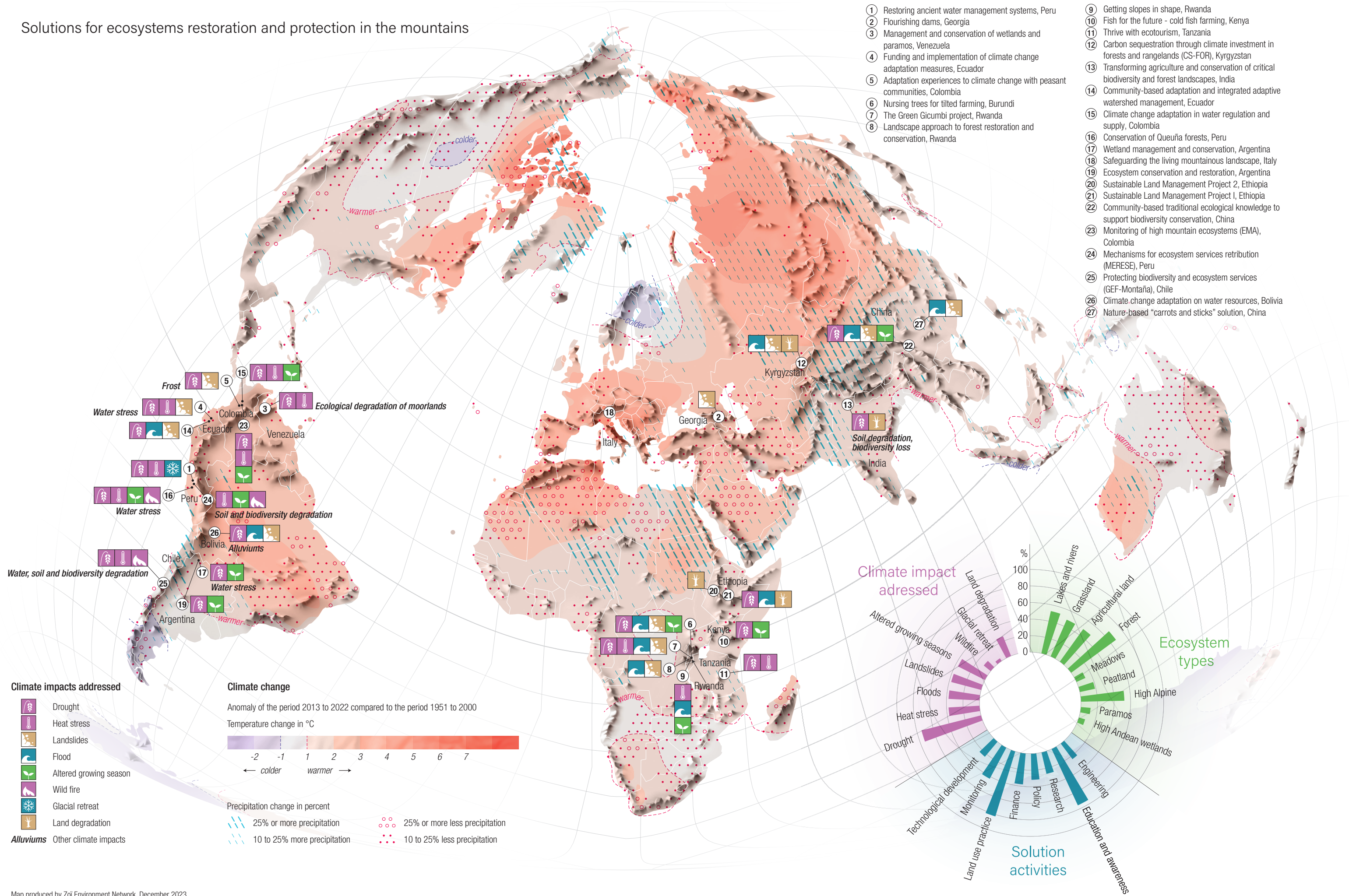
Mountain ecosystems are severely impacted by climate change and land degradation. Yet these ecosystems contribute greatly to the livelihoods of upstream and downstream populations by supporting water supply, timber and food production, hazard regulation, culture and tourism. Thus, to maintain these populations' quality of life, mountain ecosystems need to be protected and restored. Ecosystem restoration and protection are among the most widely implemented nature-based solutions for adaptation, as these solutions have the capacity to counter climate change impacts and biodiversity loss while also improving social wellbeing. However, implementing these solutions in large landscapes remains challenging. Based on evidence gathered in the [Adaptation at Altitude Solutions Portal](#), this analysis provides lessons learned that can help inform future projects.

