Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Feasibility Study

for

Resilient Puna

Ecosystem based Adaptation for sustainable high Andean communities and ecosystems in Peru

As of December 2023, v.04

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Table of Contents

List of Figures

List of Tables

Abbreviations

AE	Accredited Entity
AMA	Accreditation Master Agreement
BAU	Business-as-usual
BMZ	Federal Ministry for Economic Cooperation and Development
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CO_2eq	Carbon dioxide equivalent (referring to GHG emissions)
EE	Executing Entity
ESIA	Environmental and social impact assessment
ESMP	Environmental and social management plan
ESMF	Environmental and social management framework
ESS	Environmental and social safeguards
EU	European Union
EUR	Euro
FS	Feasibility study
FP	Funding Proposal
GA	Gender Assessment
GAP	Gender Action Plan
GCF	Green Climate Fund
GDP	Gross domestic product
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal rate of return
M&E	Monitoring and Evaluation
MRV	Measuring, reporting and verification
MTR	Mid-term review
MW	Megawatt
MWh	Megawatt-hour
NDC	Nationally Determined Contribution
NGO	Non-governmental Organisation
UN	United Nations
O&M	Operation and Maintenance
SDG	Sustainable Development Goal
USD	US Dollar

1. Introduction to the Feasibility Study

1.1 Objective of the study

This Feasibility Study has been developed to support the design of the proposed Green Climate Fund (GCF) project "*Resilient Puna: Ecosystem-based approaches for sustainable High Andean communities and ecosystems in Peru"*, being developed by GIZ (the Accredited Entity) through a coordinated approach with Peru's government.

The primary objective of this study is to assess the factors supporting the relevance of the project's proposed interventions for GCF investment, with focus on technical design, social and environmental impacts, legal and regulatory environments. This Feasibility study thus constitutes Annex 2 of the Funding Proposal submission package and analyses climate impacts in the region, the water and agriculture sector, as well as the ecosystem services and their role as part of Andean communities' livelihood strategies. It also provides a project baseline to demonstrate how project design will contribute to the outcomes of the project.

The study will analyse the context supporting climate change risks and the adaptation sector in Peru, expand on project activities identified in the approved Concept Note (CN), and analyse the capacity of national and devolved governments to implement these activities to reach the following outcomes:

- **Outcome 1:** Puna ecosystems are restored, conserved, and better managed through the implementation of EbA measures complemented by CRVC,
- **Outcome 2:** Public and private financing for EbA measures and climate resilient livelihoods are established and being actively used by vulnerable communities in the Puna ecosystem.
- **Outcome 3:** EbA and climate resilience are mainstreamed into multilevel landscape governance instruments.

1.2 Methodology of the study

The study is based on a primary information and secondary literature review on relevant documents for the climate change profile and agriculture and ecosystem services sectoral impacts.

The climate change profile was elaborated using a combination of secondary reports and academic literature. Primary data from Peru's national hydrometeorological service was used in (SENAMHI) previous Climate Risk and Vulnerability Analysis conducted by GIZ, the Accredited Entity (AE) submitted to the GCF as Annex 3 at the CN stage (See section 3.2. for more information). Information on hydrological data was based on an internal hydrological model, for which a detailed methodology is found in Annex 2g.

This primary and secondary analysis was supplemented with a series of validation discussions with national stakeholders such as MIDAGRI and MINAM, about prioritization of Ecosystem-based Adaptation (EbA) interventions and regional agricultural value chain data gaps.

2. Country Profile

2.1 Overall Country Profile

Located in western South America, Peru is one of the 10 most biodiverse countries in the world, has the fourth largest tropical forest cover and is home of 71% of the world's tropical glaciers (MINAM, 2016). The country has a territorial extension of 1,285,216 km², with the Andes Mountain range crossing its national territory from north to south and is considered the 20th largest country in the world (SENAMHI, 2009). In 2014, 58.9% of the Peruvian territory was covered by forests (MINAM, 2014).

3. Although Peru is located between the equatorial line and the tropics of Capricorn, different factors, such as the Humboldt current and the Andes Mountain range generate a heterogenous climate within the territory. According to Thornthwaite's classification, Peru has 27 of the 32 types of climates existing on the planet (SENAMHI, 1988). The El Niño and La Niña phenomena have a great influence on the country's climate (see Section 3. Ecosystems of the High Andean Ecoregion

All prioritized districts are made up of high mountain ecosystems, with the Puna ecosystems peatlands, grasslands and wetlands being of particular interest for the project. Due to the focus on high mountains, the ecosystems within the 91 prioritized districts shared more similarities than the ecosystems within each project region. The main ecosystem types in the prioritized areas are Andean grassland and Andean highlands with little or no vegetation. Scattered areas of shrub tickets and highland wetlands (Bofedal) are contained in most prioritized districts.

Pajonal de Puna Seca (Dry Puna Grassland): The Dry Puna grassland refers to High Andean ecosystem with herbaceous vegetation, which can occupy flat or undulating terrain as well as hills of moderate slope. The soil has a sandy-loamy texture with low organic matter content; soil cover is less than 35%, maximum height generally and does not exceed 1.5 meters. The climate is markedly seasonal, with a very intense dry season, which is accentuated towards the South and West. It is generally made up of lawns dominated by low grasses and grasslands dominated by robust and xeromorphic tufted grasses, often with stiff, hard, and sharp leaves, with variable presence of resinous shrubs, interspersed with saxicolous vegetation on rocky ridges (typically associated with shrubs) and *canllares* (formations of Margyricarpus sp.). A notable community is formed by Puya *Raimondi.*

Pajonal de Puna Húmeda (Wet Puna Grassland): The Wet Puna grassland refers to High Andean ecosystem with herbaceous vegetation consisting mainly of low grasses and grasslands dominated by gramineous that grow in clumps, dispersed, with hard stems and leaves, and some scattered shrub associations, interspersed with saxicolous vegetation on rocky ridges. It can occupy flat or undulating terrain or hills of moderate slope. It presents a coverage of 35-50% and its height generally does not exceed 1.5 meters. A notable community is formed by *the Puya Raimondi.*

Bofedal (High-Andean Wetland): Andean hydromorphic ecosystem with herbaceous vegetation of hydrophilic type, which occurs in the high Andes on flat soils, in depressions or slightly inclined; permanently flooded or saturated with running water (poor drainage), with dense and compact evergreen vegetation, cushion or cushion-shaped; the physiognomy of the vegetation corresponds to grasslands of 0.1 to 0.5 meters. The organic soils can be deep (peat). This type of ecosystem is considered an Andean wetland. In many parts of the country these ecosystems are known as *oconales*, which in Quechua means "wet zone". Soil conditions (bulk density and peat depth) are most closely correlated to the provision of important ecosystem services such as carbon and water storage.

Periglacial and glacial zone: High Andean ecosystems are located above 4,500 meters. Cryoturbed and bare soils with abundant melting zones as well as the presence of cryoturbed and dynamic vegetation. Low and scattered vegetation (generally no higher than 30 or 40 cm), represented by sparse grasses, asteraceae, lichens, and cushion plants, among others. It should be noted that there are periglacial zones that are no longer associated with glaciers. These zones include glaciers, which are masses of ice that accumulate on the highest levels of the mountain ranges (above 5,000 m a.s.l.); it includes rocky debris and is characterized by a balance between the accumulation and melting of snow and ice.

High Andean Relict Forest (queñoal and others): Forest ecosystem consisting of high Andean relic / natural forest dominated by associations of *queñua* (Polylepis spp.), extending over 0.5 hectares, with trees taller than 2 meters and a ground cover of more than 10%; commonly restricted to rocky slopes or ravines with a distribution in patches or vegetation islands.

Meso Andean relict forest: Andean ecosystem of variable composition and structure represented by pure or mixed communities of:

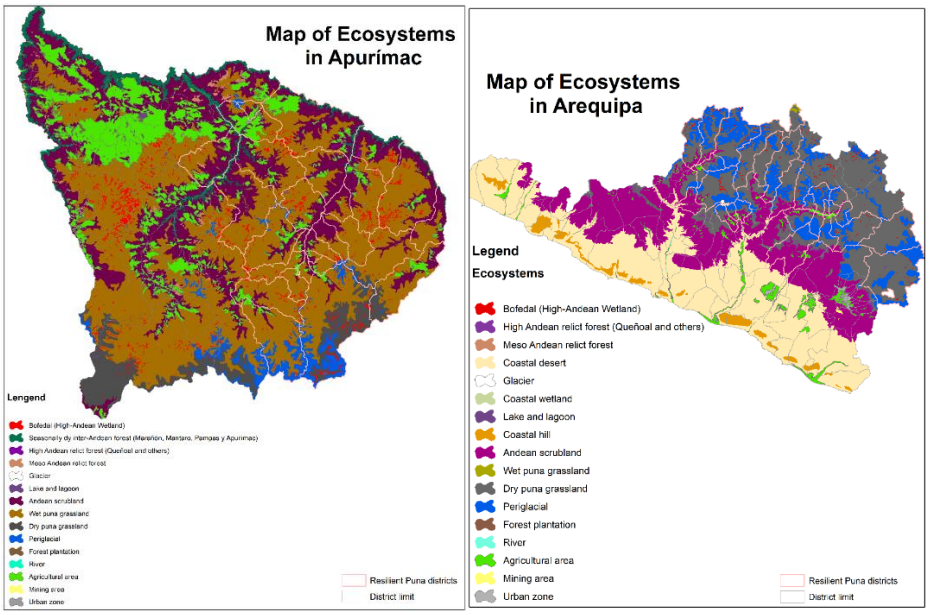
- Escallonia resinosa *chachacoma* or *karkac*, Escallonia myrtilloides *tasta*, Podocarpus glomeratus *intimpa*, Myrcianthes oreophila *unka* in wetter areas and
- Kageneckia lanceolata *lloque*, Alnus acuminata *aliso* or *lambrán* and other species in drier areas.

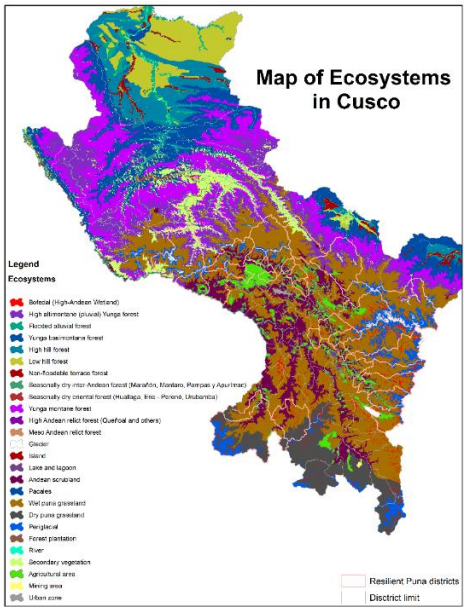
It extends over 0.5 hectares, with trees over 2 meters high and ground cover over 10%; commonly distributed as patches or islands of relict vegetation restricted to special localities, on mountainous slopes with moderate to steep gradients.

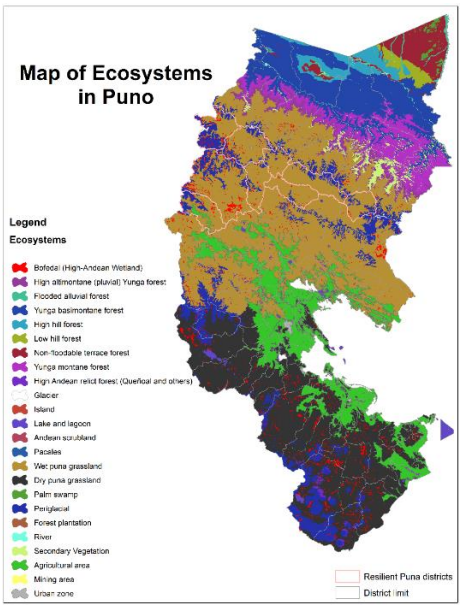
Seasonally dry inter-Andean Forest: Forest ecosystem characterized by deciduous tree communities distributed along the inter-Andean valleys, including seasonal herbaceous species in the lower stratum; tree-like cacti are notorious, abundant, and mostly endemic. The dominant physiognomy corresponds to a seasonally dry forest open on slopes, with individuals up to 7 or 8 meters. Its altitude ranges from 500 to 2 500 meters above sea level approximately. This ecosystem is found in the inter-Andean valleys of the Marañón Huancabamba, Pampas, Apurímac, among others.

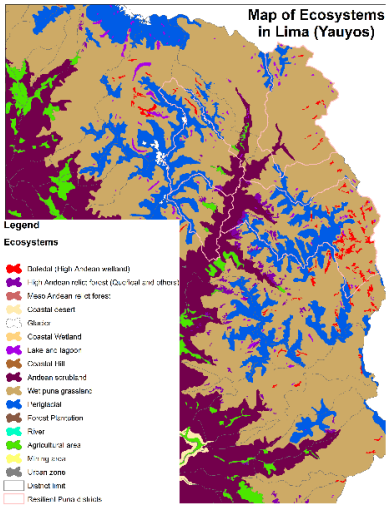
Andean scrubland: An Andean ecosystem with a wide national distribution that includes three types of scrublands (montane scrubland, dry puna scrubland and Andean scrubland), with an altitudinal range of 1500 to 4500 m.a.s.l. It is characterized by the presence of woody and shrubby vegetation of variable composition and structure, with a ground cover of more than 10% that extends over more than 0.5 hectares, and whose height above the ground does not exceed 4 meters. In the dry puna scrub, there are extensive areas of *tola* (Parastrephia spp.), as well as Lepidophyllum quadrangulare, Baccharis spp. and other species; in the montane scrub, there are sclerophyllous shrubs and small trees up to 2 meters tall and the presence of epiphytes; and in the Andean scrubland itself, there are thickets with scattered trees and cacti.

Figure 24 Geographical distribution of ecosystem types in the project target departments (MINAM 2018).




Map of Ecosystems in Cusco
Legend
Ecosystems
Resilient Puna districts
District limit


Map of Ecosystems in Puno
Legend
Ecosystems
Bofedal (High-Andean Wetland)
High altimontane (pluvial) Yunga forest
Flooded alluvial forest
Yunga basimontane forest
High hill forest
Low hill forest
Non-floodable terrace forest
Yunga montane forest
High Andean relict forest (Queñoal and others)
Glacier
Island
Lake and lagoon
Andean scrubland
Pacales
Wet puna grassland
Dry puna grassland
Palm swamp
Periglacial
Forest plantation
River
Secondary Vegetation
Agricultural area
Mining area
Urban zone
Resilient Puna districts
District limit


Map of Ecosystems in Lima (Yauyos)
Legend
Ecosystems
Coastal Wetland
Lake and lagoon
Andean scrubland
Periglacial
River
Agricultural area
Urban zone

Climate Change Profile). By generating an increase and decrease of the sea temperature, respectively, both phenomena produce changes in air temperature and rainfall.

Peru has three hydrographic slopes, the biggest one, the Atlantic, generates 98% of water resources at the national level for a population of 31%. The Pacific slope, where the majority of the population (66%) is located, generates only 2%, creating a problem of water stress that can be aggravated by climate change. The Titicaca slope, where the 0.56% of the population is located, generates 0.5% (MINAM, 2010). Peru's glaciers are also of great importance, since they are commonly used for human water consumption and productive activities, such as agriculture and energy generation. Peru's 2,679 glaciers, spread over 19 snow-capped mountain ranges. The country is home to 70% of the world's tropical glaciers, which are especially sensitive to warming temperatures (UNFCCC, 2014).

In administrative terms, the country is divided into 24 departments and one constitutional province. The departments are divided into 195 provinces, which in turn are divided into districts. In 2019, the total number of districts reached 1896, with 49 districts being created between 2010 and 2019 (INEI, 2019). The State is unitary and decentralized, being structured into national, regional, and local level responsible for municipalities in provinces, districts and metropolitan area (Government of Peru, 2023)

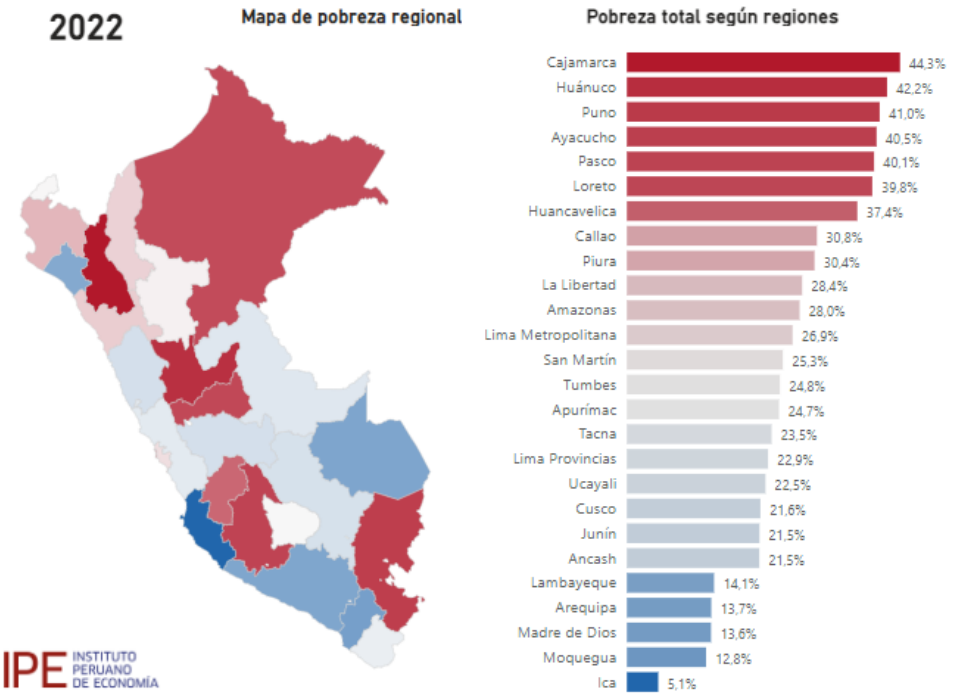
2.2 Socio-economic Profile

Peru's population reached more than 33 million people in 2021, of which 50.5% are women. The country's annual population growth decreased to 1.2%, in comparison to 1.9% in 2019 (World Bank, 2023). Most of the population, 78.5%, lives in urban centers, while 21.5% live in rural areas (FAO, 2023).

Over the last 20 years Peru has experienced a considerable socioeconomic progress and improved wellbeing of the population due to a combination of sound domestic policies and favourable external conditions (OECD, 2023). High commodity prices favoured the country's growth average rate of 6.1% between 2002 and 2013 (World Bank, 2022). The strong economic growth has been accompanied by poverty reduction, from around 60% in 2004 to less than 24% in 2014 (World Bank, 2023). However, the pandemic led to a deep economic recession and reversed more than a decade's progress in poverty reduction. Poverty rose to 25.9 percent in 2021, a level similar to that of 2012, while the size of the middle class fell dramatically from 33.7 percent in 2019 to just 26.7 percent in 20213. These impacts were driven by a severe labour market shock, with 2.4 million jobs lost in 2020 and an increase of 4 percentage points in an already high level of informality (World Bank, 2023).

According to the Peruvian Institute of Economy, in 2020 the country experienced loss of 6 million jobs, 30.6% reduction in the employed population and 30.2% reduction in the GDP (Peruvian Institute of Economics, 2020). Peru's GDP contracted 11.1% in 2020, one of the highest drops among the major economies in the region (World Bank, 2021). Although the country has experienced a rapid post-pandemic recover, with its GDP increasing by 2.7% in 2022, the poverty rate remained higher than the pre-pandemic levels and inflation has been on the rise since 2021 (World Bank, 2023). From 2021 to 2022, poverty increased from 25.9% to 27.5%, due to lower economic growth and higher inflation (Peruvian Institute of Economics, 2023). In 22 of the 25 regions in the country poverty remains higher than the pre-pandemic levels. Figure below shows total poverty per region.

Figure 1: Regional poverty map and total poverty per region in Peru (IPE, 2023)



Although poverty levels have converged to the Latin America and the Caribbean (LAC) average, Peru continues to lag in terms of other key indicators of economic development. In 2020, only 51 percent of the population in Peru had access to safely managed drinking water, compared to upper-middle-income country averages of 75 percent. Fast internet connectivity and financial inclusion remain low, with broadband penetration and the share of adults having an account at a financial institution lagging both the LAC and the upper-middle-income country averages. Public services and quality of life vary dramatically across the country, with poor access to services and low human capital accumulation affecting both densely populated urban pockets as well as remote rural communities (World Bank, 2022).

Since the early 2000's. Peru has established a stable macroeconomic management and a responsible fiscal policy, with debt and deficit levels among the lowest in the region (World Bank, 2021). During the COVID-19 pandemic, the government opted for an extraordinary suspension of the fiscal rules for 2020 and 2021, implemented public investments programs to support economic activities and developed a new transfer income program, resulting in an increase of public debt (IMF, 2020). Peru's public debt closed the year above the legal limit of 30% of GDP in 2020 (World Bank, 2021). In 2021, the public debt reached its highest level since 2006, 35.7% of the country's GDP (World Bank, 2023).

The country's domestic demand and exports have been increasing after the COVID-19 pandemic and the country's GDP growth in 2023 is expected to reach 2.4%, led by the primary sectors and services. Informality in Peru is still one of the highest in Latin America, at close to 60%, impacting job quality and productivity (OECD, 2023). Both unemployment and informality rate are higher among women than men, see.

Figure 2: Employment data Peru (CEPAL, 2023)

Unemployment rate	5.8	%	2021
Men	5.2	%	2021
Women	6.6	%	2021
Urban population employed in low productivity sectors of the labour market	64.7	%	2021
Men	60.8	%	2021
Women	69.2	%	2021
Structure of employed population, by category of employment, sex and geographical area			
Employers	3.5	%	2021
Employees	49.9	%	2021
Self_employed	37.6	%	2021
Domestic service	2.7	%	2021
Annual real average wages, average annual index (2000=100)	123.6	-	2021

According to data from the INEI, the services sector, which includes subsectors such as transport, financial services and communication, is responsible for more than 60% of Peru's GDP (INEI, 2023). The agricultural sector, including livestock production, contributes with approximately 7% of the country's GDP (World Bank, 2023). As per data from 2021, the subsectors related to tourism, specifically lodging and restaurants, and construction, were the ones that had the highest percentage variation in their contribution to the country's GDP (INEI, 2022). In 2021, the agricultural sector's activities registered a 3.8% increase due to the higher demand from foreign markets (INEI, 2022). Since 2020 the sector has been growing more than the country's GDP (Figure 3), and between 2016 and 2021 the agricultural exports increased 71.7% (Figure 4) (EY, 2022).

2.3 The agriculture sector in Peru

The agricultural sector employs 29.9% of the total population in Peru (CEPAL, 2023), and 30% of the national territory is dedicated to activities within the sector. In the rural areas, the number reaches, on average, 78% of the population (FAO, 2023). Besides the economic benefits, the sector also contributes to the country's food security, as 70% of the food consumed in the country is produced internally (Fernández, 2021). However, the government expenditure and investment in the sector is still very low, mainly due to a lack of interest from policy makers (World Bank, 2017).

Figure 3: Evolution of total GDP vs. Agriculture (in billions of S/) (EY, 2022)

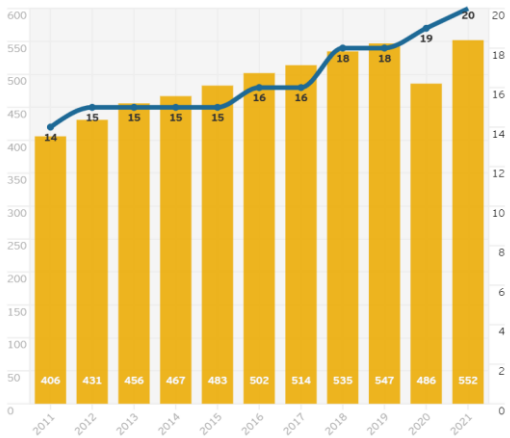
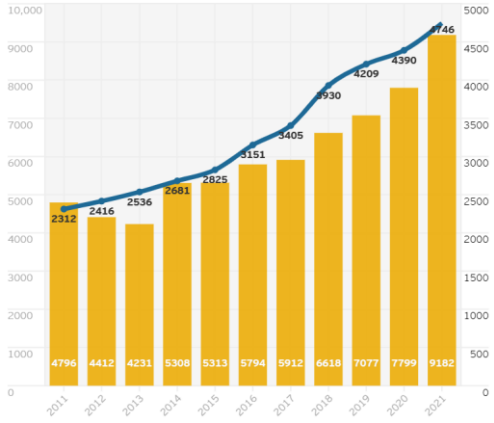


Figure 4: Agricultural exports between 2011 and 2021 (EY, 2022)



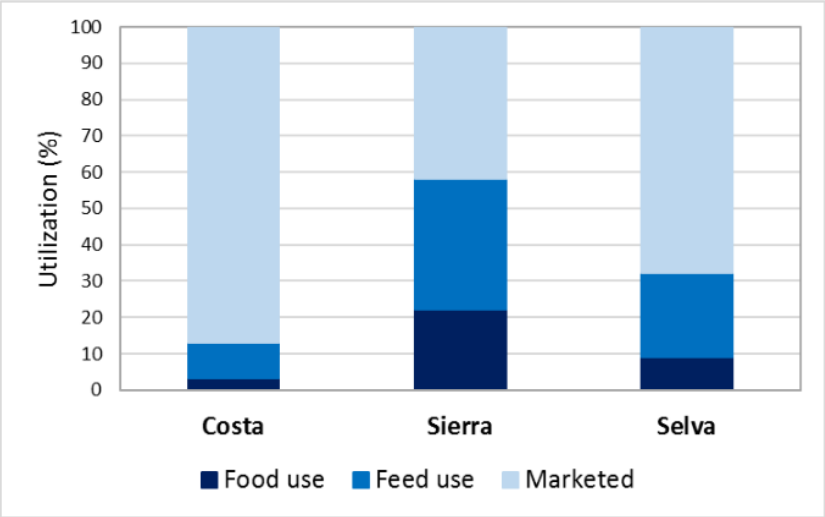
In Peru, a similar pattern of structural transformation has occurred alongside economic growth. The share of agriculture in the overall economy and the proportion of agricultural workers in total employment have

both declined. However, the pace of structural transformation has been slow, and the composition of GDP has remained relatively stable since the early 1990s. During the period of 1990-2015, all three sectors—agriculture, industry, and services—grew at comparable rates. The services sector made the largest contribution to GDP growth (around 3 percentage points), followed by the industry sector (1.8 percentage points), and the agriculture sector (0.3 percentage points). As a significant number of the poor are employed in agriculture and services, these sectors have contributed the most to income increases among the poor. Agriculture, in particular, has played a crucial role in reducing extreme poverty (World Bank, 2017).

According to data from the IV National Agricultural Census from 2012, 2.2 million households have agriculture as their main source of income and are registered as agricultural units (AU) (Fernández, 2021). From this total, 82% corresponds to farms with equal or less than 5ha, 64% are characterized as subsistence farming and 57,5% are located in the highlands, especially in the departments of Cajamarca, Puno and Cusco (INEI, 2012).

Peruvian farms have become more connected to markets over time, reflecting increased commercial orientation. However, the degree of market integration varies across the natural regions. In the coastal region, more than 81% of the harvested area is dedicated to market-oriented crops, while in the jungle region, it is 67%. In contrast, only 42% of the harvested area in the highlands is devoted to market-oriented crops, indicating a significant focus on subsistence in this region (World Bank, 2017).

Figure 5 Utilization of agricultural production by region (World Bank, 2017)



The distribution of agricultural land in Peru is highly unequal. While small-scale farmers constitute a large proportion of the farming population, they control a relatively small share of total agricultural land. Approximately 77% of agricultural land is controlled by just 23,000 large-scale commercial farms with holdings exceeding 100 hectares, which represent only 1 percent of all farming units. This unequal distribution of land, coupled with the predominance of small farms, poses challenges as small farm sizes are associated with higher levels of subsistence production (World Bank, 2017).

Figure 6 Distribution of landholdings (2012) (World Bank, 2017)

Size of farm	Producers		Area	
	Number	Share (%)	Number (ha)	Share (%)
Without land	47,467	2.10	0	0.00
< 0.5	507,137	22.43	99,700	0.26
0.5 to 1	324,706	14.36	204,933	0.53
1 to 5	922,572	40.80	1,964,119	5.07
5 to 10	218,564	9.67	1,418,311	3.66
10 to 15	81,937	3.62	595,696	1.54
15 to 20	36,337	1.61	595,696	1.54
20 to 100	98,798	4.37	3,692,042	9.53
> 100	23,455	1.04	29,841,281	77.02
TOTAL	2,260,973	100	38,742,465	100

Agriculture in the highlands of Peru is primarily characterized by small-scale farming systems focused on subsistence production, and low-complexity value chains tied to local markets. These farming systems combine the cultivation of staple crops such as potatoes, wheat, and quinoa with livestock rearing (particularly camelids, such as alpacas and *vicuña*, sheep, and cattle). The majority of farms in this region are less than 5 ha in size, and farmers often have dispersed plots located in various micro-environments. These micro-environments differ in terms of altitude, soil quality, water availability, and climate.

Food production in the highlands is often inadequate to meet the consumption needs of households, leading many farmers to seek additional income through off-farm activities. Smallholder farmers in the highlands region make use of the diverse ecological niches available to them. In high-altitude areas, livestock is grazed, and specialized tubers like native potatoes, *mashua*, *olluco*, *oca*, and *maca* are grown. At intermediate altitudes, farmers cultivate grains such as wheat, barley, rye, and maize, along with pulses, fruits, berries, and vegetables. In the inter-Andean valleys, various types of fruits like avocado, orange, lemon, and banana are grown (World Bank, 2017).

Peru's ongoing transformation of its food system, by factors such as income growth and urbanization, presents significant opportunities for product differentiation in the domestic market. While the penetration of supermarkets has been slower in Peru compared to other similar countries, it still offers potential for farmers to connect with markets, provided they can adapt their products to meet evolving consumer demand. The expansion of local agroindustry, including smaller firms, creates possibilities for collaboration between smallholder farmers and processors/manufacturers of various food products such as fruit juices, dairy products, snack foods, and nutritional supplements. The development of the gastronomy value chain also provides opportunities for smallholder farmers as high-end restaurants increasingly source ingredients directly from local farmers, emphasizing traceability to appeal to socially conscious consumers (World Bank, 2017).

4. Value chain analysis

Over the past 25 years, Peru has successfully captured a significant share of global markets for agricultural products. It started diversifying its exports away from traditional commodities like coffee, cocoa, sugar, and cotton in the mid-1980s, with asparagus being the first successful export. This expansion paved the way for diversification into various high-value products for export, establishing Peru as a world leader in horticultural production (World Bank, 2017).

Despite the significant progress made in Peru's horticulture subsector and the promising future prospects, there have been missed opportunities to create additional value by strengthening backward and forward linkages and generating opportunities in related industries. An example is the table grape industry, which

has expanded greatly over the past two decades, making Peru the second-largest global supplier. However, a significant portion of the value generated in this industry goes to foreign actors (Schuster & Maertens, 2017).

In Peru, family farming holds significant importance, as it plays a substantial role in most regions. Therefore, promoting and advancing family farming is crucial for the country's decentralized development. To this end, Peru's "Family Farming Strategy" was launched in 2015 to foster greater social inclusion of smallholder farmers. This Strategy comprises tree central objectives: i) promote timely, equitable and quality access of family farmers to factors of production, services and public goods, as well as the sustainable management of resources.

ii) strengthen knowledge and capacity management to ensure the sustainability of development opportunities for family farmers and recognize the role of women producers in family farming; and ii) national, regional and local institutions in favour of achieving family farming results.

There are a number of prominent value chains in the Southern High Andes of Peru (SHAP) region, which are essential for the food security and income of smallholder farmers, agropastoralists, and herders. They can be broadly grouped as “High Andean crops,” “South American camelids,” and “complementary” value chains.[1]

3.1 High Andean crops: quinoa and native potato

3.1.1 Quinoa

Over the past four decades, there has been a significant expansion in quinoa production driven by the “Superfoods Peru” Campaign.[2] Quinoa-based products are popular in niche markets worldwide, including nutraceutical, organic, and fair-trade markets, with various presentations such as ready-to-eat foods, breakfast cereals, snacks, noodles, and beverages. Peru is a major quinoa producer, and its main producing regions include Puno, Ayacucho, Cusco, and Junín. Quinoa grows well in extreme climates and adapts efficiently to water usage. Organic quinoa, in particular, experiences increased demand from foreign markets, offering higher economic returns compared to conventional quinoa.

Amidst the challenge of meeting the growing demand for high-quality food to feed the global population amidst climate change, quinoa emerges as a significant option due to its nutritional attributes and agronomic adaptability. It holds the potential to contribute significantly to regional and global food security, particularly in regions where food production faces limitations (FAO, n.d.).

[1] See the separate Value Chain Report document for a detailed analysis.

[2] A public-private initiative launched by Peru’s Exports and Tourism Promotion Board (PromPeru) within the Ministry of Foreign Trade and Tourism (MINCETUR).

Figure 7 Main destinations for Peruvian quinoa. Source: Trade Map (2021) in ILO (2023).

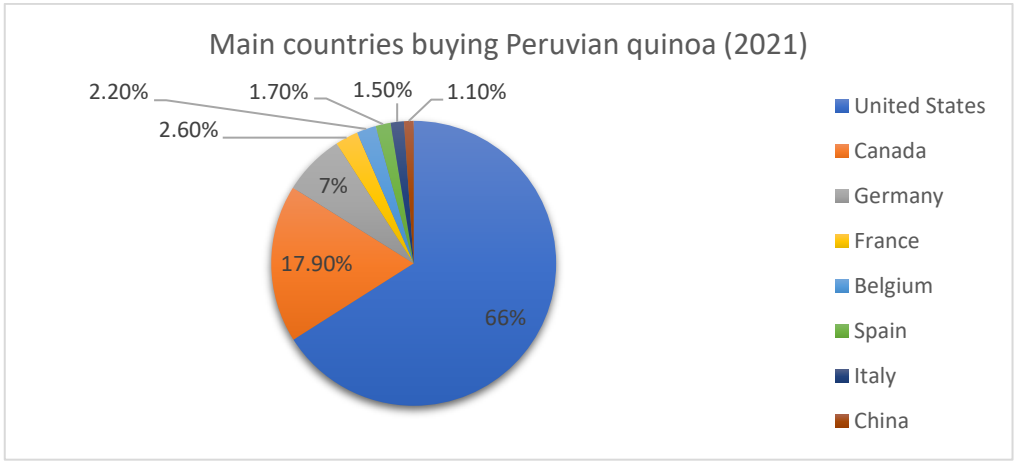
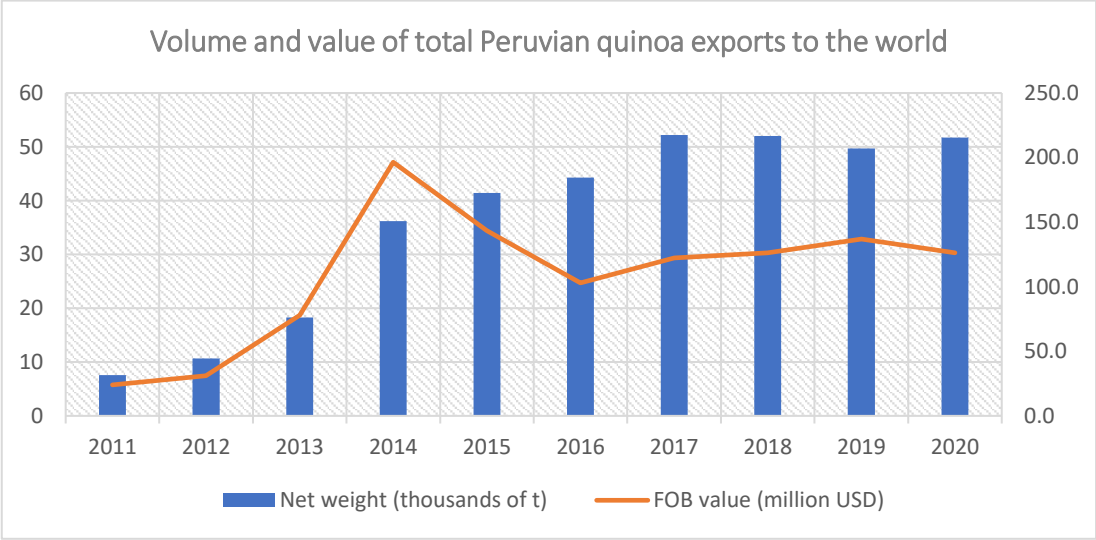


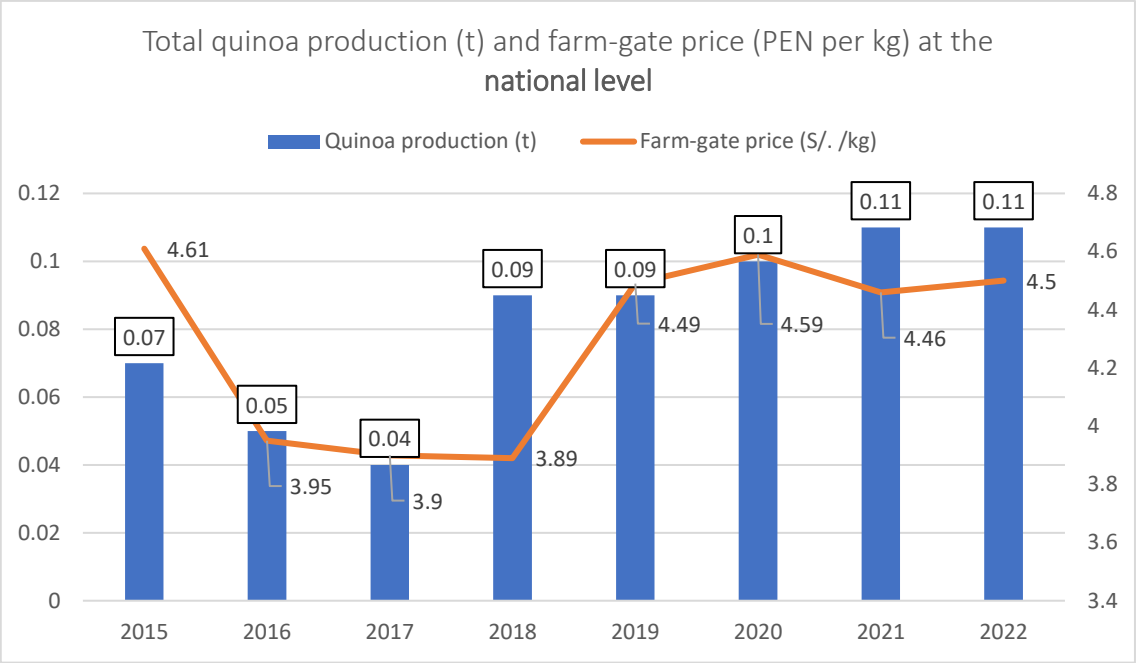
Figure 8 Volume and value of Peru's total global exports of quinoa. Source: ILO (2023). Own elaboration.



In the face of climate change and extreme weather, quinoa's ability to thrive in challenging conditions makes it a valuable option. The National Institute for Agricultural Innovation and Forestry in Bolivia recognizes quinoa as a climate-resilient seed. Peru, along with Bolivia and Ecuador, is a major quinoa producer. Quinoa cultivation in Peru's SHAP region contributes significantly to its agricultural production, generating around PEN 130 million in value, with consistent growth.

Over the past three years, quinoa production has remained steady at 0.11 million tons. Leading producing departments in 2022 included Puno, Ayacucho, Cusco, Arequipa, and Junín. Traditional quinoa producers in Puno are projected to earn gross income of PEN 9,450 per hectare, based on an expected yield of 1,350 kg/ha and an average selling price of 7 PEN per kg.

Figure 9 Total national quinoa production (t) and farm-gate price (PEN per kg). Source: SIEA - MIDAGRI (2023).



Demand for organic quinoa has increased due to its popularity in foreign markets and better economic returns, despite lower yields compared to conventional quinoa. Demand expansion comes from the United States, Europe, and Asia. In Peru, consumer demand remains steady, allowing both the quinoa area and producers' income to grow.

In terms of pricing and value addition, the production cost per hectare of quinoa in 2018 was approximately PEN 5,906.2. The production cost per kilogram was around PEN 2.25, in line with the national average producer price of PEN 3.84 per kg. Key cost components include wages, fertilizers, and various operational expenses.

In international markets, organic quinoa is priced at EUR 8.40-9.15 per kg (equivalent to PEN 33.6-36.6), while conventional quinoa is sold at EUR 5.6 per kg (equivalent to PEN 22.4). This highlights the premium that organic quinoa commands due to its increased demand and potential health benefits.

In the last 3 years, the total production of quinoa has remained at 0.11 million tons. The departments that produced the most kg of quinoa in 2022 were Puno, Ayacucho, Cusco, Arequipa and Junín. Today, in the prioritized districts by department, the distribution is as follows:

Figure 10 Quinoa production (t) and avg farm-gate price (PEN/kg) (Apurímac)

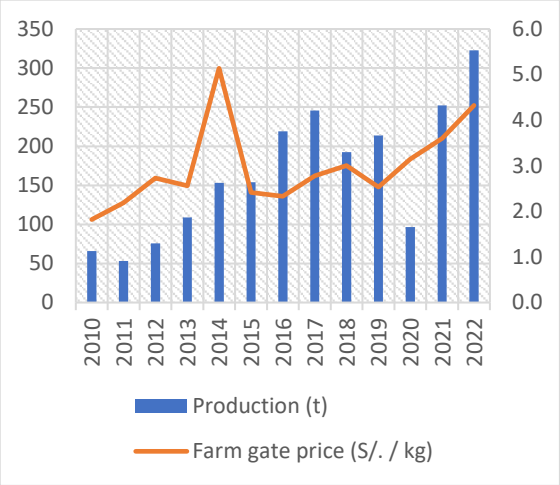


Figure 11 Quinoa production (t) and avg farm-gate price (PEN/kg) (Arequipa)

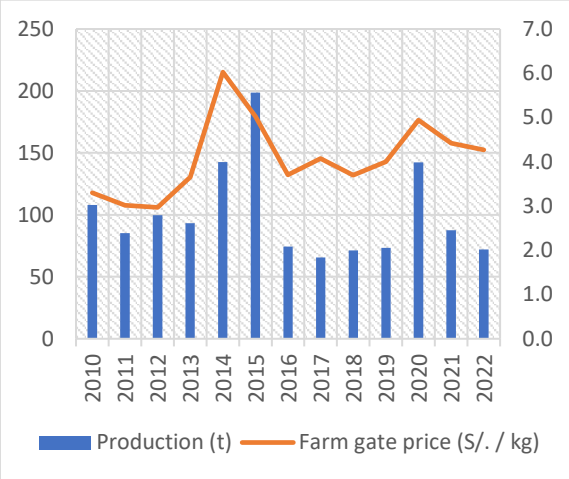


Figure 12 Quinoa production (t) and avg farm-gate price (PEN/kg) (Cusco)

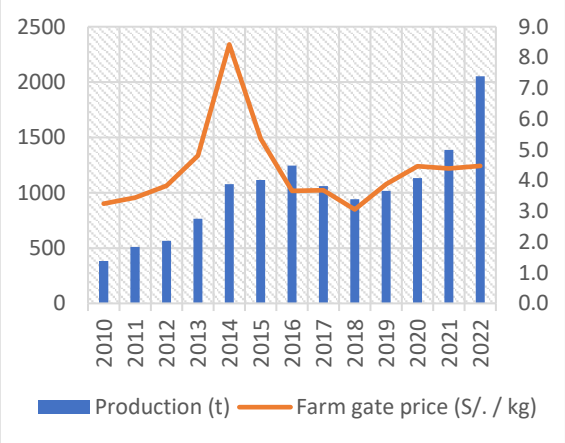
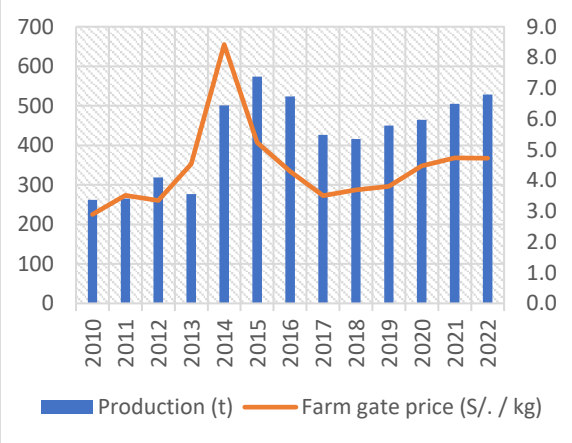


Figure 13 Quinoa production (t) and avg farm-gate price (PEN/kg) (Puno)



Source: SIEA - MIDAGRI (2023). Own elaboration

Producers in the quinoa value chain in Peru face significant challenges, including low market prices leading to inadequate income levels and limited formal employment opportunities. Six key factors contribute to this situation: low productivity and quality, weak collaboration within the value chain, insufficient farmer associativity, low per capita consumption, limited technological advancements, and inadequate public-private coordination. Organic quinoa encounters challenges due to low profitability compared to high production costs, stemming from low productivity, depressed market prices, a shift from organic to conventional production, and poor institutional coordination. This cycle increases the risk of resorting to harmful practices, impacting both producer livelihoods and the environment.

