

6. PERU:

Sustainable watershed management in glacial mountain ecosystems

Implementing partners	NGO: CARE Peru Financed by the Swiss Agency for Development and Cooperation (SDC) Project executed in consortium with the University of Zurich Government: Glaciology Unit of the National Water Authority, Regional Governments of Ancash, Cusco and Lima, Peru Ministry of Environment, Peru Ministry of Economics and Finance Community-based organisations: communities of Cusco and the Nor Yauyos-Cochas Landscape Reserve in Cañete, Lima Other: Meteodat, the Alpine Environment Research Center (CREALP), and the Federal Polytechnic School of Lausanne (EPFL)
Location	Ancash, Cusco, and Lima, Peru
Ecosystem types	Highland glacial mountain ecosystems with a mosaic of glacial lagoons, glacier-fed lakes and rivers, grassland and human settlements downstream
Operational scale	163 hectares in the Ancash, Cusco, and Lima provinces, covering many towns and landscapes, with potential benefits for human settlements and ecosystems many kilometers downstream
Time frame	2011–2019



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The Challenge

Climate change: 71% of the world's tropical glaciers are found in Peru. Over the last 40 years, due to the impacts of climate change, the glacial surface of 18 snow-capped mountain ranges in the country has been reduced by 53%. The accelerated retreat of the glaciers often creates unstable lagoons and causes natural disasters such as alluvium landslides and deadly flash floods.

Nature: Many of Peru's freshwater ecosystems are fed by glaciers. Glacial melt is disrupting water flow and quality, posing a threat to the flora and fauna that rely on freshwater environments. Unsustainable management of fragile glacier ecosystems is causing environmental degradation and biodiversity loss. For example, in Cusco, many highland pasture areas have been degraded by overgrazing. This, coupled with increasing temperatures, has led to increased rates of evaporation from highland grassland, reducing available water in the landscape.

People: Ice and rock landslides from glacier melt generate waves that form deadly flash floods, inundating population centers and displacing communities, with women, children, poor, and indigenous communities most disproportionately affected.

The provision of water in Peru depends on the conservation of high mountain ecosystems that are responsible for the regulation, storage, and provision of water for consumption and irrigation by the entire country. Water deficits and droughts resulting from the loss of glaciers as a dependable form of water storage have worsened the food security situation, threatened the livelihoods of Andean farmers and multiplied the socioeconomic threats facing poor communities who rely on glaciers not only for water, but for food and energy production. For example, rivers fed by glacial meltwater are a critical source of irrigation for agriculture and energy for hydropower companies.

NbS implemented

The Proyecto Glaciares saw community-led, multi-stakeholder coalitions of scientists, public and private sector actors collaboratively develop water resources management plans to sustainably manage more than 200 new lakes. The project benefitted downstream communities and protected fragile high-altitude freshwater ecosystems. As part of those water resources management plans, communities working with other stakeholders have protected and restored wetland by replanting native species, protecting grassland and forests around important spring water resources, fencing tributaries for restoration of vegetation, and planting native

species on water banks to protect water resources. They have also established sustainable communal grazing plans to prevent overgrazing.

The project also trained smallholder farmers to carry out sustainable farming practices including the sustainable use of water. These NbS were combined with other measures: for example, building dams to harvest water from periglacial lagoons for the storage of rainwater and protection of wetlands, and the design and implementation of early disaster warning systems.

Achievements

Climate change: Restored and better-managed water resources and glacier ecosystems have helped to reduce the risk of landslides and flash floods for more than 70,000 people living downstream. In addition, women, Indigenous People and poor communities, who led these nature-based solutions, now benefit from access to climate information services, helping to protect their lives and livelihoods from natural disasters.

Nature: The project included the creation or strengthening of 34 water and sanitation service boards to sustainably manage natural and water resources. In addition:

- 143ha of wetland have been protected and restored
- 11ha of springs have been protected
- 200 new lakes have been created and sustainably managed.
- 30ha of water surface area have been restored in ten periglacial lagoons or rustic dams in high mountain areas. These are managed by communities and

water and sanitation service boards to store water and recharge and maintain wetlands.