About one third of the solutions documented in the Adaptation at Altitude portal involve the protection or restoration of mountain ecosystems. These solutions, whose implementation started between 2000 and 2020, aim at directly or indirectly financing the protection, restoration and/or sustainable management of ecosystems. They cover areas ranging from tens to thousands of hectares, and are mainly located in Latin America and Africa with a few also in Asia. Little evidence has been gathered from the global North so far (just two projects in Europe), represents a gap in the database. Different types of ecosystems are targeted, but largely with solutions focused largely on forests, freshwater ecosystems such as lakes and wetlands, agricultural ecosystems such as

grasslands and farmland, and high alpine lands. Most of the solutions tackle more than one climate impact, with water security risk the main impact addressed, notably linked to the effect of droughts, heat, water stress, and floods. Other climate impacts addressed are altered growing seasons, landslides and land degradation, resulting from climate change and other anthropogenic factors.

Changing land-use practices, education and raising awareness are some of the main activities implemented to adapt to climate change and support ecosystem restoration and protection, as reported in the portal. Changes in land use practices include the restoration of wetlands and lakes, the protection and rehabilitation of forests, the conservation of native ecosystems such as paramo, restoring land degraded by erosion, and agricultural practices such as maintaining soil cover in the dry season, rotational grazing, creating terraces and planting fruit trees. Many solutions also aim to raise the awareness of, and provide training and education to, local populations and practitioners, thus encouraging communities to adopt practices that support both livelihoods and local ecosystems, such as community forest management. Finally, several solutions have political, social or research outcomes that help to engage local communities in sustainable ecosystem management. These solutions include activities such as direct funding (e.g. incentives for good practices), monitoring and research (e.g. ecological and climate monitoring), technological development (e.g. dikes) and also improving policy (e.g. making agricultural policies more sustainable).

Solutions for ecosystems restoration and protection in the mountains



The benefits of the solutions

Ecosystem restoration and protection solutions are known to provide multiple benefits and co-benefits to populations and therefore to have a wide range of direct and indirect beneficiaries.

Alongside the environmental benefits and outcomes expected from restoration and protection adaptation solutions, the empowerment of local communities appears as a main social outcome. The reported adaptation solutions provide environmental benefits, including improvements in biodiversity, sustainable land use, water quality and soil maintenance, as well as reduced climate risk. Outcomes commonly relate to water supply (better regulation of water flow by vegetation and infrastructure), food production (improvement and diversification of agricultural practices and better soil protection) or protection against hazards (restoration of degraded lands and prevention of soil erosion). However, they also provide many other co-benefits that have social, economic, technical or political dimensions. The main social outcome is the empowerment of local communities or institutions and their increased capacity to engage local actors in sustainable management practices. Various activities have been developed to support empowerment, such as creating space for dialogue between local communities and decision makers, and building inclusive processes with community participation in decision-making, including regarding the design, implementation and monitoring of solutions. Empowerment has been also supported by activities encouraging the prioritisation of environmental issues in local and national public policies, and by the direct funding of community capacity-building. A second important social outcome is improved livelihoods, achieved by diversifying sources of income (e.g. through new agricultural products, tourism); creating new and more diverse job opportunities, notably in “green” sectors and for young people; and providing training. A third social outcome, reported to a lesser extent, is the development of awareness and knowledge among local communities and practitioners. Local communities, government agencies and land managers have received training on sustainable practices as well as climate change impacts and vulnerability.

Figure 1. Prevalence of different types of benefit and co-benefit provided by ecosystem restoration and protection solutions