An opportunity for quinoa producers lies in community-based tourism development, exemplified by the "Quinoa Route" initiative launched in Puno. This initiative offers a unique way for tourists to experience local producers' lifestyles through production centres, contributing to economic development. Gender issues within the quinoa value chain also persist. Women play a crucial role in the agriculture sector but face challenges such as unequal access to land and markets. Gender gaps exist in land cultivation, commercialization, and access to information, affecting women's income and limiting their opportunities

for innovation and productivity improvement. Efforts to address gender disparities within the quinoa value chain are essential for achieving more equitable and sustainable outcomes.

Table 1 SWOT analysis of the quinoa value chain. Source: Hirich et al. (2021).

Strengths	Weaknesses
In terms of cultivation: ● Quinoa is more profitable compared to cereals. ● Tolerance of quinoa to various stresses that characterize the region including drought and salinity. ● Quinoa by-products such as leaves straw and saponin could potentially be valorised. ● Low requirement in terms of agricultural inputs (fertilizers, management, pesticides, etc.). At the gastronomic level: ● High nutritional value compared to cereals. ● Quinoa seeds are gluten-free with low sugar content, making it an optimal food for diabetic and coeliac consumers. ● Fast cooking. ● Versatility of quinoa-based recipes.	At the production level: ● Poor organization of producers among those who have adopted quinoa. ● Quinoa is labour-intensive with very few mechanized operations (especially in the post-harvest phase). ● Problems linked to the establishment of quinoa at field level (low germination). ● Lack of availability of good quality seed. ● Sensitivity to diseases such as downy mildew. ● Bird attacks (during emergence and maturity). ● High post-harvest costs. In value-added and marketing: ● Basic marketing channels. ● Lack of promotion and communication around quinoa-based products.
Opportunities	**Threats**
● Willingness of national and international development agencies to promote and accelerate the process of adoption of quinoa in the area. ● Availability of national and international agricultural fairs for exhibition of quinoa products. ● Increased interest in healthy food consumption by individual consumers and restaurants. ● Growing international market for quinoa. ● Promotion of quinoa at the international level through the "Superfoods" brand promoted by MINCETUR. ● There are initiatives to obtain quinoa with a denomination of origin, which will allow it to be differentiated on the international market. ● In the face of a possible expansion of world supply and the fall in the price of quinoa, there is an incentive to produce different Andean grains with similar or higher nutritional values, such as kiwicha and cañihua; and leguminous plants such as tarwi.	● Competitiveness of local quinoa products vis-à-vis imported products. ● Substitutes are numerous. ● High cost and slow organic certification process. ● Quinoa production is facing risk due to climate conditions, especially droughts and changes in maximum and minimum temperatures. Temperature decreases yield and quality, while droughts, and therefore the lack of water to irrigate the crops, can led huge losses. ● Loss of varietal purity and genetic yield due to the use of seed harvested over many years. ● Increase in international competitors, mainly Bolivia. ● Some European countries, such as France and Spain, are increasing their quinoa crops, offering them to the US market at lower prices than those of Peruvian origin.

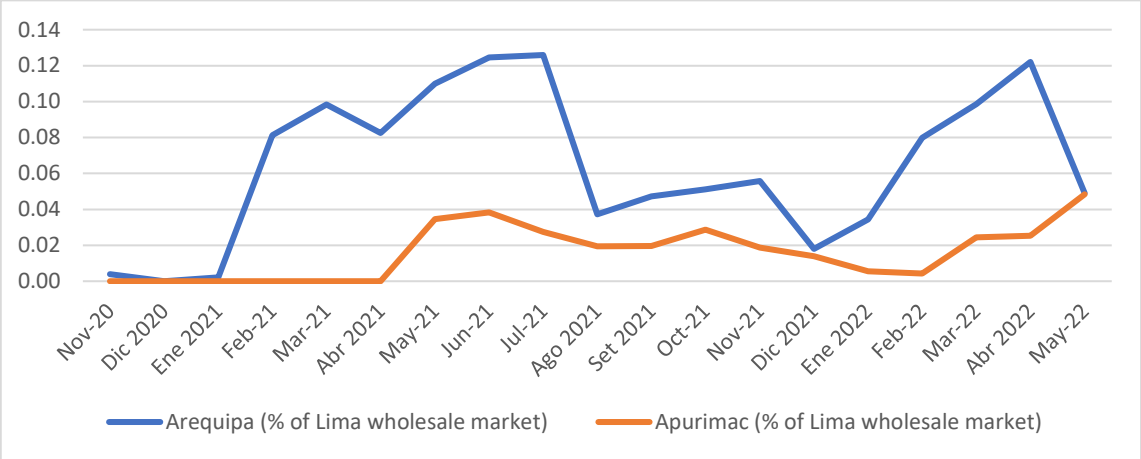
3.1.2 Native potato

In Peru, native potato consumption has grown significantly reaching 83 kg per capita consumed annually in 2017 compared to the average per capita consumption in Latin America of 25 kg (Devaux, 2019); therefore, Peru is the largest potato consumer in Latin America (MIDAGRI 2020).

In the last 20 years, the demand for native potatoes has grown significantly in urban markets, going from being a product of ethnic consumption (bought by migrants from the highlands belonging to popular sectors) to being a "gourmet" product, with a sustained demand in the upper and middle sectors of society.

At the national level, the main market is the wholesale market of Lima, where the main potato supplying departments are Junín, Ayacucho, and Huánuco, but the importance of the departments of Arequipa and Apurímac to this market increases between the months of February and July where Arequipa contributes between 8% and 13% of the potato income to the market, while Apurímac contributes between 2% and 5% of the potato income to this market.

Figure 14 Potato incomes of Arequipa and Apurimac (Nov 20 – May 22) as a percentage of the Lima wholesale market (%). Source: MIDAGRI monthly wholesale market entry reports by department.



The main international destinations are the USA, France, Germany and the Netherlands (Veritrade. 2023). In the Andean region, the main destinations are: Bolivia, Ecuador, Colombia (Devaux et al., 2021). In the MIDAGRI potato market study (2022a), the great export potential of native potatoes is evident. In the snack industry, two companies exporting snacks with native potatoes stand out: Inka Crops, a Peruvian company that has managed to position the native potato snack in many markets around the world, the main market being the United States, under the name Peruvian Potato Chips, with significant growth in 2019, with a share of 23%, and Cooperativa Agraria Agropía Ltda, an organization of small producers from Huancavelica, marketing organic native potato chips, destined for the European market. This company has a share of almost 11% of total snack exports. The main export countries for processed potatoes in 2019 were Bolivia (USD 1.3 million) and the United States (USD 1 million), and to a lesser extent, France (USD 0.143 million), Chile (USD 0.082 million) and Spain (USD 0.074 million).

Figure 15 Potato snack exports (2019). Source: MIDAGRI - Sierra y Selva exportadora (2020) and Veritrade (2023)

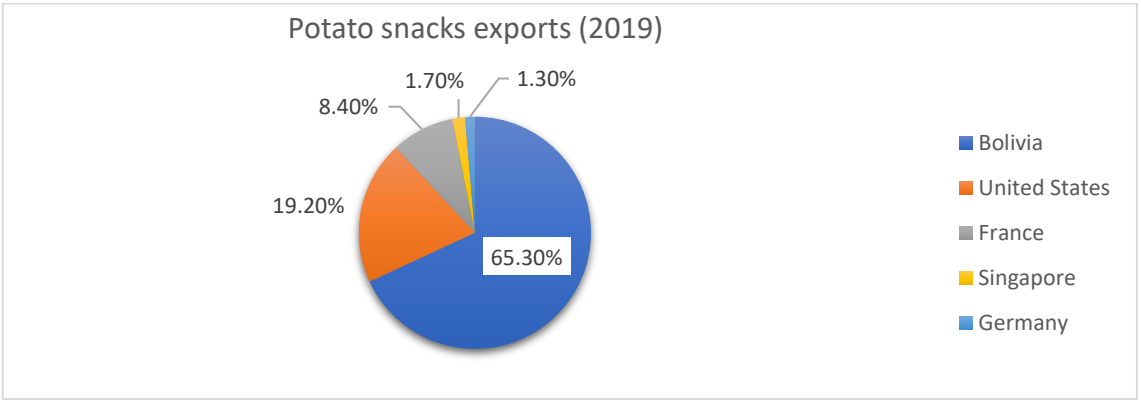


Figure 16 Native potato exports (2021-23). Source: MIDAGRI - Sierra y Selva exportadora (2020) and Veritrade (2023)

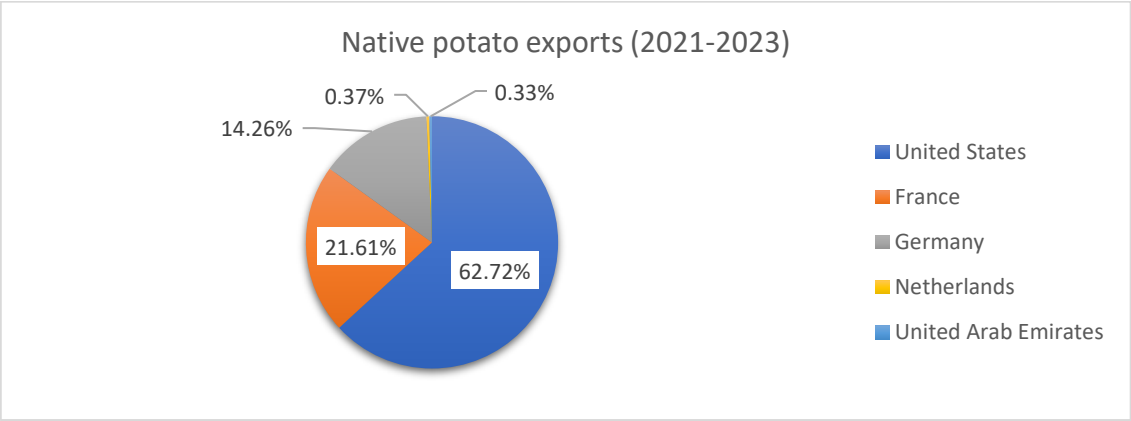
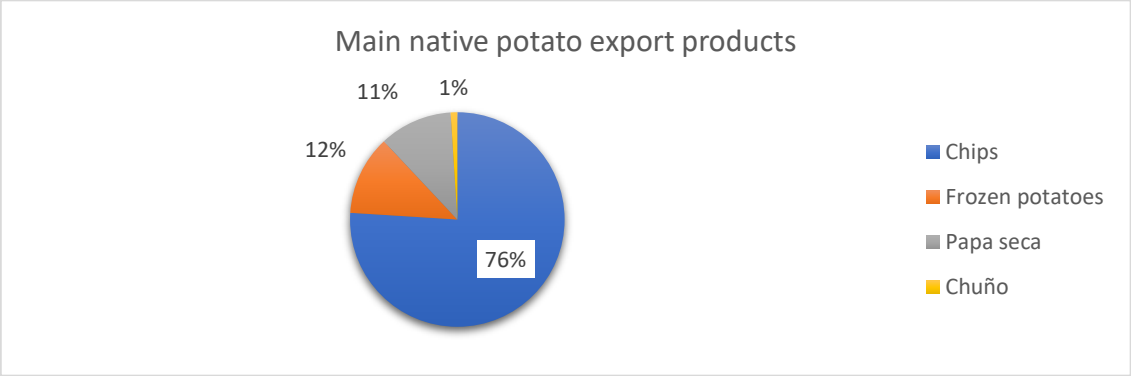


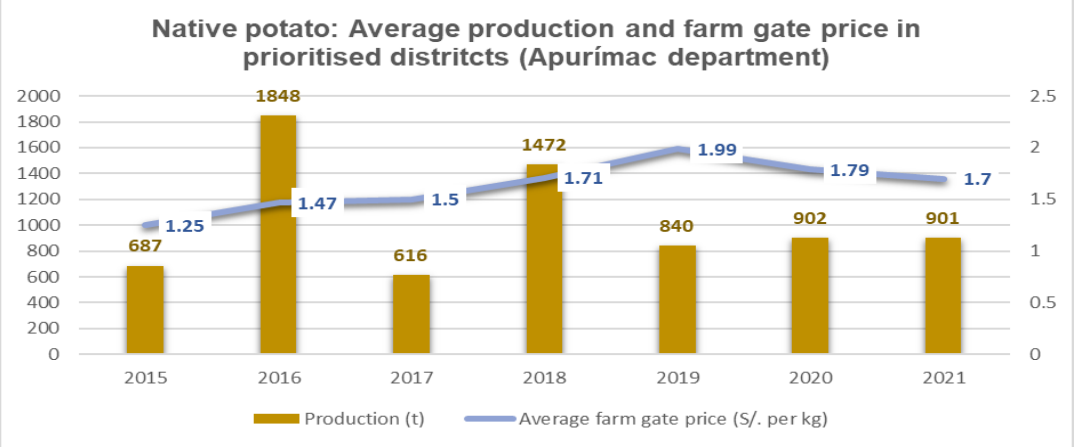
Figure 17 Main native potato export products. Source: MIDAGRI - Sierra y Selva exportadora (2020) and Veritrade (2023)



The competitive advantages in the world market are very great (nutritional and protein properties, linked to human health and which could position the crop in a totally different segment and existing varieties, with harvests throughout the year and which can be used for various industrial purposes. The challenges are associated with seasonality, development of high-quality seeds, seed treatment, productive diversification, management of good agricultural practices, technological level, degree of associativity between producers, among others).

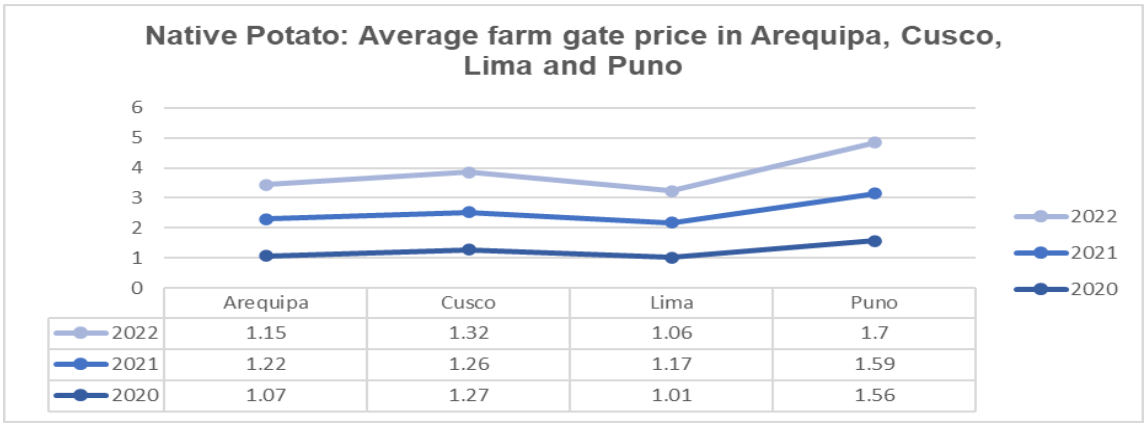
The prices of the different potato varieties vary, with the Yungay potato variety receiving the lowest price on average (PEN 0.90 per kg) and the Amarilla Tumbay variety receiving the highest average price (PEN 1.78 per kg). Prices vary according to the months of the year and prices are highest between December and March, and lowest between April and November, with variations due to market dynamics and supply problems. According to MIDAGRI's production profile data (2023), potato production and the price obtained by farmers in the prioritized districts in Apurimac department was as follows:

Figure 18: Native potato: Average production and farm-gate price in prioritised districts (Apurimac). SIEA - MIDAGRI (2023)



There is only systematised information at district level available for the department of Apurímac regarding the price and production of native potato. However, it is known that there is significant production in the other departments of Arequipa, Cusco, Puno and Lima (Yauyos). Unfortunately, the systematisation of information is not updated in the official databases of MIDAGRI at district level, but it is updated at departmental level. In this sense, the following figure emerges in the project's intervention departments.

Figure 19: Native potato: Average farm-gate price in Arequipa, Cusco, Lima and Puno. SIEA - MIDAGRI (2023)



	Arequipa	Cusco	Lima	Puno
2022	1.15	1.32	1.06	1.7
2021	1.22	1.26	1.17	1.59
2020	1.07	1.27	1.01	1.56

Average prices at departmental level in Arequipa, Cusco, Lima and Puno remain in the range of prices obtained at district level (Apurimac).

The potato value chain in Peru faces several barriers and opportunities. Key challenges include water scarcity due to droughts and rainfall fluctuations, lack of organization among producers for collective marketing, inadequate supply of certified seed for popular varieties, and diversity of losses throughout the value chain exacerbated by climate change. Limited market knowledge, insufficient access to finance, undervaluation of native potato varieties, and overproduction resulting in low profitability are also barriers. Community-based tourism offers economic benefits for potato-producing families, allowing tourists to engage with local culture and traditions.

Technological advancements are essential to enhance crop development, processing, and productivity, addressing issues like irregular production, quality seed availability, and perishability. Moreover, existing traditional knowledge and indicators contribute to agrobiodiversity conservation. Gender disparities persist, with women managing a significant portion of agricultural labour but facing challenges like limited land ownership and access to markets. State efforts are promoting women's participation in the potato value chain through training and empowerment. Improving market access, strengthening organization,

embracing technology, and addressing gender inequalities are critical factors for enhancing the efficiency, sustainability, and resilience of Peru's potato value chain.

Table 2 SWOT analysis of the potato value chain. Source: Own elaboration.

Strengths	Weaknesses
In terms of cultivation: ● There is a great diversity of native potatoes of different colours, shapes and sizes. ● The native potato fetches a higher price than the commercial potato and can be produced with agroecological practices. ● Tolerance of native potato to various stresses that characterize the region including drought and frost. ● Low requirement in terms of agricultural inputs (fertilizers, management, pesticides, etc.). ● Its cultivation is part of Peru's cultural heritage. At the gastronomic level: ● It is a nutritious and healthy product highly valued for its natural qualities. ● The native potato contains vitamin C, anthocyanins and high-quality carbohydrates.	At the production level: ● There is a low level of agricultural yield or productivity. ● Little organization of native potato producers. ● Native potatoes are labour-intensive with very few mechanized operations (especially in the post-harvest phase). ● Lack of availability of good quality seed. ● Susceptibility to diseases such as late blight. In value-added and marketing: ● Basic marketing channels, with reduced price differentiation in local markets. ● Lack of promotion and communication around native potato products. ● Poor product quality.
Opportunities	**Threats**
● Willingness of national development agencies to promote soil conservation practices where native potato has potential in the area. ● Availability of national and international agricultural fairs for exhibition of native potato products. ● Increased interest in healthy food consumption by individual consumers and restaurants. ● Growing national and international market for native potato products such as chips, *tunta*, and dried potato. ● Development of promotional events at national level to position the native potato in markets (Kusikuy, Native Potato Festival). ● State initiatives that promote agrobiodiversity conservation and food security in the country (MINAM's ReSCA initiative, SERNANP's *Aliado por la conservación* brand) ● The relationship with the gastronomic sector is very important for the promotion of native potatoes. The main Peruvian restaurants, recognised worldwide, have introduced native potatoes in their offer.	● Substitutes are numerous, such as rice, noodles and bread. ● Lack of infrastructure for production (irrigation, canals and reservoirs). ● There is a lack of local infrastructure to add value to native potatoes. ● High cost and slow organic certification process. ● Climate variability and negative effects of droughts and heat waves on native potato production. In periods of drought there is more insect attack, which can reduce yields by 10-20%. Excessive rainfall causes fungal damage such as *rancha*, which can lead to an 80% yield loss. ● Loss of genetic yield due to the use of seeds harvested over many years. ● The development of promotional events in major cities in Peru requires a high degree of subsidy. ● Native potato prices are variable throughout the year.

3.2 South American camelids: alpaca and vicuña

3.2.1 Alpaca value chain

The alpaca value chain consists of various sub-chains, including alpaca fiber, fresh alpaca meat, dried alpaca meat, and alpaca leather.

Alpaca meat is not considered an important meat at the national level, but it is important at the regional level where the production value of alpaca meat has increased from PEN 167 to PEN 224 million per year between 2007 and 2019.

As far as alpaca fibre exports are concerned, the main countries are the USA, China, the UK, Norway, South Korea and Italy. In terms of departmental distribution of alpaca fibre, in 2021 Puno accounted for 61% of alpaca fibre production, Cusco for 15%, Arequipa for 3% and Apurímac for 2%. The prices of both fibre and meat vary according to the producing areas. Apurímac, for example, in addition to having fewer alpaca producers than its neighbours, also has the lowest prices for fibre and meat than the other departments, and on the other hand, the departments with the highest productivity and dependence on alpaca as a livelihood, such as Arequipa and Puno, have the highest prices for both alpaca fibre and meat.

The main activity of the High Andean communities settled above 3,800 masl is livestock raising, with South American camelids being the most adapted and developed in this ecological zone. Furthermore, they are the main livelihood and economic activity for the communities living in these arid areas of the Andes. The main alpaca production area is the department of Puno, with 2,030,525 head of cattle, followed by Cusco (673,731), Arequipa (471,546) and Apurímac (212,220). In Puno, besides having the highest production, they also have the best prices per kg of alpaca meat, higher fibre yield per alpaca than the other 3 departments (between 5 and 9% higher yield), representing 61% of all the fibre produced in the country (4,403 t) and 46% of all the meat produced in Peru (12,583 t).

Figure 20 Alpaca population (thousand units), meat production (t), fibre production (t), 2000-2021. Source: Livestock and poultry production yearbook 2021 (MIDAGRI, 2022).

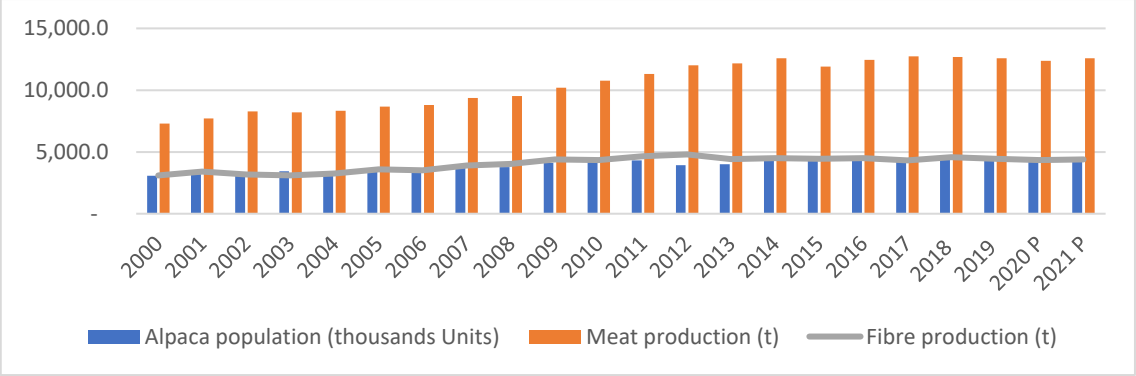
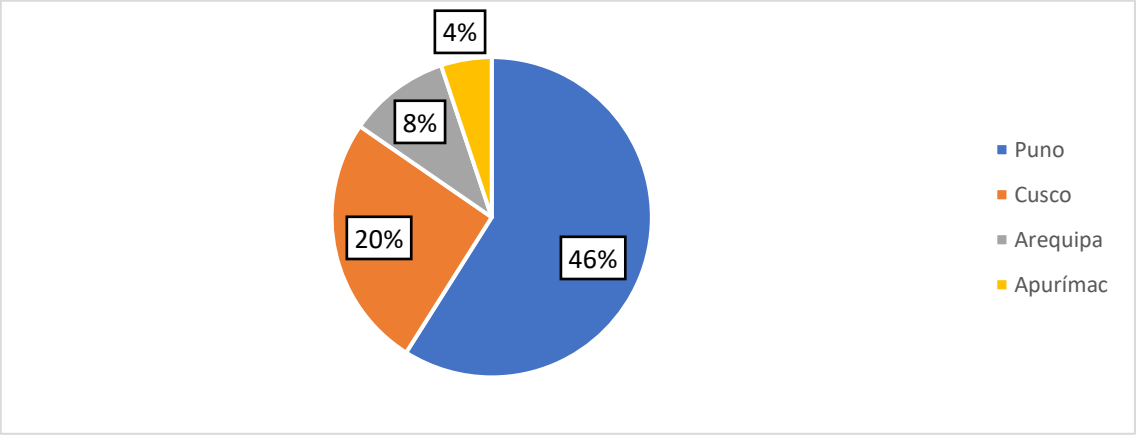


Figure 21 Departmental distribution of alpaca meat production (2021). Source: Livestock and poultry production yearbook 2021 (MIDAGRI, 2022).

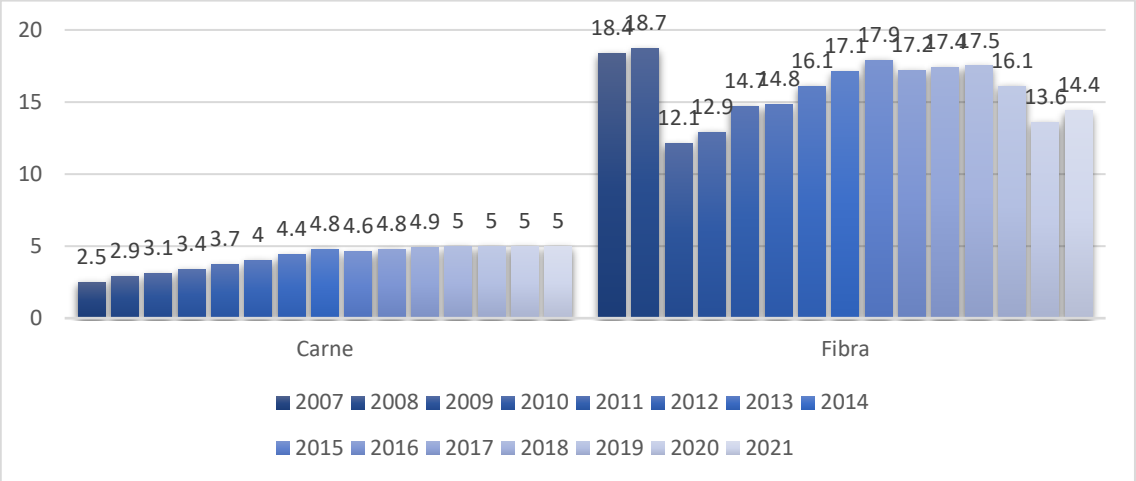


In terms of fibre production, prices are currently low, having reached PEN 13.6 per kg in 2020, which is 24% lower than the highest average price recorded in 2015. Even back in 2008, the price reached as high as PEN 18.7 per kg. In some regions, bartering is still practiced, however, some middlemen take

advantage of this system by undervaluing the fibre and overvaluing items like sugar, rice, or noodles, while also manipulating the weights. Consequently, the sales of alpaca fibre for an average producer generate only about PEN 1,800 per year at the current prices, which translates to about PEN 150 per month for a producer with 50 alpacas (according to MIDAGRI). This amount is considered to be very low.

Alpaca fibre production peaked in 2012, reaching almost 4800 t, but then stabilised between 4,400 and 4,500 t on average since then, with a drop in production to 4,312 t in 2017 and 4,352 t in 2020, the latter probably due to the effect of the pandemic. The price of alpaca fibre has decreased by 7% between 2011 and 2021, but had a price peak between 2014 and 2018, which reached prices of PEN 17.9 per kg.

Figure 22 Producer price of alpaca meat and fibre (2007-2021) (PEN /kg). Source: Livestock and poultry production yearbook 2021 (MIDAGRI, 2022).



The income of the producers depends on the sale of fibre (50%), live animals for consumption (45%) and 5% from other sources (breeding stock, leather and manure). The estimated production of alpaca fibre for the year 2020 is 5,072 t, with an estimated Gross Value for the same year of PEN 91.296 million. More than 80% of the national fibre is exported to cover the demand of European, Asian and North American countries (MIDAGRI, 2022c).

The alpaca value chain in Peru faces several challenges and opportunities. Alpaca breeding is vital in the High Andean zone, offering valuable fiber for both national and international markets. However, low prices for alpaca fiber, priced at PEN 12-13 per kg, lead to investment losses. Challenges include erratic weather affecting birthing seasons, alpaca sensitivity to cold, and diseases like enterotoxaemia, alpaca fever, scabies, and gastroenteritis.

In terms of barriers, there's price instability, competition with global markets, low demand, and limited market knowledge. Oligopsony, gender-related restrictions, and inadequate regulatory enforcement also hinder progress. Management obstacles include organizational capacity, lack of value addition, and insufficient market knowledge. The participation of women in alpaca rearing is pivotal; they take on key roles in breeding and fiber processing. However, gender inequalities in resource access and limited technology adoption hinder productivity. The government and organizations like Sierra y Selva Exportadora are undertaking initiatives to enhance women's capacities in alpaca breeding and fiber processing, recognizing the significant contributions they make to the value chain.

Table 3 SWOT analysis of the alpaca value chain (alpaca meat and fibre sub-chains). Source: own elaboration.

Strengths	Weaknesses
From alpaca fibre: ● Alpaca fibre is a product of recognised quality in the national and international market.	From alpaca fibre: ● Producers sell alpaca fibre without selection or quality classification.

Strengths	Weaknesses
● Sustainable use of native grasslands that conserves many ecosystem services and generates economic income for vulnerable populations of *alpaqueros*. ● High quality products made from well managed alpaca fibre. ● Products with alpaca fibre have thermal properties. ● Artisans trained in the production process of alpaca garments. <u>From alpaca meat:</u> ● It is a healthy product due to its nutritional qualities and low-fat content. ● The price is affordable to various market segments. ● It represents a source of protein for the local population. ● There are sales channels (local fairs) for the sale of alpacas for meat.	● The price of alpaca fibre is unstable on the international market. *Small production units that do not exceed the break-even point in production. ● Weak and weak organisation of alpaca producers with low representativeness. ● Producers receive a low price that does not meet their expectations. ● There is no good organisation of alpaca producers. ● Repetitive and non-innovative local designs for local garment production. ● Lack of good shearing practices ● Limited access to the maquila service ● The product is positioned in a market of high commercial segmentation, it does not spread to other market segments. <u>From alpaca meat</u>: ● There are health problems in alpaca meat production (sacorsistiosis). ● It is a product that is undervalued in local markets in relation to substitute products (beef, sheep meat, etc.). ● In exclusive or highly segmented markets, demand is limited.
Opportunities	**Threats**
<u>From alpaca fibre</u>: ● Alpaca fibre has commercial attributes that make it a superior value fibre compared to other fine hair fibres, such as a wide range of natural colours and softness to the touch, characteristics that are unmatched by others. ● Value can be added to reach different market segments. ● There is a potential market at national and international level for products made from alpaca fibre. ● There are governmental organisations and NGOs interested in supporting alpaca fibre producers. ● Positioning in the international market through the Alpaca sectoral brand, promoted by MINCETUR. <u>From alpaca meat:</u> ● There is an opportunity for the development of gourmet and healthy markets with a better commercial presentation of the product in tourist restaurants. ● There are non-governmental organisations interested in promoting the development of the alpaca meat market.	<u>From alpaca fibre</u>: ● European crisis reduces demand for this type of fibre ● The marketing of alpaca fibre is bought by a few companies (oligopsony). ● There is an increase in climatic variation (frost, drought, hailstorms/snowfall) that affects alpaca production. ● Scarcity of water resources for alpaca rearing. ● There is a lack of greater organisation of producers for the commercialisation of alpaca fibre. ● Alpacas are exposed to parasitic diseases such as mange, which is a risk mainly for the fibre. <u>From alpaca meat:</u> ● Lack of infrastructure for the processing of alpaca meat (*camales*). ● Climatic variations exist for the production of alpacas for meat production. ● Alpacas are sensitive to cold snaps, which have caused the death of thousands of animals.

3.2.2 Vicuña value chain

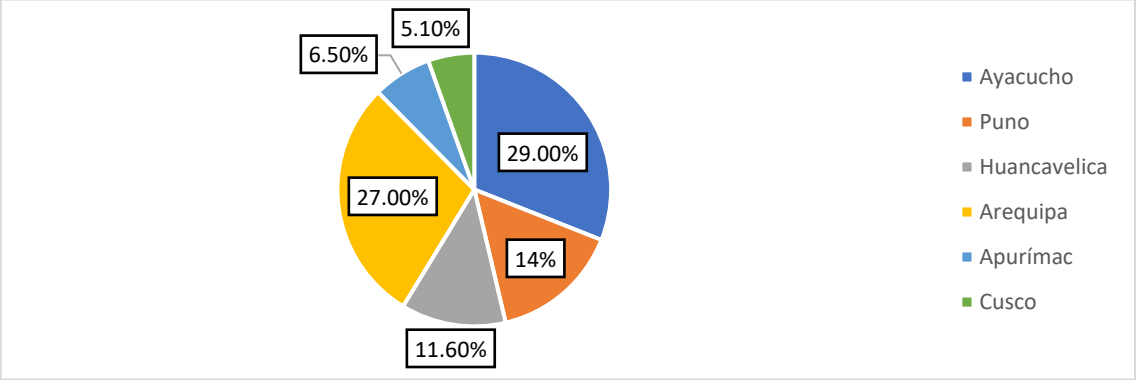
Peru is the country with the highest volume of vicuña fibre obtained from live sheared animals, with 14,830 kg recorded for the year 2021, making it the world leader (MIDAGRI, 2021). Of the volume obtained in 2021, approximately 80% goes abroad in the following presentations: pre-dehorned fibre, dirty fibre and dehorned fibre. The demand for vicuña fibre is derived from the production of high quality and high-priced garments. The domestic market lines are fibre, yarn, felt, garments and handicrafts. The main international destinations include the USA, China, the Netherlands, South Korea and Italy.

Table 4 National export of vicuña fibre (kg) (2017-2021) per type of fibre. Source: Directorate for the Sustainable Management of Wildlife Heritage - SERFOR

Type of fibre	2017	2018	2019	2020	2021
Total (kg)	**4858.681**	**5179.700**	**6756.653**	**6941.666**	**5503.094**
Pre-decomposed fibre	3725.165	4621.854	4982.190	4688.953	3612.987
Washed fibre	100.000	0.000	0.000	227.604	
De-zippered fibre	169.292	143.960	316.742	319.968	925.091
Staple fibre, and bristles	0.000	0.000	0.000		55.850
Dirty Fibre	864.224	413.886	1457.721	1705.141	909.166

The departments of Ayacucho, Arequipa, Apurimac, Huancavelica, and Puno produced approximately 54% of the total national vicuña fibre production in 2021. Of those departments, the distribution was as follows:

Figure 23 Departments with the highest production of vicuña fibre (2021).



In terms of pricing, prices have fluctuated over time. The price fluctuation generates great uncertainty for the producer, who opts for other activities in order to obtain income. In 2022, the price for dirty fibre fell to USD 280 per kg, and for pre-dressed fibre to USD 380 per kg

Table 5 Free on Board (FOB) value in USD per type of vicuña fibre exported (2017-2021). Source: Directorate for the Sustainable Management of Wildlife Heritage - SERFOR

Type of fibre	2017	2018	2019	2020	2021
Total FOB value (USD)	**2,299,762.090**	**2,194,989.255**	**2,732,877.230**	**3,087,483.270**	**2,331,254.295**
Pre-decomposed fibre	1,598,976.660	1,888,378.455	1,891,446.620	1,771,683.120	1298133.275
Washed fibre	135,000.000			330,025.800	
De-zippered fibre	235,551.200	197,427.000	426,263.400	440,058.600	693,866.800

Type of fibre	2017	2018	2019	2020	2021
Staple fibre, and bristles					34,085.000
Dirty Fibre	330,234.230	109,183.800	415,167.210	545,715.750	305,169.220

The vicuña value chain in Peru presents both barriers and opportunities. State entities have initiated actions to strengthen the value chain, such as financing programs and scabies control initiatives. Economic challenges include sheared and atomized fibre, limited niche markets, poor access to funding for management holders, and lack of technological development for value addition at the artisanal level. Social barriers encompass low associativity and organizational weaknesses in producer associations, while institutional and regulatory hurdles involve health measures enforcement and difficulty accessing media and communication channels. Management issues include limited market knowledge, lack of value addition and innovation, cumbersome transformation procedures, and limited financial inclusion development.

The gender aspect of the vicuña value chain highlights the significant contribution of women, who play a crucial role in capturing the animals and processing their fiber. Vicuña farming has improved rural livelihoods, with women undertaking tasks like cleaning, dehairing, and sorting fibers in the transformation process. Women's roles have evolved from traditionally submissive to more empowered positions, facilitated by the formation of productive associations and technical support from institutions like SERFOR for fibre processing.

Table 6 SWOT analysis of the vicuña value chain. Source: own elaboration.

Strengths	Weaknesses
● South American camelids are well adapted to the ecological conditions of the high Andes. They withstand low temperatures and water scarcity and have other adaptations to the radical climate and altitude. ● Vicuña fibre is a product of recognised quality in the national and international market. ● Sustainable use of a wild species that generates economic income for vulnerable high Andean populations. ● High quality garments made with vicuña fibre, with characteristics of fineness, softness, lightness, thermal and natural colour. ● SERFOR: records the entire process of using vicuña fibre from shearing. ● Peru has the largest vicuña population in the Andean countries and in the world. ● Promotional events for the positioning of vicuña fibre, such as the "Festival Internacional de Camélidos Sudamericanos" (International Festival of South American Camelids).	● Scarce and weak organisation of vicuña handlers with low representativeness. ● Fibre processing has its own know-how and is costly. ● Limited access to the transformation service ● Limited bargaining power of communities ● Limited application of the technical standard (NTP) on shearing ● Despite the obvious economic potential of South American camelids and their undisputed ecological advantages, most of the punas continue to raise cattle and sheep, with very low profitability and great environmental damage (Dourojeanni, 2014). ● Community members who work directly with vicuñas, most of whom are extremely poor, receive little return.
Opportunities	Threat

● Value addition (pre-spun fibre, clean, felted, de-waxed, spun, garment/craft) is possible. ● There is a potential international market for products made from vicuña fibre. ● Implementation of good shearing practices for a better management of the resource. ● Opening of new markets (Germany, Italy, UK) ● Product is positioned in established market niches ● Updated national protocols are in place for the control of parasitic diseases (scabies).	● There is increased climatic variability (frost, drought, hailstorms/snowfall) affecting vicuña habitat and populations. ● Scarcity of water resources for the pastures that feed the vicuñas. ● Poaching and informal sectors. ● There are few incentives for practicing sustainable methods of vicuña farming. ● Increase in highly contagious diseases (scabies)

3.3 Complementary value chains: emerging Andean grains and tubers (kiwicha, cañihua, tarwi, oca, mashua), guinea pigs, textile handicrafts, community-based tourism

Kiwicha is an important Andean grain with significant production areas in regions like Cusco, Apurímac, Ancash, Arequipa, Cajamarca, Huancavelica, and Ayacucho. Apurímac leads in production, accounting for 46.4% of the national output in 2017. Kiwicha thrives at altitudes up to 3,000 m above sea level (masl) and is highly drought and soil salinity tolerant, making it a valuable option for low-water availability lands. It is considered a highly nutritious food due to its rich essential amino acids, vitamins, minerals, and health benefits. In Peru, most kiwicha is sold directly from the producer, with the retail trader being the primary buyer. The USA and Japan are the main export destinations for Peruvian kiwicha, and its export volume has shown exponential growth. Although kiwicha has great potential for national and international growth, it faces competition from other countries' production. However, efforts by the Peruvian government to promote Andean grains, including kiwicha, are ongoing, targeting markets like Germany, which shows significant interest in vegetarian and vegan nutrition.

Cañihua is an Andean cereal native to the Andean region and cultivated in Peru and Bolivia for centuries. It contains twice as much protein as common grains like wheat, rice, or oats and has shown resilience to external climate events such as frost, drought, and low temperatures. While its main market is domestic, cañihua exports have increased, with the US, the Netherlands, Spain, Italy, China, and the UK being key destinations. Despite its potential for growth, cañihua faces challenges, including limited cultivation extensions, low productivity, weak value chain integration, and limited technological development.

Tarwi is a legume native to the Andes known for its potential in combating malnutrition and improving soil fertility. It can withstand harsh environmental conditions, making it suitable for the altiplano's production system. Although it is traditionally grown in small, isolated plots, its cultivation has been increasing by 2.3% annually in recent years, with La Libertad, Cusco, Apurímac, Puno, and Huánuco being the main regions for production. Despite its potential in the superfoods segment, tarwi faces challenges in the Peruvian agricultural sector, leading to limited competitiveness compared to other producing countries.

Oca is a traditional Andean crop native to southern Peru and grown at high altitudes. It is a nutritious tuber containing proteins, carbohydrates, and vitamin C. Oca is commonly cultivated in small plots along with potatoes, mashua, and olluco, forming a significant part of the local diet. While it takes longer to mature and has a lower yield compared to potatoes, oca is more resistant to pests, ensuring stable production. It is widely appreciated for its pleasant flavor and is used in various traditional dishes. Despite its popularity among the Andean population, oca faces challenges, such as small plot sizes, low technologies, and limited access to credit and communication routes, which hinder its production and restrict it mainly to domestic consumption. The demand for oca is increasing at the local and regional levels, but there is a lack of demand from processing companies, and exports are minimal. Oca has potential for value-added products like flour, starch, jams, and oils, which could open opportunities in specialized markets.

Mashua is an ancient tuber highly valued for its nutritional and cultural significance in the Andean region. It stands out for its antioxidant properties, being rich in anthocyanins, as well as containing substantial amounts of vitamins A and C, making it a healthy food choice. Mashua is known for its hardiness, thriving in poor soils without the need for fertilizers or pesticides, and it has a higher yield compared to potatoes. It exhibits remarkable resistance to frost and nematodes, making it a protective barrier when grown in

association with other crops like oca and native potatoes. Despite its importance for food security and economic income among peasant families, mashua's commercialization is still limited, and it is primarily cultivated for self-consumption.

Guinea pig rearing is an ancient and important activity in rural areas of Peru, providing a reliable source of protein and additional income for families, especially in the context of climate change and food security concerns. In recent years, guinea pig rearing has gained recognition for its nutritional value and income-generating potential through commercialization of surplus production. The main guinea pig-producing departments in Peru are Cajamarca, Ancash, Cusco, Apurímac, Junín, Lima, La Libertad, and Huánuco. Local marketing mainly involves live animals, while national and international markets include both live animals and freshly processed guinea pig meat.

The Peruvian **textile handicrafts** sector is a vital part of the larger textile cluster, which includes alpaca breeding, processing, and garment industries. The value chain involving textile handicrafts supports over 150,000 families, particularly in the poorest areas of the country. These families are engaged in breeding alpacas and producing handicrafts, which are essential for their subsistence. Many artisanal producers seek to add value to alpaca fiber by transforming it into yarns, felts, and various handicrafts, enabling them to achieve better economic benefits. Alpaca fiber is highly prized for its softness, durability, and luxurious feel. Knitted jumpers made from alpaca fiber topped the list of exported products in 2022, with other products such as toys, hosiery, cardigans, shawls, handkerchiefs, scarves, blankets, coats, and *chullos* also performing well.

Community-based tourism value chain: The area of intervention is the communities with a tourist vocation located in rural areas in the main tourist destinations of Peru. These communities have a vast cultural and natural heritage that makes it possible to offer tourism through travel experiences with a high degree of authenticity. These spaces are ideal for the development of community-based tourism ventures. Community-based tourism ventures are: A set of tourism initiatives established in a territory with a tourist vocation and linked to a tourist route, driven by entrepreneurs and with the participation of managers who, under a collaborative management model, promote the development of Community-based tourism products, in order to generate authentic, quality and meaningful travel experiences that contribute to sustainability and the integral wellbeing of local populations. The main product in community-based tourism is the identification and preparation of tourist circuits around native potatoes, alpacas and guinea pigs, defining special routes for each of these products and taking advantage of the presence of a high flow of tourism in the Cusco-Puno-Arequipa axis, the most touristic in the country. Proposals can be implemented for agronomic, cultural, ecotourism and gastronomic tourism, or a mix.

Community-based tourism brings many benefits to communities, especially in relation to the conservation of natural and cultural resources, empowerment and increased ownership among local people, improved communication infrastructure, job creation and increased income, and reduced rural migration (Goulding et al., 2014). When tourism services are operated by women, economic empowerment and greater gender equality have also been documented (LaPan et al., 2016).

A business model based on high Andean community-based tourism requires promoting the sustainable socio-economic development of rural communities in marginalised areas. The Community-based tourism strategy has triggered the flourishing of community-based tourism initiatives in the Peruvian Andes and the emergence of many governmental and non-profit institutions seeking to provide technical training and marketing assistance to local communities.

5. Ecosystems of the High Andean Ecoregion

All prioritized districts are made up of high mountain ecosystems, with the Puna ecosystems peatlands, grasslands and wetlands being of particular interest for the project. Due to the focus on high mountains, the ecosystems within the 91 prioritized districts shared more similarities than the ecosystems within each project region. The main ecosystem types in the prioritized areas are Andean grassland and Andean

highlands with little or no vegetation. Scattered areas of shrub tickets and highland wetlands (Bofedal[3]) are contained in most prioritized districts.