The improved water supply has allowed new watering holes for wildlife to be created and mountain meadows to be restored.

People: Communities now have better access to water, improved income and strengthened capability and knowledge to manage climate change risks and water resources. Improved scientific knowledge, better public policies and local implementation skills also contribute to long-term poverty alleviation in Peru. Some of the achievements include:

- 1,000 small-scale farmers have gained greater skills in climate adaptation, disaster risk management and integrated management of water resources;
- 73 farmers have been trained in good agricultural practices that sustainably and efficiently use highland water resources such as the periglacial lagoons;

- Four women-owned and operated companies have been created to sustainably produce and market products such as coffee, granadilla and honey
- Nearly 70,000 people living downstream from the glaciers have benefitted from early warning systems for landslides.

Success factors

Combining scientific knowledge with traditional knowledge helped to ensure that the design of the NbS solutions incorporated both local indigenous knowledge and robust scientific data. Combining science with local knowledge of flood risks also led to the creation of an early warning system for floods through the community mapping of flood-prone areas and evacuation routes. This system also helps communities and researchers collect and monitor data in the long term to inform the design of appropriate NbS and other measures to adapt to climate change impacts.

Combining NbS and grey infrastructure to meet a diverse set of short-term and long-term needs: As glaciers continue to retreat at a fast rate, NbS alone are not enough to sustainably manage water resources in a way that can meet the increasing demands for human consumption while preventing further loss of crucial habitats like wetlands. Combining the restoration of native vegetations and sustainable use of natural resources in key watersheds with grey infrastructure such as dams can help ensure long-term sustainable management of water resources while meeting immediate needs for irrigation, fishing and energy generation. This type of hybrid management can meet and balance water needs and generate broader stakeholder support for NbS. The NbS contributed to the adaptive capacity of the communities and utilised gender-sensitive CVCA methodology to identify adaptation measures aligned with Peru's NDC.

Multi-stakeholder partnership: Close collaboration amongst communities, researchers and government officials has strengthened collective management of resources and climate risks. Scientific and local knowledge on NbS is now integrated into government development plans, strategies, and investments. This has led to increased public and private investment

in sustainable water resources management. Increased monitoring capacity supported by the government of Peru enables more data to be used by researchers to inform the design of NbS and other measures, creating a virtuous cycle of long-term planning and implementation.

Strengthening of capabilities at the three levels of government (national, regional and local) and in academia has raised awareness of the importance of glaciers and the integrated management of water resources for political actors. Likewise, it has allowed dialogue and the exchange of knowledge between the scientific community and the public sector and increased the integration of scientific information into development plans, strategies, methodological tools and investment projects, such as in the use of flooding and landslide hazard risk maps. In addition, scientific information on the effects of climate change on glaciers and other natural resources has been incorporated into territorial development plans, led to the creation of the National Institute of Glaciers and Mountain Ecosystems, helped in the formulation of the multipurpose public investment projects for environmental protection and management, and allowed for the integration of community-based adaptation, disaster risk reduction, and integrated water resources management approaches in development plans agreed at the regional level.

Engaging women in natural resource management: Women are more aware of natural resource distribution and long-term risks and often bear most responsibility for securing long-term access to water for their families. By supporting women to be more active in communal decision making, communities are more likely to monitor and assess long-term risks and manage their natural resources sustainably for long-term benefits.

Resources

The **Proyecto Glaciares website** hosts a range of resources, including **infographics**, **videos** and **photo galleries**

DeMerritt-Verrone, P. (2020). **Taking care of our Mountains**. Care International.

Proyecto Glaciares (2020). **Modelling Future Lakes in Glacier Beds: First Experience in Peru**. Proyecto Glaciares.

Contact

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