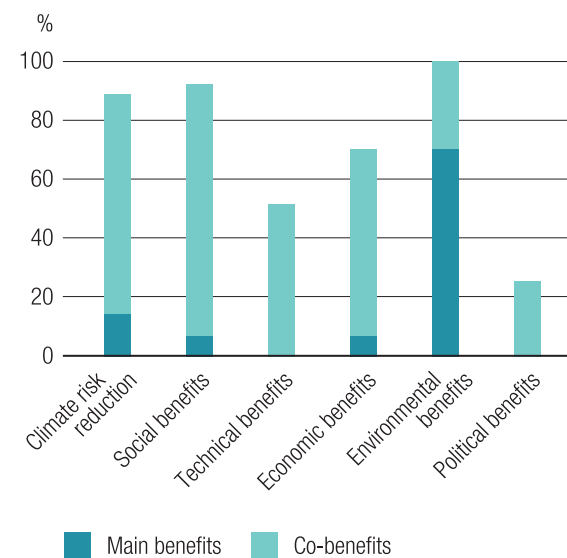
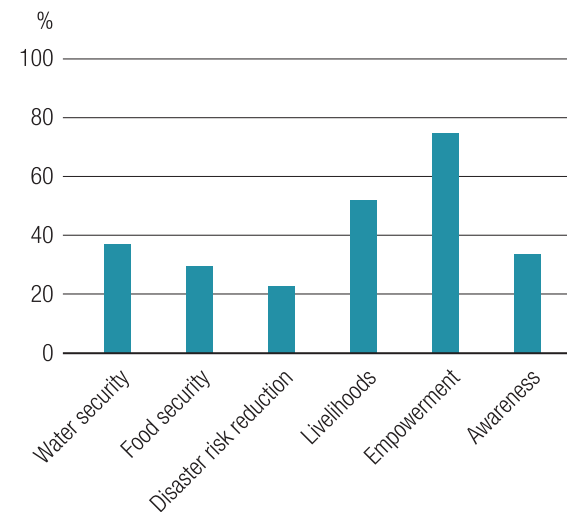


Figure 2. Prevalence of main social outcomes reported in ecosystem restoration and protection solutions



An integrated erosion control project with a combination of solutions was implemented in two villages in Tusheti, Georgia. In total, 27 structures were installed in gullies to prevent further erosion and stabilise the soil to enable vegetation regrowth.



Erosion marks on pasture above Jvarboseli village in Tusheti, Georgia. © Sustainable Caucasus

This solution contributes to the conservation and restoration of high Andean wetland ecosystems through the implementation of more sustainable grazing practices in the Laguna de los Pozuelos with the active participation of local communities.

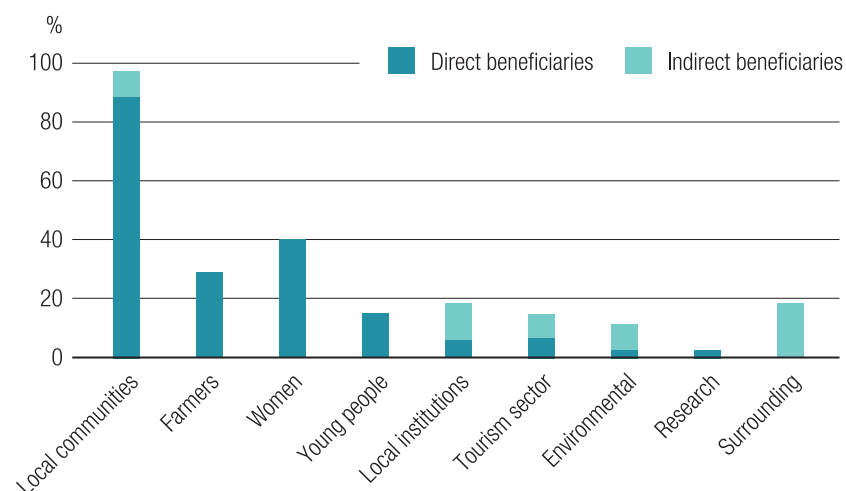


Ecosystem conservation and restoration in Laguna de Los Pozuelos, Argentina. © Wetlands International/Fundación Humedales

Local communities are the most common direct beneficiaries of restoration and protection solutions (88%) with an increasing emphasis on women (40%) and their involvement in planning, implementation and decision-making processes. Direct beneficiaries of the solutions reported are often involved in protection or restoration activities and live near the areas where the solutions are implemented. They include local communities (beneficiaries in 88% of solutions), including families, households or entire villages, micro-watershed populations, indigenous communities or landowners; the agricultural sector (29%), farmers, peasants and shepherds; and the tourism sector and local businesses (7%). Particular attention is paid to vulnerable groups, especially women (40%) and youth (15%). The majority of these solutions try to ensure that benefits are equitably distributed within the population, including among genders and socially disadvantaged groups.

Among indirect beneficiaries, the tourism sector increasingly gains from the protection and restoration of landscapes and ecosystems, and thus contributes to the diversification of income sources for local populations. Other main indirect beneficiaries are surrounding rural or urban populations, particularly those located in the catchment area downstream of projects involving water resource management. Other beneficiaries can include government and civil society organisations (especially those with a focus on the environment) at local, regional and national levels, which may enjoy increased funds, capacities, participation and support for their adaptation initiatives.