Pajonal de Puna Seca (Dry Puna Grassland): The Dry Puna grassland refers to High Andean ecosystem with herbaceous vegetation, which can occupy flat or undulating terrain as well as hills of moderate slope. The soil has a sandy-loamy texture with low organic matter content; soil cover is less than 35%, maximum height generally and does not exceed 1.5 meters. The climate is markedly seasonal, with a very intense dry season, which is accentuated towards the South and West. It is generally made up of lawns dominated by low grasses and grasslands dominated by robust and xeromorphic tufted grasses, often with stiff, hard, and sharp leaves, with variable presence of resinous shrubs, interspersed with saxicolous vegetation on rocky ridges (typically associated with shrubs) and *canllares* (formations of Margyricarpus sp.). A notable community is formed by Puya *Raimondi.*

Pajonal de Puna Húmeda (Wet Puna Grassland): The Wet Puna grassland refers to High Andean ecosystem with herbaceous vegetation consisting mainly of low grasses and grasslands dominated by gramineous that grow in clumps, dispersed, with hard stems and leaves, and some scattered shrub associations, interspersed with saxicolous vegetation on rocky ridges. It can occupy flat or undulating terrain or hills of moderate slope. It presents a coverage of 35-50% and its height generally does not exceed 1.5 meters. A notable community is formed by *the Puya Raimondi.*

Bofedal (High-Andean Wetland): Andean hydromorphic ecosystem with herbaceous vegetation of hydrophilic type, which occurs in the high Andes on flat soils, in depressions or slightly inclined; permanently flooded or saturated with running water (poor drainage), with dense and compact evergreen vegetation, cushion or cushion-shaped; the physiognomy of the vegetation corresponds to grasslands of 0.1 to 0.5 meters. The organic soils can be deep (peat). This type of ecosystem is considered an Andean wetland. In many parts of the country these ecosystems are known as *oconales*, which in Quechua means "wet zone". Soil conditions (bulk density and peat depth) are most closely correlated to the provision of important ecosystem services such as carbon and water storage.

Periglacial and glacial zone: High Andean ecosystems are located above 4,500 meters. Cryoturbed and bare soils with abundant melting zones as well as the presence of cryoturbed and dynamic vegetation. Low and scattered vegetation (generally no higher than 30 or 40 cm), represented by sparse grasses, asteraceae, lichens, and cushion plants, among others. It should be noted that there are periglacial zones that are no longer associated with glaciers. These zones include glaciers, which are masses of ice that accumulate on the highest levels of the mountain ranges (above 5,000 m a.s.l.); it includes rocky debris and is characterized by a balance between the accumulation and melting of snow and ice.

High Andean Relict Forest (queñoal and others): Forest ecosystem consisting of high Andean relic / natural forest dominated by associations of *queñua* (Polylepis spp.), extending over 0.5 hectares, with trees taller than 2 meters and a ground cover of more than 10%; commonly restricted to rocky slopes or ravines with a distribution in patches or vegetation islands.

Meso Andean relict forest: Andean ecosystem of variable composition and structure represented by pure or mixed communities of:

- Escallonia resinosa *chachacoma* or *karkac*, Escallonia myrtilloides *tasta*, Podocarpus glomeratus *intimpa*, Myrcianthes oreophila *unka* in wetter areas and
- Kageneckia lanceolata *lloque*, Alnus acuminata *aliso* or *lambrán* and other species in drier areas.

It extends over 0.5 hectares, with trees over 2 meters high and ground cover over 10%; commonly distributed as patches or islands of relict vegetation restricted to special localities, on mountainous slopes with moderate to steep gradients.

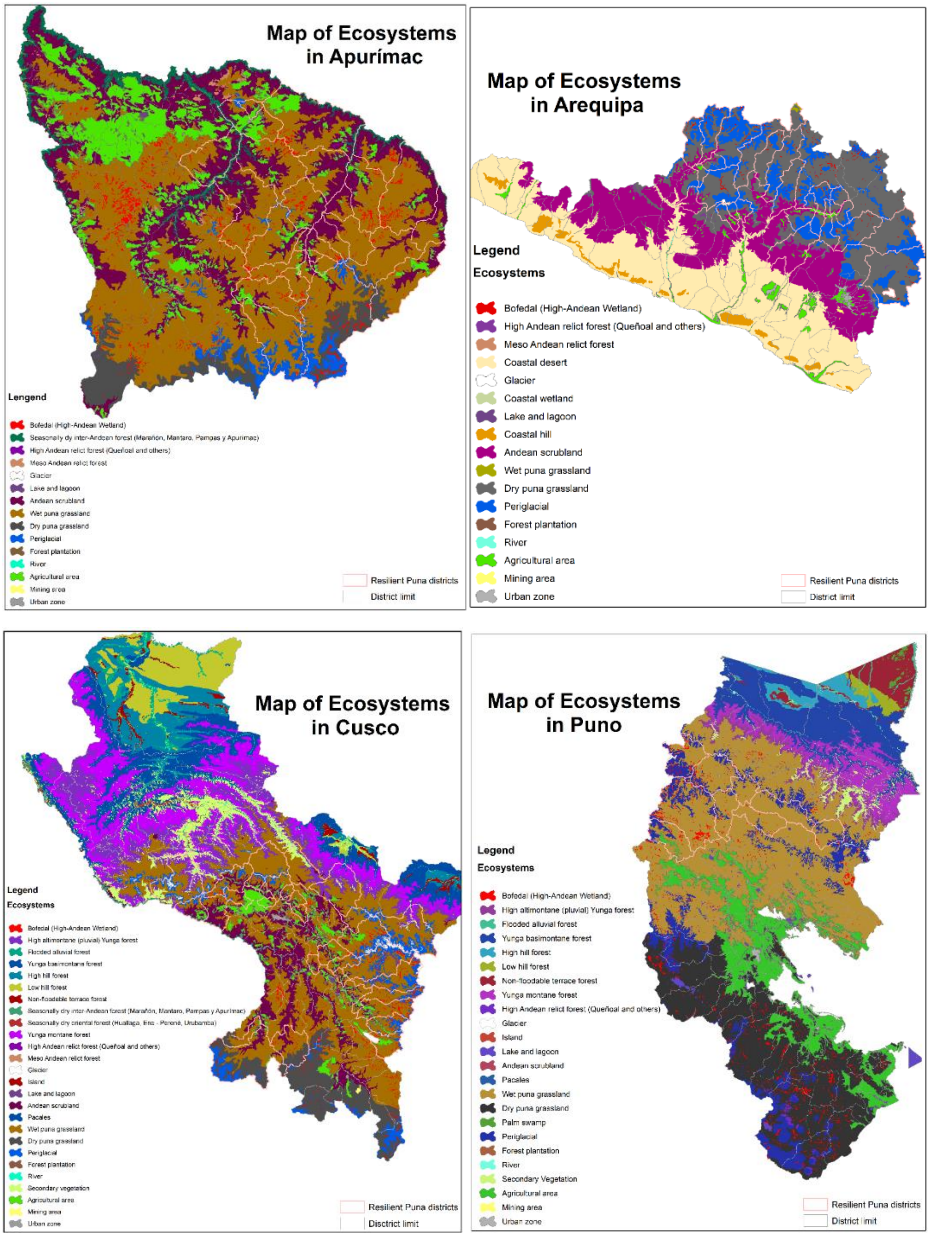
Seasonally dry inter-Andean Forest: Forest ecosystem characterized by deciduous tree communities distributed along the inter-Andean valleys, including seasonal herbaceous species in the lower stratum; tree-like cacti are notorious, abundant, and mostly endemic. The dominant physiognomy corresponds to

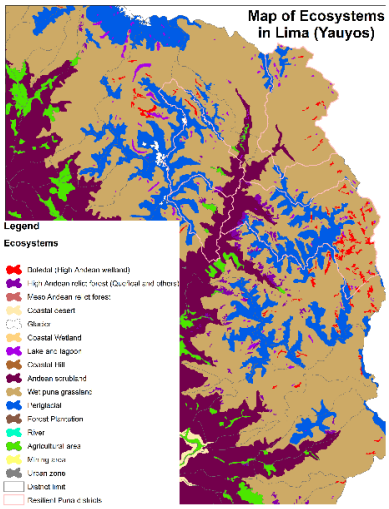
[3] In Peru, the term “bofedales” is used to describe areas of wetland vegetation that may have underlying peat layers. These areas are a key resource for traditional land management at high altitudes. Because they retain water in the upper basins of the cordillera, they are important sources of water and forage for domesticated livestock as well as biodiversity hotspots. Maldonado (2014). An introduction to the bofedales of the Peruvian High Andes.

a seasonally dry forest open on slopes, with individuals up to 7 or 8 meters. Its altitude ranges from 500 to 2 500 meters above sea level approximately. This ecosystem is found in the inter-Andean valleys of the Marañón Huancabamba, Pampas, Apurímac, among others.

Andean scrubland: An Andean ecosystem with a wide national distribution that includes three types of scrublands (montane scrubland, dry puna scrubland and Andean scrubland), with an altitudinal range of 1500 to 4500 m.a.s.l. It is characterized by the presence of woody and shrubby vegetation of variable composition and structure, with a ground cover of more than 10% that extends over more than 0.5 hectares, and whose height above the ground does not exceed 4 meters. In the dry puna scrub, there are extensive areas of *tola* (Parastrephia spp.), as well as Lepidophyllum quadrangulare, Baccharis spp. and other species; in the montane scrub, there are sclerophyllous shrubs and small trees up to 2 meters tall and the presence of epiphytes; and in the Andean scrubland itself, there are thickets with scattered trees and cacti.

Figure 24 Geographical distribution of ecosystem types in the project target departments (MINAM 2018).





6. Climate Change Profile

5.1 Summary of climate change impacts and possible EbA measures to be used

The following table summarizes the projections for temperature and precipitation in the SHAP region, which determine all the knock-on climate change impacts. Table 8 summarizes how EbA can address the climate change impacts identified.

Table 7: Summary table for precipitation and temperature projections by 2050.

Climate indicator	Projections
Temperature	Temperature changes are always positive, showing an increase of temperature in any season and scenario. According to the RCP4.5 scenario, by 2050, the maximum temperature increases between 2.1 and 3.8°C, with stronger signals in winter. Minimum temperature shows increases between 1.3 to 4°C. Spatially, these increases are larger in districts located at high altitudes between the SE and A regions. Under the RCP8.5 scenario, by 2050, increases in maximum temperature range between 2.5 to 4°C, with stronger signals in winter. Minimum temperature increases between 2 to 4°C. Spatially, these changes are particularly larger over high altitudes in the northwest SW region and between the SE and A region.
Precipitation	Under the RCP4.5 emission scenario, annual changes range from -5 to +20% by 2050. In winter, changes are mostly negative in most parts of the SHAP. On the other hand, the largest increases occur in summer, especially over the north of the SE region. Under the RCP8.5 emission scenario, annual changes range from -30 to +30% by 2030. The biggest negative changes take place in winter. However, spring is the season when the largest increases in precipitation are expected. Overall, the SHAP shows mixed positive and negative changes.

Table 8: Summary of climate impacts in the SHAP region and possible EbA measures to be used.

Climate change impacts	Description of impact	Ecosystem-based Adaptation options (from EbA catalogue)[4]	Other adaptation options (non EbA)
Increase in droughts and reduced water availability	Under RCP 8.5, there is an increase of droughts in the Altiplano region by 2050, and wetter climates at lower altitudes. The total number of drought months by some estimates is projected to almost double by 2100 under the RCP 8.5 scenario (Potter, et al., 2022). This will have impacts on the water balance, with knock-on impacts on agricultural activity.	• **Conservation and restoration of wetland ecosystems** (*bofedales)* retain rainwater, regulate runoff flows, increasing soil moisture and improve water regulation. • **Infiltration ditches**- retain and infiltrate rainwater, Increase the humidity of the soil plant water system as a result of localized infiltration. The deposited water infiltrates the soil and helps with aquifer recharge improving water regulation. • **Qochas** – Qochas are natural reservoirs in the High Andes that store rainwater and improve infiltration.	• Geotanks • Greenhouses
Decreased crop yields and shorter growing seasons	Potato crops in Apurimac and Cusco (SE subregion) would decrease. In Arequipa (SW subregion), onion yield will present larger physiological imbalances. The wheat crop yield projections will significantly decrease in this region. Pests and diseases will affect potato and onion crops due to shifts in species distribution (SENAMHI, 2015).	• **Andenes/terraces** to reduce water runoff and soil erosion, usually on steep slopes. Terraces maintain soil moisture and generate a suitable microclimate for crops (HELVETAS Swiss Intercooperation, 2017). • **Agroforestry -** tree-crop interaction helps control erosive processes and increases water infiltration (HELVETAS Swiss Intercooperation, 2017). Agroforestry measures increase soil productivity and contribute to food security, while providing agrobiodiversity benefits. • **Forest restoration with native species-** native species such as Buddleja coriaceae*, Alnus acuminata* or *Polylepis racemosa* have high soil retention capacity, stabilize sudden temperature changes and hold soil and environmental moisture.	• Technified irrigation. • Integrated pest management techniques. • Crop rotation • Solar pumping • Productive diversification (vegetables, guinea pigs) • Management of crop and livestock health.

[4] More detailed information on the EbA measures can be found in Section 9.

Climate change impacts	Description of impact	Ecosystem-based Adaptation options (from EbA catalogue)[4]	Other adaptation options (non EbA)
		• **Integrated soil fertility management** (ISFM) via green manure and majadeo[5]. ISFM enhances soil fertility, improves water retention and even reduces germination time through seed priming (Liniger, Mekdaschi, Hauert, & Gurtner, 2011). • **Contour farming:** Consists in orienting the crop rows following the contour lines of the topography. This practice helps to reduce water runoff and soil erosion. • **Conservation agriculture –** farming system that prevents soil disturbance and emphasizes maintenance of permanent soil cover. Hydrological optimization for water retention, improve water retention and reduce erosion rate.The aim is to enhance biodiversity and improved and sustained crop production.	
Glacial retreat and melting	According to the National Research Institute on Glaciers and Mountain Ecosystems (Inaigem), Peru glaciers have been reduced by 43% over the last 40 years because of global warming. In the Andean glaciers, at least seven watersheds have already crossed peak flow; once the glaciers feeding these rivers are gone, dry season average discharge may decrease by up to 30 per cent causing actually water stress.	EbA's would be located downstream from glaciers to better retain and collect water: • **Conservation and restoration of wetland ecosystems**- *bofedales* retain rainwater and regulate runoff flows, increasing soil moisture. • **Qochas** – Qochas are natural reservoirs in the High Andes that store rainwater. • **Infiltration trenches- retain and infiltrate rainwater.** The deposited water infiltrates the soil and helps with aquifer recharge.	N/A

[5] Majadeo is the practice of soil fertilization using herds. The process starts with herd grazing, in which the animals are guided to feed on specific plots of land, and then the leftover manure is used to plant crops (Tapia, Fries, Mazar, & Rosell, 2007).

Climate change impacts	Description of impact	Ecosystem-based Adaptation options (from EbA catalogue)[4]	Other adaptation options (non EbA)
	(Baraer et al., 2012 cited by Bergmann et al 2021[6]). Evidence from the field shows that in recent years the scarcity of water resources has impact local livelihoods in areas closer to glaciers melted because of the Andean community's vulnerability.		
Shifting landscapes-affecting grasslands	• Ludeña et al. (2014) show there will be an increase in shrub surface under a high emissions scenario in the Puna region. The same phenomenon is projected for the *páramos.*[7] • Glaciers, the suprandino area (the area between glaciers and the *puna*[8]), the *puna* and *yungas* forests show large reductions in extension. • Projected expansion of desert and dry areas will reduce water availability (Ludeña, Sánchez-	• **Forest restoration with native species-** intended to avoid the spread and dominance of invasive species in the Andes, such as *Eucalyptus globulus.* Native species Polylepis incana, *Alnus acuminata* or Buddleja coriaceae intercept, condense and infiltrate water, making them resilient to dry conditions. • **Sustainable grassland management-** by controlling overgrazing, increasing water infiltration, and controlling erosion.	• Rotation of livestock grazing

[6] Bergmann, J., K. Vinke, C.A. Fernández Palomino, C. Gornott, S. Gleixner, R. Laudien, A. Lobanova, J. Ludescher and H.J. Schellnhuber, 2021. Assessing the Evidence: Climate Change and Migration in Peru. Potsdam Institute for Climate Impact Research (PIK) and International Organization for Migration (IOM). Potsdam and Geneva

[7] Grassland and shrub-land ecosystems found in Peru and other areas of South America.

[8] The ecoregion above 3,500 masl

Climate change impacts	Description of impact	Ecosystem-based Adaptation options (from EbA catalogue)[4]	Other adaptation options (non EbA)
	Aragón, de Miguel, Martínez, & Pereira, 2014). • Wetlands, grasslands and shrub-lands will change in surface due to glacial retreats and temperature increases. The area that is constituted by grasslands, wetlands, and shrub-lands, which in 2010 represented 77.6% of the total extension of the *puna,* would be reduced to approximately 50% by the end of the century Flores (2016).		
Diminished carrying capacity of ecosystems for livestock (including camelids)	• Meat production (sheep, cattle, camelids, equines and goats) will decrease due to the reduction of available grazing land and water availability. This impact will be larger under a high emissions scenario Ludeña et al. (2014). • An economic study found that under a high emissions scenario, the economic impact on livestock in the whole of the Andean region (i.e. not just the project intervention area) is projected to be up to 9 billion Peruvian *soles* in accumulated losses at a discount rate of 0.5% by 2100 (MIDAGRI, 2012).	• **Forest restoration with native species-** Native species *Schinus Mole, Alnus acuminata* or *Podocarpus glomeratus* intercept, condense and infiltrate water, hold soil and environmental moisture and have high soil reterention capacity. This means that they can help regenerate ecosystems. • **Sustainable grassland and pasture management-** by controlling overgrazing, increasing water infiltration, and controlling erosion, grasslands can be recovered and provide enough fodder for livestock (HELVETAS Swiss Intercooperation, 2017).	
Impacted livelihoods	• The chosen districts in the SHAP are rural areas, where the system of	• **Aforementioned EbA interventions related to soil management, agroforestry and water management-**	• **Promotion of eco-agrotourism as a revenue**

Climate change impacts	Description of impact	Ecosystem-based Adaptation options (from EbA catalogue)[4]	Other adaptation options (non EbA)
	small agricultural producers dominate. Some highland communities use migration to anticipate or react to hazards. Migration of workers is influenced by climate impacts such as drought, especially of young people, in highland communities in the Puno region (Sperling et al., 2008). • 4.5 million people live in the SHAP of whom 50 % are women. Around 40 to 60 % of this population live in rural areas and rely on subsistence agriculture and livestock breeding as main source of income. They have been identified by Peru's 3rd National Communication to UNFCCC as highly vulnerable to climate change's impacts on High Andean ecosystems (Ministerio del Ambiente, 2016). • Women depend to a larger extent on ecosystem services at a household level, due to existing inequalities in education, access to credit and public services. (MIMP, 2012)	these will have knock on impacts on ecosystem services and provide timber and non-timber products for income generating activities, for example.	**source to diversify livelihoods-** By managing visitor flow in a way that limits ecosystem degradation and wildlife disturbance but generating local alternative incomes. • **Investment in climate-resilient value chains-** helping rural communities increase and diversify their income, as well as enhance the resilience of their livelihood source (small-scale agriculture and livestock production)

5.2 Methodology

5.2.1 Historical climate trends

To characterize the current climate and that of recent years, data from the Peruvian Interpolated data of the SENAMHI's Climatological and hydrological Observations (PISCO product) was used (see Huerta, Aybar, & Lavado-Casimirio, 2018; Aybar, et al., 2019). PISCO is a gridded product that provides data on maximum and minimum temperature, as well as precipitation at a spatial resolution of 10km and daily and monthly temporal resolution from 1981 to 2016. This product was developed by National Meteorology and Hydrology Service of Peru (SENAMHI) based on meteorological stations from long records and satellite images CHIRPS, TRMM and MODIS.

Precipitation and temperature variables of the PISCO dataset were developed in a different, although similar way. In the case of PISCO precipitation, bias corrections and calibrations were made on the products CHIRPm, CHIRPd (CHIRPS monthly and daily, respectively) and TRMM (Aybar, et al., 2019). After this, a union of these products was made with the observations of meteorological stations that were used through the Residual Ordinary Kriging (ROK) method and finally, the monthly data were statistically corrected (Aybar, et al., 2019). It is important to highlight that this product will have greater confidence in areas where weather stations are present, and confidence will be lower in areas with a lower density of weather stations. In the case of the project intervention area several meteorological observation points are observed, but most of them are below 3500 meters above sea level.

PISCO temperature was developed using daily and monthly data from weather stations and MODIS satellite images. The Geographic Weighted Regression Kriging (GWRK) and Regression Splines (RSPLINES) methods were used, and the results were evaluated through cross validation (Huerta, Aybar, & Lavado-Casimirio, 2018). The authors indicate that it cannot be safely assumed if this product is reliable in areas far from the points of meteorological stations, due to the limited information and topographic complexity.

Other than temperature and precipitation, the following extreme climate indices were considered in the analysis using SENHAMI's PISCO data:

- Frost days: Because of their sensibility to temperature below zero, crops are particularly sensitive to frost days. Frost days (FD) has been therefore included.
- R10: Events with days of rainfall over 10mm were considered due to its impact on crop damage, especially on hill slopes with possible flooding risk.
- SPI: The Standardized Precipitation Index (SPI) was used to determine drought risk. Because of the importance of drought risk in the summer months in the Andean area, SPI3 was used for the summer months (December, January, February). SPI values above 0.99 indicates a wet climate, with values above 2 would be qualified as "extremely wet". SPI values below -0.99 indicates a drier climate, with values below -2 indicating "extremely dry" climates.

For a detailed description of the methodology used, please refer to Appendix I- Methodology for historic and future climate change trends

5.2.2 Climate change projections

Temperature and precipitation data for the project intervention area comes from various sources, including an internal Climate Risk and Vulnerability Analysis conducted by GIZ, the Accredited Entity (AE). For climate projections, for RCP 4.5 and 8.5 scenarios for 2050, the RCA4 RCM (Regional Climate Model) driven by the Had-GEM2-ES circulation model was selected. RCA4, a regional climate model, offers high resolution (50km) simulation of

precipitation, considering the local topography for higher accuracy. Recent publications show that RCA4 performs well for South America (Falco, Carril, Menéndez, Zaninelli, & Li, 2019).

This information has been supplemented with data from two secondary sources:

- National Service for Meteorology and Hydrology of Peru (SENAMHI, for its acronym in Spanish): RCP 8.5- Multi-model regional ensemble by Peru's hydrometeorological service: combining CIMP5, Had-GEM2-ES and MPI-ESM-LR and adjusted for higher resolution (Llacza, et al., 2021). For more information refer to Appendix I.
- Climate Information Platform: The GCF-funded database uses CORDEX (Coordinated Regional Climate Downscaling Experiment) South America data (Climate Information Platform, 2023).

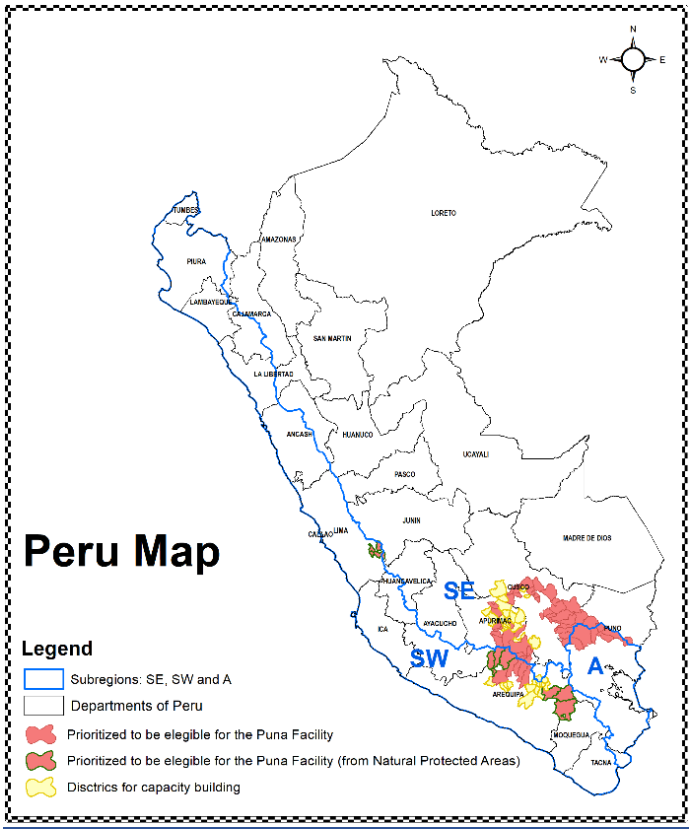
Extreme weather events indicators- the same climate change indicators were used as for historical trends to maintain consistency. The inputs come from the RCA4 RCM (Regional Climate Model) driven by the Had-GEM2-ES circulation model.

- SPI3 was calculated for the growing season (December, January and February) for 2050 and RCP 4.5 and RCP 8.5.
- R10 was calculated for 2050 for RCP 4.5 and 8.5.
- Changes in frost days were estimated for 2050 for RCP 4.5 and 8.5.

5.3 Current climate

The project's geographical location in the Southern High Andes of Peru (SHAP) covers 22 different climates which are located in 14 different life zones (biomes), meaning that within regions and districts climate is highly variable (SENAMHI, 2020). Most of this territory corresponds to headwaters of different basins and, therefore, have altitudes greater than 2000m above sea-level. These districts, which encompass four different political regions, will be classified into three sub regions for a better climate analysis, which are: Southern west (SW), southern east (SE) and Altiplano (A) (Spanish for "high plateau") (Figure 26). For a list of districts and which subregions they fall under, refer to Appendix II.

Figure 25: Map of project districts and subregions: Southern west (SW), southern east (SE) and Altiplano (A)



Throughout the SHAP, there is a marked difference between the summer and winter months, both in precipitation and temperature, with summer typically being rainy (wet period) and winter, very dry (dry period). In summer, 57% of the annual precipitation occurs; while only 3% occurs in the winter months (Lavado, Ronchail, Labat, Espinoza, & Guyot, 2012).

Annual precipitation ranges from 47.1 to 1128 mm. The districts where annual precipitation values are less than 100 mm are those in the SW subregion, closer to the southern coast of Peru. On the other hand, the districts with the highest rainfall (over 900 mm per year) are those of SE and A that are closer to the transition zone to the Amazon (SENAMHI, 2015).

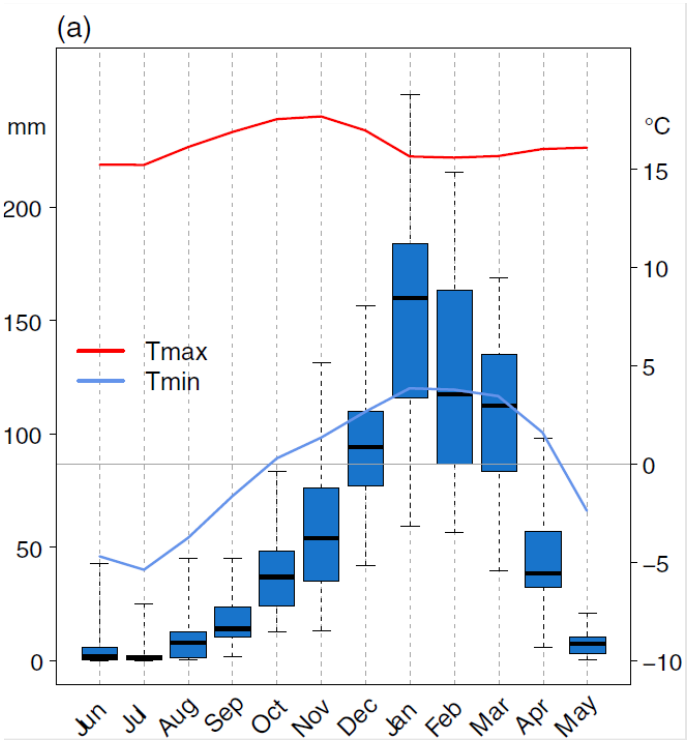
The annual maximum temperature mean ranges from 13 to 24.9°C. The districts that show lower values of this variable are at a higher altitude. Minimum temperatures range from -3.1 to 12°C and, similarly to maximum temperatures, the higher altitudes experience lower minimum temperatures (SENAMHI, 2015).

Seasonal trends vary district to district. Broadly speaking, the wettest season of the year is spring in the SE and A subregions; however, for SW, the wettest season is autumn. In contrast, the driest season is winter (SENAMHI, 2015).

Seasons with the highest maximum temperatures are spring in A and SE. On the other hand, the coldest season is in winter in most of the districts of the project's intervention zone, except in some districts located in SW, where the season with the lowest maximum temperatures is autumn. Annual minimum temperatures are higher in summer in most districts, except in some SW districts, where the highest values are in autumn. The lowest minimum temperatures in all districts occur in winter (SENAMHI, 2015) (Imfeld, Sedlmeier, & Gubler, 2021).

The annual cycle of precipitation and temperatures averaged per month throughout the SHAP, is shown below.

Figure 26: Mean annual cycle of precipitation and temperatures in the SHAP from 1981 to 2016. The highest maximum temperatures occur in spring, the minimum, in winter. The highest minimum temperatures happen in summer and the minimum, in winter. Precipitation exhibits a skewed distribution during the year, with maximum values in summer and minimum values in winter.



(Imfeld, Sedlmeier, & Gubler, 2021)

5.4 Historic climate trends

5.4.1 Temperature

Temperatures during the analysed period (1981-2016) overall show an increase. Maximum temperatures show the *greatest increases during the spring, while the smallest increases show in the autumn season. Annual trends of maximum temperatures show a statistically significant increase in temperature in all project intervention areas, particularly at higher altitudes, in comparison to the 1981-2016 reference period. Increases range from 0.3°C to 0.44°C per decade and the districts with the greatest trends are approximately at 4600m above sea level. In summer months, trends range from 0.17 to 0.48°C increases per decade and greater trends are observed at higher altitudes. Autumn is the season that shows the lowest trends, ranging from 0.17°C to 0.38°C per decade. In this period, a greater trend is observed in the districts located further south, in SW and A subregions. Winter shows trends ranging from 0.33 to 0.44°C increases per decade. The spring season shows the greatest increases in annual maximum temperatures, ranging from 0.35 to 0.55°C per decade (26-27).*

Figure 27: Maximum temperature trends for the period 1981-2016 in the project intervention area for the a) annual mean (b), summer (DJF), c), autumn (MAM), d), winter (JJA), and e) spring (SON). All periods show steep increases. In spring we see the steepest trend.

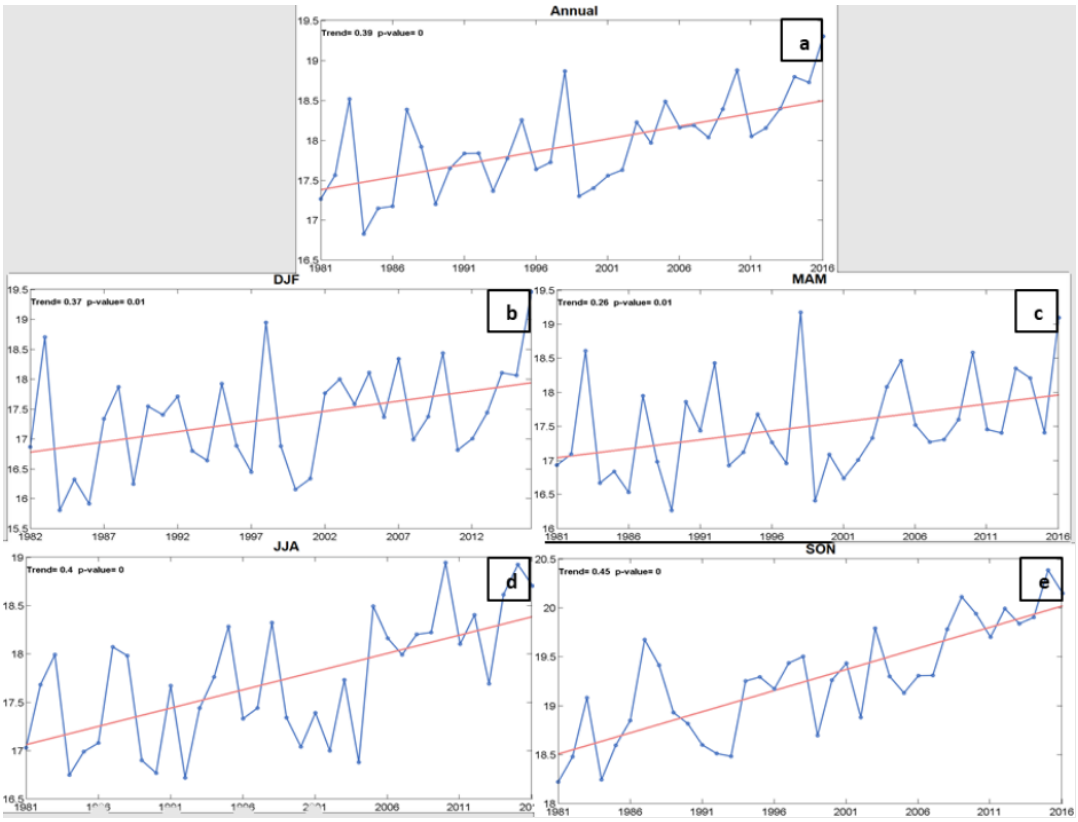
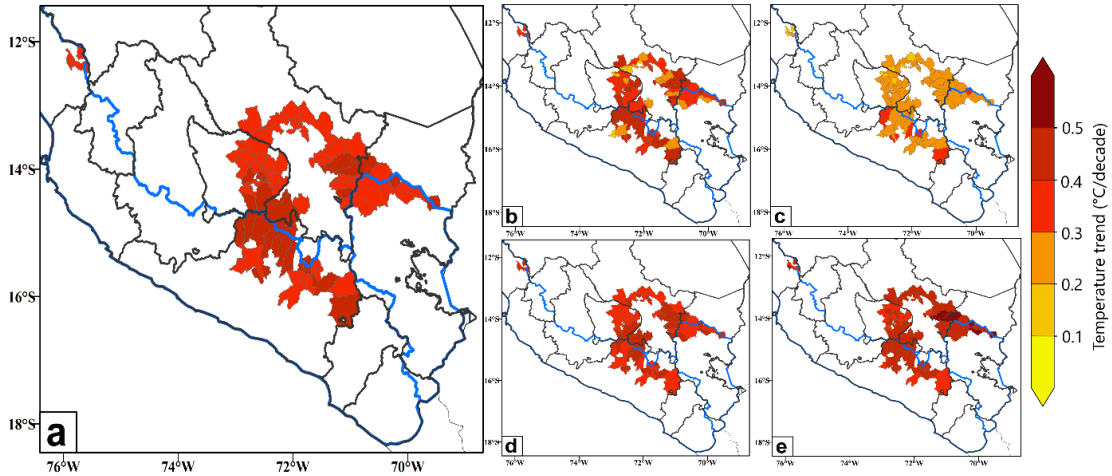


Figure 28: Spatial trends of Tx (°C/decade) from 1981 to 2016 in the SHAP chosen districts. Annual trends (a) indicate a dominant increase, with an emphasis in high altitudes. In summer (b), the signal of increase is also clear. The lowest increases of the year happen in autumn (c). In winter (d), trends are also positive, especially over high altitudes. The largest trends occur in spring (e), especially in the border of SE and A.

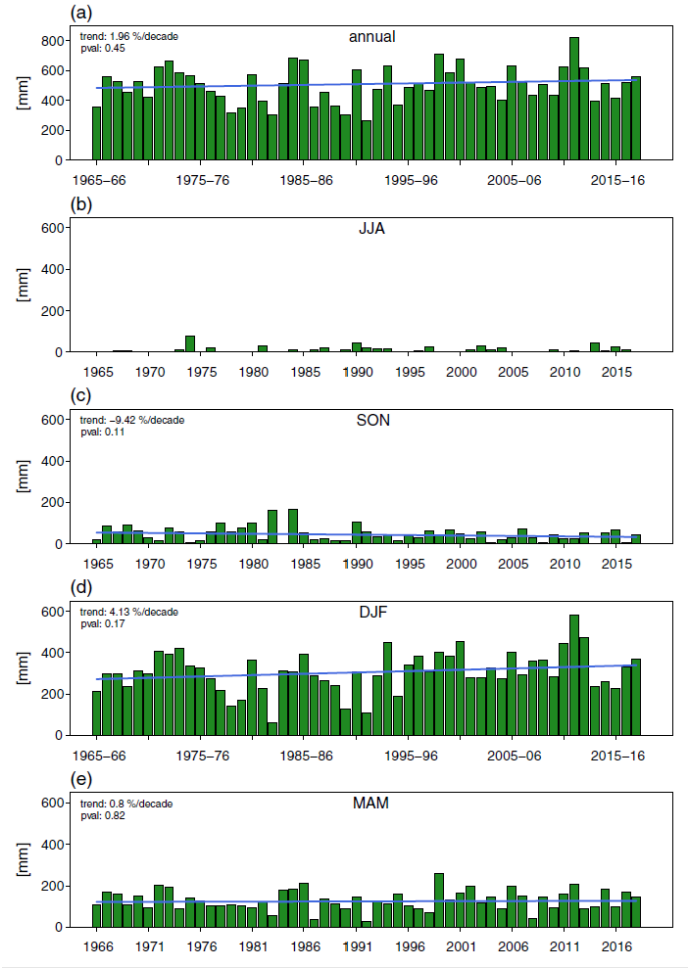


5.4.2 Precipitation

Precipitation historical trends show high seasonal and interannual variability. Trends are therefore of low magnitude and do not usually show statistical significance. Overall, the SHAP shows increases in precipitation annually, as well as in the summer and autumn seasons. In spring, trends in precipitation have been negative in recent decades.

Figure 29: Precipitation trends for the period 1965-2016. Annual trends (a) show a slight increase of with no statistical significance. In summer months (d), the trend increases more than the annual

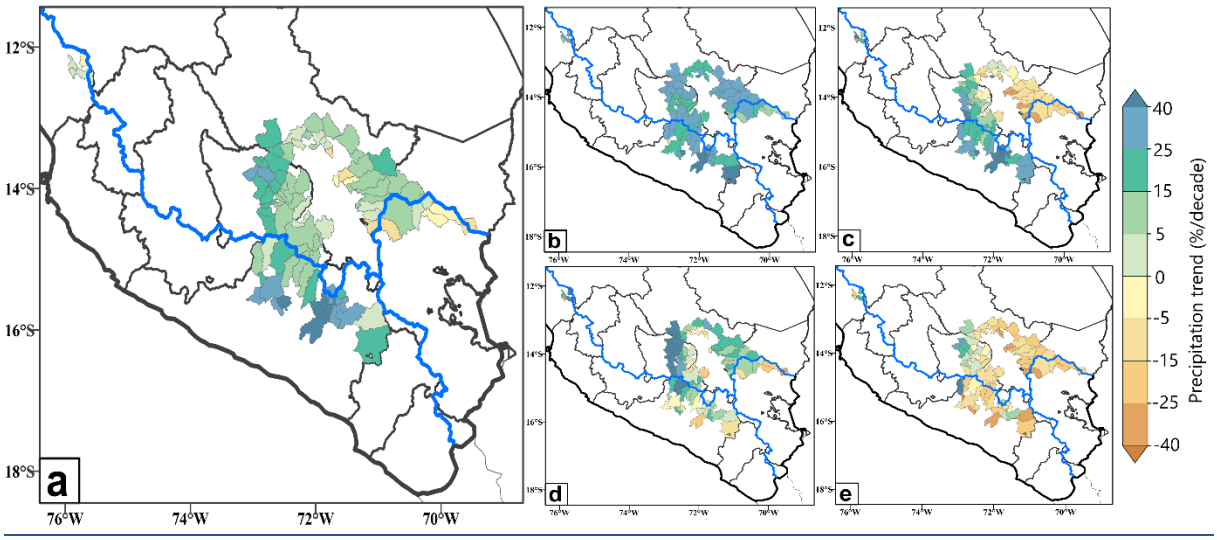
precipitation. In spring (c) the trend is negative, showing a clearer decrease. For winter (b), no precipitation trend is shown.



(Imfeld, Sedlmeier, & Gubler, 2021).

Annual trends i*n precipitation range from -14.1% to 55.4% per decade. Annual trends are positive throughout SHAP, except in a few, which show slightly negative trends (Figure 30). In summer, trends show a clear spatially distributed positive trend ranging from 3.7 to 50.9% per decade. In autumn, trends range from -28.6 to 65.4% per decade, with eastern SE and A showing negative trends. In contrast, west of SE and SW return spatially positive trends. In the winter months, trends are not significant, but discrepancies in trends again between east of SE and A (decrease) and west of SE and SW (increase), are notable. In spring, there is a clear trend of decreasing rainfall, ranging from -45.7 to 45.7% per decade. All districts show decreases, except for a few located northwest of the SE. These decreases in spring months are related to the tendency to delay the onset of rainfall that typically begins in this season. These decreases go in line with other studies in the Peruvian Andes that have noticed similar patterns of rainfall seasonality (Giráldez, Silva, Zubieta, & Sulca, 2020).*

Figure 30: Spatial distribution of precipitation trends (%) from 1981 to 2016 in the SHAP chosen districts. Annual trends (a) indicate an increase in most districts, with an emphasis in the northwest of SE and SW subregions. In summer (b), the signal of increase is pretty clear in all the districts. In autumn (c), winter (d) and spring (e), a higher increase occurs in the northwest of SE and SW than in the eastern part of SE and A. In spring, negative trends are dominant.



5.4.3 Glacier retreat

Since the end of the 1970s, Andean tropical glaciers have been shrinking at an increasing rate. The main factor that explains this retreat is the warming of the atmosphere, given that precipitation does not show significant changes. Francou et al. (2013) concluded that the magnitude of glacier loss is directly related to glaciers size and elevation, therefore, glaciers that are above 5400m above sea level lost glacier mass at a rate of -0.6m water equivalent every year in the last decades. Meanwhile, those with lower altitudes contracted at a rate of -1.2m water equivalent by year, which means the double. This shows that smaller glaciers are more vulnerable to increasing temperatures (Francou, Rabatel, Soruco, & Sicart, 2013).

Tropical glacier melting happens because of temperature increases, high solar radiation and tropical humidity dynamics. Furthermore, the fact that precipitation falls as rain and not as snow, reduces the albedo of the surface (Vuille, 2013). Additionally, one of the main factors that influence the deglaciation on the external tropics of Peru (corresponding to the SHAP region) is the onset of the wet season (Francou, Rabatel, Soruco, & Sicart, 2013). The crucial factor for accumulation is the early generation (from November-December) of snow, so that it may block the melt.

Moreover, El Niño–Southern Oscillation (ENSO) events are also associated with the reduction of the glacier mass due to the increase in temperature and the reduction of precipitation, with often (but not always) significant mass loss during warm episodes associated with El Niño events. Meanwhile cold phases associated with La Niña events tend to lead to less negative or in some cases even balanced or slightly positive mass balance (Vuille, 2013).[9]

Recent analysis of glacier melting in the last decades in the SHAP show considerable glacier losses (Seehaus, Malz, Sommer, Lippl, & Braun, 2019). During the period between 2000-2013, the retreat rate in the southern SE subregion was −1.3 % by year, and in the SW subregion, it was −2.3 % by year, approximately. Faster losses are found in the SW subregion, because of the dominant low-altitude and small glaciers in this area. These losses may lead to the increasing GLOF (Glacial Lake Outburst Flow) risk, because of the gain and formation of glacial lakes, and might also impact on water availability.

Glaciers play an important regulating role in the hydrology of the Andes by storing water in the rainy season and releasing it throughout the year (Schoolmeester, et al., 2016). The proportion of glacial meltwater in rivers is substantially higher in the dry season and in dry years. This happens because of the lack of rain in the dry season. Glaciers have a particularly significant

[9] The El Niño phenomenon has long-distance impacts on the behaviour of the climate of the Altiplano and its surroundings, causing a decrease in rainfall during El Niño episodes.

effect downstream in rivers that move into arid areas towards the Pacific, Atlantic or Titicaca lower basins after leaving the mountains. On average, the contribution of glacial water in this river is between 4 and 8 %. However, in years with little precipitation the contribution can be as high as 80 % in the dry season (Schoolmeester, et al., 2016).

The compensation effect of glaciers is particularly important, since in Peru the highest difference in seasonal precipitation and annual precipitation totals are low. In the short term in the Tropical Andes, diminishing glaciers cause increased water flow, enhancing agricultural productivity. In the long term, however, meltwater runoff will decrease dramatically, once "peak water flow" has been passed (Denkhan, Huggel, Salzmann, Giráldez, & Suarez, 2014) (Vuille, 2013). Besides reduced streamflow, deglaciation can exacerbate water quality issues. Meltwater can also accumulate in glacial lakes that carry risks of outburst floods (Bergmann, et al., 2021)

A near-future crossing of the 'peak water' is expected in the southern Andes, from where on prior enhanced streamflow decreases and levels out towards a new still unknown minimum discharge. Consequently, a sustainable future water supply especially during low-level runoff dry season might not be guaranteed whereas Peru's water demand increases significantly (Denkhan, Huggel, Salzmann, Giráldez, & Suarez, 2014).