Figure 3. Prevalence of direct and indirect beneficiaries of ecosystem restoration and protection solutions



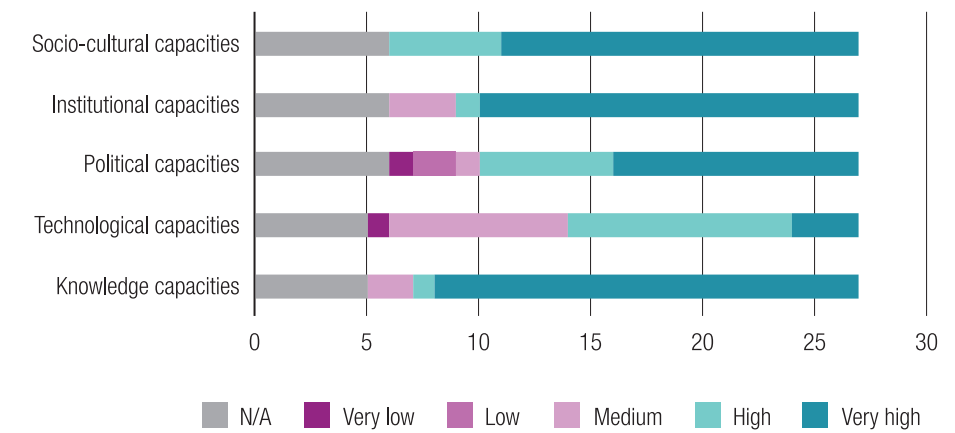
Levers and barriers for implementation

The implementation of solutions requires significant capacities and resources. While many solutions successfully mobilised funding, knowledge, legal and political, institutional and sociocultural capacities, challenges also arose during their implementation.

Most of the solutions are transnational, national or sub-national projects funded by international programmes and institutions (e.g. World Bank, Food and Agriculture Organization of the United Nations) or national funds (e.g. Rwanda National Climate and Environment Fund). Although solutions are mainly coordinated at the national or sub-national level by government institutions, non-governmental organisations or academic institutes, they are often implemented by local actors, institutions and communities. The funding of the solutions recorded and the duration of their implementation varied significantly. Budgets ranged from USD 27,000 to USD 900 million, with a median of around USD 5 million. The implementation period varied between 3 and 25 years, indicating a median budget per year and per solution of about USD 950,000.

For some solutions, implementation was enabled and encouraged by strong institutional support and inclusive decision-making processes. Many solutions were supported by motivated governments, national and international engagement strategies and existing national public policies promoting

Figure 4. Level of capacities mobilised in the 27 ecosystems restoration and protection solutions



climate change adaptation, mitigation and biodiversity preservation, alongside economic development. Adaptation solutions were also sometimes facilitated by new institutional arrangements, with new forms of decision-making more inclusive of local actors. This has increased ownership, legitimacy and acceptance, and thus improved the effectiveness of decision-making processes.

Collaboration among stakeholders across different scales, institutions and sectors was crucial for the successful coordination of the initiation, implementation and monitoring of solutions. All solutions developed multi-stakeholder processes for at least one implementation step, ranging from planning to monitoring. These processes included civil society groups, government institutions, private companies and research institutes active across different scales and sectors. Stakeholders were involved in steering, technical or management committees that helped to define the roles of partners and facilitate decision-making processes. The institutional organisation and experience of funding agencies helped leverage these partnerships.

A substantial exchange of knowledge and skills occurs among solution stakeholders, with local communities contribute ancestral and traditional knowledge. Project leaders further foster local involvement by promoting capacity-building and empowerment through training and awareness-raising. Stakeholder engagement has been key to involving local populations in the sustainable management of ecosystems. To ensure that local needs, perceptions and knowledge were considered, local communities were involved in solutions from the beginning. For some solutions, this included the physical implementation of restoration actions on their land and in watersheds.

The restoration and protection solutions required considerable knowledge and skills. This included existing and newly acquired knowledge that helped identify vulnerabilities to climate change, map and assess ecosystems, and identify locations and best practices for implementation. In most cases, scientific, technical, local and traditional knowledge all informed the design of the solution. Knowledge produced during this process was made accessible to current and future projects, for example through training courses and practical handbooks.

“The project aims to strengthen organizational capacities, such as cross-sectoral and multi-stakeholder collaboration and coordination mechanisms, and has established cross-sectoral working groups at different levels.”