Qualitative studies based on interviews show how these "peaks" (where water availability increases then decreases) will drive vulnerability in multiple dimensions. Communities' vulnerability is not only driven reduced water availability (once the "peak" has been passed), but also by this initial increase in meltwater, which impacts water quality and exposes populations living near these streams and lakes to flooding (McDowell, et al., 2022)

5.4.4 Extreme weather events

- *Frost days*

Associated with the general warming in the region, frost days trends return a general decrease over the last three decades, especially at higher altitude in A and SE (Figure 31: Trends for several extreme weather indices for the period 1981-2020 a) Frost days (FD), b) extreme rainfall (R10) and c) summer drought SPI3 Trends in frost days mostly correspond to trends of minimum temperature with low magnitudes and few significant signals. Since frost days are strongly related to incoming longwave radiation, the occurrence of frost days follows the cycle of minimum temperature cycle (García, Raes, Jacobsen, & Michel, 2007). Regionally, differences in the occurrence of frost days are observed. For instance, the percentage of frost days is considerably reduced close to the border of Lake Titicaca compared to the areas more distant to the lake. This is an indication of the warming effect of the lake on minimum temperature.

- *Heavy rainfall events*

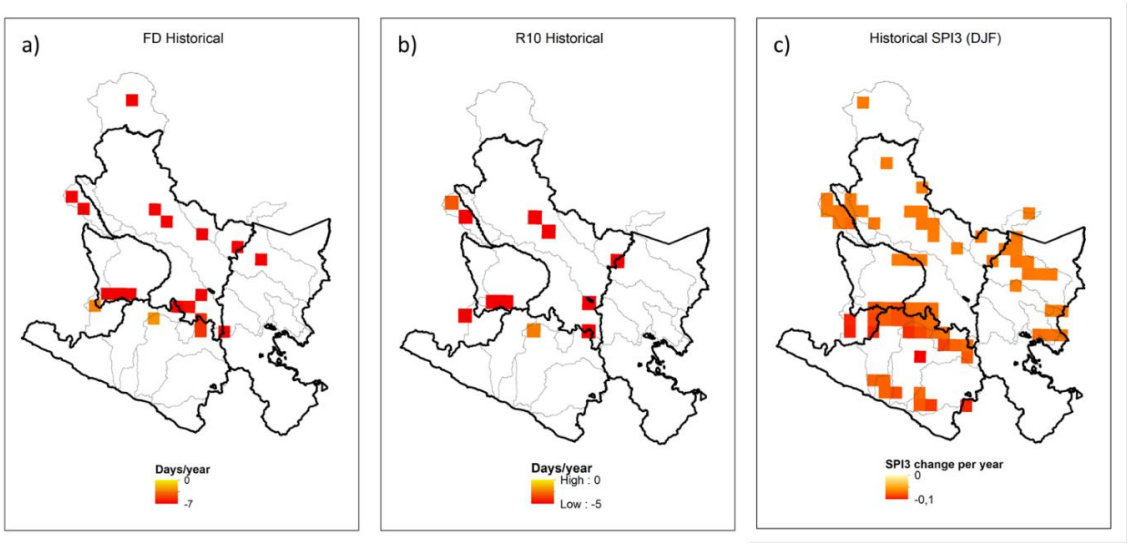
In accordance with total precipitation trends, the number of events with more than 10 mm rainfall show very few significant trends over the regions with very small intensity. In a recent study, authors were not able to attribute trends in R10 to trends in precipitation in the region (Imfeld, Sedlmeier, & Gubler, 2021). Variability in decadal trends explain well the variability of precipitation in the region and the challenges in detecting significant trends (Imfeld, Sedlmeier, & Gubler, 2021).

- Drought *risk*

SPI3 trends over the last decades lean towards more droughts in the SHAP region (a negative SPI indicate more severe droughts). Significant trends are visible in the A, SW and SE region. In recent decades, the Cusco, Puno and Arequipa regions (SHAP), were the most affected by major meteorological droughts, especially in 1983, 1987, 1990, 1992, 2005 and 2016. The El Niño phenomenon has long-distance impacts on the behaviour of the climate of the Altiplano and its surroundings, causing a decrease in rainfall during El Niño episodes. ENSO only partially explains a proportion of this decrease in the Andes, mainly in the central and southern western highlands (Lavado W. E., 2014). Therefore, it is important to consider that recent

studies of projections of ENSO events indicate that, with a warmer climate comes an increase in ENSO events, and therefore an increased risk of droughts (Cai, Ng, Wang, Santoso, & Yang, 2022).

Figure 31: Trends for several extreme weather indices for the period 1981-2020 a) Frost days (FD), b) extreme rainfall (R10) and c) summer drought SPI3



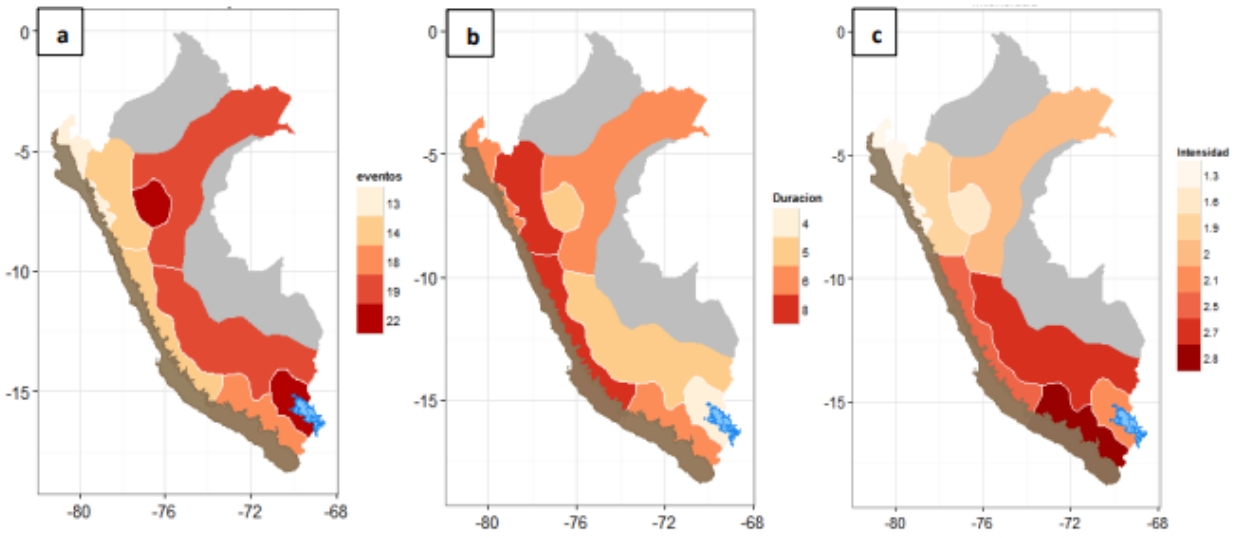
Moreover, in a 2015 SENAMHI study, it was found that the greatest numbers of dry events between 1970 and 2014 are located in the SHAP region. In the Altiplano region (A subregion), these events have a shorter length. The SW subregion, roughly corresponding to Arequipa's high areas, experiences drought with the maximum intensity. Between Cusco and Apurimac (SE subregion), dry events show greater intensity and number of events at the same time (SENAMHI, 2015).

The same SENAMHI study calculated short-term droughts using the SPI3 index for the 1970-2014 period (defined as lasting three months) (**Error! Reference source not found.**32). The A subregion experiences significantly less precipitation (negative SPI) during the winter season, followed by spring. Similarly, the areas corresponding to the SE and SW subregion experience a very dry climate in the winter season (SENAMHI, 2015).

5.5 Future climate projections

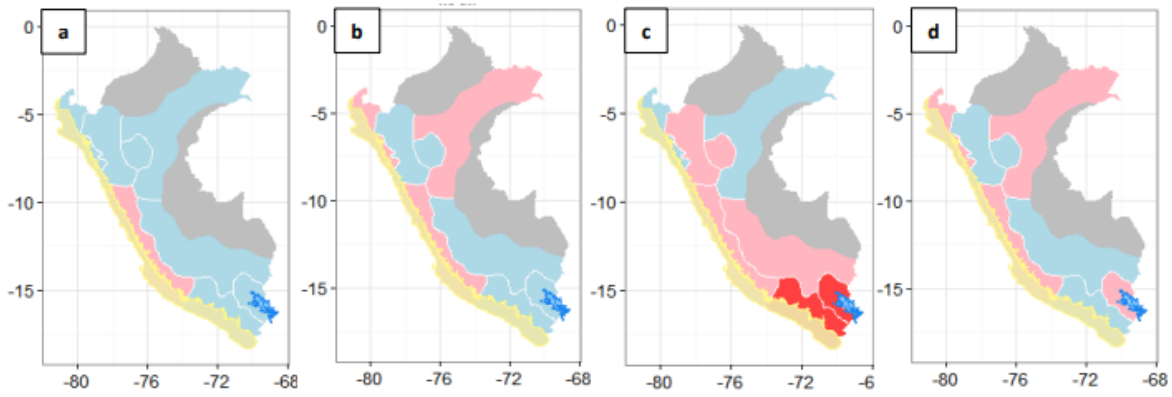
Projections for RCP 4.5 and 8.5 scenarios for 2050 are derived from the internal GIZ modelling exercise for all climate change indicators using a 1981-2005 reference period (see Section 4). Additional data from the Climate Information Platform has been used for province-level projections for temperature and precipitation, which uses the CORDEX South America ensemble (Climate Information Platform, 2023). Any other additional information coming from secondary sources has been cited accordingly.

Figure 32: Droughts in Peru showing a) the number of events b) length and c) their intensity between 1970-2014.



(SENAMHI, 2015)

Figure 33: Seasonal trends of droughts in a) summer b) autumn c) winter and d) spring from 1970 to 2014. Blue means positive SPI (wet climate) and red regions represent a negative SPI, to indicate a drier climate

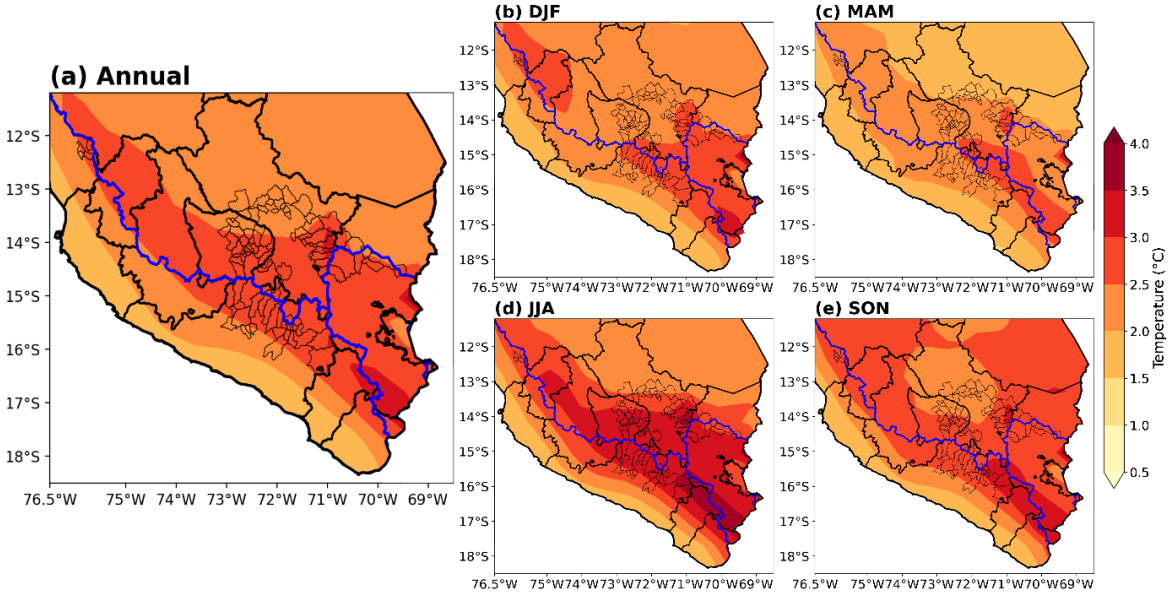


(SENAMHI, 2015)

5.5.1 Temperature

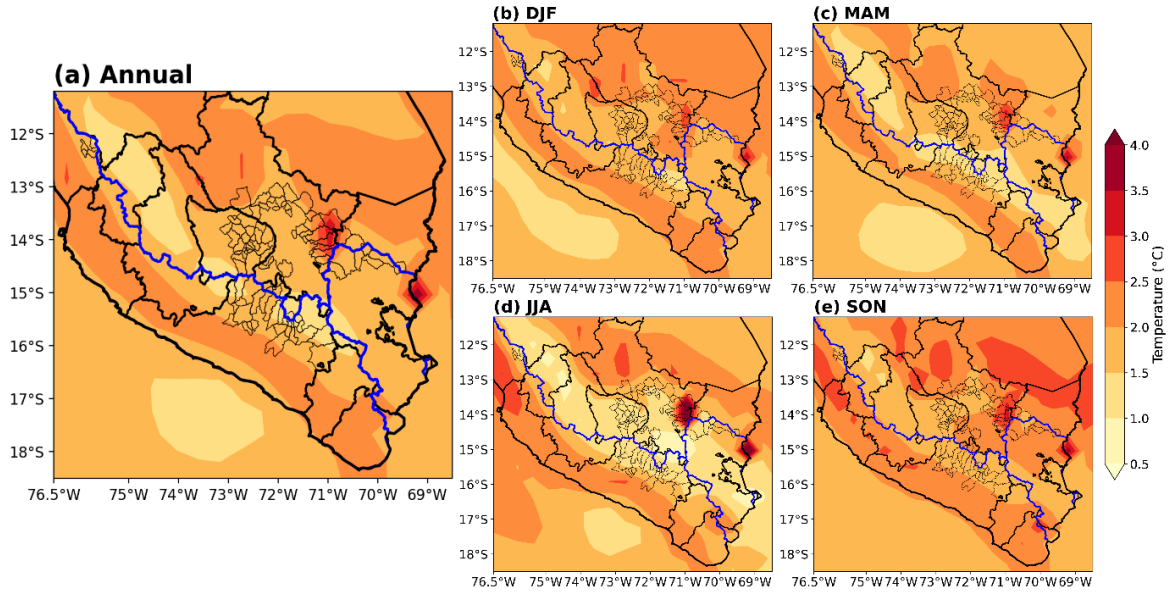
Under an RCP 4.5 emission scenario, the projected annual mean increases of maximum temperatures range from 2.1 to 3.2 °C by 2050, using a 1981-2005 baseline period. Areas that show higher increases in most seasons are located at the border of SE and A and in the border of SW and SE (high altitudes). Seasonally, winter shows the greatest changes, ranging from 2.4 to 3.8°C, while autumn is the season when the smallest changes occur. These changes show consistency with previous studies; for example, Peru's National Meteorology and Hydrology Service's (SENAMHI in Spanish) previous study of changes in the Urubamba River basin (SENAMHI, 2009). According to this technical report, the greatest changes in maximum temperatures are projected for between winter and spring.

Figure 34: Projected changes in maximum temperature towards 2050 under the RCP4.5 scenario for the annual mean (a), summer or DJF (b), autumn or MAM (c), winter or JJA (d) and spring or SON (e). Sub regions are shown divided by blue lines. Higher increases take place in winter. Areas that show higher increases in all seasons are the border of SE and A and the border of SW and SE in autumn (high altitudes).



Changes in minimum temperatures range from 1.3 to 3.4°C increases by 2050 under the RCP 4.5 using the same baseline as maximum temperature (1981-2005). Seasonally, the largest changes occur in spring in most districts except for some located in the SE subregion, where six districts show an increase of more than 4°C during the winter (Figure 34, (d)).

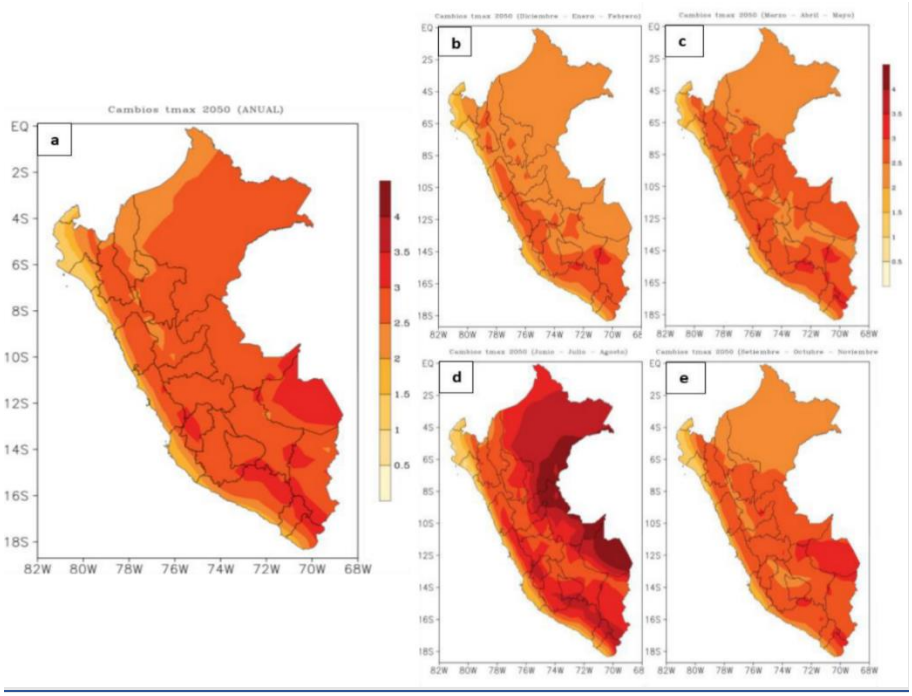
Figure 35: Projected changes in minimum temperature towards 2050 under the RCP4.5 scenario for the annual mean (a), summer (b), autumn (c), winter (d) and spring (e). Sub regions are also shown and divided by blue lines. The area that shows the highest increases in all seasons is the border of SE and A (higher altitudes)



Under an RCP 8.5 emission scenario, changes in annual maximum temperatures range from 2.5-3.5 °C across the SHAP regional using a 1981-2005 baseline. Seasonally, the greatest increases of maximum temperatures occur during the winter, between 2.5 to 4°C. In all seasons, the region with the greatest changes is the northwest of SW between SE and A. Both areas are headwaters of basins where also glaciers exist.

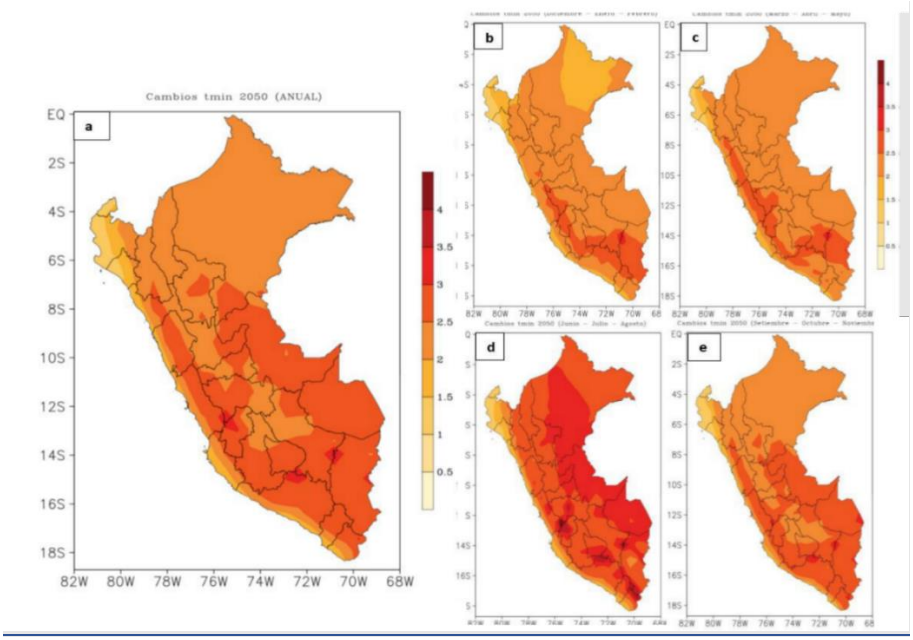
Figure 36: Projected changes in maximum temperature (°C) towards 2050 under the RCP8.5 scenario for the annual mean (a), summer or DJF (b), autumn or MAM (c), winter or JJA (d) and spring or SON

(e). Winter is when bigger changes take place. Similar to RCP4.5, areas that show higher increases in all season are the border of SE and A and the border of SW and SE



Under RCP 8.5, increases in minimum annual temperatures will range from 2.5 to 3.5°C by 2050 using a 1981-2005 baseline. However, for most of the districts in SHAP, these increases are lesser than maximum temperatures. The largest changes in minimum annual temperatures happen in the winter, followed by the spring season. In winter, the increases range from 2-4°C. The two geographical areas that will be impacted the most are in the northwest SW subregion and between SE and A, similar to the increases observed for annual maximum temperatures.

Figure 37: Projected changes minimum temperature (°C) towards 2050 under the RCP8.5 scenario for the annual mean (a), summer (b), autumn (c), winter (d) and spring (e). Winter is when bigger changes take place. Similar to maximum temperature, changes are bigger in two specific zones placed over high altitudes, which are the northwest of the SW region and between the SE and A region.



These positive trends are also consistent with data from the Climate Information Platform, which uses the CORDEX South America ensemble medians for annual temperature 2041-2070, using a 1981-2010 baseline under RCP 4.5 and 8.5 emission scenarios (Climate Information Platform, 2023). It shows that under RCP 4.5, annual mean temperatures will rise between 1.7°C and 2.7°C in the 24 provinces where the project will intervene by 2070. Under RCP 8.5, annual mean temperatures will increase by 2.7°C and 3.9°C (Climate Information Platform, 2023).

Table 9: Annual mean temperature (°C) changes under different emission scenarios for the 24 project intervention provinces, for 2041-2070 (1981-2010 baseline), where the project will be implemented. The WMO-GCF database uses the CORDEX South America Ensemble (Climate Information Platform, 2023):

Region	Province	Annual mean temperature increases under RCP 4.5 (ensemble median) °C	Annual mean temperature increases under RCP 8.5 (ensemble median) °C
Apurimac	Antabamba	2.6	3.9
Apurimac	Cotabambas	1.8	2.8
Apurimac	Grau	2.6	3.9
Apurimac	Abancay	2.3	3.6
Arequipa	Caylloma	2.3	3.3
Arequipa	Condesuyos	2.2	3.4
Arequipa	Castilla	2.2	3.3
Arequipa	La Union	2.7	3.9
Arequipa	Arequipa	2.1	2.9
Cusco	Chumbivilcas	2.0	3.0
Cusco	Canchis	2.2	3.7
Cusco	Quispicanchi	2.1	3.6
Cusco	Anta	1.7	2.7
Cusco	Calca	1.9	2.9
Cusco	Paucartambo	1.9	2.9

Region	Province	Annual mean temperature increases under RCP 4.5 (ensemble median) °C	Annual mean temperature increases under RCP 8.5 (ensemble median) °C
Cusco	La convencion	2.2	3.6
Cusco	Urubamba	1.7	2.7
Cusco	Acomayo	2.1	3.3
Cusco	Canas	2.2	3.3
Lima	Yauyos	2.3	3.4
Puno	Melgar	2.4	3.4
Puno	Sandia	2.2	3.3
Puno	Azangaro	2.2	3.4
Puno	Carabaya	2.2	3.2

(Climate Information Platform, 2023)

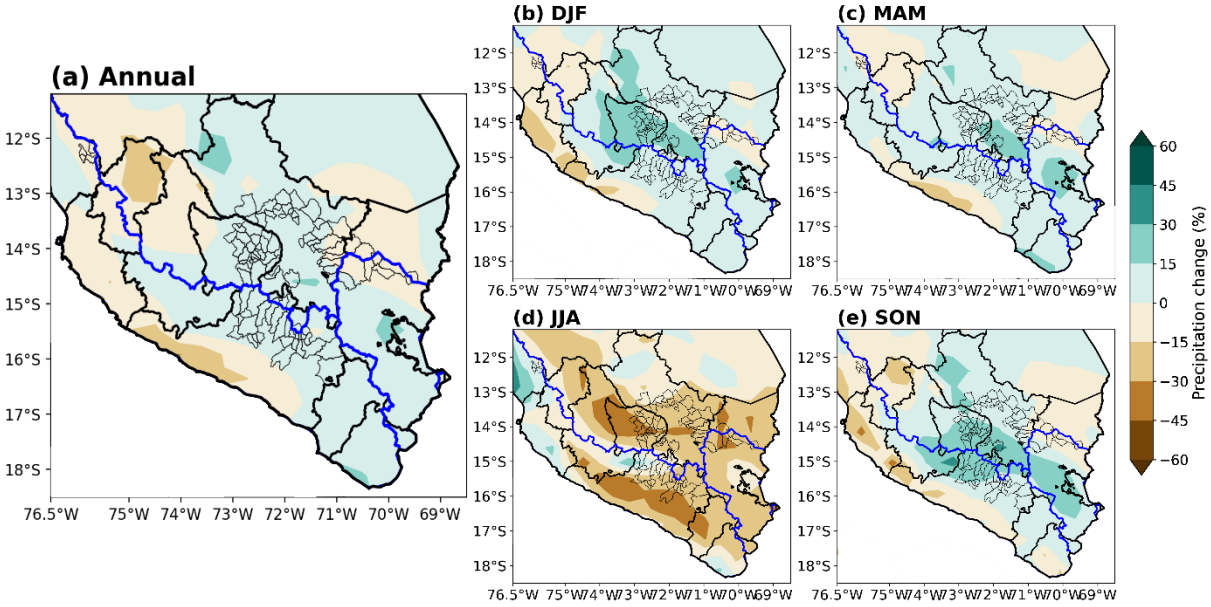
Data from SENAMHI (using a multi-model regional ensemble combining CIMP5, Had-GEM2-ES and MPI-ESM-LR and adjusted for higher resolution) shows a similar maximum, minimum and average temperature trend increase (Llacza, et al., 2021). It identifies two temperature hotspots at the south of the Cusco region and the north-east of Arequipa, where maximum annual temperatures under a high emission scenario (RCP 8.5) will increase up to +3.2°C by 2050 (in comparison to 1981-2005 historic data). The highest increases are observed during the winter, especially in the Arequipa and Puno regions (Llacza, et al., 2021).

Meanwhile, minimum temperatures for the four project regions (Puno, Arequipa, Apurimac, and Cusco) are expected to increase between 2.8°C and 3.2°C by 2050 under RCP 8.5, using the same multi-model ensemble and baseline data (Llacza, et al., 2021).

5.5.2 Precipitation

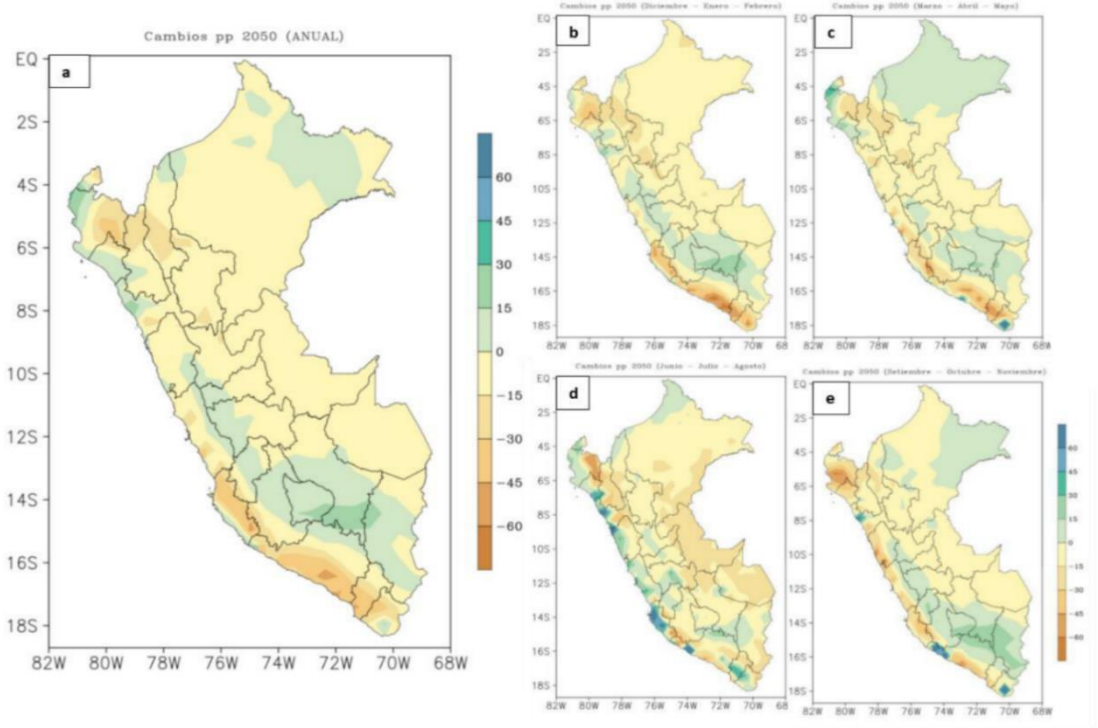
Under an RCP 4.5 scenario, the annual precipitation changes in this scenario range from -7.4 to +15.5% by 2050, using a 1981-2005 reference period. Most districts expect positive changes (increases); however, the few districts that show negative changes (decreases) are located in the A subregion, at higher altitudes. Seasonally, the greatest changes in precipitation in all districts is winter, which exhibits negative changes with high values (between -30 to -20%). The greatest positive changes occur in spring in most districts. In summer and autumn, there is a positive change in most districts. Spatially, areas that show higher increases in most seasons are located at the west of SE, while areas with decreases or smaller increases are located in the A subregion.

Figure 38: Projected changes in precipitation towards 2050 under the RCP4.5 emission scenario for the total annual (a), summer (b), autumn (c), winter (d) and spring (e). Subregions are also shown divided by blue lines. Higher decreases take place in winter. In general, areas that show higher increases in all seasons are located at the west of SE. On the contrary, areas with decreases or smaller increases are located in the A subregion.



Under an RCP 8.5 scenario, the annual precipitation changes range from -30 to +30% by 2050 (Figure 39) The season that shows the greatest changes in most districts is winter, which shows strong negative changes (between -60 to 0%). On the other hand, the greatest positive changes are observed in spring, ranging from 0 to 30% in the entire SHAP. The districts located in the SE and A subregions are the ones that show slightly greater increases, but those that are located in SW show decreases or smaller increases.

Figure 39: Projected changes in precipitation (%) towards 2050 under the RCP8.5 scenario for the annual mean (a), summer or DJF (b), autumn or MAM (c), winter or JJA (d) and spring or SON (e). Annual changes are positive. The SE and A regions show mostly positive changes; however, the SW region show mostly negative changes. The biggest negative changes happen in winter, while spring is the season when the biggest positive changes.



These trends are in line with WMO-GCF analysis. The CORDEX South America ensemble medians for annual temperature 2041-2070, using a 1981-2010 baseline under RCP 4.5 and

8.5 emission scenarios, shows great variation across the 24 provinces of the project site. In some areas, such as the Yauyos province in Lima, annual precipitation is expected to decrease by 26% and 33% under RCP 4.5 and RCP 8.5 respectively by 2070 (Climate Information Platform, 2023).

Table 10: Annual mean precipitation changes (%) under different emission scenarios for the 24 provinces for 2041-2070, where the project will be implemented. The WMO-GCF database uses the CORDEX South America Ensemble.

Region	Province	Annual mean precipitation changes under RCP 4.5 (ensemble median) (%)	Annual mean precipitation changes under RCP 8.5 (ensemble median) (%)
Apurimac	Antabamba	11%	12%
Apurimac	Cotabambas	8.70%	20%
Apurimac	Grau	17%	25%
Apurimac	Abancay	13%	26%
Arequipa	Caylloma	-6.10%	-6.30%
Arequipa	Condesuyos	1.20%	7.10%
Arequipa	Castilla	-6.10%	-6.30%
Arequipa	La Union	1.20%	7.10%
Arequipa	Arequipa	-13%	16
Cusco	Chumbivilcas	17%	25%
Cusco	Canchis	-11%	-11%
Cusco	Quispicanchi	9.80%	9.90%
Cusco	Anta	12%	28%
Cusco	Calca	8.20%	17%
Cusco	Paucartambo	8.20%	17%
Cusco	La convencion	24%	46%
Cusco	Urubamba	12%	28%
Cusco	Acomayo	9.80%	9.90%
Cusco	Canas	1.40%	-2.10%
Lima	Yauyos	-26%	-33%
Puno	Melgar	-11%	-12%
Puno	Sandia	11%	15%
Puno	Azangaro	-1.40%	-0.98%
Puno	Carabaya	-11%	-11%

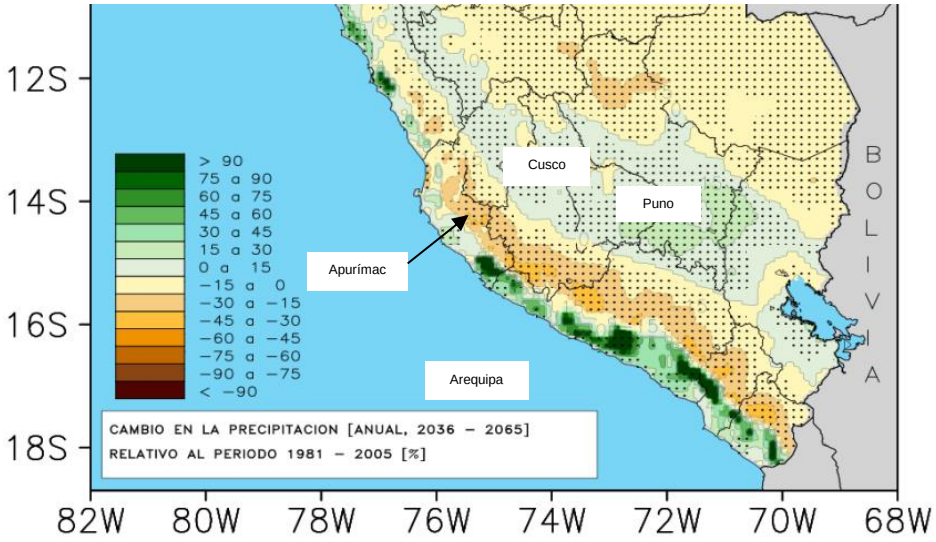
(Climate Information Platform, 2023)

As it can be observed from Table 10: Annual mean precipitation changes (%) under different emission scenarios for the 24 provinces for 2041-2070, where the project will be implemented. The WMO-GCF database uses the CORDEX South America Ensemble., precipitation trends vary greatly even within regions. The province of La Convención in Cusco is predicted to experiences the greatest increases in rainfall (24% under RCP 4.5 and 46% under RCP 8.5 by 2040-2071). Meanwhile, Yauyos province in Lima will experience the greatest decrease in precipitation.

This data is in line with SENAMHI data, that uses a multi-model regional ensemble combining CIMP5, Had-GEM2-ES and MPI-ESM-LR and adjusted for higher resolution. It shows that by 2050 under RCP 8.5, there will be great average annual precipitation decreases and increases

within regions (e.g. Arequipa) (Llacza, et al., 2021). This can be observed in **Error! Reference source not found.**.

Figure 40: Changes in annual precipitation by 2050 (1981-2005 baseline) under RCP 8.5. Regions of Apurimac, Cusco, Puno, and Arequipa have been labelled.



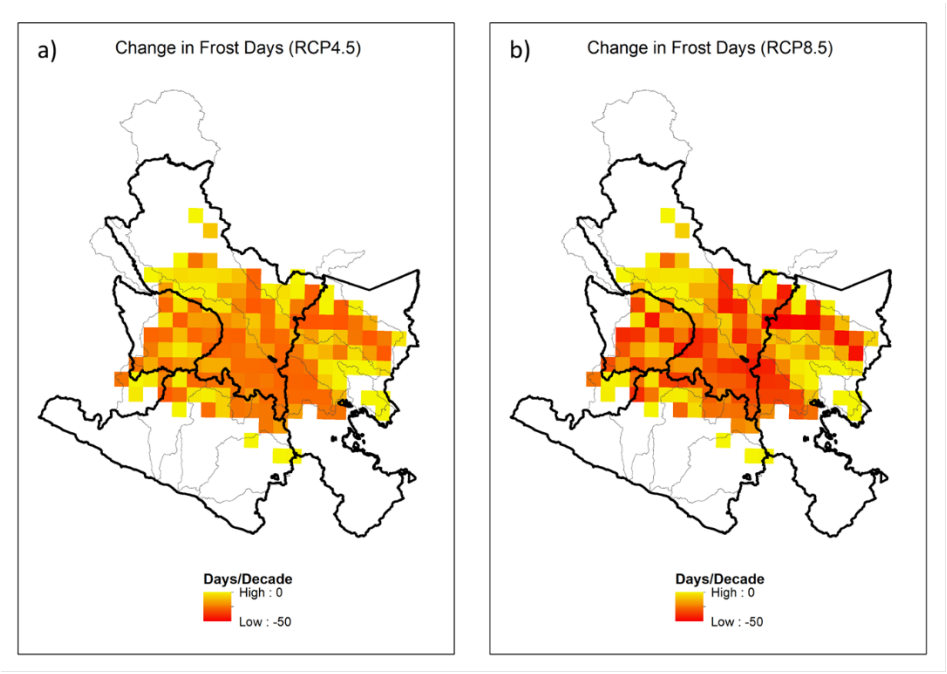
(Llacza, et al., 2021)

5.5.3 Extreme weather events

Frost Days

Figure 41 shows the changes for frost days (days/decade with temperatures below zero) in the intervention area for RCP 4.5 and RCP 8.5 scenarios by 2050. The number of frost days is expected to experience the largest decrease in SW and A sub-regions. A reduction in frost days is potentially threatening to the production of certain crops, such as Chuño (freeze-dried potatoes), that are produced in higher altitudes (Schoolmeester, et al., Outlook on Climate Change Adaptation in the Tropical Andes Mountains. Mountain Adaptation Outlook Series., 2016).

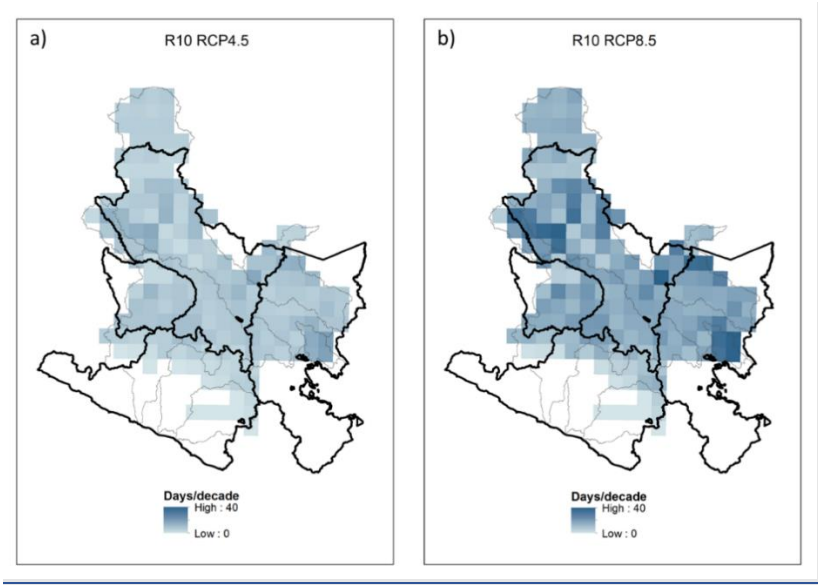
Figure 4142:Change in Frost days (2050) compared to the baseline period for a) RCP4.5 and b) RCP8.5



Heavy rainfall events

Generally, for both RCP 4.5 and RCP 8.5 emission scenarios, an increase in the southern and northern part of the study area is expected by 2050 of days with precipitation events over 10mm. A decrease is expected in the SW sub-region. Combined with the existing aridity of the region, it could lead to increase flash flood events and erosion.

Figure 43: Heavy precipitation days (days with precipitation events over 10mm) under RCP 4.5 and RCP 8.5 by 2050 (1981-2005 baseline)



Drought Risk

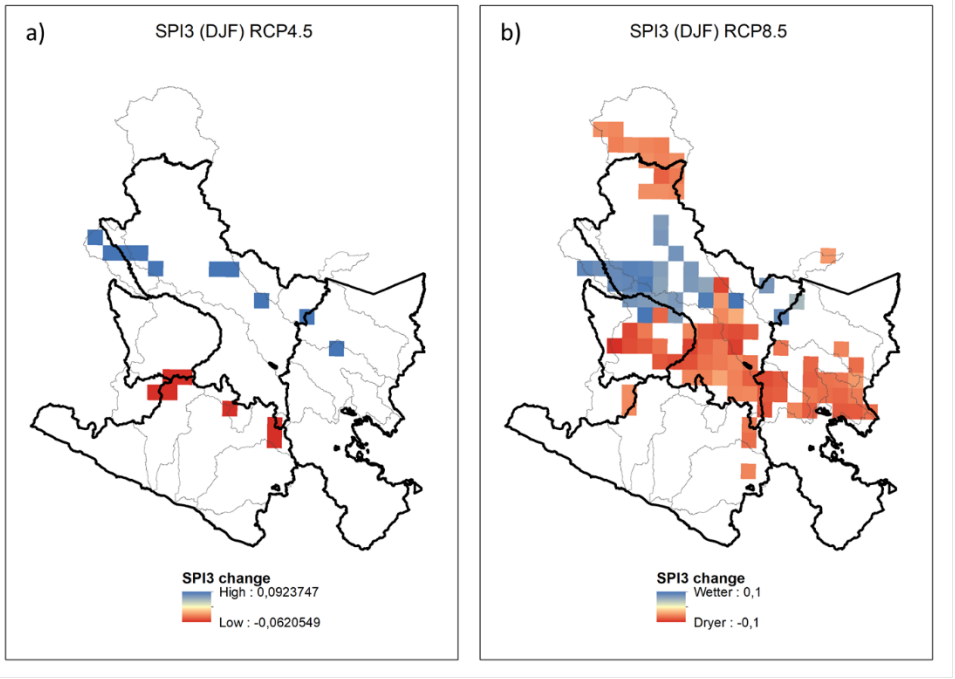
The figure below shows changes in SPI3 index (number of days per year with SPI below -1.5 for the growing season, as a proxy for drought risk) for RCP 4.5 and RCP 8.5 in 2050 compared to the baseline period (1981-2005). A red hue indicates changes towards a dryer climate whereas a blue hue indicates a change towards a wetter climate. Although few changes are found for RCP4.5, results are consistent with other indices explored in this section. Changes under the RCP8.5 scenario are stronger in magnitude and show an increase in droughts in the

altiplano, whereas lower altitude will experience a wetter climate. A drier climate towards the coast and in the southern part of the intervention area likely for the coming decades. Nevertheless, the index does not inform on the length of the drought period but is best at describing drought during the growing season (December, January and February months).

These results are in line with other research in the area (e.g (Zubieta, Molina-Carpio, Laqui, Sulca, & Ilbay, 2021). They found out that under the RCP 8.5 scenario, evapotranspiration will also (apart from temperatures) increase towards 2050. The frequency of droughts lasting between one to two months is expected and would develop between the dry season and the rainy season onset (in the transition between the wet to the dry season).

Similarly, other studies have considered changes in future meteorological droughts using the Standardised Precipitation Evapotranspiration Index (SPEI) which considers potential evapotranspiration, as well as precipitation (Potter, et al., 2022). They estimate that despite projected precipitation increases, temperature increases leading to an increase in evaporation may be large enough to increase droughts in the future, with the total number of drought months projected to almost double by 2100 under the RCP 8.5 scenario (Potter, et al., 2022) .

Figure 44: Change in SPI3 (by 2050) compared to the baseline period (1981-2005) for a) RCP 4.5 and b) RCP8.5



5.6 Hydrological balance

Please refer for more information to Annex 2g – Hydrological Study.

A hydrological analysis of Puna, a ecoregion in Peru above 3,500 masl, was conducted as parrt of this feasibility study. The domain of interest of this hydrological study consists primarily of grasslands, wetlands (locally known as bofedales), peatlands (turberas in Spanish), and some reed beds. Some relicts of high Andean forests also persist.

The hydrological analysis of the Puna ecosystems (peatlands, wetlands, and grasslands) and services they provide (provision and regulation of water; provision of fodder, food, and fiber; nutrient and carbon regulation) in the Southern High Andes of Peru (SHAP) aims to specifically cover five regions: Lima, Puno, Cusco, Arequipa and Apurimac.

This study was conducted in order to address the following points:

- Describe the status of the hydrological system;
- Describe how it will be affected by climate change;
- What would be the status of the system with the EBA measures promoted by the project?

In summary, different indexes (normalized water index, reclassified climate change index and the Combined Current Status and Climate Change Index The Reclassified Climate Change Indexes - CI and RCI) were analysed and provide information on the current and future status of water resources availability as repect to the water resources demand of the districts. This can be interpreted as hazards metrics. The detailed methodology and results are presented in Annex 2g.

5.7 Climate Change Impacts Risks and Vulnerabilities

5.7.1 Overall impacts of climate change on ecosystem services

Decreasing water availability (due to variable precipitation rates, higher temperatures, glacier retreat and droughts) will have an impact on the ecosystem services that the High Andean landscapes provide. There are four categories of services that ecosystems provide (FAO, Ecosystem Services & Biodiversity, 2023):

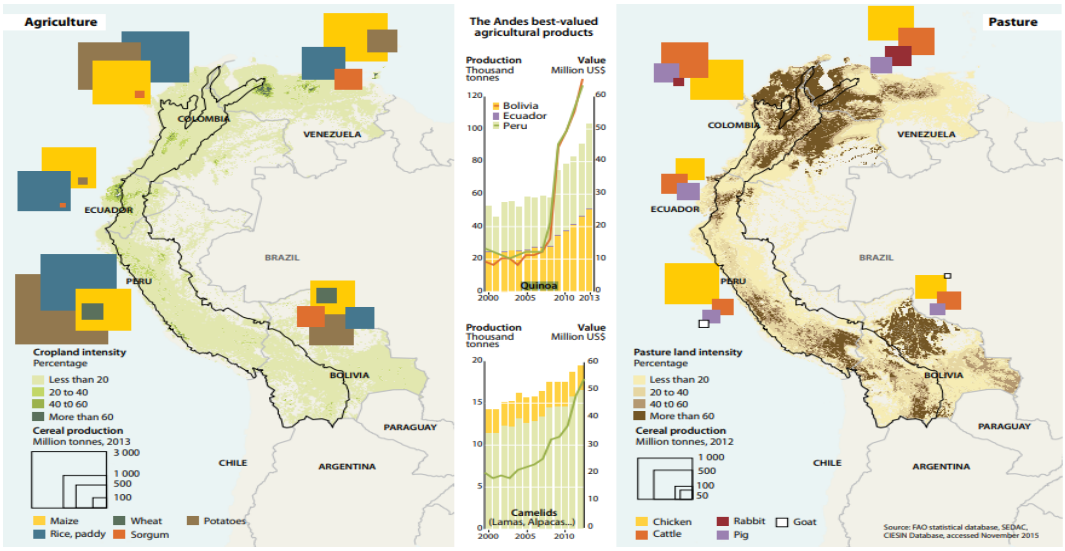
- **Provisioning services:** the material benefits such as food, fibers, wood and fuel. Sections 3.7.2., 3.7.3 and 3.7.5 show how livestock and agricultural activities will be impacted by climate change hazards, and the impacts on smallholder farmers and farmers' associations.
- **Regulating services**: the benefits obtained from the regulation of ecosystem processes. Services such as soil fertility, protection against extreme weather events (such those provided by *bofedales* during droughts) will be negatively affected as landscapes in the SHAP are degraded by climate change and human pressures.
- **Supporting services:** the provision of processes that enable the production of other ecosystem services. For example, provision of habitats for species. As detailed in section 3.7.4., fauna and flora species are being displaced by changing temperatures and water availabilities, having knock-on impacts on agriculture and livestock production.
- **Cultural services:** the non-material benefits people gain from ecosystems, for e.g. cultural identity and spiritual well-being. Section 3.7.6 details how the SHAP ecosystems have affected communities' cultural identity (through the migration of younger people to urban centers for e.g.) and their livelihoods.

In the sections below, the impacts of climate change on different aspects of agricultural production and livelihoods in the SHAP region are detailed.

5.7.2 Impacts of climate change on agriculture and livestock production

In the SHAP region, potatoes and maize are the main crops, and cropland intensity is below 20%. The highest-valuated agricultural product is quinoa. Pastureland intensity for livestock in the SHAP is more than 60%, mostly used for cattle, chicken, pig and goat raising. The best-valued livestock product are camelids such as lamas and alpacas (Schoolmeester, et al., 2016). One of the greatest climate change hazards that will impact the agricultural sector is droughts. 66% of agricultural activity in Peru is rainfed and is mainly located in the mountains. Moreover, despite a higher volume in rainfall than in other parts of the country, there is a deficit of water storage and irrigation infrastructure. The uneven topography means that potentially expanding to different areas for cultivation is a limited option (Ludeña, Sánchez-Aragón, de Miguel, Martínez, & Pereira, 2014)

Figure 45: Summary of Peru's agricultural activities as of 2016, including crop and pastoral farming.



(Schoolmeester, et al., 2016)

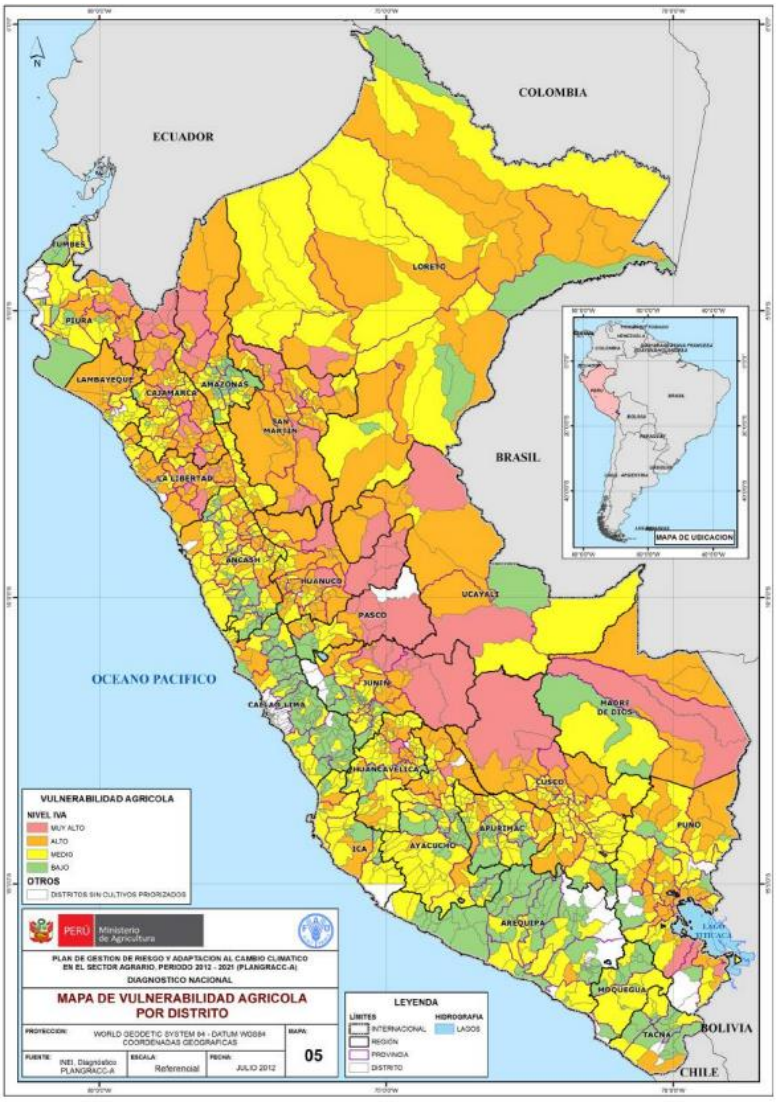
More generally, across the SHAP, vulnerability was ranked as *medium* and *high,* and *very high* in a vulnerability analysis conducted by Peru's Ministry of Agricultural Development and Irrigation to inform its sectoral Climate Risks and Adaptation Strategy for 2012-2021 (MIDAGRI, 2012). It evaluated the agricultural vulnerability for each district in the country for the 2003-2010 period. Twelve main crops were identified: potato, rice, hard yellow corn, cassava, coffee, cocoa, wheat, banana, starchy corn, barley grain, broad bean, and bean grain, as well as three grasses/forages: alfalfa, forage oats and brachiaria. To estimate vulnerability, socioeconomic and agricultural indices were used (MIDAGRI, 2012):

- Social vulnerability indices: human development indices, food insecurity
- Yield/ production indices: non-irrigated land, technology (technical assistance, agricultural equipment)
- Economic dimension: investment indices in agricultural activity based on the 12 analysed crops and technology-related indices.

Furthermore, Sanabria & Lhomme (2013) examined the potential implications of the 2030 climate change scenarios for potato, corns, wheat, barley and broad bean crops in Cusco and Apurímac (corresponding to the SE subregion). The results showed that under an increase of 1 °C, and a moderate increase in precipitation, there would be earlier harvest periods, shorter growing seasons and in some cases a higher risk of sowing failure by 2030.

Similarly, an evaluation by SENAMHI found that increases in maximum temperature (2°C to 3°C), minimum temperature (4°C to 6°C), and higher rainfall (10% to 20%) by 2050 would lead to negative impacts in agricultural activity in the SHAP region. Potato crops in Apurimac and Cusco (SE subregion) would decrease. In Arequipa (SW subregion), onion yield will present larger physiological imbalances. The wheat crop yield projections will significantly decrease in this region. As previously described, precipitation and temperature changes will also impact species distribution, meaning that pests and diseases will affect potato and onion crops (SENAMHI, 2015).

Figure 46: Map displaying agricultural vulnerability in the country, district by district.



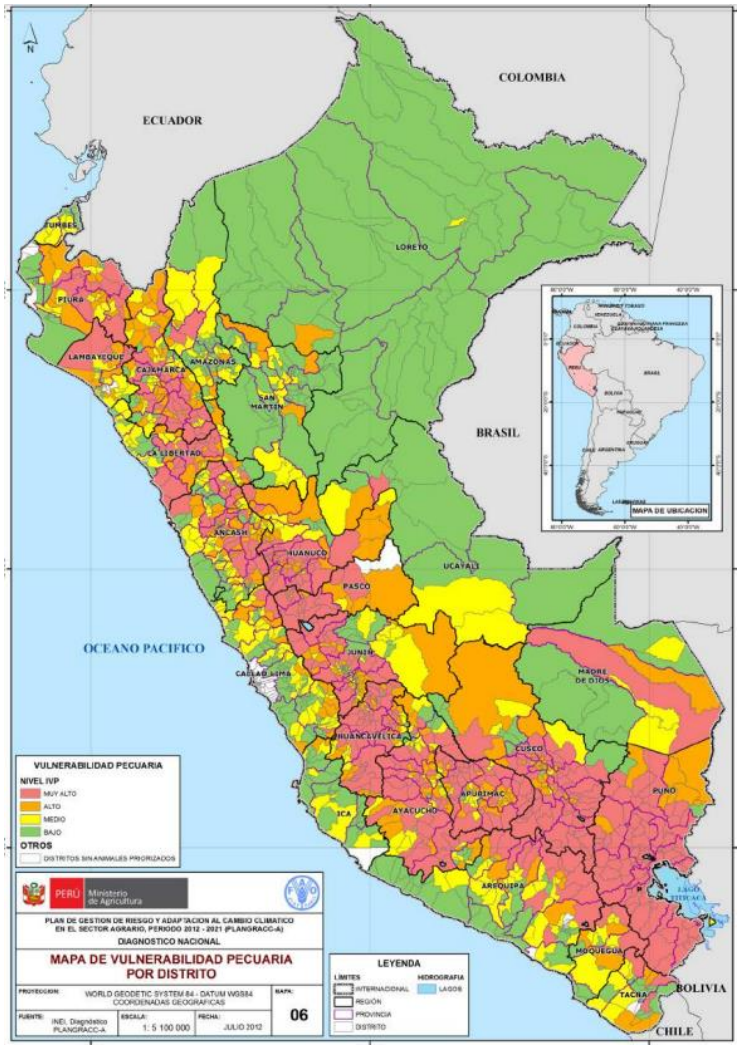
(MIDAGRI, 2012)

Livestock production

The Ministry of Agricultural Development and Irrigation's 2012 assessment of livestock vulnerability was conducted in the same way as for crop farming, meaning that it was calculated by district taking into account socioeconomic and productivity indices for the 2003-2010 period. It considered camelids, sheep, and cattle. The SHAP area is qualified as "*very high"* in terms of vulnerability (MIDAGRI, 2012).

Most cattle, sheep and camelids in Peru are located between 2200 and 4500m above sea level and are raised by rural communities who use grasslands for feeding their livestock (Ludeña, Sánchez-Aragón, de Miguel, Martínez, & Pereira, 2014). As previously discussed, Flores (2016) projected a significant reduction in the extension of grasslands in the SHAP region. This means that livestock is highly vulnerable to climate change, as appropriate forage is crucial. The impact of forage reduction is also coupled with drought risk and the calculated reduction of surface area in wetlands, and glacier retreat which livestock depend on (Flores, 2016).

Figure 47: Livestock vulnerability for each district between 2003-2010. As observed in the SHAP, most districts fall under "very high" vulnerability.



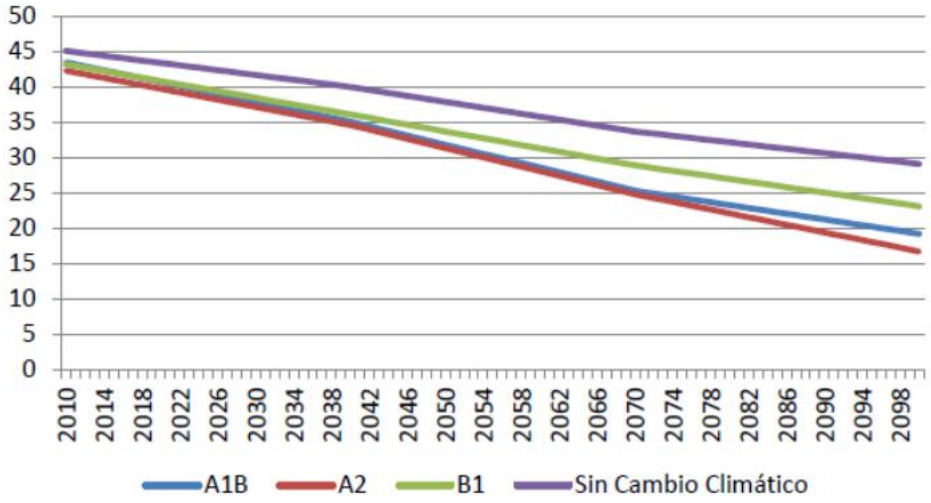
(MIDAGRI, 2012)

To analyse the impact of climate change on high Andean livestock, Ludeña et al. (2014) transformed livestock species (sheep, cattle, camelids, equines and goats) into equivalent “sheep units” (owing to their adaptability to the Andean environment, and for methodological convenience) to determine the variation in meat production. Results for the three climate change scenarios suggest a progressive reduction in the carrying capacity of ecosystems and a decrease in the available area of grazing land. As shown in

Figure 48, the greatest impact would be for scenario A2 (similar to RCP 8.5), where sheep units would go from 45 million in 2010 to 19 million by the end of the century. The A1B scenario would follow, with reductions ranging from 45 million to 21 million for the same period. Finally, B1 (similar to RCP 4.5) scenario shows the least impacts.

This reduction in the carrying capacity of ecosystems in the high Andes translates into economic losses for communities in the SHAP region. The value of the loss of livestock due to climate hazards was estimated in the context of the Ministry of Agricultural Development and Irrigation’s Climate Risks and Adaptation Strategy. The losses in the Puno region alone constitute over 60% of the national total in terms of monetary loss (MIDAGRI, 2012).

Figure 48:Impact of climate change on livestock under different emission scenarios towards 2100. The y axis represents millions of "sheep units".



(Ludeña, Sánchez-Aragón, de Miguel, Martínez, & Pereira, 2014)

Table 11: Value (in Peruvian Soles) of loss of livestock due to climate hazards by regions in the SHAP area, between 2003-2010.

Province	Cattle value (Peruvian Soles)	Sheep value (Peruvian Soles)	Camelids value (Peruvian Soles)
Puno	17,011,750	9,827,600	39,408,720
Apurímac	2, 918.300	1,393,950	5,179,200
Cusco	557,900	3,096,400	3,927,480
Arequipa	1,668,100	1,345,000	3,303,360

(MIDAGRI, 2012)

The same economic study found that under the A2 scenario (high emission scenario), the economic impact on livestock in the whole of the Andean region (i.e. not just the project intervention area) is projected to be up to 9 billion Peruvian *soles* in accumulated losses at a discount rate of 0.5% by 2100. This would translate into a 90% loss of Peru's livestock contribution to the national GDP using 2011 as a reference point (Ludeña, Sánchez-Aragón, de Miguel, Martínez, & Pereira, 2014). Farming *of guinea pigs is also commonplace in the Andes, as it is a species with high cultural significance in the region. In Andean rural communities, the farming of guinea pig for their meat is usually self-consumption and falls under the responsibility of women and children. Families will also sell the excess production However, since the 1980s, commercial breeding of "improved" guinea pig (generally weighing 500g and over) has taken place in Peru* (Avilés, Martínez, Landi, & Delgado, 2014)*. Due to their quick development, protein-rich meat and high climate adaptability they are considered an important source of meat in the Andes, where qualitative data shows that many smallholders have shifted from crop cultivation to guinea pig farming* (Heikkinen, 2021) (Morales, Checa, Diéguez-Santana, & Cossío, 2017).

5.7.3 Climate Change impacts on relevant value chains

Climate change is posing severe challenges to the livelihoods of subsistence farmers in the Andes highlands, specifically impacting the agricultural and livestock value chains. With

drought, delayed rainfall, and temperature fluctuations, crop yields are diminishing, compromising the farmers' ability to produce enough food for sustenance. The scarcity of water and limited grazing areas are further reducing livestock productivity. Extreme temperatures and frost events disrupt the reproductive cycles of both plants and animals, further exacerbating the vulnerability of subsistence farmers who heavily rely on these resources. Consequently, the adverse effects of climate change on agriculture and livestock threaten the overall well-being and resilience of subsistence farming communities in the highlands and prevent farmers from capturing a larger portion of the value chain.[10]

Quinoa

Table 12: Climate change impacts on quinoa value chain

VALUE CHAIN PHASE / CLIMATE DRIVER	INPUT	HARVEST	LOCAL PROCESSING	LOCAL SALES AND TRADING	LOCAL TRANSFORM. PROCESSES	DOMESTIC MARKET	EXPORT	INT'L MARKET
Temperature extremes	↓ crop growth ↓ production quantity	↑ heat stress for workers ↓ crop yield	↑ heat stress for workers ↓ efficiency of mechanical/automated processes	↑ heat stress for workers ↑ commodity scarcity, increased prices	↑ heat stress for workers ↓ efficiency of mechanical/automated processes ↓ production quality	Minor impacts		
Extreme rainfall	↓ soil fertility ↓ production quantity	↓ crop yield from logistical difficulties	Minor impacts	↓ trade due to logistical difficulties	Minor impacts	↓ trade due to logistical difficulties		Minor impacts
Drought	↓ crop growth ↓ production quantity	↓ crop yield	↓ production quality ↓ production quantity owing to water scarcity	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Frost	↓ crop growth ↓ production quantity	↓ crop yield	↓ production quality	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Glacial retreat	↓ crop growth ↓ production quantity	↓ crop yield	↓ production quality	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices

Legend: ↑ increase ↓ decrease Minor negative impacts Moderate negative impacts Major negative impacts

Source: Own elaboration based on scientific literature

In the Andean grain chain, drought is impacting crops due to delayed rainfall, while an increase in birds is invading organic quinoa crops. In Puno, individual ownership is prevalent with a majority of women members and leaders, but in Cusco, women have limited involvement. Quinoa is sensitive to climate change, with the flowering and milky grain stages being most affected by frost, hailstorms, and water deficits, impacting yield and quality. However, quinoa varieties offer potential for farmers in dry and salty climates, with adaptability to poor soils, drought tolerance, and contribution to food security. Temperature changes and extreme temperatures negatively affect quinoa production, causing reduced yields, pollen sterility, and impaired growth. Lack of rainfall and humidity also affect crop productivity.

[10] A comprehensive analysis of the project-related value chains as well as the climate impacts is available in the separate value chain analysis report.

Native potato

Table 13: Climate change impacts on native potato value chain

VALUE CHAIN PHASE / CLIMATE DRIVER	INPUT	HARVEST	LOCAL PROCESSING	LOCAL SALES AND TRADING	LOCAL TRANSFORM. PROCESSES	DOMESTIC MARKET	EXPORT	INT'L MARKET
Temperature extremes	↓ crop growth ↓ production quantity	↑ heat stress for workers ↓ crop yield	↑ heat stress for workers ↓ efficiency of mechanical/automated processes	↑ heat stress for workers ↑ commodity scarcity, increased prices	↑ heat stress for workers ↓ efficiency of mechanical/automated processes ↓ production quality	Minor impacts		
Extreme rainfall	↓ soil fertility ↓ production quantity	↓ crop yield from logistical difficulties	Minor impacts	↓ trade due to logistical difficulties	Minor impacts	↓ trade due to logistical difficulties		Minor impacts
Drought	↓ crop growth ↓ production quantity	↓ crop yield	↓ production quality ↓ production quantity owing to water scarcity	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Frost	↓ crop growth ↓ production quantity	↓ crop yield	↓ production quality	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Glacial retreat	↓ crop growth ↓ production quantity	↓ crop yield	↓ production quality	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Pests and diseases	↓ crop growth ↓ production quantity ↓ native varieties	↓ crop yield as epidemic diseases impact local communities	↓ production quantity as epidemic diseases impact local communities	↑ commodity scarcity, increased prices ↓ trade quantity as epidemic diseases impact local communities	↓ production quantity as epidemic diseases impact local communities ↓ production quality	↓ trade quantity as epidemic diseases impact local communities	Minor impacts	↑ commodity scarcity, increased prices

Legend: ↑ increase ↓ decrease Minor negative impacts Moderate negative impacts Major negative impacts

Source: Own elaboration based on scientific literature

The Altiplano, a high-altitude region in the High Andes Mountains of Peru, is highly vulnerable to climate variability caused by the ENSO phenomenon, drought, and radiative frosts. Agriculture, particularly potato cultivation, is the primary economic activity in the area, mainly for self-consumption, and climate change is affecting potato production in various ways. Water deficits pose a challenge as the potato plant's shallow roots struggle to overcome small retention stress. Farmers have been shifting their agricultural frontier upwards to maintain favorable temperatures, but this has unintended consequences like the conversion of native grasslands to cultivated areas. Changes in weather patterns increase pest and disease attacks, reducing potato varietal diversity and favoring commercial varieties. Droughts and frosts have significant impacts, causing substantial yield losses, while frost events can lead to the destruction of entire potato farms. Frost compensation programs have been implemented, but the losses far exceed the compensation provided.

Camelids (alpacas and vicuñas)

Extreme climatic events such as drought and frost have significant impacts on alpaca rearing in rural communities, resulting in economic losses for producers and affecting their livelihoods. Alpacas, which provide wool, meat, and income when sold, suffer from hunger and cold as they are not raised in stables. The mortality rate of alpacas due to extreme events is high, particularly in calves, adults, and miscarriages. Drought retards the growth of pastures, exacerbating the challenges faced in alpaca rearing. Snowfall and frost can cause substantial damage to natural pastures. Climate change, especially drought and frost, increases disease

and mortality among alpacas, affecting their offspring and the availability of food. The drop in temperature during the night can lead to pneumonia in alpacas. Efforts have been made to protect alpacas from low temperatures by constructing sheds in high Andean areas. Droughts have a detrimental impact on alpaca productivity and reproductive performance, resulting in a significant number of miscarriages and a reduction in livestock capital. Frost not only affects alpacas by causing diseases but also burns the sprouting grasses, reducing their availability.

Vicuñas are wild South American camelids adapted to high Andean zones and rely on natural grasses for food. However, the availability and quality of pastures are compromised by these extreme events. Vicuñas' activity patterns and movements are influenced by water availability, and they are also exposed to higher levels of radiation during the dry season. Droughts increase the risk of fires in the humid Puna ecosystem, which affects the vicuñas' habitat. Lack of resources for disease prevention in vicuñas can result in lower-quality fiber due to issues like mange and dandruff. Additionally, heavy frosts degrade the grasses that vicuñas depend on, reducing their food supply.

Table 14: Climate change impacts on camelid value chain

VALUE CHAIN PHASE / CLIMATE DRIVER	INPUT	HARVEST (meat/fiber)	LOCAL PROCESSING (washing, combing etc.)	LOCAL SALES AND TRADING	LOCAL TRANSFORM. PROCESSES (weaving, knitting etc.)	DOMESTIC MARKET	EXPORT	INT'L MARKET
Temperature extremes	↓ carrying capacity ↑ herd morbidity and mortality ↓ herd size	↓ meat/fiber yield ↓ fiber quality	↑ heat stress for workers ↓ efficiency of mechanical/automated processes	↑ commodity scarcity, increased prices	↑ heat stress for workers ↓ efficiency of mechanical/automated processes ↓ production quality	↑ commodity scarcity, increased prices	Minor impacts	
Extreme rainfall	↓ vegetation quality ↓ carrying capacity	↓ fiber quality	Minor impacts	↓ trade due to logistical difficulties	Minor impacts	↓ trade due to logistical difficulties		Minor impacts
Drought	↓ carrying capacity ↓ herd size	↓ meat/fiber yield	↓ production quality ↓ production quantity	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Frost	↑ herd mortality ↓ herd size	↓ meat/fiber yield ↓ fiber quality	↓ production quality ↓ production quantity	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Glacial retreat	↓ sources of drinking water ↓ herd size	↓ meat/fiber yield	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices
Pests and diseases	↑ herd morbidity and mortality ↓ herd size	↓ meat/fiber yield ↓ fiber quality	↓ production quantity as epidemic diseases impact local communities	↑ commodity scarcity, increased prices	↓ production quantity as epidemic diseases impact local communities	↑ commodity scarcity, increased prices	Minor impacts	↑ commodity scarcity, increased prices

Legend: ↑ increase ↓ decrease Minor negative impacts Moderate negative impacts Major negative impacts

Source: Own elaboration based on scientific literature

Community-based tourism

Climate change poses challenges to the tourism sector, which relies on healthy natural landscapes and is sensitive to the impacts of climate-related events such as road breaks, landslides, floods, forest fires, loss of biodiversity, and scenic beauty. The projected losses by 2100 are estimated to be significant. Changes in temperature, rainfall patterns, and the intensity of weather events affect both agricultural and tourism activities. Glacial retreat threatens the natural environment and cultural practices of indigenous communities, impacting sacred festivals and rituals. Droughts and frosts lead to crop losses, reducing product variety and increasing prices in the local market, including tourism-related offerings. Moreover, heavy rains and avalanches pose risks to tourists and infrastructure, while the scarcity of water affects

canoeing activities and scenic beauty. The decline of nature-based tourism due to climate change results in job losses and economic hardships for mountain communities.

Table 15: Climate change impacts on community-based tourism value chain

VALUE CHAIN PHASE / CLIMATE DRIVER	INPUT (environment)	SUPPLIERS (travel agencies, tour operators)	TRANSPORT & ACOMMODATION	LOCAL COMMUNITY SERVICE PROVISION (tour guides, recreational activities, handicrafts etc.)
Temperature extremes	↓ ecosystem degradation ↓ natural beauty	↓ income reduction from lack of tourists	↓ income reduction from lack of tourists	↑ heat stress tourists and local community ↓ income reduction from lack of tourists ↓ crop losses ↓ tourist satisfaction ↓ impact on cultural practices
Extreme rainfall	↓ trail deterioration ↑ risk of landslides	Minor impacts	↓ visits due to logistical difficulties	↓ reduced tourist capacity
Drought	↓ reduction in drinking water ↓ ecosystem degradation ↓ natural beauty	↓ income reduction from lack of tourists	↓ lack of drinking water ↓ income reduction from lack of tourists	↓ crop losses ↓ reduced tourist capacity ↓ income reduction from lack of tourists ↓ tourist satisfaction ↑ commodity scarcity, increased prices
Frost	↓ ecosystem degradation	↓ revenue reduction from lack of tourists	↓ income reduction from lack of tourists	↓ crop losses ↓ reduced tourist capacity ↓ reduction in agricultural activities ↑ commodity scarcity, increased prices
Glacial retreat	↓ ecosystem degradation ↓ natural beauty	↓ revenue reduction from lack of tourists	↓ income reduction from lack of tourists	↓ income reduction from lack of tourists ↓ reduced tourist capacity ↓ impact on cultural practices

Legend: ↑ increase ↓ decrease Minor negative impacts Moderate negative impacts Major negative impacts

Source: Own elaboration based on scientific literature

5.7.4 Impacts on species distribution

The impact of higher temperatures and less precipitation will have an impact on species distribution. For example, Feeley et al. (2010) studied the behaviour of Andean trees in the tropical Andes located between 950m 3400m above sea-level. The authors concluded that due to the increase in temperature, trees were migrating to higher elevations, at a mean rate of 2.5-3.5m per year (and even up to 20.6m for some species). The observed mean rate of change is less than predicted in comparison to the temperature increases in the region, suggesting that there is a limited capacity to respond to these and poses extinction risks for some genera (Feeley, et al., 2010).

Similarly, glacier retreat has meant that there is more suitable territory for some species to inhabit. For example, the glacial retreat in the Vilcanota mountain range (SE subregions) has opened an ecological corridor in recent decades where species' distributions have been affected. Many of the woody and herbaceous species in the Andes (e.g. *Ericaceae, Bromeliaceae*) depend on interactions with animals for seed dispersal and pollination, and the effects of climate change on these organisms could cause spatial, temporal or physiological asynchronies between mutualistic species.

5.7.5 Impacts on ecosystem coverage and surface area

The changes on species distribution mentioned above implies that there will be changes in the coverage of landscapes as well. For example, Ludeña et al. (2014) found that, in the Puna region, there would be an increase in shrub surface under an A2 emission scenario (equivalent of an RCP 8.5 scenario with regards to temperature rise). The same phenomenon is projected for the *páramos.*[11] Conversely, glaciers, the suprandino area (the area between glaciers and the *puna*[12]), the *puna* and *yungas* forests show large reductions in extension.

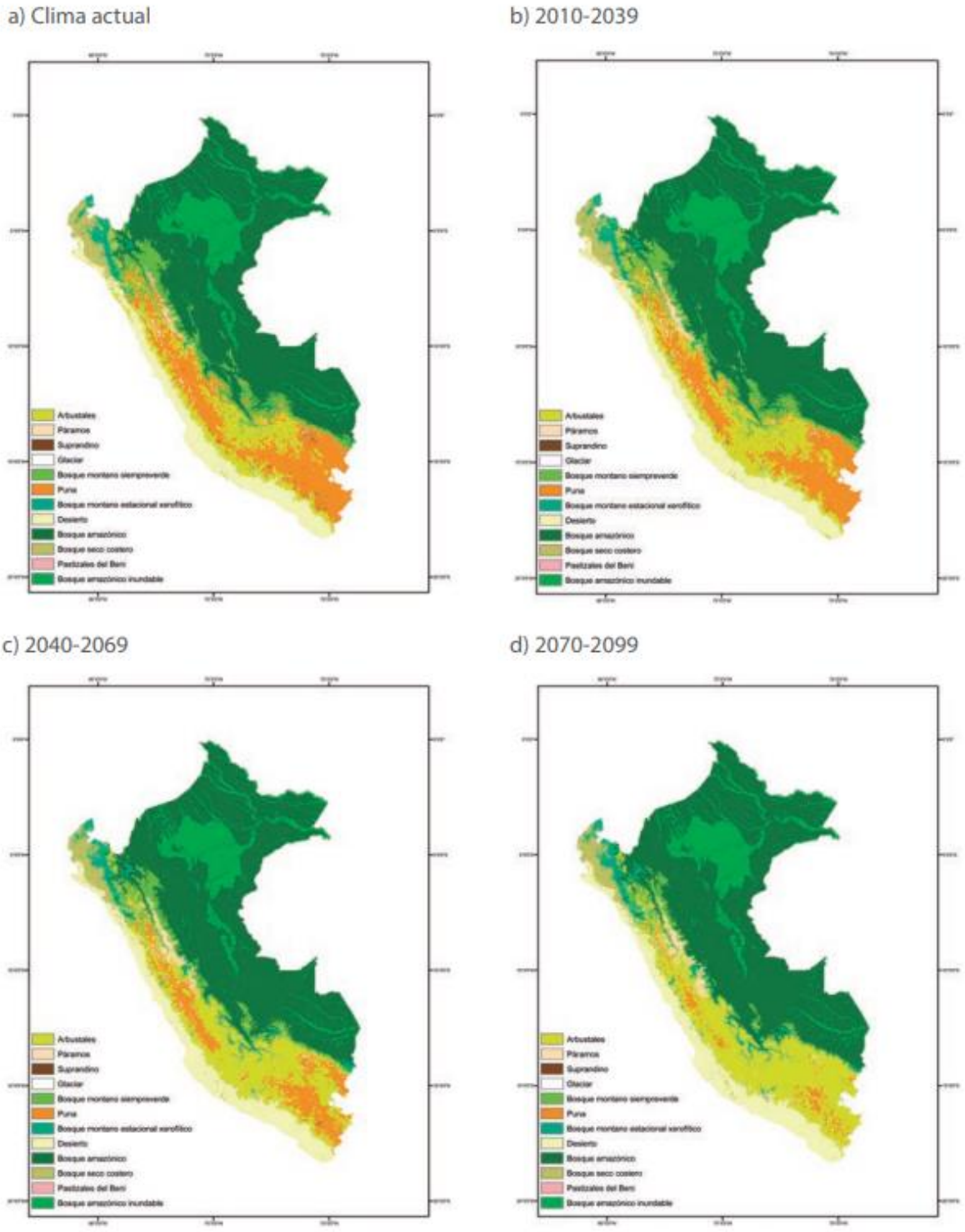
In general, a migration to higher elevations was observed in the vegetation bands that characterize the Andes, but the *puna* was replaced by shrubs rather than *yungas* forests. The projected expansion desert and dry (xeric) areas will reduce water availability (Ludeña, Sánchez-Aragón, de Miguel, Martínez, & Pereira, 2014). Figure 49 reflects this change in biome coverage.

Similarly, Flores (2016) analysed the behaviour of grasslands, wetlands, and shrub-lands in an intermediate climate change scenario. Findings show that the three types of ecosystems will change in surface due to glacial retreats and temperature increases. The area that is constituted by grasslands, wetlands, and shrub-lands, which in 2010 represented 77.6% of the total extension of the *puna,* would be reduced to approximately 50% by the end of the century. In the case of the grasslands, these would reduce their extension, going from 15.4 to 4.6 million ha, while the wetlands would go from 0.5 to 0.2 million ha. Shrub-lands would substantially increase their extension over time, increasing from 2.8 to 7.1 million ha (Flores, 2016). Figure 50 below shows this trend.

[11] Grassland and shrub-land ecosystems found in Peru and other areas of South America.

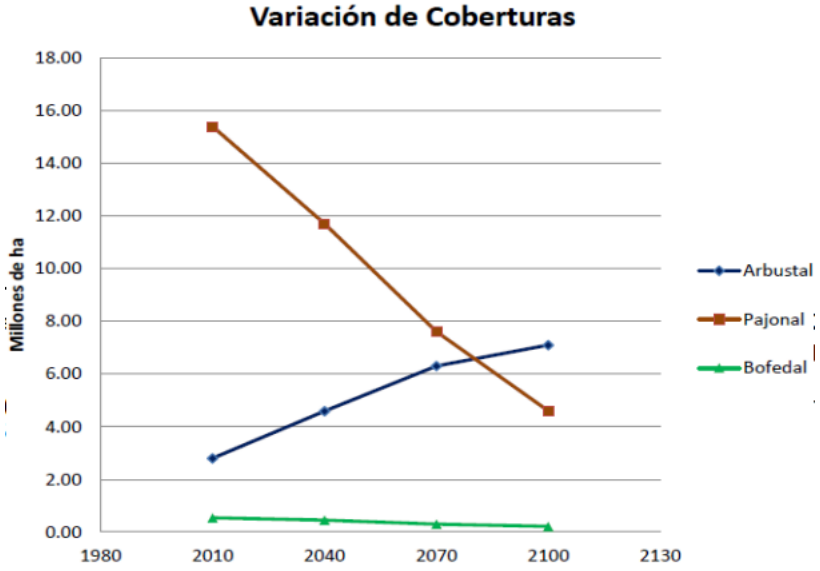
[12] The ecoregion above 3,500 masl

Figure 49: a) Current and projected change in biome extension under the A2 emission scenario (equivalent to an RCP 8.5 scenario regarding temperature increase) in b) 2010-2039, c) 2040-2069 and d) 2070-2099. Puna areas are the biomes that show the biggest shrinkages, while shrub areas the largest increases.



(Ludeña, Sánchez-Aragón, de Miguel, Martínez, & Pereira, 2014)

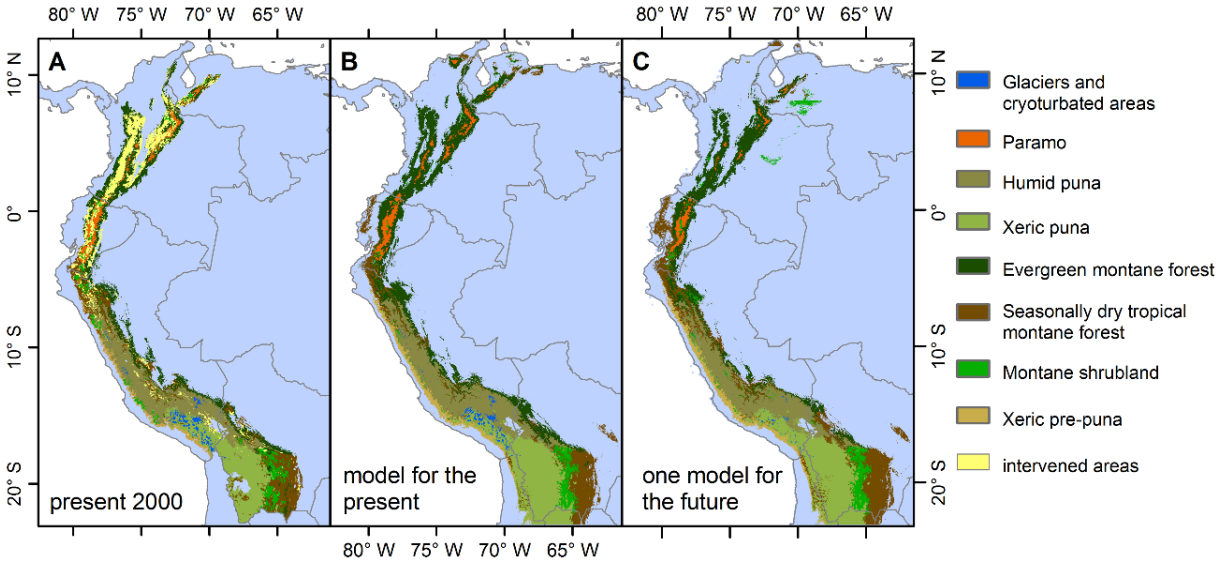
Figure 50: Land cover extension from 2010 to projections towards the years 2040, 2070 and 2100 under a medium emission scenario, considering shrub-lands (blue line), pajonal areas (red line) and wetlands (green line). A clear decrease of pajonal areas is shown, while shrub-lands increase their extension. Wetlands (bofedales) show a slight decrease.



(Flores, 2016)

Similarly, Tovar et al. (2013) modelled the Tropical Andes biomes against different timescales and climate models. Authors find that wetter biomes exhibit an upslope displacement of both the upper and the lower boundaries as expected, most dry biomes tend to show downslope expansion. Despite important losses being projected for several biomes, projections suggest that up to 25.2% of the Tropical Andes biomes will change. Figure 51 shows that for the future biome distribution in the SHAP, glacier areas show an alarming decrease, while xeric puna and xeric pre-puna show increases in their extension.

Figure 51: A) 2013 biome map B) modelled potential biome map for the present 2000 and C) an example of future biome map using climatic variables of model gfdl_cm2_0 for A1B 2040–2069 scenario.



(Tovar, Arnilla, Cuesta, & Buytaert, 2013)

Carbon stocks in Andean ecosystems are comparable with those in tropical lowland forests, especially when organic carbon stocks in the soil are considered (Spracklen & Rigelato, 2014). However, for Andean Forest biomes, the limited carbon assimilation rates at higher elevations due to low nighttime temperatures might be overcome by a climate change induced-temperature increase. In the case of a reduction of up-slope or down-slope migration of plant populations, aboveground carbon storage will be reduced. Nevertheless, impacts on carbon storage may differ biome to biome (Spracklen & Rigelato, 2014).

5.7.6 Socioeconomic Vulnerabilities

Having established the climate hazards that communities in the SHAP region are exposed to, the following sections detail different dimensions of the vulnerabilities that exacerbate the impacts of climate change.

Livelihoods

In the high Andes, poverty, insufficient property rights and resources, poor soil quality, poor infrastructure and basic services, and a lack of quality education generate vulnerabilities to climate change (Oliver-Smith, 2014). In a large-scale survey of more than 46,000 farmer households across the Peruvian highlands, Aragón et al. (2018) observe a 55% of poverty incidence. In Puno, almost two-thirds of surveyed families had regular incomes, and only a third can cover food expenses for all of their children (Cavagnoud, 2018) .

The climate change impacts on water availability and the degradation of biomes will have knock-on effects on agriculture. Being the main economic activity in the region, this exacerbates the vulnerability of SHAP communities. Most highland communities in the Andes rely on crop and livestock farming for their livelihoods. Many are smallholders who own livestock and use traditional farming practices, relying on rainfed crops and limited irrigation (Aragón, Oteiza, & Rud, 2018). Similarly, in surveys carried out in Apurimac in 2009, the loss of potato production due to drought was 69% and 65% for corn. Most of the products from this region are used for self-consumption (Llosa, 2009).

Moreover, several studies demonstrate the lack of alternative income-generating activities and the dominance of agriculture (Cavagnoud, 2018) (Sperling, et al., 2008). In a study in Cusco highlands for example, pastoralism was the only livelihood option (Orlove, 2009). In cases where households engage in non-agricultural activities to supplement their income, this is highly dependent on location and the ability to commute. The study conducted by Cavagnoud (2018) in Puno revealed that approximately 33% of the respondents reported receiving supplementary off-farm incomes. Among these respondents, 25% obtained their additional income from social programs, while 19%, 18%, and 10% received their income from construction, mining, and trade, respectively.

Land tenure and Land Use

The Andean puna is comprised of marginally productive (subsistence) agricultural lands and small scattered human settlements characterized by extreme poverty, low education levels and literacy rates with significantly lower life expectancy and higher child mortality rates than the rest of Peru.

Peru's Agrarian Reform laws were enacted in 1969, before that date, land in the project area was owned by haciendas[13], where the local population worked as serfs. Under the Agrarian Reform Peru's government expropriated over 9 million hectares of land which were redistributed to collective agricultural cooperatives controlled by state bureaucrats. Also, in this context an identity shift was experienced, from cultural to class: Indigenous communities

[13] In Spanish, a large landed estate, originating in the colonial period (source: Hacienda | Spanish Colonial, Landownership, Agriculture | Britannica)

from 1969 onwards changed their name to peasant communities. During the 1970's and 80's the Andean communities began to occupy and retake the lands previously taken from them by the hacienda owners. It is important to mention that in 1980 the Law on Agricultural Promotion and Development allowed parcelling out the land previously awarded to associative enterprises in smallholdings in favour of individual peasants. By 1990 most of the land in the Andes was under the control of the communities with the agricultural cooperatives being largely dissolved. In addition, the interest for attracting investments resulted in free formalization or legalization of the land market and allowed again the free transfer of land[14].

Various legal reforms have occurred since the 1980's recognizing the Andean communities as the legal title holders of their land mainly:

- In 1987 the General Law of Peasant Communities, Law N° 24656, was approved and it recognizes peasant communities as organizations of public interest, with legal existence and legal personality, recognized by the State and protected by Peru's Political Constitution, with rights over natural resources and the territory they occupy. Peasant communities are made up of families united by ancestral, cultural, social and economic ties, who have communal ownership of the territories they inhabit.
- In 1991, the goal of attracting private investments gave a boost to land registration and titling efforts through the Rural Land Registry Act No. 667. The Law on the Promotion of Investments in the Agricultural Sector No. 653, also from 1991, removed all restrictions, including the transfer of rural land and restrictions for commercial entities to access land, which is considered as the end of the agrarian reform. This openness to commercial land ownership is expressed in the 1993 Constitution by the recognition of land rights to 'any other associative tenure form' besides private and communal (Art. 88).In 1995, the Law No. 26505, better known as the Land Law, (later modified by Laws No. 26570, 26597, 26681) set the principles to promote private investments for the development of economic activities, including in the land of peasant and native communities. The law establishes a liberal regime when it comes to land as compared to previous legislation and guarantees access to land to any natural and legal person without limitation in extension and use (Article 4). The Regulation of the law states that any land susceptible of being used for agricultural purposes can be offered to private investments (Article 4).
- In 1992, Decree-law No. 667 on the Rural Property Registry created a Special Land Titling and Cadastre Project (PETT), which was established as a specialized institution of Peru's Ministry of Agricultural Development and Irrigation (MIDAGRI)[15]. The project was intended to formalize private property rights through titling, to encourage the development of an efficient and transparent rural land market and to promote investment in agriculture. These objectives were to be implemented through two main strategies: i) The development of standards and guidelines for cadastral surveys and; ii) The monitoring, evaluation and proposition of standards to organise the registration of rural lands.
- According to the article 88 of the current Political Constitution of Peru (1993), it states that the Peruvian State supports agrarian development and guarantees the right to land ownership, in private, communal or any other associative form land. This article also states that the law can fix the limits and the extension of the land according to the peculiarities of each area. Moreover, peasant communities' lands are unseizable, imprescriptible, and inalienable, and by exception they can be sold to third parties, following a rigid procedure pre-established in article 7 of Law N° 24656; they can also be ceded in use to third parties for purely productive purposes and for the direct benefit of the Peasant Community by means of a contract or agreement. Finally, if communal

[14] Peru - Context and Land Governance

[15] FAO, Land titling in Peru: What future for women's tenure security, 2013

lands are abandoned, they return to the domain of the State. This will mark an important milestone, initiating the liberalization of the land ownership and the individual rural property regime with the to promote the development of the agrarian sector and the acceleration of the Peruvian economy.

- Some legislation includes measures promoting smallholdings but with questionable implementation. Law No. 30355, from 2015, is specifically devoted to support family producers through measures like formalising land titling, providing technical and technological support, developing financial programmes, promoting the effective access to water and other basic services, and promoting the association and cooperation of family producers, among others[16].