Green-Ag, India

The objective of this project is to work with local communities to protect and restore queuña (*Polylepis* spp.) forests along with their water, landscape and biodiversity, using traditional collective work strategies.



Community reforestation in action in the Vilcanota mountains near Cuzco, Peru. © ECOAN, Luis Torres, 2018

The Green Gicumbi Project in northern Rwanda uses an integrated landscape management model to restore and enhance degraded watershed ecosystems and promote the sustainable management of forest resources. Terraces have been introduced on steep cultivated hills to promote climate-resilient farming practices.



Newly constructed terraces in Rwanda © iStock

“The participation of local and women’s organisations in the execution of these activities was a turning point in the project that not only promoted ownership of the solutions, but also produced a transformative change within the beneficiaries and local communities themselves.”

Chingaza-Sumapaz-Guerrero Conservation Corridor, Colombia

Providing local communities with tools, data and infrastructure was key to sustaining the benefits produced by the solutions over the long term. The solutions required the mobilisation of technical and technological resources during all implementation steps. For example, resources mobilised during initiation and monitoring for data collection and mapping tools, remote sensing satellite imagery, climate models or scenarios, and ecological and meteorological measurements. Infrastructure was provided to, for example, store and distribute water (e.g. dikes, channels, rain-water harvesting systems). Also, participatory or digital tools were used to train, communicate and raise awareness among local communities (e.g. virtual platforms).

“Remote sensing and geographical information systems are valuable tools to support the planning and monitoring of wetlands management and livestock-raising practices.”

Wetland management and conservation in the Pozuelos Biosphere Reserve, Argentina

Restoration and protection solutions can face barriers and have adverse effects, such as displacing environmental pressure to lands beyond the area of implementation. Barriers to the successful implementation of solutions were often rooted in the social, economic and political context. Problems encountered included economic

pressures, corruption, shifts in political support, staff turnover, tensions among local actors, and lack of institutional capacity. In some cases, this led to a lack of financial and human resources to implement solutions. Some solutions were also hampered by the COVID-19 pandemic. Restrictions put in place in many countries severely limited stakeholder engagement as well as fieldwork and restoration activities, causing delays. Project staff also encountered difficulties in reconciling the different needs and objectives of local stakeholders, particularly between nature conservation, industry, agriculture and energy interests. Finally, some solutions faced resistance from stakeholders involved in unsustainable practices, such as mining, agriculture and the cultivation of exotic species. Social and environmental risk assessments allowed some projects to better anticipate and resolve these challenges.

“The limited availability of logistical and human resources, especially at the regional and local levels, frequent staff turnover, inadequate working conditions, and insufficient capacity to support project interventions appeared among the main issues.”

Sustainable Land Management Project I, Ethiopia

Maintenance and upscaling

Ecosystem restoration and protection solutions are designed with the intention that improved practices will be maintained over time to support the sustainability and livelihoods of local communities. Their inclusion in the Adaptation at Altitude Solutions Portal encourages the replication and scale-up of the solutions in other areas and contexts.

Strong local ownership and economic sustainability are key to ensuring solutions are maintained beyond the life of a project. Firstly, activities to monitor solution outcomes and impacts need to be carefully planned to sustain stakeholder engagement. Secondly, economic sustainability plays a crucial role in solution maintenance. Funding could be bolstered by government investments or

the establishment of commercial activities eco-tourism linked to ecological protection and restoration. Finally, across the solutions, empowerment and capacity-building activities enhanced people's sense of ownership and their commitment to adopting sustainable practices. In many cases, various actors engaged in implementing the solutions through committees, local alliances or development plans.

“The long-term sustainability of this solution is supported by the training, awareness and active involvement of local community members in the participating districts, which helps to ensure ownership of the results and of the landscape restoration and [integrated water resources management] processes”