Analysing the 2012 National Agrarian Census, land tenure in the High Andes generally appears to be dominated by private regime, in average 48% of the agricultural units [17]in the prioritized districts of the Resilient Puna project (varying from 24% to 86% depending on the region), followed by communal land regime, for 44% of agricultural units in average (variation from 1% to 70 % depending on the department). Tenant and Possessors regimes are less common in the target area of the project. Traditional herder communities living in the High Andes tend to combine private and collective regimes as an alternative form for strengthening land tenure, treating grasslands as common resources which are accessed, used and controlled collectively, usually under open access or communal land tenure regimes.[18]

Table 16: Land tenure in the prioritized districts by department

Department	Private Property	Communal Property	Tenant	Possessors[19]	Other	Total Agricultural Units
Apurímac	73%	19%	4%	3%	1%	62,753
Arequipa	86%	1%	7%	2%	4%	58,592
Cusco	24%	70%	3%	1%	1%	168,961
Lima	73%	5%	10%	11%	1%	1,921
Puno	75%	15%	5%	1%	4%	12,691
Total	48%	44%	4%	2%	2%	304,918

Source: National Agricultural Census, 2012. INEI.

The property formalization programs of the 1990s achieved some progress in the individual titling of land parcels, but also of some peasant communities. However, mainly due to the state's prioritization of individual land titling, large extensions of land of peasant communities have still not been titled, so there is still a large gap and sometimes source of social conflicts[20].

[16] Peru - Context and Land Governance

[17] It is defined as the land or set of land used totally or partially for agricultural production including livestock, conducted as an economic unit, by an agricultural producer, regardless of size, tenure regime or legal status. (CENAGRO, 2012)

[18] Damonte, G., M. Glave, S. Rodríguez and A. Ramos. 2016. 'The evolution of collective land tenure regimes in pastoralist societies: lessons from Andean countries. IDS Working Paper No. 480. Brighton: Institute of Development Studies.

[19] People who informally occupied land.

[20] Baldovino Silvana (2016). Una primera mirada: Situación de la tenencia de la tierra en el Peru. SPDA, Lima-Peru.

Table 17: Formalization of landowners in the prioritized districts by department

Department	With title registered in public registers	With title not registered in public registers	Without title, but in the process of being titled	No title, no title process	Total area (ha)
Apurímac	30%	55%	0%	15%	598,013
Arequipa	43%	23%	13%	21%	849,533
Cusco	41%	50%	6%	3%	756,965
Lima	16%	0%	0%	84%	73,394
Puno	41%	37%	9%	13%	440,985
Total	38%	39%	7%	15%	2,718,891

Source: National Agricultural Census, 2012. INEI.

Regarding local communities in the project area, 700/755 have been recognised, of which only 610/700 are titled and share communal property. It is worth noting that during the field consultations, discussions were held with approximately 242 local communities/producer's associations/cooperatives.

Table 18: Communities' formalization in the project districts

Department	Number of communities	Total area (ha)
APURIMAC	**233**	**248,941**
Unrecognised	**17**	**-**
Untitled	17	-
Recognised	**216**	**248,941**
Untitled	22	44,815
Titled	194	204,126
AREQUIPA	**52**	**660,716**
Unrecognised	**4**	**-**
Untitled	4	-
Recognised	**48**	**660,716**
Untitled	4	9,930
Titled	44	650,786
CUSCO	**395**	**462,124**
Unrecognised	**26**	**-**
Untitled	26	-
Recognised	**369**	**462,124**
Untitled	52	48,346
Titled	317	413,779
PUNO	**75**	**215,020**
Unrecognised	**8**	**-**
Untitled	8	-
Recognised	**67**	**215,020**
Untitled	12	-
Titled	55	215020
Total recognised and titled		
Recognised	**700**	1,586,801

Titled	610	1,483,711
Total general	**755**	**1,586,801**

Source: MIDAGRI

In 2013, MIDAGRI's steering role in this area became even clearer with the enactment of Law No. 30048, which amends the Legislative Decree approving the Law on the Organization and Functions of MIDAGRI. Organization and Functions of MIDAGRI, and which establishes as a specific function and exclusive competence of this ministry, to dictate the norms and technical guidelines in matters of physical-legal sanitation and formalization of the land. in matters of physical-legal regulation and formalization of agrarian property, which includes the lands of peasant and native communities. With the decentralization process, competencies for peasant land formalization activities were transferred to regional governments.

With regard to the problem of community's property formalization, Baldolvino (2016) identified multiple long-standing issues that include legal, institutional, technical, social, gender, stakeholder diversity, migratory processes, budgetary, social, economic, social and political aspects, overlapping of rights, geographic location or even confusion in the application of the law. This confusion has increased with the transfer to regional governments and the competencies assigned to these and the competencies assigned to them, either due to ignorance of the processes or lack of resources to implement them. processes or lack of resources to implement them.

Conflicts are also caused by land tenure disputes between adjoining communities. these conflicts have not resulted in people injured. Nevertheless, some of these conflicts may eventually escalate into episodes of violence between police forces and protesters, mostly when key highways are blocked. Therefore, it is important to highlight the project will not support mining activities nor deal with land tenure issues (communities without title or with delimitation boundary conflicts). The project envisages the elaboration of a risk plan to constantly map the types of problems and conflicts that will be encountered during implementation. It should also be noted that the project will identify at the beginning of implementation communities that have tittle and do not have territorial demarcation conflicts with other landowners.

Regarding land use in the project area, according to the National Agrarian Census (2012), the distribution was as follows:

Table 19: Land uses (surface area in hectares) in the prioritized districts by department

Department	Total (ha)	Agricultural land	Natural pastures	Forests and woodlands	Other uses
Apurímac	**622,082**	**12%**	**54%**	**9%**	**26%**
Arequipa	**915,486**	**3%**	**87%**	**2%**	**8%**
Cusco	**924,925**	**12%**	**75%**	**5%**	**7%**
Lima	**74,908**	**1%**	**96%**	**0%**	**3%**
Puno	**502,468**	**4%**	**89%**	**0%**	**7%**
Total	**3,039,869**	**8%**	**77%**	**4%**	**11%**

Source: National Agricultural Census, 2012. INEI..[21]

Finally, it is important to mention that there is a clear distinction between land that depends on rainfall and land that has access to irrigation. In the high Andean zona, land essentially depends on rain 60% while 40% depends on irrigation access.

[21] IV Censo Nacional Agropecuario 2012 - Base de Datos REDATAM (inei.gob.pe)

Table 20: Agricultural area (ha) by type of agriculture (irrigated vs rainfed) in the prioritized districts by department

Department	Irrigated area	Rainfed area	Total area	Total Agricultural Units
Apurímac	40%	60%	622,082	62,753
Arequipa	61%	39%	915,485	58,592
Cusco	40%	60%	924,925	168,961
Lima	23%	77%	74,908	1,921
Puno	7%	93%	502,467	12,691
Total	40%	60%	3,039,867	304,918

Source: National Agricultural Census, 2012. INEI.

Migration

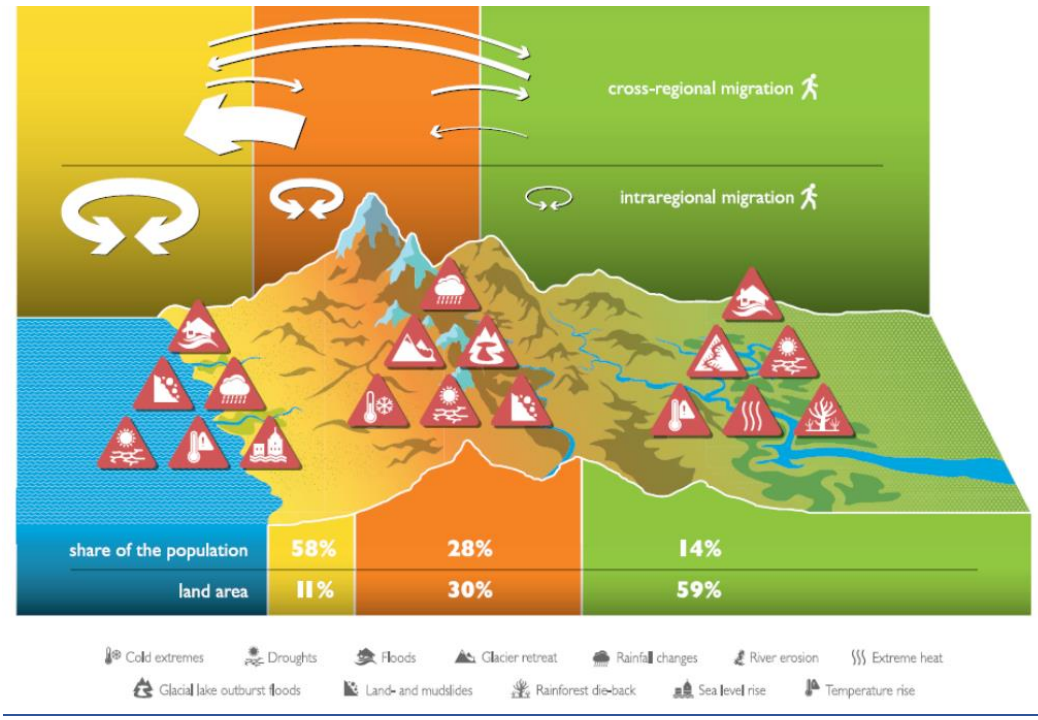
A considerable proportion of family members of migrants indicate that "environmental problems" play some role in the migration decision. In addition to permanent migration, temporary/ periodical migration is also common. Sperling et al. (2008) describe the migration of young people in search of work in Puno. Given the disadvantages of the small farmer's market, entire families sometimes leave to improve their income. Some households close enough to cities travel daily, constantly or sporadically.

According to a survey carried out in the Apurimac region, in the last five years, 50% of the relatives of the inhabitants of that region have emigrated due to the drought, being the province of Grau (76%) with the highest immigration according to the proportion of cases (Llosa, 2009).

Some highland communities use migration to anticipate or react to hazards. In terms of temperature-related hazards, Sperling et al. (2008) mention the emigration of communities from the highlands of Puno, especially of young people, due to frosts and droughts. Crespeigne et al. (2009)'s findings show that after an episode of rainfall deficiencies investigated in a community in Puno in 2007, 31% of those surveyed migrated or looked for work as vendors, waiters and shoe-shiners to smooth out income losses in places like Lima and other cities, or by working in mines and in agribusiness.

Temporary migration was also among the main diversification strategies of subsistence farmers in the highlands: 54% of households had at least one member who was a temporary migrant. The use and duration of such migration increased when harvests were unsatisfactory. The authors suggest that temporary migration is often an option of last resort (Bergmann, et al., 2021).

Figure 52: Climate migration across geographical regions in Peru. In the SHAP region, main drivers of migration are rainfall variation, glacier retreats, floods, cold extremes, droughts and landslides.



(Bergmann, et al., 2021)

Gender inequalities in water, ecosystem maintenance and conservation, and agricultural activities.

In general terms, women in the SHAP area face more barriers than men that hinder the achievement of gender equity in climate change adaptation measures. Women face unequal access to resources (use, control) and receive lower income. They also have limited access to microfinance; less opportunities and time for education, training, and technical assistance/capacity to develop and implement nature-based solutions and climate-resilient agribusinesses. For a detailed analysis of how these inequalities are present at the institutional and policy level, refer to Annex 8a.

Firstly, while both women and men contribute to natural infrastructure through their actions and knowledge, men dedicate more time overall to construction and surveillance activities, such as construction aquifer recharge systems *(amunas*), dikes and moles, and the removal of debris. Women meanwhile carry out “assistance” activities such as assisting workers in fieldwork, maintenance of *amunas* or the collection of biomass (USAID, 2019).

While women are taking up more roles that men have traditionally occupied, they take up this work on top of existing responsibilities, meaning that the time burden is placed on women. These changes are happening because of periodic migration that occurs in the SHAP region, during which women will carry out activities that are considered outside of their traditional roles. (USAID, 2019)

Furthermore, in the SHAP region, due to limited access to electricity, biomass is the main source of energy. This dependence on biomass means that women and girls require less time and energy to education, production, and recreation in comparison to their male counterparts. Nationwide, women in rural areas cook an average of 19 hours and 41 minutes a week. Considering that 68.5% of rural households use firewood and dung for cooking, this means that women depend more on the ecosystem services provided by the landscape at a household level (MIMP, 2012). Coupled with less access to credit, financing and job opportunities; high

illiteracy rate (which is especially high among women), low level of education, information and training in the region, women depend to a greater extent on ecosystem services.

Similar dynamics are at play in terms of agricultural activities. The 2012 agrarian census shows that 30.8% of those participating in agricultural production are women, versus 69.2% are men. This gap has been reduced in relation to the 1994 agrarian census in the four prioritized regions (Apurímac, Cusco, Puno and Arequipa). Women cultivate more area than men in the four regions of the project for self-consumption and subsistence than for income generation (INEI, 2012) However, as for landscape management, the participation of women in farming activities has not necessarily improved living conditions due to women's additional caring responsibilities (refer to Annex 8a for more information and a regional breakdown). In the face of knock-on climate impacts such as reduced water availability, women's activities in subsistence farming will be affected, with impacts on household food security for example.

The lack of improvement in material conditions of women despite higher participation throughout the year manifest themselves in lower wages. In rural areas, women make 61% of what men make in income (USAID, 2019). This is due to barriers such as:

1) Women have less access to land and water resources due to inheritance and tenure traditions (USAID, 2019). Moreover, women manage a lower number of plots of cultivable land (2.65 ha on average vs men's 3.12 ha). (INEI, 2012) In Andean family farming, the number of plots is related not only to the total cultivable area per person and the volume of production, but also to risk management: the greater the number of plots located on different ecological levels, the lower the agro-climatic risk (whether from frost, hailstorms, drought and pests or diseases) that the farmer has to face, and the higher the production expectation. Therefore, climate hazards will mean that already reduced number of women's plots are less productive.
2) Women are less likely to be formally educated. In rural areas, 10% of the population has not completed their primary education. In the case of rural women, this figure increases to 20% (USAID, 2019). Furthermore, the proportion of women who receive technical assistance and business training for farming and agribusiness is also imbalanced in the four regions, with percentage gaps between 4.4% and 10-2% in favor our men, which is a higher gap than the national average (INEI, 2012). See Annex 8a for a regional breakdown and more information.
3) Women constitute 84% of domestic abuse and violence victims. In the case of sexual violence, this figure is 93%, and 72% of cases are towards girls under the age of 18. This worrying trend impacts women's decision-making power and physical and economic autonomy. (USAID, 2019)

5.8 National Climate Goals and Priorities

The **updated Nationally Determined Contributions (NDC) of Peru for the Period 2021-2030** was approved by the High-Level Commission on Climate Change, chaired by the Presidency of the Council of Ministers, and conformed by 13 State ministries and representatives of the National Center for Strategic Planning, the National Assembly of Regional Governments, and the Association of Municipalities of Peru, with the technical support from the NDC Working Group.

The document, formulated based on the responsibilities assumed by the country within the UNFCCC, updates the Nationally Determined Contributions (NDC) defined by the country until the year 2030, whose application corresponds to the period between January 1, 2021 and December 31, 2030 and considers the emission sectors included in the National Inventory of Greenhouse Gases (INGEI) which are: i) Energy; ii) Industrial Processes and Product Use (PIUP); iii) Waste, iv) Land Use, Land Use Change and Forestry (LULUCF); and, v) Agriculture. The updated NDC presents an increase in the country's commitment and efforts to implement both mitigation and adaptation measures from 2021 to 2030. In terms of mitigation, the country

is committed to limit its GHG emissions to 208,8 $MtCO_2eq$ until 2030 and to 179,0 $MtCO_2eq$ based on the availability of international funding and favourable conditions. These targets reflect an increase of 10% emissions reduction (from 20% to 30%) as the unconditional goal, and a 10% increase (from 30% to 40%) as the conditional goal, compared to the first NDC submitted in 2015 (WWF, 2021).

It is also noted in the document that Peru presents seven of the nine characteristics recognized by the UNFCCC to classify countries as particularly vulnerable to climate change: i) low-lying coastal areas; ii) arid and semi-arid zones; iii) areas exposed to floods, droughts and desertification; iv) fragile mountain ecosystems; v) disaster prone areas; vi) areas with high urban air pollution; and, vii) presents an economy dependent on income generated by the production and use of fossil fuels. The country's adaptation priorities, therefore, seek to reduce and/or avoid loss, damages and current and future changes triggered by climate change hazards on livelihoods, ecosystems, basins, territories and infrastructure.

According to the NDC, Peru's five priority sectors for climate change adaptation are: i) Water resources; ii) Agriculture; iii) Fisheries; iv) Forests and v) Health. The updated NDC presents a conceptual framework for the management of risks associated with climate change, as well as concrete adaptation measures with indicators, goals and implementation deadlines for each priority sector.

The table below details how the Peru's updated NDC aligns with this project. The adaptation measures cited were identified in a technical catalog of adaptation measures published by the Ministry of the Environment to guide the implementation of Peru's NDC (Minsitry of the Environment, 2020).

Table 21: Alignment of this project with Peru's updated NDC to UNFCCC.

NDC Adaptation Measure	Description	NDC indicator	Alignment with Resilient Puna	Estimated contribution
AGRI7.- Natural grassland management to secure feed for livestock and reduce vulnerability to climate change	Management of pastures through the planning of their use, to maintain a good vegetation cover that helps water infiltration, aquifer recharge and, at the same time, increase of feed for livestock production.	# of hectares managed in climate-vulnerable areas	Natural grasslands are Puna ecosystems, adaptation measures promote by the project will contribute to maintain or improve their ecosystem service, that secure feed for livestock and reduce vulnerability to climate change.	19,442.51 hectares managed in climate-vulnerable areas
AGRI11 .- Management of wild South American camelids (vicuñas) considering the effects of climate change.	Proper management of camelids can have a lower impact on soil compaction, as they weigh much less than cattle and horses, and resist the effects of climate change (low temperatures). Their implementation requires: - Raising awareness of the importance of wildlife and their environment. - Planning and establishing agreements for the management of wildlife species. - Technical support to agricultural producers for the transfer of technologies for the conservation of genetic resources. technologies for the conservation of wildlife genetic resources.	# of wild South American camelids (vicuñas and guanacos) at national level.	The project proposes to support local initiatives that work on vicuña management considering specific measures to reduce climate vulnerability.	46,830 wild South American camelids (vicuñas)
AGRI16.- Implementation of business strategies that incorporate risk and opportunity	It includes the implementation of business and bio-business plans, which are essential to achieve a competitive advantage by incorporating risk management in the face of climate change and seeking sustainability. The	# of agricultural producers with business plans that incorporate climate change	The project will support beneficiaries to make an analysis of their climate risk and integrate EbA measures in agricultural business plans to make	1,560[22] agricultural producers with business plans that

[22] It is estimated that at least 52 local initiatives will have business plans that integrate climate risk analysis. Each initiative will involve an average of 30 producers.

NDC Adaptation Measure	Description	NDC indicator	Alignment with Resilient Puna	Estimated contribution
management in the face of climate change.	strategies will therefore be linked to projects and programmes aimed at developing agribusiness, rural agro-industry, strengthening producer organisations and small-scale enterprises, promoting agro-productive or value chains and improving the conditions for small producers' access to markets.	risk and opportunity management in value chains.	their businesses more resilient to climate change.	incorporate climate change risk and opportunity management in value chains.
AGU2.- Implementation of interventions related to planting and harvesting water for agricultural water security in watersheds vulnerable to climate change.	Consists of actions related to planting and harvesting of water that contribute to infiltration, surface storage and aquifer recharge to increase agricultural water security in periods of increased water scarcity. Technological options to be implemented: - Fencing of natural pastures - Afforestation, reforestation and revegetation with native species. - Infiltration ditches in areas free of stony and/or rocky outcrops, and with non-steep slopes. - Artificial recharge of aquifers in high mountain rock massifs. - Other local water planting and harvesting options recognized by users.	Area prepared for planting and harvesting water in hectares for agricultural water security in watersheds vulnerable to climate change.	All options outlined in this NDC are in the catalogue of optional measures in order to be part of the Local initiatives supported by this project, because they contribute to the recovery of the ecosystems improving the water recharge and the water security for the vulnerable population.	202 ha prepared for planting and harvesting water in hectares for agricultural water security in watersheds vulnerable to climate change.

The NDCs update is relevant to the GCF project because it highlights the project's areas of intervention and its contribution to the fulfilment of the country's committed NDCs, creating conditions for additional actors in their sphere of influence to join the project´s effort.

Peru National Adaptation Plan (NAP) was approved in 2021 and developed with the participation of relevant stakeholders, including private sector, civil society, academia and indigenous communities. The document focuses on strengthening the resilience of people, ecosystem, livelihoods and economies through the definition of 13 strategic actions that includes enhancing weather prediction services, implementing ecosystem-based adaptation actions and improving water supply systems for multisectoral use. All actions were thought and will be implemented following the principles of human rights, gender equality, and intergenerational and intercultural justice.

The project results will directly contribute to the following NAP specific priority objectives and respective strategic actions:

- 1. Reduce in the populations and their livelihoods, the damages, the possible alterations and the consequent current and future losses generated by the dangers associated with climate change;
    - 1.1 Develop conditions and capacities among the vulnerable population, strengthening modeling, prediction capacity, and knowledge in a context of climate change.
    - 1.3 Implement good management, improvement and conservation practices through the agricultural population in agricultural production systems.
- 2. Reduce in ecosystems, basins and territories, the damages, possible alterations and the consequent current and future losses, generated by dangers associated with climate change
    - 2.2 Strengthen inter-institutional articulation and optimize the water supply system for the multisectoral user population.
    - 2.3 Implement good agricultural soil management practices.

The project is fully aligned with Peru’s adaptation needs as identified and described in both its NDC and NAP, as it supports the fulfilment of adaptation measures in two priority sectors – water and agriculture, with co-benefits addressing mitigation targets as well.

The **National Climate Change Strategy 2015 (ENCC)** is the main management instrument to guide and facilitate the State’s action against climate change at the national, regional and local levels in the long term. It was developed in 2015 and is based on the Decree Nº029-2018-PCM. Currently the strategy is being updated for 2050. The Ministry of Environment has started a participatory process to collect inputs and information needed from different stakeholders, with the aim of ensuring transparency and participation. The final version is yet to be approved, but the draft priority objectives include: i) reduce climate risk for the most vulnerable; ii) reduce GHG emissions from the energy sector; iii) reduce GHG emissions from the agriculture and LULUCF sectors; iv) reduce GHG emissions from the production processes of goods and services and v) improve participatory governance to fight climate change.

6. Institutional, Policy and Regulatory Framework

6.1 Development Plans and Strategies

Summarize the National Development Plans and strategies. Analyse their relevance for the GCF project and how it contributes to the achievement of the plans. --> max. 2 pages

6.1.1 National Development Plans and Strategies.

The **Strategic Plan for National Development (PEDN) until 2050** (CEPLAN, 2022), is an instrument of strategic planning, whose objective is to guide the action of the State including National Government, Regional Governments and Local Governments and the efforts of society including unions, academia, business, and other organizations, to achieve a harmonious and sustained development in Peru. It is the update of the Strategic Plan for National Development (PEDN) until 2021. Some important national objectives considered in the PEDN until 2021 are not explicitly reflected in the PEDN until 2050. These are: 2) Equal opportunities and universal access to basic services; and 5) Balanced regional development and adequate infrastructure.

The PEDN until 2050 is relevant for the proposed GCF project as it can motivate the regional and local governments prioritized in the project, to plan and develop interventions within the framework of objectives 2) and 3) of the PEDN until 2050, which would allow scaling up the interventions, replicating their actions in non-prioritized districts in the area of intervention of the project.

It contains the following elements: i) a shared and concerted vision of the country's future; ii) policy guidelines; iii) policy priorities; iv) objectives, with indicators and goals; and v) strategic actions that allow the achievement of the objectives.

It proposes the following national objectives:

1) Achieve the full development of people's capabilities without leaving anyone behind;
2) Manage the territory sustainably in order to prevent and reduce the risks and threats that affect people and their livelihoods, with the intensive use of knowledge and communications, recognizing geographic and cultural diversity in a context of climate change;
3) Raise the levels of competitiveness and productivity with decent employment and based on the sustainable use of resources, human capital, the intensive use of science and technology, and the digital transformation of the country; and
4) Guarantee a just, democratic, peaceful society with an effective State at the service of the people, based on dialogue, national agreement, and the institutional strengthening.

6.1.2 Agriculture Sector Plans and Strategies

In 2021 the government of Peru approved the **National Agrarian Policy 2021-2030** (Supreme Decree 017-2021 MIDAGRI), with the overall goal of increasing agricultural development and productivity in Peru. It identifies three major obstacles impeding the development of the agricultural sector (of which 97% is made up of family farmers, according to the IV National Agricultural Census of 2012), as well as their effects:

1) *Low vertical integration in agricultural value chains***:** agricultural producers, including family farmers and businesses, face challenges in accessing markets due to limited productive and commercial capacities. Only a small percentage of farmers reach higher-value segments or engage in agribusiness. The distribution of profits among multiple actors in the value chain, such as collectors and retailers, leads to smaller shares of profits for farmers. Additionally, farmers struggle to maintain their position in the value chain due to market demands, such as quality specifications, certification, innovation, and lower prices. Increasing production costs and supply issues further impact their sustainability in the agricultural value chain. The limited competitive development of agricultural activity has severe direct effects on the livelihoods of agricultural producers. It hampers their income, savings, and ability to meet basic and food needs, thereby affecting their overall livelihood. These constraints are further

exacerbated for a significant number of farmers in the highlands and jungle regions of Peru, where they have even more limited access to agricultural inputs, technologies, technical assistance, and markets.

2) *High proportion of subsistence-level farmers:* MIDAGRI identifies subsistence farmers as those who own less than two hectares of land and classifies them either as critical or noncritical family farmers. Critical family farmers do not make use of any agricultural technologies (such as certified seeds, or irrigation), whereas noncritical farmers utilize at least one.
3) *Unsustainable agricultural production and inadequate management of natural resources*: the inadequate management of natural resources in agricultural production is attributed to limited access, improper practices, and insufficient administration of resources such as forests, and water. These resources are essential for productive capacities and the competitive development of agriculture. Inadequate management of natural resources lead to their degradation, which results in a decrease in productivity.

The National Agrarian Policy sets three priority objectives, one directly addressing each obstacle, as well as a total of 14 guidelines (sub-objectives), 22 services to be provided to the agricultural sector to meet the guidelines, and eight coverage indicators, all of which are to be followed up annually in M&E reports by the General Directorate of Statistics, Monitoring and Evaluation of Policies of MIDAGRI.

The **National Strategy for Family Farming 2015–2021 (ENAF)** was a comprehensive policy framework designed to address specific needs and challenges faced by family farmers in Peru, with rural poverty reduction for family farmers at its core. It proposed nine strategic guidelines to achieve the desired outcomes of: (1) increasing productivity levels, (2) increasing food security and social inclusion, (3) increasing the sustainability in the management of natural resources. The nine strategic guidelines of the ENAF are:

1) *Access to factors of production*: promoting access to land and water to improve living standards and productivity and strengthening property rights of family farmers.
2) *Comprehensive support for innovation based on local resources*: enhancing family farmers' access to appropriate and sustainable agricultural technologies.
3) *Strengthening of associativity*: strengthen cooperative networks and associations of family farmers.
4) *Market engagement*: strengthen and expand access from family farmers to local, regional, and national markets.
5) *Sustainable management of natural resources in the face of climate change*: promotes sustainable agricultural practices that conserve biodiversity, protect natural resources, adopt risk management measures against natural disasters and extreme weather events;
6) *Social inclusion and food security*: close gaps centred around the exercise of rights, access to labour opportunities, safe food products.
7) *Greater investment for the provision of public goods with a territorial approach*: expand the coverage and quality of education and health services, water and basic sanitation, and infrastructure in rural areas.
8) *Institutional strengthening*: build and consolidate institutional networks, avoid 'siloing,' promote family farmer organizations and their engagement with the public and private sectors, and civil society.
9) *Knowledge management and innovation:* promote traditional knowledge, develop better understanding of family farming practices, and generate mechanisms to involve the academic community.

ENAF was formalized into the National Family Farming Plan 2019-2021 (Supreme Decree NO. 007-2019-MINAGRI). However, with the outbreak of COVID-19, it is unclear whether M&E activities were carried out for the National Plan. However, Peru has endorsed the UN Decade

of Family Farming 2019-2028, and therefore family farming remains a development priority for the country.

The **Rural and Indigenous Women Entrepreneurship Strategy**, part of the Women & Vulnerable Population Groups Ministry's (MIMP) National Gender Equality Policy framework, is an initiative funded by MIDAGRI that contains two components administered by separate programs within MIDAGRI. The first, administered by the Rural Agricultural Development Program (AgroRural), provides technical support in the formulation and implementation of business plans belonging to rural and indigenous women's organizations. The second, implemented through the Agricultural Competitiveness Grant Program (AgroIdeas), disburses funds to these organizations to empower the enterprises of rural and indigenous women agricultural producers, diversify their incomes, improve their quality of life, and boost local economies (Government of Peru, 2022). The first round of funding occurred in 2022 and has awarded grants ranging from 63,000 *soles* to 130,000 *soles* to 381 organizations representing around 4,700 women. The second round of funding has been approved for 2023 (El Peruano, 2022).

The **National Strategy for the Restoration of Ecosystems and Degraded Forest Lands** (2021-2023) This document establishes a programmatic and orientation tool for the management of the actions that are implemented in affected territories, considering their diverse realities and socio-economic and biophysical contexts and the economic, social and environmental objectives. The strategy is in line with rules on restoration of ecosystems and degraded forest lands established under Ministerial Resolution 338- 2020-MIDAGRI (SERFOR, 2022).

The project is congruent with Peru's national development plans and strategies for the agricultural sector, both past and current, especially as they pertain more so to the economically isolated communities in the Andes. The project contributes towards promoting climate resilient agricultural practices and resource management in the region, building resilience to climate change, diversifying livelihoods and reducing poverty, increasing the inclusion of women, and strengthening institutional capacity and regulatory frameworks.

The **National Livestock Development Plan 2017-2027**, which promotes sustainable livestock, including alpacas. To this end, it promotes the recovery of native grasslands and the planting of cultivated pastures, with the implementation of the "National Pasture and Forage Programme", which is important for improving the quality and production of livestock.

6.1.3 Water Sector Plans and Strategies

Regarding the plans and strategies related to the water sector, the National Water Resources Policy and Strategy – PENRH , is the public instrument that defines and guides the actions of public and private sector entities to guarantee attention to the country's water demand, in the short, medium and long term. It constitutes the instrument of a conceptual and binding nature, which defines the objectives of national interest to guarantee the sustainable use of water resources.

In accordance with the Water Resources Law (article 99) the planning instruments of the National Water Resources Management System SNGRH are the following:

- National Environmental Policy (PNA) - 2009. 4 policy axes
- Policy and National Strategy for Water Resources (PENRH). 5 policy axes, 18 Intervention Strategies, 85 Action Guidelines
- National Water Resources Plan (PNRH) – 2013 11 intervention strategies, 30 programs of measures
- Basin Water Resources Management Plans (PGRHC) – 2013, 6 pilot basins

National Environmental Policy considers that approximately 60% (15 of 24) of the services provided by the ecosystems examined are being degraded or used in an unsustainable manner, the National Environmental Policy considers the decrease of goods and services provided by ecosystems as a public problem that affect the development of people and environmental sustainability.

The services provided by ecosystems are classified as:

i) SUPPORT, basic/sustainability/support services, those necessary to produce other ecosystem services, such as the conformation of habitats, soil formation, nutrient cycles, etc
ii) SUPPLY services, supply/provision/provision, of products obtained from ecosystems, such as food, wood, fibers, water, etc.
iii) REGULATION services, are benefits obtained from the regulation of ecosystem processes, such as climate regulation, pest control, hydrological cycles, etc.
iv) CULTURAL Services, intangible benefits obtained from ecosystems, such as scenic beauty, recreation, relaxation, spirituality, etc.

The National Water Resources Policy and Strategy (PENRH) is a conceptual planning instrument of the National Water Resources Management System (SNGRH). It is made up of a series of public principles, guidelines, strategies, and instruments that define and guide the actions of the public and private sectors, to guarantee attention to demand and the best use of water in Peru, within the framework of the national environmental policy. In this document, five (5) water policy axes are defined, each of which is associated with a series of intervention strategies.

The National Water Resources Plan (PNRH) contains the programs that, in compliance with each of the five axes of policy and strategies of national interest established in the PENRH, allow solving the problems of water management in Peru, establishing the costs and sources of financing, as well as its program of implementation. The meeting of water demands is the common thread of the PNRH.

The Basins Water Resources Management Plans (PGRHC) have the same general objective as the PNRH, but their measures fall within their basin territorial scope, so there should be no interaction between the two plans. Consequently, for the planning process to be efficient at the national territorial level and in the areas of hydrographic basins, these instruments must be coordinated and aligned with the current legal framework for water and with integrated national planning.

The Guidelines for the formulation and evaluation of investment projects of the typology of Water Sowing and Harvesting, is a methodological document for the formulation and evaluation of public investment projects with the typology of Water Sowing and Harvesting within the framework of the National System of Multiannual Programming and Investment Management. The Water Sowing and Harvesting consists in implementing ancestral measures (amunas, qochas, ecosystem restoration, etc.) to collect and infiltrate (sowing) rainwater and runoff (underground, superficial and hypodermal) in the subsoil to be able to capture it (harvest it) sometime later (MIDAGRI, 2022).

In the case of peasant communities and native communities identified as part of the indigenous peoples, the public entity responsible for implementing the action guidelines of the strategies contained in the PENRH or another planning instrument on water, assumes the responsibility of analysing and determine if it is appropriate to carry out a prior consultation process according to the global regulations in this regard.

Water governance

Peru's hydrography is strongly influenced by the presence of the Andes, which shapes a network of 159 basins known as hydrographic units. These units are further grouped into three major hydrographic regions: the Pacific Hydrographic Region, covering 21.8% of the national

territory with 62 basins; the Amazon Hydrographic Region, covering 74.6% of the territory with 84 basins; and the Titicaca Hydrographic Region, covering 3.6% of the territory with 13 basins. Rainfall patterns vary across these regions, with the Pacific Hydrographic Region experiencing scarce or nearly zero average annual rainfall, the Amazon Hydrographic Region receiving around 2,400 mm per year, and the Titicaca Hydrographic Region receiving approximately 700 mm per year.

To facilitate territorial planning and management, the National Water Authority (ANA) has structured the administration of the 159 hydrographic units into 72 Local Water Administration Offices (ALA). These ALAs, in turn, are organized into 14 Administrative Water Authorities (AAA), serving as superior bodies for water resource administration. These administrative structures are decentralized to efficiently manage water resources in the country.

Based on the geographical reality described and according to the needs of the country, the National Water Resources Policy and Strategy (PENRH), proposes as a general objective: Achieve integrated management of water resources at the national level, so that it allows meet present and future demands, as well as guarantee the conservation, quality and availability of water resources and their efficient and sustainable use; with criteria of social, economic and environmental equity; with the participation of the three levels of government from the public and private sectors, organized social actors from civil society and peasant communities and native communities, contributing to the culture of water and the development of the country with a vision of social inclusion and sustainable development.

It proposes the following Specific Objectives:

a. Achieve the conservation of ecosystems and hydrological processes, as well as the determination and planning of water supply and availability in the country.
b. Recover and protect the quality of water resources in natural sources and their ecosystems, as well as the surveillance and control of polluting agents from natural sources at the national level.
c. Timely address the demand for water resources to promote universal access to drinking water within the framework of water security and food security.
d. Promote the integrated management of water resources with a focus on solidarity and sustainable development, as well as their appreciation in a scenario of governability and water governance.

The National Water Resources Plan (PNRH) objectives are: to define the guidelines and the programs of measures, in accordance with the water policy of Peru for the next 22 years, with two planning horizons (2021 and 2035); coordinate water management planning and define solutions to problems of a national nature and interest that go beyond the scope of the Water Resources Management Plans in the Basin (PGRHC).

Given the problem of water resources in Peru and selecting the two most probable scenarios that can reflect the water situation for the two indicated planning horizons, the solutions that will solve these problems were determined. The action measures proposed in the PNRH are within the framework of the planning instruments contained in the Water Resources Law: policies and strategies, organized around the five policy axes, which are defined in the PNRH.

With this conceptual framework, 30 programs of measures were established within the five policy axes, so that the solutions are aligned with the Water Resources Law.

Regarding the Basin Water Resources Management Plans - PGRHC, they correspond to the scope of action determined by the ANA based on the characteristics of the territory and the supply and demand of water resources, and may include one or more adjacent hydrographic basins, whose actors must be represented in the Basins Councils. Its content refers exclusively to the determined territory, it must observe the policies and strategies contained in the PENRH and in the planning and formulation must follow participatory methods.

The PGRHC are aligned with the PNGRH and with the guidelines issued by the institutions that make up the National Water Resources Management System.

6.2 Institutional Frameworks

6.2.1 Agriculture sector institutional framework

The main body of the Peruvian government responsible for the development of the country's agricultural policy is the Ministry of Agricultural Development and Irrigation (MIDAGRI), established based on the Law No. 31075/ Law on the organization and functions of the Ministry, which establishes the legal nature, the scope of competence, the functions and the basic organization of the ministry. The Ministry exercises leadership over the national policies of its area of competence, which are mandatory at all levels of government, in the following matters: i) land for agricultural and grazing use, forest land and fallow land; ii) agriculture and livestock; iii) forest resources and their sustainable use; iv) flora and fauna; v) health, safety, research, extension, technology transfer and other services related to agricultural activity. In accordance with National Environmental Policy 2030 (Supreme Decree 023-2021-MINAM), to increase climate change adaptation, MIDAGRI is in charge in developing infrastructure for sowing and harvesting water from reliable manner for water security.

The following are public bodies attached to MIDAGRI with relevance to the project: 1) National Institute of Agricultural Innovation (INIA); 2) National Water Authority (ANA); 3) National Agricultural Health Service (SENASA); 4) National Forest and Wildlife Service (SERFOR); 5) Sierra Azul Fund; 6) Agroideas, 6) AgroRural, 7) Sub-sectorial Irrigation Program (PSI). The following MIDAGRI´s line bodies will also be relevantfor the implementation: i) General Directorate for Territorial Coordination, ii) General Directorate for Statistics, iii) General Directorate of Livestock Development, iii) General Directorate for Associativity, Financial Services and Insurance, iv) General Directorate of Agrarian Environmental Affairs and the v) Office of Budget and Multiannual Investment Programming Office[23]; and programs:

The institutions whose mandates in the agriculture sector are relevant for the purposes and activities related to the Resilient Puna Project are shown in the table below:

Table 22: Summary of relevant institutions – agriculture sector

Institution	Duties/Functions/Responsibilities	Relevance to this project
Planning, regulation, and coordination		
Ministry of the Environment (MINAM)	Governing body of the National Environmental Management System, responsible for formulating, planning, directing, coordinating, executing, supervising, and evaluating the National Environmental Policy.	Important, as it guides the implementation of the NDCs and the control of their progress. Provides technical support and policy guidance.
Ministry of Agricultural Development and Irrigation (MIDAGRI)	Responsible for formulating, planning, directing, coordinating, executing, supervising, and evaluating the National Agrarian Policy, the Agrarian Planning System, the Integrated System of Agricultural Statistics, as well as for national innovation, health, food safety, physical- legal sanitation, use and development of natural resources in accordance with the National Environmental Policy.	Important, as the ministry will co-finance and will be an executive entity. It oversees activities related to strengthening value chains, environmentally friendly practices, and the sustainable management and transfer of land. Also, the ministry oversees developing infrastructure for

[23] See "Capacity Needs Assessment" document for detailed information.

Institution	Duties/Functions/Responsibilities	Relevance to this project
		sowing and harvesting water for water security
Ministry of Production (PRODUCE)	Responsible for formulating, planning, directing, coordinating, executing, supervising, and evaluating national development policiesand plans related to all levels of production, industry, manufacturing, and fishing.	Important, as it provides leadership for national dialogue and consultations and information gathering processes. Supports activities related to the strengthening of value chains.
Ministry of Women's Affairs and Vulnerable Populations (MIMP).	Responsible for formulating, planning, directing, coordinating, executing, supervising, and evaluating national and sectoral policies with a gender approach.	Important, as it can help support the activities related to gender mainstreaming.
Ministry of Foreign Affairs and Tourism (MINCETUR)		Supports activities related to the strengthening of value chains (handicraft and community-based tourism) Promotes access to international markets
Ministry of Economy and Finance (MEF)	Harmonize economic and financial policy, through transparency and fiscal accountability, contributing to the country's sustained economic growth. Approves and distributes the regular funds of the annual budget to all government entities (national, regional, and local governments, ministries, universities, and other public institutions).	Is the NDA and Evaluates GCF full proposals and gives Non-Objection Letter. It is the governing body of the national public budget system and the national public investment system which are implemented by ministries, local and regional governments.
Ministry of Culture (MINCUL)	Responsible for formulating, executing, and establishing strategies to promote culture in an inclusive and accessible manner, carrying out actions for the conservation and protection of cultural heritage, encouraging all forms of artistic expression, planning, and managing activities with all levels of government that allow the development of the Amazonian, Andean and Afro-Peruvian peoples. Implement the strategy for the identification of indigenous or aboriginal peoples to have sufficient and updated information to achieve their incorporation into the official database of indigenous or aboriginal peoples.	MINCUL can support activities related to the harmonization and dissemination of materials related to ancestral knowledge. It can also support in making capacity-building materials be culturally sensitive and locally responsive. Also, it oversees the issuing of the certificates for the absence of archaeological remains, which will be necessary before implementing local initiatives. Finally, it could provide information about communities
Administration		

Institution	Duties/Functions/Responsibilities	Relevance to this project
National Forestry and Wildlife Service (SERFOR) - MIDAGRI	Responsible for the implementation and enforcement of national forestry and wildlife regulations, the issuance of permits, authorizations, concessions, promotes sustainable forestry and wildlife management	Important, for all activities carried out in forests, and regarding the management of *vicuña*.
National Service of Natural Areas Protected by the State (SERNANP) - MINAM	Responsible for directing and establishing technical and administrative criteria for protected area conservation and for the maintenance of biological diversity. Governs the National System of Protected Areas (SINANPE)	Important, for all activities carried out in Natural Protected Areas inside the target districts of the project. It will co - finance and will be an executive entity
	Operational aspects	
Peasant farmer community representative organizations Women's associations and cooperatives	Advocate for the welfare of rural communities, promote cultural heritage, defend land and natural resource rights, participate in decision-making processes that affect communities. Promote women's rights, their economic empowerment through income diversification and economic independence to improve their livelihoods, particularly those of rural and indigenous women.	Important for the supply of information related to local communities (land tenure, statutes, economic activities, traditional land management practices), and for facilitating local stakeholder consultation and engagement with communities.
Profonanpe	Private non-profit organization, specialized in attracting and managing financial resources efficiently, aimed at implementing programs and projects that contribute to the conservation of biodiversity, mitigation and adaptation of climate change. Profonanpe is the only environmental fund in Peru which is a direct access entity accredited to the GCF.	Important, it will be an executive entity. Profonanpe will host the Puna Facility. The Puna Facility will support the alignment, mobilization, and upscaling of private funding to finance EbA measures on the ground and Climate Resilient Value Chains.
Instituto de Montaña	Is an NGO that supports men and women in mountain communities so that they can prosper in healthy environments based on sustainable economies, ecosystem conservation, research and innovation, all founded on their own cultures and spirituality.	Important, It will be executive entity, it will implement activities of output 1.2 supporting communities enhance engagement for monitoring and observation systems to measure impact of EbA investments
AgroRural, Agroideas, Sierra Azul Fund, SENASA, PSI, INIA, Sierra y Selva exportadora	Programs operated by MIDAGRI aimed at promoting agricultural development, rural livelihoods, and sustainable practices by providing financial support, technical assistance, capacity building, and market access to farmers. Support the implementation of sustainable land management practices, reforestation	Important, because they are the programs that will provide co-finance to the project. Within the framework of implementation, work will be done on the alignment and complementarity between the activities and outcomes

Institution	Duties/Functions/Responsibilities	Relevance to this project
programs - MIDAGRI	initiatives, biodiversity conservation, and climate resilience for rural communities.	of the project. with the existing programs.
Institutional and territorial support		
Regional Management Committees for the Agrarian Sector (CGRA) - MIDAGRI	The CGRAs aim to promote territorial agricultural development, through the coordinated and articulated participation of the different territorial actors, such as regional governments, local governments, other sectors involved in the territory and civil society linked to agriculture and irrigation.	The CRGAs of Arequipa, Puna, Cusco and Apurimac are relevant stakeholders in this project. They will be a good channel for communication of project activities and articulation with sectorial actors. Important in facilitating engagement with local stakeholders, and to ensure that regional needs are in alignment with national agricultural policies and programs.
Regional and local governments	They contribute to the planning, financing and execution of works and actions to support development for economic growth, social justice, and sustainability in the territory. Regional Governments of Puno, Arequipa, Cusco and Apurimac will be part of the multilevel governance in the territory. They are responsible for the development of Regional Climate Change Strategies and Regional Adaptation Plan for the agrarian sector.	Important, as they can participate in consultation processes, information gathering at local and regional levels, and the design and implementation of activities and regional and local levels. Also, they will receive training on how to develop public climate resilient investment projects, plans, etc.

Key institutional challenges persist in the administration of the agricultural sector. There is weak coordination in the planning and management of land, grasslands, and forest resources, affecting ecosystems and local livelihoods. There is little or no alignment and coordination among stakeholders to reinforce positive impact in the field, and upscale sustainable business models that work. For example, government-led programs such as AgroRural, and Sierra Azul Fund promote similar activities on the ground, however their operating units establish ad-hoc, short-term “siloed” goals without seeking synergies with other programs, with no alignment of public and private financing flows. Also, there is limited ability to coordinate with other sectors for interventions in the territory.

There is also a lack of available scaling-up mechanisms and accessible platforms for dissemination of best practices. Also, extension approaches remain vertical (generates package and delivers it), not necessarily favouring adoption, adaptation, and co-innovation. For example, successful experiences in local landscape management with support of MINAM and local and regional government authorities such as the implementation of EbA in the landscape reserve of Nor Yauyos Cochas are not widely known. Similarly, technical, institutional, and financial structures to scale up successful activities at country level do not exist. There is no institutionalized space for the agriculture sector to collect demands from peasant communities. For example, participatory processes to assess climate vulnerability and establish internal zoning agreements and management plans as well as monitoring progress and resilience building through ecosystem services have been successful in the context of previous projects in other areas but have not been replicated in the SHAP.

There is little or no policy and regulatory framework for the enforcement of EbA and gender approaches and climate resilient bio-friendly value chains. The procedures and tools to operationalize them considering the role and functions of those who should be implementing activities are just being developed and need support to be tested. As an example, MIDAGRI has several lines of subsidies (incentives) with public resources, however, in some cases they have not been designed according to the context of the high Andean areas (they are generally designed on a national basis) and do not contribute to improve climate resilience. There are no specific mechanisms or protocols to raise private sector funds for the recovery and conservation of high Andean ecosystems that are used in the agricultural sector. Although advances in MERESE scheme regulatory framework have been made to increase water regulation ecosystem services, legal constraints persist, for example regarding the implementation modalities and enabling flow of rewards towards the ecosystem service providers.

Likewise, MIDAGRI does not have institutionalized methodologies to monitor and evaluate interventions for ecosystem recovery in the SHAP. For example: there is no approved methodology to evaluate the change in condition of degraded grasslands, nor even well designated indicators for monitoring and evaluating effectiveness of the interventions. There is also no efficient system for monitoring and reporting on sectoral commitments for NDCs.

Finally, there is limited enabling framework for financing EbA measures. Financial institutions perceive the investment risk of the agricultural sector as too high, and rarely develop products and services adapted to the needs of vulnerable populations. When available, the financing instruments to encourage EbA measures come at a very high cost, with requirements that limit the participation of the majority of smallholder and vulnerable farmers.

6.2.2 Water sector institutional framework

The Law Nº 29338 creates the National System for the Management of Water Resources (SNGRH) to conduct integrated management and conservation processes of water resources in basin areas, the ecosystems that compose them, and associated assets, establishing spaces for coordination and dialogue between public administration entities and the stakeholders involved.

The SNGRH includes the National Water Authority; the Ministries of Environment, Agrarian Development and Irrigation ,Housing, Construction and Sanitation, Health, Production, and Energy and Mines; regional governments and local governments through their competent bodies; agricultural and non-agricultural user organizations; hydraulic sector operating entities, both sectoral and multisectoral; rural communities and native communities; and public entities linked to water resources management, such as regulatory and supervisory institutions.

The institutions whose performance in water management is relevant for the purposes and activities related to the Resilient Puna Project are shown in Table 233.

Table 23: Summary of relevant institutions – water sector

Institution	Duties/Functions/Responsibilities	Relevance to this project
Planning, regulation, and coordination		
Ministry of the Environment (MINAM)	Governing body of the National Environmental Management System, responsible for formulating, planning, directing, coordinating, executing,	Important, as it guides the implementation of the NDCs and the control of their progress.

Institution	Duties/Functions/Responsibilities	Relevance to this project
	supervising, and evaluating the National Environmental Policy.	.
Ministry of Agricultural Development and Irrigation (MIDAGRI) – National Water Authority (ANA)	Responsible for the development of the National Agrarian and Water Resources Policy and Strategy.	Important, as it oversees the implementation and control of actions contained in the Agrarian and Water Resources Law. Also, it organises Basin Water Resources Councils - CRHC, important platforms for scaling the EbA approach and increase the community's participation in decision making processes.
Regulators		
Presidency of the Council of Ministers		
National Superintendence of Sanitation Services (SUNASS)	Regulates and supervises the provision of drinking water and sewerage services, approves rates, protects the interests of users, Sanitation Service Providers, and the State.	Important, as it can help improve the collection of resources by employing the Mechanisms of Rewards for Ecosystem Services (MERESE).
Administration		
ANA – National Water Authority – MIDAGRI Territorial organization: 14 Administrative Water Authorities (AAA) 71 Local Water Authorities (ALA)	Plans the management, administers, monitors the natural sources of water, authorizes its concession for human consumption and other purposes, grants water use rights, authorizes discharges, reuse of treated wastewater, authorizes works in natural sources. It is the governing body of the SNGRH, directs the formulation of HR Management Plans in hydrographic basins. It leads the National Water Resources Information System (SNIRH).	Very important in the planning and management of water resources, in legal and administrative aspects of granting rights and licenses related to water usage. In the areas of intervention, they act through the AAA and ALA.
Operational aspects		
User boards, irrigation boards, irrigation committees and	They are responsible for the collection, conveyance, and distribution of water	It is part of the Andean collective culture for communities to organize

Institution	Duties/Functions/Responsibilities	Relevance to this project
rural and native communities	intended for agricultural purposes by holders with recognized rights. They assume responsibility for the operation and maintenance of the hydraulic infrastructure that is at their service for the provision and distribution of the resource.	communal work gatherings for the construction and/or maintenance of water management infrastructure, registering participants' work to acknowledge their rights. They have priority in the allocation of water after the ecological flow.
Water and Sanitation Service Provider Entities (EPS)	Provision of drinking water services, sanitary sewerage, wastewater treatment for final disposal or reuse, and sanitary disposal of excreta in urban areas. They assume ownership of the water use rights of the populations they serve. They are responsible for collecting the contributions for the MERESE (Mechanism of Payment for Ecosystem Services)	Very important for the future sustainability of the actions that the project will undertake. Important for the care of water for human consumption in communities and small rural populated centres.
Sanitation Services Administration Board (JASS)	Social organization of neighbors and users, they oversee the operation of the infrastructure of water supply services in rural and native communities and in small, populated centres in rural areas.	
Institutional and territorial support		
Regional and local governments	They contribute to the planning, financing and execution of works and actions to support the regulation and management of water resources for human consumption, agricultural production, and other productive and social uses in the territories under their responsibility. The Regions promote the constitution of the Basin Water Resources Councils and preside over them. Together with the municipal mayors and other members of the Council, they participate in the identification of problems in water management and in the formulation of basin water resource management plans.	Their support is important in regulating the occupation and uses of the territory. Regions and municipalities have the capacity to allocate financing to replicate successful project activities in areas not prioritized by it. They can also assume the financing of complementary activities not covered by the project or partially covered.

Some of the institutional challenges include weak coordination in the planning and management of water supply, an incomplete implementation of planning and management mechanisms for water supply as outlined in the Water Resources Law, and the absence of effective coordination platforms among the entities comprising the National Water Resources Management System. There is also an inadequate representation and insufficient participation from institutions directly involved in watershed management within the organization of Basin Water Resources Councils, for example only one community representative is part of this council, when there is no mechanism to ensure that this representative can ensure adequate communication with his or her constituents. Moreover, there is limited information and weak communication among the entities involved in water resource management, restricting active participation of regional and local governments in the National Water Resources Management System (SNGRH).

Some of the challenges and avenues to improve institutional capacity include the strengthening of institutional coordination between public and private entities involved in the planning and management of water resources, particularly the water supply, as well as the establishment of effective horizontal and vertical coordination platforms among the entities comprising the National Water Resources Management System.

Water resources and water-related ecosystems, currently, there is an inadequate allocation of financial resources to support water management. This generates inefficient and inadequate water use. To tackle these, enhancing the appreciation and conservation of water and ecosystems located in the headwaters of watersheds to increase public and private investment for their restoration and conservation. Similarly, improve water regulation that improves water availability in the dry season and improve water use efficiency can contribute to better water management.

6.3 Sectoral Policy and Regulations

6.3.1 Agriculture Sector Policy and Regulation

Peru places an increasing importance in transforming the agrarian sector along the lines of the National Agrarian Policy 2021-2030. This requires significant investments in institutional and human capacities, strengthening, institutional coordination, promotion of public-private partnerships and supporting smallholders access to financing and to markets, and their integration into sustainable value chains.

Peruvian policies focus on supporting smallholder farmers and rural communities. Initiatives include providing access to credit, technical assistance, infrastructure development, and promoting value chains to enhance the competitiveness and productivity of small-scale agricultural activities. Peru has also implemented trade policies and agreements to facilitate market access for agricultural products. The country has signed free trade agreements with several nations, including the United States, Canada, and the European Union, promoting agricultural exports and international competitiveness.

Peru has also recognized the importance of environmental sustainability in the agricultural sector. Efforts are being made to promote sustainable land use practices, conservation of biodiversity, and the adoption of climate-smart agricultural techniques to mitigate the sector's environmental impact.

Policy highlights:

The “Action Plan in the Agricultural and Irrigation Sector for the implementation of state purchases of food of origin in family farming" is a national plan with the objective to identify and plan the activities and actions for the implementation of Law 31071 on the organization

and functions of MIDAGRI and its Regulations in order to efficiently carry out the processes of state purchases of food from family farming.

The National Forest and Wildlife Policy is a policy that aims to contribute to the sustainable development of the country through an appropriate management of the National Forest and Wildlife Heritage, while ensuring its sustainable harvesting, conservation, protection and increase, in order to deliver goods and services of forestry ecosystems, other wild flora and fauna ecosystems, in harmony with the social, cultural, economic and environmental interests of Peru.

The "Business and Biodiversity Initiative" commits to the promotion of competitiveness through its National Biocommerce Program. Its aim is to promote and support the generation and consolidation of businesses based on native biodiversity, applying sustainable environmental, social, and economic criteria in accordance with the objectives of the Convention on Biological Diversity (CBD) and the National Biodiversity Strategy, such as through the promotion of EbAs.

At regional and local levels, the Concerted Development Plans (PDCs) have a 10-year planning horizon, however few of these plans were elaborated based on an inclusive dialogue between the stakeholders in each territory, and in most cases these plans are not specifically used in order to prioritize and manage investments based on common territorial goals.

Other policies relevant to the agriculture sector include: (i) National Strategy on Climate Change (Supreme Decree 011-2015-MINAM); (ii) National Plan of Climate Change Adaptation of Peru (Ministerial Resolution 096-2021-MINAM); (iii) Intervention Strategies for 2030 of the National Program of Forest Conservation (Resolution of Executive Coordination 028-2020-MINAM/VMDERN/PNCB).

A supranational policy platform currently in development and endorsed by other countries in the Andean region of South America besides Peru—Argentina, Bolivia, Colombia, Chile, Ecuador, and Venezuela—is the Andean Mountain Initiative (IAM), which strives to promote sustainable development and conservation in mountain ecosystems.

Legal and regulatory highlights

Law on the Associations of Producers into Agricultural Cooperatives (Law No. 31335). The law aims to provide a regulatory framework that allows the organizational strengthening, promotion of agricultural cooperatives of users and their integration agencies, providing them in turn with a tax regime that responds to their nature and the type of acts they carry out with their partners. The Law defines the requirements for the constitution of an agrarian cooperative and their governance mechanism. The law also provides for the creation of the National Council of Agricultural Cooperatives (CONACA), under MIDAGRI, which is the highest-level body in charge of the coordination, planning, promotion, and research of the agricultural cooperative activity of users in the country.

Law on the Promotion of the Family Farming (Law No. 30355). The law aims to establish the responsibilities of the state in the promotion and development of family farming, based on the recognition of family farming and its importance of its role in food security, in the conservation of agrobiodiversity, in the sustainable use of natural resources, in the revitalization of local economies, in the contribution to rural employment and the validity of communities.

Legislative Decree on the Promotion of the Organization of Agricultural Producers and the consolidation of rural property for agricultural credit (Legislative Decree No. 1020). This Legislative Decree establishes the regulatory framework to promote the organization of agricultural producers and the consolidation of rural property to expand access to agricultural credit and promote competitiveness, reconversion, and modernization of the agricultural sector.

Legislative Decree on the General Law of Agricultural Health (Legislative Decree No. 1059). This General Law of Agricultural Health aims to prevent, control, and eradicate pests and

diseases in plants and animals which represent a risk to life, the health of people and animals, and the preservation of plants; promote favorable sanitary conditions for the sustainable development of agro-export; regulate the production, marketing, use, and final disposal of agricultural inputs.

Organic Law for the Sustainable Use of Natural Resources (Law No. 26821). The law aims to regulate the regime of sustainable use of natural resources, establishing its conditions and the modalities of granting to individuals, and aims to promote and regulate the sustainable use of natural, renewable, and non-renewable resources, establishing an adequate framework for the promotion of investment, seeking a dynamic balance between economic growth. Natural resources include water, surface and underground; soil, subsoil and land for their greater capacity for use (agricultural, livestock, forestry and protection); biological diversity (species spectrum; minerals etc).

General Law of Peasant Communities (Law No. 24656). This law declares the integral development of peasant communities of national necessity and social and cultural interest, recognizing them as fundamental democratic institutions, autonomous in their organization, communal work and land use, as well as economically and administratively. Consequently, the state guarantees the integrity of the right of ownership of the territory of such communities and promotes the organization and operation of communal enterprises.

Law on the Sustainable Management of Pastures for the Development of Livestock (Law No. 31804). The aim of this law is to ensure that grassland coverage in different ecosystems is adequate for livestock production in the face of increasing climate change hazards. It will promote the recovery and sustainable management of natural pastures because of its role in livestock production, and as the base of smallholder farmer's livelihoods. This will be achieved through the implementation of actions such as restoring degraded pastures, promoting sustainable livestock production that does not impact pastures, improve water, soil management, and promote the development of additional income sources from livestock derivatives for farmers.

6.3.2 Water sector Policy and Regulation

The political framework for water and natural resources management is established in the Political Constitution of Peru, whose article 66 states, "Renewable and non-renewable natural resources are the heritage of the Nation. The State has sovereignty over their use. By means of an organic law, the conditions for their utilization and grant to individuals are established. Concession grants the holder a real right, subject to said legal norm". This is reaffirmed in article 73, which states, "Public domain assets are inalienable and imprescriptible. Goods for public use can be granted to individuals in accordance with the law, for their economic use", without transferring of ownership.

The national framework is complemented by State Policies (National Agreement Forum, 2023), such as Policy No. 33, "State Policy on water resources", which; i) emphasizes that water is essential for the life and human development of current and future generations; ii) sets the main objectives of the Peruvian State regarding water, a resource considered the heritage of the Nation, and iii) determines access to drinking water as a fundamental right of the human being. It establishes that "no person or public or private entity can claim ownership of the water."

The following State Policies are also directly or indirectly linked to water management: Policy No. 15 "Promotion of Food Security and Nutrition"; Policy No. 19 "Sustainable Development and Environmental Management"; Policy No. 32 "Disaster Risk Management", and Policy No. 34 "Territorial Planning".

In accordance with the provisions from the Political Constitution of Peru, community regulations, and the Water Resources Law, rural communities and native communities have the right to use the existing water or that naturally flows through their lands, as well as the basins where it originates, for economic, transportation, survival, and cultural purposes. This right is inalienable, prevailing, and exercised in accordance with the ancestral customs and traditions of each community.

Legislation for water management is specified in the Water Resources Law (Law No. 29338) and its Regulations. This legal framework considers the National Water Resources Management System (SNGRH) as a platform composed of institutions, principles, norms, procedures, and instruments, through which the State develops and ensures the decentralized implementation of IWRM in Peru. Its conformation and functions have been described in the previous section.

The legal nature of the right to water and access to natural resources linked to its management is established in Law No. 26821, Organic Law for the Sustainable Use of Natural Resources, and in Law No. 29338, Water Resources Law, which regulate the granting of licenses for the use of these public assets to individuals, for their use for social and/or economic purposes.

The National Agricultural Policy (Supreme Decree 017-2021 MIDAGRI) is also a tool for water resources planning. Under Priority Objective 3, Guideline 3.1, Service 3.1.3, which pertains to the provision of infrastructure for water storage and harvesting in agricultural production, it considers operational activity AO4: "management of the implementation of public investment projects in water storage and harvesting."

Likewise, the National Water Resources Policy and Strategy (PENRH), a binding instrument that defines objectives of national interest to guarantee the sustainable use of water resources, based on the five axes of water policy: quantity management, quality management, opportunity management, water culture management, and adaptation to climate change and extreme events, and the National Water Resources Plan (PNRH), a planning instrument of the National Water Resources Management System (SNGRH), which is formulated on the basis of the diagnostics of each basin and is the implementation tool of the PENRH. It contains the objectives, strategies, guidelines, and policies that seek to achieve the integrated management of water resources (IWRM).

Furthermore, to secure financial resources exclusively for the restoration and conservation of ecosystems, the Law 30215 – Mechanism of Payment for Ecosystem Services (PES/MERESE) was enacted in 2014. Its objective is to promote, regulate, and supervise mechanisms for payment for ecosystem services resulting from voluntary agreements to carry out conservation, recovery, and sustainable use actions that ensure the permanence of ecosystems with the contribution of users of the services provided.

MERESE promotes private economic contributions towards actions for the restoration and conservation of ecosystems and services that produce social, economic, and environmental well-being, direct and indirect, for people, such as water regulation, conservation of biodiversity and genetic resources, carbon sequestration, landscape beauty and soil recovery, among others.

In 2017, the Ministry of the Environment and the Ministry of Economy and Finance approved the INVIERTE.PE system, through the INVIERTE.PE system, which is a national system for multiannual programming and investment management (Minisrry of Economy and Finances, 2017). The relevant principle that guides the INVIERTE.PE system is that investments should aim to close the “infrastructure gap” and increase access to public goods and services. Investments should provide infrastructure or services necessary for the country’s development, with a territorial and regional focus, and the resources aimed at this investment should procure the greatest impacts for society. This includes regulations to consider public investment, the restoration and maintenance of ecosystems linked to the conservation of biodiversity, protection of water resources and erosion control, through entities of the national government, regional governments, and local governments.

These national policies and legislation promote and facilitate interventions in the restoration and protection of ecosystems linked to biodiversity conservation and water regulation. They recognize and protect the rights of rural and indigenous communities to the use and disposal of natural resources in their territory to improve their quality of life. The public investment frameworks, such as MERESE and INVIERTE.PE promote the allocation of public funds and the direction of private contributions to the restoration and protection of ecosystems, especially those at risk. Overall, there is a strong legal framework and instruments that protect the right to access water and promote investments in ecosystem restoration and protection.

However, there is a distinct lack of effectiveness in coordination platforms among responsible institutions, and platforms for coordination and protection of the rights of water supply managers. Additionally, there is a lack of enforcement/penalization of inappropriate water use and management.

6.3.3 Payment for Ecosystem Services (MERESE) - Policy and regulation

According to MINAM (2022), initiatives related to payment for ecosystem services (MERESE, in Peru) started to be introduced 2004 in the San Martín region, with the encouragement and participation of the regional government, civil society and international cooperation. In the case of the MERESE implemented with the Service Provider Entities[24], pilot projects in EP Moyobamba and EP Cusco were developed in 2012 by MINAM, with the support of Forest Trends. These MERESE schemes were aimed at the conservation, recover and sustainable use of ecosystem services.

These experiences served as the basis for the development of regulations that allow their implementation at the national level. Thus, MERESE schemes have been regulated since 2014 with the approval of Law No. 30215, Law on Retribution Mechanisms for Ecosystem Services, and its subsequent regulation (DS No.009-2016-MINAM), as well as its modification in 2021 (DS No.033-2021-MINAM).

The objective of the Law on Retribution Mechanisms for Ecosystem Services (Law No. 30215) is to define payment for ecosystem services, which are ““the direct and indirect economic, social, and environmental benefits that people obtain from the proper functioning of ecosystems”. In the same way, it defines the compensation mechanisms for ecosystem services, as "the schemes, tools, instruments, and incentives to generate, channel, transfer and invest financial and non-financial resources, based on agreements between “contribuyentes” and the “retribuyentes”, for conservation, recovery, and sustainable use of ecosystem services”. “Contribuyentes” are considered those who manage, recover and conservate ecosystem services, and “retribuyentes” are those which obtain a social, ecological, and financial benefit, and thus compensate contribuyentes.

The Supreme Decree No. 009-2016-MINAM, which approves the Regulations of Law No. 30215, Law on Retribution Mechanisms for Ecosystem Services, approved by Supreme Decree No. 009-2016-MINAM, along with its subsequent modification, specifies the functions and roles of MINAM and indicates which ecosystems services can be part of MERESE schemes, such as water regulation (relevant to this project)[25]. The modified definition for

[24] Public companies providing water and sanitation services in Peru.

[25] See Project activities - MERESE schemes will be strengthened for water regulation with Service Provider Entities under Activity 2.1.2.

MERESE schemes in water regulation defines them as “those that, through the management and implementation of conservation, recovery and sustainable use actions and/or traditional ecosystem practices, generate, increase or improve the quantity of water and its opportunity for population, agricultural, energy, aquaculture, industrial use, among others.”

Likewise, it specifies the participation of Service Provider Entities as “remunerators” for water regulation MERESE schemes. It indicates that the conditions for the administration of the resources collected are established through the tariff resolution; being able to formulate, evaluate, approve, and execute public investment projects, as well as pay the costs of operation and maintenance.

6.4 Agriculture and Water Sector Financing

6.4.1 Agriculture Sector Financing

The agricultural sector in Peru represents only 7% of the country’s GDP, but it is still considered by the government as a key sector to ensure economic diversification and development. However, public investments in the sector are still considered low. The government’s official budget dedicated to the sector in 2023 continues representing, on average, only 3% of the total amount (Agronoticias, 2023). The total budget of 6856 million soles for the agricultural sector will be divided in different project categories, such as irrigation infrastructure (S/. 176.3 million), productive agriculture (S/. 17.9 million), and others (El Peruano, 2023).

Rural development is also constrained by, among other issues, the limited access to financial services and markets (IFAD, 2018). Although there are some government and private sector programs to provide credit to smallholder farmers in Peru, in the early 2010s, Agrobanco estimated that the financing gap was of approximately S/. 16 billion (Nolte, 2015). Moreover, according to the National Agricultural Census from 2012, only 8.2% of family farms producers applied for formal credit (INEI, 2012). In 2020, the credits dedicated to the agricultural sector reached only 5.63% of the total credits placed by the formal financial systems (Ruiz, 2021).

Similarly, according to a review of 92 public and private financial institutions in Peru regulated by the national banking and insurance superintendency (SBS, in Spanish), it was found that only a third of these offer a green financial product in their services, and these are deemed to be inadequate for small-scale family agriculture (HELVETAS Swiss Intercooperation, 2023) . The high interest rates, the lack of guarantees and limited technical capacity are some of the main reasons why farmers do not apply for credits.

From the supply point of view, there is limited knowledge and understanding on the characteristics of smaller-scale agriculture, and of financing climate change adaptation actions, in both financial institutions regulated and not regulated by the SBS (HELVETAS Swiss Intercooperation, 2023) . In a range of interviews with executives and experts from entities such as CMAC, COFIDE, COOPAC and Agrobanco (amongst others), it was stated that small scale agriculture is perceived as a high-risk activity in these regions, and despite pilot initiatives such as CMAC Ica [26], generally these pilots had not had an impact on the appetite for risk, particularly due to a low capacity to withstand it in the first place. The main barriers are thus the limited knowledge about the sector and climate change resilience and adaptation and the high perceived risks. This results in a large gap in financing small-scale agriculture in the Andean region, with regulated offer only covering 15% of potential demand. (HELVETAS Swiss Intercooperation, 2023)

The main institutions involved in the agriculture sector financing in Peru are:

[26] More information on CMAC Ica can be found here

- **Agrobanco:** Established in 2001, it is the national financial institutions dedicated to promoting the development of the agricultural sector. Agrobanco offers a wide range of credit products, almost of them are individual, but there are also credit lines that include the participation of organizations. It includes a credit line dedicated to women farmers (Crédito AgroMujer) and a fond to promote financial inclusion of smallholder farmers (FIFPPA). The bank is also responsible for administrating the Agroperú fund.
- **Private financing institutions:** Private institutions such as Compartamos, Proempresa, Confianza, and others, raise resources from the public and specialize in facilitating the placement of first securities issuances and providing financial advice to different economic sectors, including agriculture. According to data from the Superintendency of Banking, Insurance and AFP (SBS), between January and March 2023, only 4.9% of the direct credit issued by these institutions was related to the agricultural sector (SBS, 2023).
- **Rural Savings and Credit Banks (CRAC):** The CRARs began operating in 1993 and are multi transactions nonbank financial institutions, regulated by the SBS and authorized to grant credits and attract deposits from clients (Pacheco, Porras, Mego, & Infante, 2017). The are focuses primarily in the agriculture sector.
- **Municipal Savings and Credit Banks (CMAC):** The CMAC were first established in 1980s, with technical support from international institutions and local banks, which incorporated lines of financing for small and micro-enterprises, identifying business units with formality potential. They public companies from provincial municipalities, have economic, financial, and administrative autonomy and are organized in a federation at the national level. They are the main source of formal microcredit in Peru (Maisch, 2000).
- **Small and micro business development companies (EDPYME):** EDPYME are entities specialized in microfinance and were created with the idea of regulating the NGOs that worked in this activity and that had been growing continuously. The purpose of EDPYMES is to grant financing to individuals and legal entities that carry out activities classified as small and microenterprise, using their own capital and the resources that come from donations (Quispe, 2013).

6.4.2 Water Regulation Ecosystem Services Financing

The information recorded in the publication “Recovering Fluidity”, published by the National Institute for Glacier and Mountain Ecosystem Research (INAIGEM) (Cerdán, Smith, Camacho, & Grados, 2022)**,** covers the period between 2008, the year of the creation of the Ministry of Environment, and 2021, when results of various measures taken by the government and committed actors in allocating public funds and promoting investments in the restoration, protection, and sustainable management of ecosystems linked to water resources capture and regulation started to bear fruits, as previously discussed.

During the study period of 14 years, a total of 175 approved projects for natural infrastructure for the restoration and conservation of ecosystems linked to water regulation have been identified. These projects had a total value of S/. 850 million, of which S/. 497 million, representing 58% of the approved amount, was executed until December 2021.

Table 24: Composition and actors of the amount executed for natural infrastructure projects (2008 - 2021)

Executor	Amount (millions of Soles)	Percentage
Regional governments	236	48
Local governments	165	33
National government	55	11

International Development and Cooperation	28	6
Private actors	7	1
Water and Sanitation Service Providers (EPS)	6	1
Total	**497**	**100**

(Cerdán, Smith, Camacho, & Grados, 2022)

The main actors for carrying out the actions were the rural communities located in the surroundings of the intervened ecosystems, who received financial support through the following management actors:

1) National government including MIDAGRI with Sierra Azul, Agrorural and MINAM.
2) 13 Regional governments, which lead the number of water-related projects and the highest percentage of investments executed (S/ 236M), amongst which are the regional governments of Cusco, Huancavelica, Ica, Apurimac. The Regional Commonwealth of Los Andes also participated, made up of the regional governments of Apurimac, Ayacucho, Huancavelica, Ica, and Junín.
3) 37 Local governments occupy the second place in the execution of investments, the local governments that executed the largest amounts are in the Cusco Region but not in the chosen project intervention districts.
4) Water utilities which executed the resources collected by MERESE: SEDAPAL - Lima, SEDACusco, EMUSAP Abancay.
5) International cooperation with donors whose funds were executed through: Guamán Poma de Ayala Education and Communication Centre, The Nature Conservancy, Association for Research and Integral Development.
6) Private sector with donors such as Quiroz Water Fund – Chira, with technical support from Nature and Culture. Anglo American Quellaveco Company. Mitsubishi Corporation Foundation for the Americas.

Based on a review of the identified projects aimed at restoring, protecting and managing water regulation and availability, multiple challenges were identified to successfully invest in such activities (Cerdán, Smith, Camacho, & Grados, 2022):

- Long waiting times for the disbursement of funds: The Peruvian State is the largest executor of the projects and the entities that approve the fund disbursement take an average of one year between the declaration of feasibility of the project and the first disbursement.
- Inadequate monitoring of the ecological and hydrological benefits of the projects. It is necessary to consider in the project specialized personnel, methodology and appropriate equipment to analyze and measure the effects and impacts produced by projects.
- The participation of stakeholders that contribute to financing the restoration and conservation of ecosystems, such as service provider companies that are not yet participating, companies that generate hydroelectric power, metallic and non-metallic mining companies, industries that consume water, especially those that use it as a production input.
- Incorporate the participation of regional and local governments that are not yet involved in ecosystem restoration and conservation actions.

In 2017, on the recommendation of the Ministry of the Environment, the Ministry of Economy and Finance, within the framework of the National System of Multiannual Programming and Investment Management - INVIERTE.PE, (created to reduce social gaps and of the society, through the selection of project portfolios according to the needs of the population), approved regulations to allocate public investment aimed at Investment Projects and Optimization

Investments, Marginal Expansion, Rehabilitation and Replacement - IOARR, intended for the restoration and maintenance of ecosystems linked to the conservation of biodiversity, protection of water resources and erosion control. This mechanism is applied through entities of the national government, regional governments and local governments (INVIERTE.PE). It is a line of public investment that we must take into account, because it is available to regional and local governments that present ecosystem restoration or conservation projects.

6.4.3 Payment for hydrologic Ecosystem services conservation (MERESE) [27]

MERESEs are instruments that allow the generation, channeling and investment in actions aimed at the conservation, recovery and sustainable use of ecosystems as a source of ecosystem services through voluntary agreements between contribuyentes and retribuyentes. A MERESE can be designed based on one or more ecosystem services. In Peru, Payment for hydrologic ecosystem services conservation has been named those that support the recovery and conservation of ecosystems that contribute to guarantee the provision of water services in quantity, quality, and regularity for the benefit of local populations.

Sanitation Service Providers (water utilities) may be retribuyentes for the ecosystem services provided by the river basin and/or aquifers in their watershed and/or the aquifers within their scope or other ecosystems from which they benefit, allowing them to provide drinking water services.

At the national level, there are 50 water utilities that are spread across 24 regions of the country. 43 of these have incorporated MERESE funds into their tariffs. According to MINAM (2022), the process of developing MERESE initiatives in service provide entities began in 2013, with Sedacusco.

In 2020, there were 54 MERESE schemes in the water sector. An analysis by MINAM (2022) found that 76% of them were led by public sector entities, of which 92% are under Service Provider Entities' responsibility. Until 2013, water MERESE schemes were led by civil society, NGOs, and international development agencies (47%).

In the project intervention region (Arequipa, Apurímac, Cusco, Puno and Lima), there are 13 Service Provider Entities, 46% of them have integrated MERESE funds. Those that do not have MERESE schemes are in the Puno region primarily. The project will focus in the following five EPS with available MERESE Scheme:

Table 25: Service Provider Entities in the water sector in the project intervention area

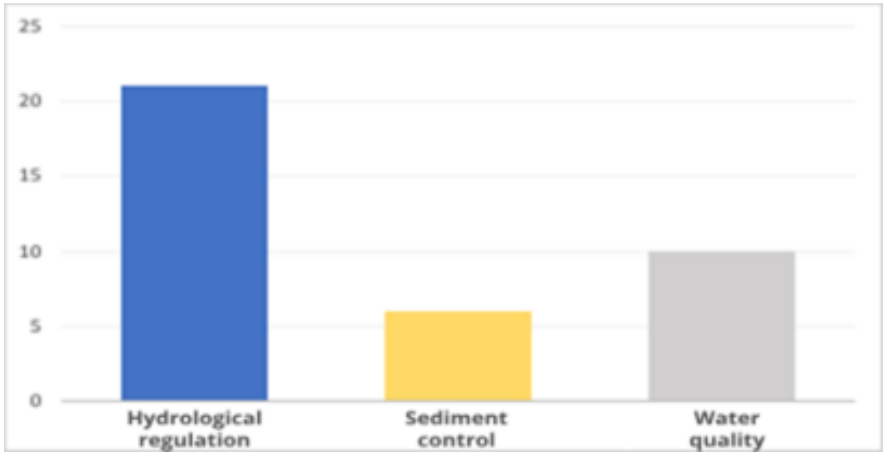
No.	Service Provider (Water utilities)	Region	Province	Basin	Availability of MERESE Scheme
1	EMUSAP Abancay S.A.	Apurímac	Abancay	Cachimayo, Rontococha, Simpe	Yes
2	SEDAPAR S.A.	Arequipa	Arequipa Caylloma	Quilca, Vitor, Chili	Yes
3	EMAPA Cañete S.A.	Lima	Yauyos	Cañete	Yes
4	EMSAPA Calca S.A.	Cusco	Calca	Cochocc	Yes

[27] See the separate MERESE report document for a detailed analysis.

5	SEDACusco S.A.	Cusco	Canas, Canchis. Melgar, Quispicanchis	Vilcanota	Yes

Nationwide, there were, as of 2022, 23 water projects being executed under MERESE schemes, aimed at improving water availability through conservation and rehabilitation of water sources.

Figure 53: Focus of water projects under MERESE Service Provider Entity schemes. From left to right: hydrological regulation, sediment control and water quality.



(SUNASS, 2022)

These 23 projects amount to 44% of collected revenues from the Service Provider Entities, corresponding to S/.138,537, 425. A quarter of these projects are still in the implementation phase. (SUNASS, 2022)

7 Project Baseline and Barriers

7.1 Baseline and Problem Analysis

7.1.1 Problem Statement

Climate change and unsustainable management of productive practices has been affecting and degrading the Puna ecosystems (peatlands, wetlands and grasslands) and the services they provide in the Southern High Andes of Peru (SHAP). Fewer rains and longer drought periods have contributed to glacier melting, threating the livelihoods of approx. 4,5 million people in SHAP and the water security of millions more downstream.

The communities in the SHAP are characterized by their vulnerabilities such as low levels of development, dependence on subsistence agriculture and husbandry practices, limited economic opportunities, and overall high vulnerability to climate change. They are losing their traditional knowledge and are abandoning ancient practices, resulting in insufficient means and capacities to develop alternatives or adopt climate-resilient livelihoods.

7.1.2 Baseline Analysis in the project intervention area

The project intervention districts are located in Apurímac, Arequipa, Cusco, Puna and Lima regions, which have been selected following a prioritization exercise (see Section 7.7 for more information on the selection of districts). The sections below give more detail on the current socioeconomic and environmental conditions in the project districts. For a more detailed baseline description per district, consult the “Characterisation of project districts” report.

7.1.3 Ecosystems

The area of intervention of the Resilient Puna Project includes territories located in the highest region of the Andes Mountains, where hydrographic basins that discharge into the large basins of the West Pacific and Amazon (W. Atlantic) are born. It contains fragile ecosystems that provide very important regulating, provisioning, supporting and cultural services for rural communities that inhabit this region, as well as those located downstream, in the lower areas of the mountain range.

These ecosystems are the basis for the livelihood of the population located in their surroundings because they facilitate the provision of resources for the production of food and fodder, through family farming, raising and/or grazing animals, as well as energy and shelter, necessary for their homes. However, the main Puna ecosystems, such as wetlands, bofedales (peat bogs) and pajonales (natural grasslands) are in the process of frank deterioration due to different causes, the main ones being prolonged droughts and overgrazing. These ecosystem services provided are necessary to sustain communities' livelihoods. Amongst others, these include hydrological regulation, fodder and water for livestock activities, soil fertility, as well as being an area of scenic beauty, which allows for tourism in the area.

As summarised in section 5, temperature is projected to increase, in any season or emission scenario in the SHAP region. This will impact on the coverage of grasslands and wetlands and species distribution, as well as reduce crop yields. Precipitation is highly variable, annual changes projected to range from -5 to +20% under a medium emissions scenario (RCP 8.5) by 2050. Droughts are expected to increase in their duration at higher altitudes. Coupled with glacial retreat and melting, this will have an impact on water availability downstream, which is important for biodiversity conservation, crop production and livestock farming. Both temperature and precipitation will also impact the carrying capacity of ecosystems such as bofedales and grasslands, impacting the farming of camelids and other livestock.

7.1.4 Socioeconomic baseline

The total population in the project intervention area is of 567,049 habitants, with almost an even split between genders (49.9% of which men, 50.1% of which are women), with much of the population in the 11-15 age range. Most of the population in the identified districts is rural (more than 50%), except in Puno and Apurímac, where 59% and 58% of the population live in urban areas, respectively. This portion of people living in rural areas is higher than the national average, which according to the 2017 Census, was 21%. The population growth rate is negative (-1%); except in Apurimac, where there was an intercensal growth of 12%. The latter could be explained by the presence of the Las Bambas mining project, which, demands labor (INEI, 2017).

14% of the population living in the project intervention area are in the poorest districts of the country and 24% of it is in the second poorest quintile. At a regional level, Puno concentrates the largest number of people living in the poorest districts, with 33% of its population in the lowest quintile. Puno is followed by Cusco, with 15% of its population concentrated in the poorest districts, specifically Marcapata, Ocongate and Layo (INEI, 2018). It is important to note that because of the 2020 Covid-19 pandemic, poverty in Peru increased by 10 percentage points, reaching 30.1%. Nevertheless, the figures at a district level are not available at the time of writing (INEI, 2021). The Report on the Human Development Index (IPE, 2019), for the districts prioritized in the intervention by the project, records the values shown in the following table:

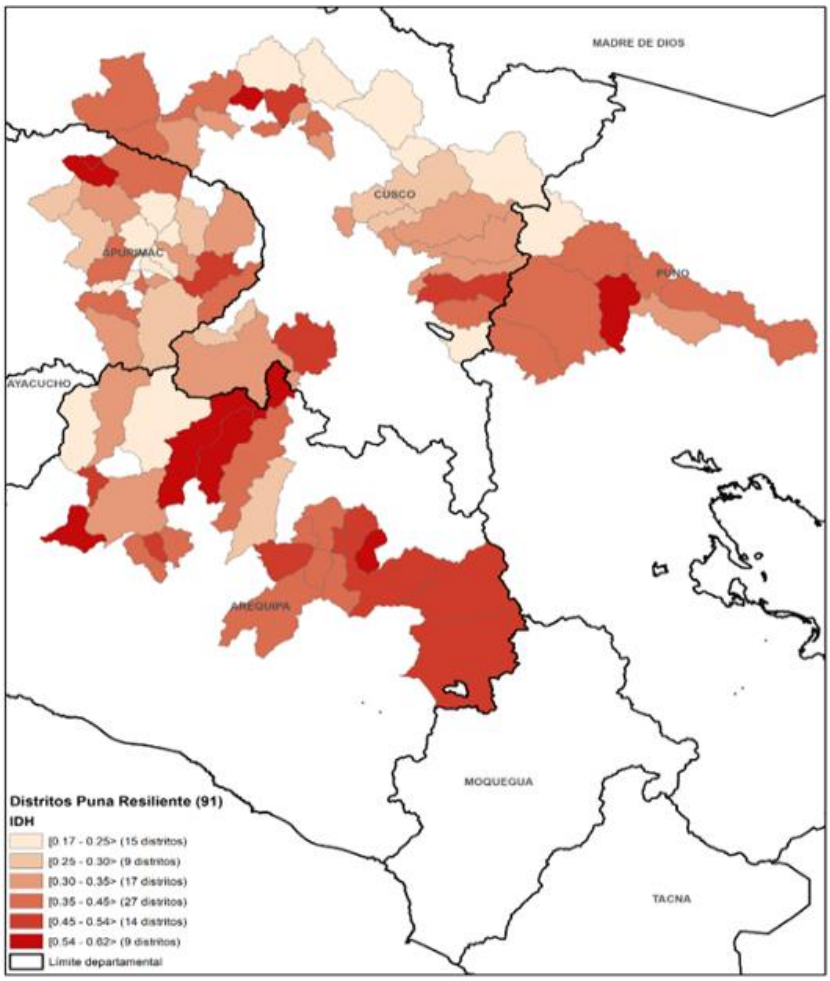
Table 26: HDI Peru,.

EVALUATED FACTORS	MINIMUM VALUE	DIST, PROV. DEPT.	MAXIMUM VALUE	DIST, PROV. DEPT.
Life expectancy at birth	54.30	Antabamba, Antabamba, Apurimac	85.00	Cayarani, Condesuyos, Arequipa
Population 18 years old with Educ. Sec.	12.36	Miraflores, Yauyos, Lima	78.87	Abancay, Abancay, Apurimac
Years of education – Population older than 25 years	3.13	Challabamba, Paucartambo, Cusco	10.59	Abancay, Abancay, Apurimac
Family income Per/capita	110.66	Pampamarca, La Union, Arequipa	1,217.75	Orcopampa, Castilla, Arequipa
HDI normalized value	0.1768	Ccarhuayo, Quispicanchi, Cusco	0.6158	Laraos, Yauyos, Lima

Source: UNDP 2019

The other districts in the region present values that are below the average of the indicated figures, observing the tendency that the lowest HDI are shown in the territories furthest away from the provincial and regional capitals. Only 2 districts had an HDI higher than the national level: Abancay (Apurímac) and Urubamba (Cusco). On the other hand, the districts with the worst HDI were Pataypampa, Curpahuasi and Gamarra (Apurimac), Ccarhuayo and Paucartambo (Cusco), and Puyca (Arequipa), all with less than 0.2 HDI (IPE, 2019). The map below shows HDI for every district.

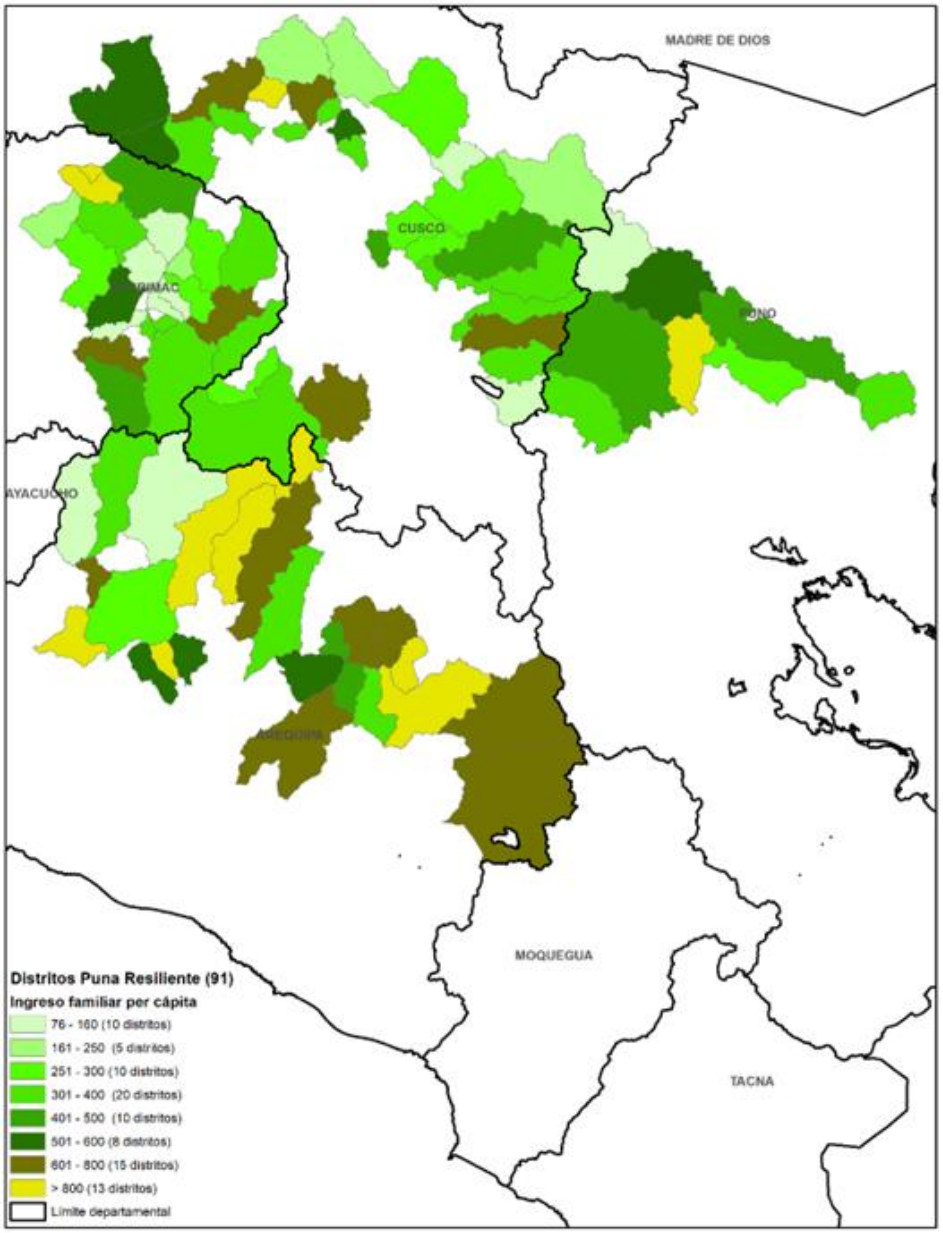
Figure 54: Map showing HDI across 91 project intervention districts. Elaborated by GIZ based on UNDP 2019 HDI values (IPE, 2019).