The EWMMR pilot project, Rwanda

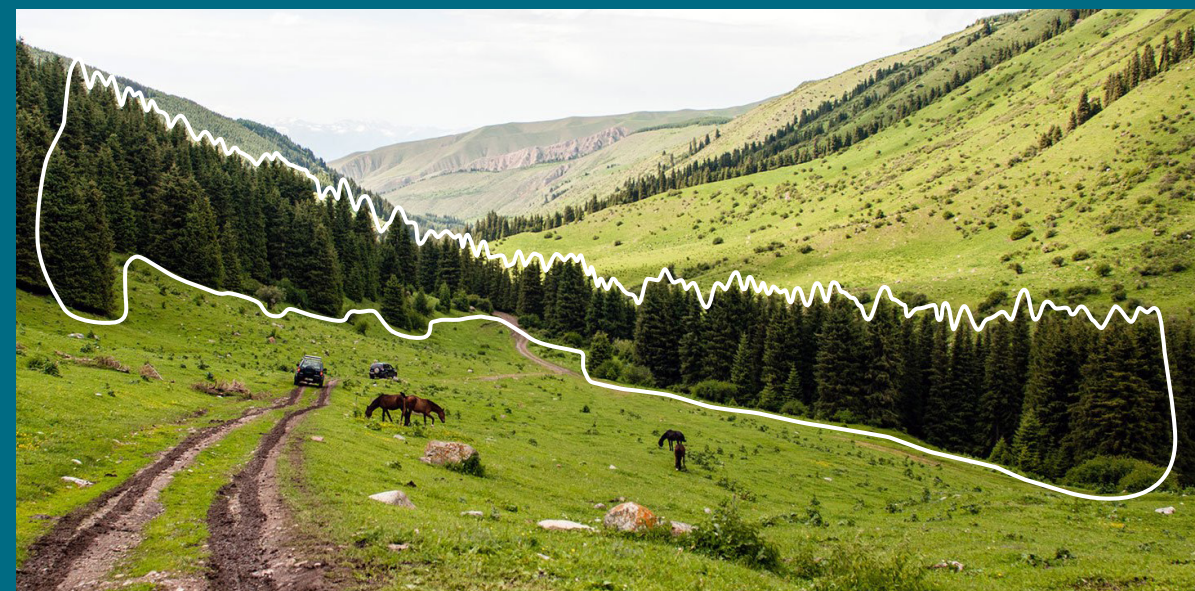
Knowledge transfer and institutional capacity-building are the main factors supporting the replication and upscaling of ecosystem restoration and protection solutions. Many solutions have been replicated in various locations or countries, often under the same funding mechanism. Knowledge generated from one project, including practices developed and lessons learned, may be easily transferable to another, which can help to reduce costs and generate positive outcomes. Various tools have been employed to make such knowledge available, including handbooks, videos and websites. Content can be translated into the language of the target audience. Some solutions have gained recognition for their effectiveness, receiving awards that enhance their visibility and encourage replication. Efforts invested in training institutional partners and influencing public policies during projects also contribute to the mainstreaming of sustainable practices and to replication of solutions.

Overall, ecosystem restoration and protection solutions have been successful in promoting transformative adaptation by shifting societal values, practices, and behaviours to address the root causes of climate change while mitigating its worst effects. It has achieved this success: by **empowering communities** to actively participate in the design and implementation of solutions, promoting transformative change in how climate-related challenges are addressed; by moving away from conventional, environmentally harmful land practices towards more **ecologically friendly and resilient methods**, contributing to the preservation of ecosystems and water resources; by **restoring and conserving ecosystems**, thus contributing to climate change mitigation, biodiversity conservation and the strengthening of ecosystem services such as water regulation and soil stabilisation; by recognizing the value and relevance of **local, indigenous and traditional knowledge** systems, the solutions promote more holistic and context-specific approaches to climate-change adaptation; by **raising awareness among local communities** about the impacts of climate change, people become more informed, engaged and more interested to adopt climate-resilient behaviours in their daily lives; and by **advocating for changes in policy and institutional frameworks** to support climate change adaptation and facilitating the integration of climate considerations into development planning and decision-making processes.

“The project supports fundamental change in climate change adaptation in high Andean wetlands ecosystems through capacity-building and knowledge transfer to local communities and local governments of the area, so that they can work together on a sustainable and long-term perspective.”

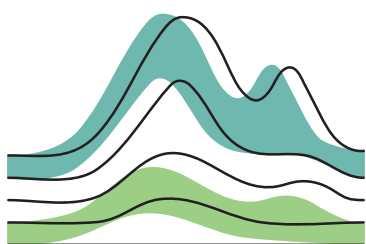
Ecosystem conservation and restoration in Laguna de Los Pozuelos, Argentina

Through a combination of adaptation and mitigation strategies, this project in Kyrgyzstan aims “to contribute to the development of a low carbon and climate-resilient economy, while capitalising on important co-benefits from adaptation and disaster risk reduction”.



Kyrgyzstan Landscape. © Green Climate Fund, 2021

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