Regarding this situation, in order to improve the human development index, it is necessary to strengthen the intervention capacities of regional and local governments. in land management (UNDP, 2019).

At the regional level, the highest average per capita household income is in Arequipa (S/ 632 or USD 166), mainly in the districts of Cayarani and Orcopampa, which have an average income greater than S/ 1,000 or USD 263. Meanwhile, the lowest per capita household income is in Apurimac (S/ 380 or USD 100), in districts such as Curasco, Gamarra, Curpahuasi, and Pataypampa, which have an average income of less than S/ 150 or USD 39.4 (IPE, 2019).

Figure 55: Map showing average household income, elaborated by GIZ using (IPE, 2019).



In terms of food security, chronic malnutrition at the provincial level in 2019 for the project intervention area, prepared by the National Institute of Statistics and Informatics - INEI (INEI, 2019), shows that the highest percentage of child malnutrition registered in the country corresponds to the province of La Unión, in the department of Arequipa (29.5%).

Table 27:Percentages of chronic child malnutrition registered in provinces in 2019

DEPT. AND PROVINCE	%	DEPT. AND PROVINCE	%	DEPT. AND PROVINCE	%
Apurimac, Antabamba	25.4	Apurimac, Cotabambas	24.8	Apurimac, Grau	24.9
Arequipa, Castile	13.7	Arequipa, Caylloma	7.0	Arequipa, Condesuyos	15.5
Arequipa, La Union	29.5	Cusco, Acomayo	19.4	Cusco, Anta	13.2
Cusco, Calca	16.9	Cusco, Canas	22.2	Cusco, Canchis	14.1
Cusco, Chumbivilcas	21.2	Cusco, Paucartambo	21.5	Cusco, Quispicanchi	17.6
Cusco, Urubamba	13.7	Lima, Yauyos	14.6	Puno, Azangaro	17.6
Puno, Carabaya	22.0	Puno, Melgar	17.3	Puno, Sandia	15.2

Source: (INEI, 2019)

The Ministry of Development and Social Inclusion - MIDIS, prepares statistics on the users of social services and assistance benefits provided by the government to less developed population groups. Table 28 presents summarized information on the population that has received these aids and subsidies (April 2023) in the 58 intervention districts.

Table 28: Services and assistance provided by MIDIS in prioritized districts

PROGRAM	DESCRIPTION	NUM.	PROGRAM	DESCRIPTION	NUM.
CUNAMAS	day care	2,242	PENSION 65	Beneficiaries	23,047
	family accompaniment	4,788	QALI WARMA	No. Children Served	88,063
FONCODES	No. Est. Users	902		No. Inst. Educat	1,949
	No. Pros. concluded.	0	CONTIGO	users	2,618
	No. Pros. Executed.	12	PAIS Program (National Platforms of Social Inclusion Actions)	No. Drums Prest. Services	43
	No. Haku Wiñay Homes in progress	2,600		Attentions carried out in Tambos	25,178
	No. Haku Wiñay households completed	10,895		No. Benef. I attended. Through Tambos	14,941
JUNTOS	Affiliated households	22,542	No. Households	(2017 Census)	134,542
	subscriber households	22,051	Population	older than 65 years	35,308
TOTAL POPULATION OF PRIORITIZED DISTRICTS				**443,109**	

Source: (INEI, 2019)

Furthermore, the illiteracy rate in the study area is higher than the national average (15% compared to 5.8%), with a higher incidence among women (23% compared to 8.5% nationally). Likewise, the highest level of education attained by half of the population aged 25 years and older is primary school. Cusco and Puno are the departments with the highest number of population (50%) that did not pass primary school; while, in Apurimac, the level of

access to higher university education stands out (21%) compared to the rest of the regions (around 8%). In the case of Apurimac, since its capital district is included in the scope of the project, it can explain the higher percentage of higher university education and show the high centralization of educational services in the country. In addition, it is necessary to mention that people who access a better level of education do not usually return to their districts of origin (INEI, 2017).

7.1.5 Project rationale in response to the business-as-usual scenario

Climate change will reduce the provisioning, regulating, cultural and supporting services provided by landscapes in the SHAP region, such as for e.g. fodder for livestock or water regulation and soil moisture retention. The communities that inhabit the SHAP region and their socioeconomic conditions also increases their vulnerability to climate change's impacts on ecosystem services. The population in the prioritised districts is mainly rural and relies on ecosystem services for their livelihoods, through agricultural activities such as crop and livestock farming. Currently, these regions experience high levels of poverty, have low access to education and training and experience food insecurity. Moreover, and, as will be detailed in section 7.2, rural communities lack knowledge and access to financing options to make their agricultural businesses more resilient. These factors drive seasonal migration of younger population to urban areas and contributes to the loss of ancestral agricultural knowledge and practices that could contribute to effective, low-cost climate change adaptation measures. In summary, under a business-as-usual scenario, ecosystems in the SHAP region will continue to degrade and diminish in carrying capacity and Andean communities will continue to see their livelihood options decrease as crop yields and livestock farming are affected by reduced water availability and higher temperatures.

This GCF project therefore aims to harness public and private financing for ecosystem-based adaption measures at a landscape level, to strengthen relevant value chains and livelihoods. It will also enhance capacity-building so that communities and farmer's associations are empowered to make their business models more climate-resilient and can access financial products that respond to their needs. It also aims mainstreaming EbA measures in local governance mechanisms and platforms to ensure longer-term, participatory planning. This project also contributes to sustained efforts by public and private actors in ecosystem restoration and conservation and livelihood diversification, such as the national's government MERESE programme and existing initiatives, detailed in the section below.

7.1.6 Gaps and complementarity with other development initiatives in the sector

This project builds on the existing initiatives for adaptation, conservation and management of relevant and similar ecosystems in the country (please see table 29). Below, we present a summary of the most relevant initiatives. A more exhaustive description of baseline projects can be found in Appendix III- Relevant Baseline Projects and programmes in the Sector

The UNDP and IUCN flagship *Mountain Ecosystem-based Adaptation* project implemented pilot EbAs in the Nor Yayos Cochas Landscape Reserve (located in the project intervention area) to improve sectoral resilience for water and agriculture. The project prioritized three EbA actions in three pilot sites, a) management of vicuñas for the extraction of animal fiber. b) Community management of natural grasslands, including livestock c) sustainable water resources management, including rehabilitation of ancestral water infrastructure and restoration of wetlands and grasslands (UNDP, 2014).

This GCF project will thus scale up these EbA interventions by providing funding to a larger geographic area in the SHAP region overall. Furthermore, both projects aimed to mainstream EbAs and climate resilience into multilevel landscape governance instruments. The "Mountain EbA" project served as a proof-of concept for EbAs to be considered as an investment option

and incorporate it in planning at regional and national levels of Peru through communication and institutional knowledge transfer (Component 4) (UNDP, IUCN, UNEP and Mountain Institute, 2016). Component 3 of this project will further the mainstreaming of EbA through strengthening participatory and territorial planning sub-regional platforms, support local governments in climate risk analyses for EbA planning and mainstreaming gender into EbA planning.

The GCF-funded project (FP 193), the *Peruvian Amazon Bio Business Facility*, implemented and managed by Profonanpe, was set up in November 2022 to invest in eco bio businesses (EBBs) to provide mitigation benefits through enhancing carbon stocks. The Puna Facility, established under Activity 2.1.1 of this proposed project, will invest in Climate Resilient Value Chains through the development of businesses that increase SHAP communities' resilience to climate change, and/or reduce the negative impacts of existing livelihood strategies on the Puna ecosystem. The Puna Facility will also invest in EbA measures to adapt to climate change impacts in the intervention area. Both facilities are thus managed by Profonanpe, which will have gained capacity and knowledge on best practices and management through implementing the EBBF. However, the Puna Facility will fund climate adaptation activities in the Puna biome and management processes will remain separate between the two facilities (EBBF and the Puna Facility).

The GEF project *Sustainable Management of Agro-Biodiversity and Vulnerable Ecosystems Recuperation in Peruvian Andean Regions Through Globally Important Agricultural Heritage Systems (GIAHS) Approach,* executed by FAO, and approved in 2018, aims to promote agrobiodiversity conservation through an integrated landscape management approach. This includes the marketing of agro biodiversity products and the use of payment for ecosystem services (MERESE, in Peru) for the following services: carbon sequestration and storage from native relict forests, watershed protection, biodiversity conservation, and the protection of landscape beauty. At the community level, these PES schemes are operationalized through participatory Management Plans for Andean forests. The project has a number of lessons learnt and experiences that will be useful for the implementation of the GCF project. These are described in the following paragraphs and in the table in Annex III. Also, a set tools and documented ancestral best practices which are provided as supplementary materials to the Feasibility Study.

Table 29: Related projects and potential synergies with the project

Project characteristics	Objetive and results	Potential synergies
Title: Mountain EbA **Budget**: USD 3,276,637 **Implementation period**: 2012-2016 **Donor**: BMU **Agency**: IUCN, UNDP	Objetive: Strengthen national, regional and local capacities to implement EbA measures and reduce community vulnerability, emphasizing mountain ecosystems. LINK Results: Improved water availability and management, as well as the rehabilitation of grasslands in Canchayllo and Miraflores, with knock-on benefits on biodiversity. Three prioritized EbA actions in three pilot sites: a) management of vicuñas for the extraction of animal fibre. b) Community management of natural grasslands, including livestock c) sustainable water resources management, including rehabilitation of ancestral water	This project serves as a "pilot" for this GCF project. The proposed GCF project builds on the lessons learnt from this first project, specifically regarding the implementation of EbA measures for better water management and agriculture in the Andes, resulting in enhanced community resilience. The Puna Facility, established under Activity 2.1.1 of this project will also fund EbA activities. Moreover, in a similar manner to the UNDP/IUCN project, this GCF project's component 3 proposes activities such as strengthening territorial and governance processes through integrating EbA measures and strengthening participatory sectoral platforms for scaling up EbA measures.

	infrastructure and restoration of wetlands and grasslands. Strengthened local capacities and knowledge related to climate adaptation and the importance of ecosystem services. This includes park rangers and small landowners to municipal-level workers. Creation of interest groups and committees made up of academics and rural communities that has reinforced locally led action. Validity of EbA as an adaptation measure to be invested in at regional and national levels as well as "proof-of-concept".	
Title: Seventh Operational Phase of the GEF Small Grants Programme in Peru (UNDP) **Budget**: 6,337,319 USD GEF grant: 1,959,132 USD. **Implementation period**: 2021-2025 **Donor**: GEF **Agency**: UNDP	Objetive:To build socio-ecological landscape resilience in the Southern Andes in Peru through community-based activities for global environmental benefits and sustainable development.LINK Results: The programme is in its Seventh Operational phase. The mid-term review for the Sixth Operational phase noted that the programme was especially successful in creating multi-stakeholder platforms called Strategic Landscape Platforms . These support participatory planning and adaptive management of landscapes, and are composed of 6-9 members, including community platforms, local authorities, and private sector. (UNDP, 2019).	Both programmes fund EbA interventions to enhance ecosystem services with agricultural and economic benefits in mind. This GEF Small Grants Programme in the Peruvian Andes seeks to address very similar challenges through providing small grants (5000-50,000 USD) for community-led projects in biodiversity conservation, improvement of ecosystem services , as well as improving agricultural value chains through soil and water conservation practices. The Puna Facility will fund similar activities to those of the GEF Small Grants programme. It is important to note, however, that the Puna Facility will fund EbA activities and climate-resilient value chains specifically if they have a climate adaptation purpose, rather than a conservation/agricultural development one.
Title: Sustainable Management of Agro-Biodiversity and Vulnerable Ecosystems Recuperation in Peruvian Andean Regions Through Globally Important Agricultural Heritage Systems (GIAHS) Approach **Budget**: 88,984,386 USD (including co-financing) GEF grant amount: 9,369,864 USD	Objective: To conserve in-situ and to sustainably use globally-important agro-biodiversity through the preservation of traditional agricultural systems, the integratcd managcment of forests, water, and land resources, and the maintenance of the ecosvstem services in selected Andean regions. LINK Results: The project is still underway. In its mid-term evaluation, it was noted that Covid-19 had a great impact on	Both projects use PES schemes to enhance ecosystem services in the region. Activity 2.1.2 of the proposed GCF project will strengthen capacities to develop and implement PES mechanisms for EbA in high Andean ecosystems, particularly for public water utilities. This will be done by providing technical assistance to develop/ improve payment for PES schemes in the sub-project areas and supporting the development of innovative PES schemes. Sub-activity 2.1.2.2. will also establish a methodology for calculating carbon in the Puna ecosystem and lay the groundwork for carbon accounting and credit systems for future trade,

Implementation period: 2018- 2022, still under implementation due to delays because of Covid-19. **Donor**: GEF **Agency**: FAO	the progress being made (FAO, 2021). In 2021, no progress had been made in terms of the area under payment agreements that maintain the supply of ecosystem services from forests, wetlands, and grasslands. 893Has in 2021 were under a ReSCA (remuneration for Agrobiodiversity Conservation Services) compensation mechanism specifically for agrobiodiversity conservation and implementing traditional management services.	including legal and institutional arrangements. At a Puna Facility level, Local initiatives will be encouraged to leverage supplementary finance from government MERESE (PES) schemes. Similarly, this FAO project's strategy to manage landscapes includes PES schemes for the following services: carbon sequestration and storage from native relict forests, watershed protection, biodiversity conservation, and the protection of landscape beauty. At the community level, these PES schemes are operationalized through participatory Management Plans for Andean forests. Profonanpe is also implementing this project, meaning that knowledge and lessons learnt from implementing PES schemes can be leveraged during activity 2.1.2.2 to support the development of innovative PES mechanisms. Besides the existing synergies for the implementation of PES schemes, this project also promotes agro-biodiversity efforts through enhancing value chains to promote the marketing of food and goods for medium-scale farmers. The Puna facility, meanwhile, will invest in value chains specifically with a climate-resilient angle rather than a biodiversity focus for agriculture.
Title: Conservation and Sustainable Use of High-Andean Ecosystems through Compensation of Environmental Services for Rural Poverty Alleviation and Social Inclusion (MERESE) **Budget**: 34,354,545 USD (including co-financing) Grant amount: 5,099,625 USD **Implementation period**: 2013-2018 **Donor**: GEF **Agency**: IFAD	Objective: To protect and sustainably use High Andes ecosystems that provide environmental services, especially biodiversity and water, by transfering economic resources from downstream beneficiaries to upstream rural communities. LINK Results: • Legal and institutional framework for PES created at a national level • Improved management of watershed ecosystems characteristic in the High Andes through 37 subprojects. 6 Territorial Management plans were created to support further activities. • Improved hydrological monitoring in the Cañete watershed. (IFAD, 2021)	This project can provide important information about the processes and lessons learned for implementing a PES scheme for watershed ecosystems. Under Activity 2.1.1, the Puna Facility will leverage innovative financial mechanisms such as a PES scheme.
Title: Conservation and Sustainable Use of High-	Objective: To protect and sustainably use High Andes	This project can provide important information about the processes and

Andean Ecosystems through Compensation of Environmental Services for Rural Poverty Alleviation and Social Inclusion (MERESE) **Budget**: 34,354,545 USD (including co-financing) Grant amount: 5,099,625 USD **Implementation period**: 2013-2018 **Donor**: GEF **Agency**: IFAD	ecosystems that provide environmental services, especially biodiversity and water, by transfering economic resources from downstream beneficiaries to upstream rural communities. LINK Results (IFAD, 2021): • Legal and institutional framework for PES created at a national level • Improved management of watershed ecosystems characteristic in the High Andes through 37 subprojects. 6 Territorial Management plans were created to support further activities. • Improved hydrological monitoring in the Cañete watershed.	lessons learned for implementing a PES scheme for watershed ecosystems. Under Activity 2.1.1, the Puna Facility will leverage innovative financial mechanisms such as a PES scheme.
Title: Peruvian Amazon Bio Business Facility **Budget**: 10,000,000 USD GCF grant: 8,972,400 **Implementation period**: 2022- 2032 **Donor**: GCF **Agency**: PROFOFONAPE	Objective: The Amazon Eco Bio Business Facility (EBBF) (FP193) will provide effective climate change mitigation outcomes by investing in eco bio businesses (EBBs) supporting the sustainable management and conservation of Peruvian forests. LINK Results: This project is still under implementation, but the EBBF aims to contribute to enhancing carbon stocks and avoiding the emission of 3.8 million tonnes of CO2, with an estimated cost of 2.63 USD / t CO2eq during its lifetime, and support REDD+ infrastructure in Peru.	This facility, managed by Profonanpe, provides repayable grants to EBBs that manage and conserve Peruvian forests in the Amazon, and provide mitigation benefits through enhancing carbon stocks. The Puna Facility, established under Activity 2.1.1 of this proposed project, will invest in Climate Resilient Value Chains through the development of businesses that increase SHAP communities' resilience to climate change, and/or reduce the negative impacts of existing livelihood strategies on the Puna ecosystem. The Puna Facility will also invest in EbA measures to adapt to climate change impacts in the intervention area. Both facilities are managed by Profonanpe, which will have gained capacity and knowledge on best practices and management through implementing the EBBF. However, the Puna Facility will fund climate adaptation activities in the Puna biome.
Title: AYNINACUY-Strengthening the livelihoods for vulnerable highland communities in the provinces of Arequipa, Caylloma, Condesuyos, Castilla and La Union in the Region of Arequipa, Peru	Objective: Strengthening the activity of obtaining and selling alpaca fibre through improved climate resilience. LINK Results: • Strengthened livelihoods through improved, wetlands and pastures, as well as increased forage. • Improved water management through	Some of the sub-activities and techniques to improve livelihood strategies (e.g. pasture rotation) and water management are complementary to the EbA measures listed in the EbA catalogue of the proposed GCF project. This project is also an example of enhancing climate-resilient value chains in some of the target districts of the project, which will serve as a basis for the

Budget: 2,941,446 USD (full grant amount). **Implementation period**: 2018-2020 **Donor**: Adaptation Fund **Agency**: Latin American Development Bank (CAF)	improved rustic canals, pressurized irrigation modules, micro-damns, and irrigation water reservoirs. Improved community and institutional coordination and capacity (Libélula, 2022)	activities funded by the Puna Facility once it is established
Title: Market Strengthening and Livelihood Diversification in the Southern Highlands Project (PDSS) **Budget:** $ 34,400,000 USD IFAD financing: 24.59M USD **Implementation period:** 2005-2011 **Donor:** IFAD **Agency:** IFAD	Objective: Increased sustainable productivity in South American camelid husbandry activities and reduced pressures on Puna ecosystems through the implementation of microloans and technical assistance to individual producers and organizations. LINK Results (IFAD, 2018): • 12.6 percent reduction in poverty through diversified income and improvement of natural resources families have access to. This figure was obtained through a quantitative analysis using the National Agriculture Census and Household surveys, which showed a further decline in poverty in the clusters covered by the project. (IFAD, 2018) • Increased agricultural and livestock activity. • Enhanced local leadership.	This GCF project will invest, through the Puna facility, in climate-resilient value chains. The facility will help establish new businesses or scale-up existing ones that increase resilience of SHAP communities or reduce the negative impacts from existing livelihood strategies. This GCF project will build on this project's achievements, as it demonstrated that the improvement of natural resources has economic benefits for rural communities. The project also developed participatory planning methods and favoured horizontal knowledge transfer amongst smallholder farmers and families, which will be furthered through the dissemination of EbA knowledge under 1.2.1 of this project.
Title: PACC II, Resilient Andes and the Andean Forest Program **Budget**: 9,899,388 USD **Implementation period:** 2020-2023 2023-2027 **Donor:** Swiss Cooperation **Agency:** Swiss Cooperation	Objective: Enhance capacities of public and private actors to support climate resilience among impoverished and vulnerable rural Andean populations, with a focus on improving food and water security. LINK Results: As of 2021, the project had contributed to the development of Regional Action Plans for sectoral Nationally Determined Contribution (NDC) adaptation measures for Puno and Cusco and strengthened SENAMHI's local agricultural management platform. (Swiss Cooperation	Their experiences with working in micro basins, communities, academia, scientists, subnational and national governments will be considered for this proposal.

	and Development Agency (COSUDE), 2021)	
Title: Natural Infrastructure and Water Security Project **Budget**: 27,500,000 USD **Implementation period:** 2017-2023 **Donor**: USAID/Canada **Agency**: Forest Trends	The Natural Infrastructure for Water Security Project promotes the conservation, restoration and recovery of ecosystems at the national level, forming alliances with public and private organizations to reduce water risks such as droughts, floods and water pollution	The USAID/Forest Trends/Canada "Natural Infrastructure and Water Security Project", which promotes public-private partnerships and ecosystem recovery to prevent hydrometeorological risks will serve to replicate tools and methodologies to identify where to implement EbA measures. Potential synergies with this project during implementation in some territories will be closely coordinated.

The proposed GCF Project "Resilient Puna" will strengthen capacities to develop and implement PES mechanisms for EbA in high Andean ecosystems, particularly for public water utilities. This will be done by providing technical assistance to develop/ improve payment for PES schemes in the Local initiatives areas and supporting the development of innovative PES schemes. Sub-activity 2.1.2.2. will also establish a methodology for calculating carbon in the Puna ecosystem and lay the groundwork for carbon accounting and credit systems for future trade, including legal and institutional arrangements. At a Puna Facility level, Local initiatives will be encouraged to leverage supplementary finance from government MERESE (PES) schemes. Moreover, Profonanpe is also an implementing entity of the GIAHS project, meaning that knowledge and lessons learnt from implementing PES schemes can be leveraged during activity 2.1.2.2 to support the development of innovative PES mechanisms.

Furthermore, the proposed GCF Project will use the technical information on agrobiodiversity derived from the GIAHS FAO project in the regions of Puno, Apurímac and Arequipa to inform the implementation of EbA measures and making agricultural value chains more resilient. For example, the GIAHS FAO project identified several native potato species and their adaptability to different climates and altitudes in the Apurímac region, and leveraged traditional knowledge to record cultivation techniques. The project compiled and organized traditional knowledge on the production potato and other crops' throughout the year (using communities' calendars) in two reports that were shared and used in schools and by local communities. Similarly, information on climate indicators and climate adaptation into locally-sensitive informational material (e.g. a video in Quechua, Aimara, Spanish and English). This material can be used under Output 1.1 and Output 1.2 of this project to scale-up ancestral knowledge in the project intervention area and provide technical assistance to Local initiatives beneficiaries to strengthen the production of High Andean crops.

The *Seventh Operational phase of the GEF's Small Grants Programme (SGP)* in Peru is implemented by UNDP and was approved in June 2021, covering the regions of Arequipa, Puno and Cusco. Both programs fund EbA interventions to enhance ecosystem services with agricultural and economic benefits in mind. This GEF Small Grants Programme in the Peruvian Andes seeks to address very similar challenges through providing small grants (5000-50,000 USD) for community-led projects in biodiversity conservation, improvement of ecosystem services, as well as improving agricultural value chains through soil and water conservation practices. The Puna Facility will fund similar activities to those of the GEF Small Grants programme. It is important to note, however, that the Puna Facility will fund EbA activities and climate-resilient value chains specifically if they have a climate adaptation purpose, rather than a conservation/agricultural development one. The GEF SGP's previous operational phase was successful in creating multi-stakeholder platforms called Strategic Landscape platforms, as well as knowledge-exchange platforms (*Encuentros de Saberes),* that this project could leverage in Component 3.

This GCF project will fund, through the Puna Facility, EbA actions and climate-resilient value chains *in tandem,* meaning that through the adoption of EbA measures, targeted farmers (from subsistence farmers to established farmer associations) will be able to integrate them into their businesses. Profonanpe will use its experience with the EBBF to fund *climate-resilient* value chains through EbA measures in the Andean region, rather than agricultural development or conservation activities like the GEF SGP also does. The proposed project will build on the lessons learned in the "pilot" sites targeted by the Mountain EbA project implemented by IUCN and UNDP to scale up existing EbA and agricultural value chain activities in the SHAP region. Moreover, this proposed project will also engage with wider public and private sector actors to align their activities with EbA through additional financial mechanisms, such as strengthening existing and new government-led PES (MERESE) schemes.

A more detailed description of baseline projects can be found in Appendix III- Relevant Baseline Projects and programmes in the Sector

7.2 Barrier Analysis

The present barrier analysis has been conducted using a combination of literature review as well as expert judgement based on information collected from the various stakeholder interviews and consultations during project design.

Economic and financial barriers

Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing

The characteristics of the population in the SHAP region, with human development indices (HDI) that reveal high levels of poverty and extreme poverty, low amounts of per capita income, as well as land ownership and management (see Table 26), severely limit the living conditions of the majority of the population and affect the productive activities that they carry out in their farms, both in agriculture and livestock, obtaining yields that only allow them to precariously satisfy their subsistence needs.

The excessive fragmentation in agricultural production and supply creates barriers to market entry. This means that the limited collaboration among agricultural producers weakens their ability to negotiate effectively for input procurement and product sales, thereby detrimentally impacting the seamless connection between agricultural producers and markets (Hernández Calderón, 2006). Due to their limited understanding of business organization and management, small-scale producers struggle to form associations due to their lack of familiarity with the benefits of collaborative models and existing distrust among peers. Consequently, this lack of organization and managerial skills hampers the operational efficiency of small agricultural producers (PP121 MIDAGRI, 2021).

Among camelid producers, the majority of alpacas and llamas in the region, around 85%, are owned by small-scale farmers. These farmers usually possess less than 100 animals each within mixed herds. However, challenges such as geographical dispersion, limited technical skills, and weak organizational structures hinder effective collaboration strategies among small farmers in the high Andes. To address this, MIDAGRI has introduced the Agroideas program aimed at enhancing productivity and fostering entrepreneurship within the High Andean value chains. This initiative requires participating associations to submit their registration details, along with a comprehensive set of project-related studies and analyses, as well as co-financing ranging from 20% to 40%. Nevertheless, the program's accessibility is constrained by the restricted cooperation among small farmers, along with their limited technical and financial capabilities. This lack of collaboration impedes the wider adoption of the program, hampering the anticipated economic growth. Ultimately, this scarcity of collaboration reduces the ability of small-scale producers to effectively engage in the South American camelid value chain and

seize opportunities in international markets and advancements in sought-after products, such as vicuña fiber.

The case of the South American camelid fiber value chain demonstrates the inequality: Its commercialization structure is characterized by high intermediation, maintained by traditional relations that limit and condition the price and negotiation terms to the detriment of the producers. The supply is dispersed and in small volumes, and producers seldom have the negotiation capacity to present a collective offer due to their lack of organization (Moya & Torres, 2008). In the case of rural women, there is generally access to lower quality farmland, often in marginal areas, where land is mainly cultivated for household consumption. Rural women raise domestic animals, process primary products or sell their small surpluses in local markets, while men's participation in productive activities is more closely linked to more competitive and profitable value chains . In addition, another important gender gap in the project's region is related to land ownership and/or tenure, with women owning only 30.8% of farmland in Peru (FAO 2018).

Inequalities in income generation among women and men is also present in the target area of the project. According to the National Agricultural Census (2012), there are more women with no income of their own. For example, in Apurimac 32.8% of women no have income in their own compared to only 12.1% of men. In the case of Arequipa women without income of their own (38.1%) while men (22.3%). In Cusco women (30.5%) and men (18.2%). Finally in Puno, women 25.1% while men 17.4%. In the case of women in agricultural occupations, 37.6% are unpaid family workers and only 46.3% of women in agricultural occupations received cash income.

While Peru is the world's leading producer of alpaca fiber (80% of global production at USD 68.3 million in 2017), only a small number of Peruvian companies benefit, processing and marketing 95% of the fiber produced in the country. The situation for other Andean agricultural products is much the same. The heterogeneous and small direct producers with small plots, limited production, and a lack of information on market prices, reduce their negotiating capacity and force them to sell their products to intermediaries or collectors.

According to Cannock et al (2016), the high transaction costs derived from the remoteness and high geographical dispersion of agricultural productive areas hinders communication and interaction between producers who could share information on input prices or sales channels. In a study conducted by Escobal (cited by Cannock et al, 2016), applied to a sample of potato producers in two districts of the department of Huancavelica, the author finds that transaction costs represent 50% of the value of sales and that these costs are particularly higher for small producers compared to larger ones. The author concludes that to explain the commercial linkage strategy, the distance and time it takes to reach markets, the producer's experience in these markets, the stability of his relationships with the agents with whom he trades, and the resources invested in obtaining relevant information and supervising the fulfilment of contracts must be considered.

The rural population, being limited to the services offered by the formal financial system, prevents them from investing and improving their production, thus limiting their access to markets. This is also a consequence of the scarcity of financial products appropriate to the characteristics of the rural population, the financial services market does not work efficiently. The regulated IFI Intermediary Financial Institutions perceive the agricultural sector as very high risk, since it presents conditions of high fragmentation and dispersion of the population itself and mainly of the economic units that generate income, which operate in small-scale volume with low levels of technology applied to the production process with little specialized technical personnel, among other factors (PP121 MIDAGRI 2021). Potential clients also face limited financial literacy and inadequate loan terms, as well as generally high financial transaction costs and limited collateral (Sotomayor, Talledo, & Wong, 2018).

<u>Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development</u>

Peru's microfinance landscape comprises a limited number of institutions that provide loans to small and medium-sized businesses pertinent to this project, particularly those catering to smallholder farmers and communities in the High Andean areas. Financial institutions such as Financiera Confianza, Mibanco, Financiera Compartamos, and Caja Rural Los Andes are notable due to their alignment with the project's target borrowers, their presence in the project regions, and their emphasis on rural lending. Caja Rural Los Andes and Caja Rural Inka Sur also extend microcredits to the rural and peasant population. The Arequipa - Fondesurco Savings and Credit Cooperative is also active in the region, offering small "green loans" tailored for agriculture and livestock purposes. The state-owned bank Agrobanco, which oversees Agroperu, an independent agricultural lending fund, also holds significance due to its rural and sector-specific orientation. Likewise, Cofide, Peru's development bank, also plays a role in this landscape.

Regarding to access to loans, only between 5% and 20% of men farmers took out a loan; and for women farmers it is even lower, between 4% and 12%. The extreme shortage of capital of small producers does not allow them to invest in infrastructure (e.g. planting and harvesting water, sheds, greenhouses, road improvements), or to introduce new cultivation and grazing practices (e.g. sprinkler irrigation for pasture cultivation, mobile roosts to facilitate herd management) for the benefit of their families, and particularly women.

Demand-side barriers

Demand-side barriers include the high risk of agricultural and livestock activities resulting in high commercial interest rates, as well as the physical barriers to reach an institution's branch. In Peru as a whole, the time required to access the branch of a financial institution is much greater in rural areas (2,190 minutes, or one and a half day, on average) than in urban environments (11 minutes) (Talledo, 2015). Generally, there is also a lack of awareness of available financial services, and the financial implications of EbA and climate-resilient value chains.

Physical barriers to reach prospective borrowers in the puna is even more acute in the high Andean regions targeted by the project. While some financial institutions are more focused on rural areas than others (e.g., Confianza has a greater rural focus than other MFIs), none have a strong local presence or large enough network of credit officers. The long distances between lenders and borrowers causes, a limited knowledge on the part of the financial institutions of the lending opportunities in the puna, as well as high transaction costs. To respond to these challenges, some financial institutions have launched mobile apps. However, these apps may be sufficient for basic transaction services (e.g., repayment of loan tranches), they will not replace the credit assessment process, which requires direct interaction between credit officers and prospective borrowers.

Some of the conditions imposed by lenders also create barriers to lending. These may include the requirement for land ownership or land possession, minimum business experience in the relevant crop/sector or the existence of a formal legal entities, in the case of associations. In the case of minimum business experience or formal legal entities in the case of associations, it could be mitigated by the project with technical assistance, but in the case of land ownership or possession, they are minimum requirements to reduce potential social risks such as have land title requirement.

Limited financial literacy. This barrier applies in particular to subsistence beneficiaries who do not have or have very limited prior relationship with a bank. The conditions and documentation requested by lenders, can be a deterrent for first-time borrowers. While programs such as Cofide's promotion of UNICAs have taken place, they are not yet of the scale sufficient to tackle financial literacy in the puna at a large scale.

Inadequate loan terms. The agricultural and livestock loans offered currently by financial institutions have terms that do not necessarily reflect the specificities of the industry, even in a business-as-usual scenario (i.e. before beneficiaries switch to EbA and sustainable value chains). Confianza and Los Andes are the only two institutions that offer repayment terms

tailored to the crops/livestock financed, as described above. Other institutions offer more rigid repayment terms and often maturities that are only sufficient for working capital needs, not for long term capital investment.

Insufficient financing mechanisms designed for small-scale producers. Small agricultural producers do not have financing lines for the acquisition of goods and/or services related to fixed assets. Nor are there financial products that facilitate the acquisition of up-to-date production technology. The current financial products available to small producers are mainly oriented towards working capital, and therefore medium- and long-term financing is non-existent.

High financial transaction costs and limited collateral. Smallholders' lack of experience in managing credit, cumbersome procedures and high interest rates are barriers to smallholders' access to formal credit. It is evident that financial institutions do not grant loans without sufficient collateral; in the case of risky collateral (livestock, equipment), collateral substitutes are used, including confirmers, independent guarantors, furniture and household goods, and other substitutes. Factors that increase the costs of formal financial services in rural areas include low population density combined with the dispersion of clients.

Supply side barriers

Supply-side, barriers for lenders and financial institutions relate to the lack of understanding regarding how climate change will impact their loan portfolios, and of the financial implications of EbA measures and climate-resilient value chains, as they are unable to assess the impact of climate change on baseline profitability (Pinzon, 2019). High risk of agricultural and livestock activities resulting in high commercial interest rates. Agriculture and livestock value chains are inherently risky, due to weather and climate variability as well as volatility in input and crop/product prices as a result of macroeconomic factors (domestic and international). The EBA and sustainable value chains (SVC) measures promoted by the Puna Facility will de-risk the relevant economic activities in the puna and contribute to make them more interesting for lenders. In the current absence of such measures, lenders that operate commercially are charging interests often well in excess of 20%. Only Agroperu and Agrobanco charge concessional interest rate (3.5% in the case of Agroperu) but, their business model does not appear to be sustainable.

Lack of understanding of the financial implications of EbA and sustainable value chains on the part of the beneficiary farmers / livestock producers. In order to present a compelling case to prospective lenders, the project beneficiaries that implement EbA/SVC must first develop a full understanding of its implications on their cashflows going forward. This entails: (i) assessing their business as usual cashflows and how these will be negatively affected by climate change in the future (via reduced production and revenues); (ii) evaluating the prospective returns from a switch to EBA/SVC over a reasonable number of years, taking into account the initial capital investment, ongoing operations and maintenance costs and – offsetting the previous two over time – the likely increase in production and revenues; (iii) evaluating the resulting financial capacity to assume debt to finance, at least in part, the initial EBA/SVC investment, as well as the terms of any loans made available to them.

Lack of awareness of financial services. The reason that inhibits small producers from working with formal credit is the lack of information about the process and procedures required to carry out this type of transaction. Financial services provide a tool to support productive development, producers need not only credit, but also other services such as insurance, means of payment and transfers.

In the framework of interviews with microfinance institutions during the elaboration of the feasibility study, it was found that some financial institutions have initiated pilots of green products within the framework of the Green Protocol and the Green Finance Roadmap that is being worked on with MINAM. In this sense, these microfinance institutions are interested in

developing complementary credits to those provided by the project and/or the State can finance in the future.

MIDAGRI, through its Agrorural, Sierra Azul and Agroideas programs, promotes support for farmers in the high Andean zone (located above 3500 masl); however, access to these programs is limited for dispersed populations, which is characteristic of the Resilient Puna region, and most communities do not meet the established technical, financial, or institutional requirements. Additionally, the available funds would not be enough to cover the goals of the National Adaptation Plan or those of the NDC.

Technical barriers

Barrier 3: Limited technical capacity prevents family farmers of accessing investment and participate in decision-making processes

The legislation and norms on the participatory budget allow the involvement of the communities, both in the formulation of the budget and in the planning of the territory; however, their participation is limited, due to, among other causes, ignorance of the legislation, lack of interest and difficulty of the institutions responsible for calling and bringing communities together to inform them, discuss, negotiate and put their needs on the agenda of territorial management (Doughty, 2014). In terms of women participation on decision making process the tendency is low whether at national, sub-national or community level. Some platforms have been established with the aim of improving coordination and dialogue between stakeholders in the planning and management of interventions in river basins. However, these platforms, which should improve governance, rarely integrate experiences. The disregard for local knowledge and experience causes a lack of interest in participation and generates mistrust of the communities towards the authorities that summon them and generates an important barrier: limited participation of local communities in planning and decision-making at different levels.

This geographical dispersion is a very serious limitation for the associativity of the rural communities, which, in turn, prevents them from accessing technical and financial assistance offered to increase productivity by the MIDAGRI programs in the area, conditional on loans, which imply compliance with multiple requirements, unattainable for farmers, due to the complex procedures. This prevents small producers, particularly women, from participating in the camelid value chain, mainly higher up the chain in accessing international markets, as well as technological advances for highly valued products such as vicuña fibre (MIDAGRI, 2023). In the case of Andean women, they struggle with a position of gender inferiority regarding access and control over natural resources such as land, water, production and commercialisation of agricultural products. This translates into under representation in different type of organisations. Despite this, women actively participate in the management of key natural resources such as water and land. While men concentrate their participation and decision making in agriculture and husbandry, women are responsible for water supply for subsistence farming, food preparation, cleaning and hygiene of family members, including the ill and disable (Carrillo & Remy, 2022).

Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial planning, government processes, and M&E systems.

Different stakeholders do not possess systematic methods to plan EbA and climate resilient practices into policies, plans, budgets and investments. MIDAGRI extension services do not register or keep track of progress in climate change adaptation impact of their training or structural interventions, so there is no way to monitor and evaluate progress in adaptive capacity neither at the Ministry nor at local levels. Traditional methods for decision-making based on observation and ancient knowledge exist but are being lost. On top, in some instances, they are no longer relevant in the new climate context and are often not well understood by regional and national decision-makers.

According to Cerdan et al (2022)[28], the main challenges that must be overcome to optimize EbA investments include reducing the time of the budget allocation process from public funds to EbA investments. Sometimes, it depends on the political decision of both regional and local authorities. On the other hand, it was evidenced that only 16% of the project investments include a monitoring system, for example hydrological, what makes more complex to verify the impacts that the interventions on the quantity and quality of water resources, among other variables. Finally, the incorporation of the gender approach is a pending and necessary task in the investment projects, it is necessary to include conceptual frameworks and formal tools of the State that incorporate the needs and women's visions from the formulation, implementation and evaluation of projects.

Increasing EbA investments for water purposes requires, among other things, sufficient reliable information on benefits or positive impacts of interventions, such as, for example, increased infiltration for aquifer recharge, maintenance of flows in times of low water and conservation of moisture in the soils. It is vital for the country to have monitoring systems that specify whether the projects are meeting its objectives (Cerdan et al 2022). Of the 175 public projects identified in the study developed by Forest Trends, only 16 (9%) had hydrological monitoring actions within their budget. The indicators of the projects analysed were formulated to measure the increase in water resources and analyse the effects and impacts of the interventions, which is complex if you do not have the equipment and qualified personnel budgeted. According to interviews with several actors, the main reasons for not including monitoring is the few specialized personnel and the cost of hydrological monitoring equipment.

Regarding women participation in different government process the management of green infrastructure they are not able to do so because they are not under equal conditions (Cerdan et al 2022). Therefore, it is essential for the formulation of the investment projects to take into account rural women barriers to promote their participation in the planning and implementation process. Among the main barriers we can mention: the lack of time due to the overload of care work and gender violence, which prevents women from having time to participate and apply for management positions in organizations to express their needs and expectations regarding the benefits of projects and any other interventions in their community. Projects are not identifying those barriers and, therefore, are not contributing to closing them. To help reverse this situation, projects need to incorporate conceptual frameworks, approaches and methodological tools since the planning phase to the implementation that make them visible. these barriers and at the same time contribute to overcoming them. This will not only serve to increase women's participation, but also to achieve greater participation. Gender equality in the territory.

These situations prevent the integration into development of groups of small producers in the region, and so the barrier can be defined as: Limited technical capacity prevents family farmers from accessing investment and participate in decision-making processes.

Knowledge and information barriers

Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled up

In this field, a very important barrier refers to the fact that the best practices and ancestral knowledge linked to EbA are not disseminated or expanded sufficiently. Ancestral practices and knowledge on EbA are being lost due to:

a) the processes of emigration of young people;

28

b) the lack of appreciation and recognition of the value of such knowledge and technologies by national, regional, and local institutions; and

Lack of mechanisms for expanding and disseminating best practices on successful experiences in ecosystem management in similar territories of the country, due to the absence of assessment, analysis, and discussion platforms on appropriate technologies in the restoration and sustainability of ecosystems and strategies for broadcast for adoption. Absence of coordination platforms and joint work between the community, educational centers and authorities responsible for development.

Climandes project carried out a survey to identify the existence of a common practice among the farmers, named here "Ancestral Visual Indicator". It consists of a hereditary climate-related knowledge, based on the observation of the sky. This usage is mainly spread among old farmers (older than 70 years), for whom it has higher credibility than the information provided by SENAMHI. In contrast, young farmers tend not to adopt this ancestral knowledge, refusing non-modern and for them unreliable habits[29].

The rural areas of SHAP have experienced a significant decrease in population due to migration. While some highland communities migrate in anticipation or in reaction to hazards, others stay in spite of the challenges/dangers. The vulnerability of highlanders is often based on a function of the extent, quality, and location of household resources, including land and livestock, and demographic factors such as family size, age, and health.[30] Outmigration is deteriorating family structures, culture, traditions and local knowledge[31]. López-i-Gelats et al. (2015) found that migration may weaken the adaptive capacity as traditional knowledge and labor resources are being lost. As the younger population of the SHAP has moved to urban areas, 40 % of the population remaining are now over 54 years old.[32] Gender traditional norms in the Andes often prevent women from achieving the same level of visibility as men, or benefit from the same opportunities and recognition, despite their deep knowledge of agriculture, water and ecosystems. For example, women alpaca herders in the Andes continue to be side-lined in technical discussions at local and national level around animal health and pasture management, the same as, in discussions about agrifood systems and crop diversification[33].

Institutional barriers

Barrier 6: Limited alignment and coordination among stakeholders to reinforce the positive impact on the territory.

The weak intersectoral and intergovernmental articulation and coordination is one more reason for policies in Peru to fail. According to A. Fernández (2017)[34], the Peruvian State presents a complex and hierarchical structure organizational that limits the channels of coordination between ministries, levels of governments, among other institutions in the implementation of public policies which generates the appearance of critical knots that make the correct continuity of the policy impossible.

The implementation of public policies in Peru is the weakest link in the decentralization process and public management, due to the ineffectiveness of the instances, platforms or spaces of

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articulation and coordination where the government authorities of the three levels of government (national, regional and local) have not achieved consensus and/or agreements to establish a shared vision of territorial development in search of closing economic and social inequalities[35].

Despite the existing normative on participatory involvement of communities in budget and territorial planning, community's involvement is limited due to the lack of awareness, weak capacities to dialogue, negotiate and put their needs in the territorial agenda. Some platforms have been established at landscape level to increase the coordination and improve the dialogue among stakeholders for the planning and management of interventions in local watersheds. However, these governance platforms seldom integrate the experiences, practices, and knowledge from local communities that could foster additional knowledge and innovation, the development of appropriate technologies, and support effective participatory planning and decision-making. This is also reflected in sub-optimal project implementation and provision of extension services, preventing ownership and sustainability of the implemented measures.

Some Peru's experiences shows that achieving policy changes for EbA requires collaboration between different levels of government, integrating both bottom-up and top-down approaches. In addition, the articulation of national institutions with local structures and policies promotes the appropriation of EbA and its long-term sustainability.

Barrier 7: Limited institutional knowledge hinders the implementation of PES schemes

From the institutional point of view, barriers are related to the roles of regional and local governments in prioritizing investments to improve the impact of the actions developed within the framework of the hydrological MERESE stand out. For the specific case of the EPS, they need to adapt their organizational structure to address the challenges present in the design of the MERESE and the execution of the funds raised, as well as to incorporate conservation and recovery of water sources in their institutional culture and strategies (Tristan et al 2021)[36].

Technical barriers are mainly related to the limited knowledge to understand the functioning and management of MERESE and therefore to design projects oriented to the conservation, recovery and management of ecosystems. On the other side, limited capacities and methodologies to monitor and evaluate the impacts of the green investments on the hydrologic ecosystem services (HES); the lack of information on which activities are effective for the recovery, conservation and sustainable use of HES source ecosystems; and on methodologies to evaluate the return on investment for retribuyentes, such as EPS (Tristan et al 2021).

Barrier 8: Limited integration of EbA and climate resilient approaches into regulatory frameworks

Regarding the institutional barriers that limit the integration of EbA measures in the planning and sustainable management of the territory, although it is important to recognize that there is a State Policy No. 34 of Territorial Planning and Management, we must note that there is still no Land Management Law, which establishes the necessary instruments to channel efforts to regulate the occupation and appropriate use of the territory, establishing objectives and actors responsible for its implementation, monitoring and vigilance for compliance. (Ojea, E, 2015)

Through the organic laws linked to the decentralisation of the country, the regional and municipal governments have been entrusted with the elaboration of the Land Management Plans and their Regional and Municipal Councils with the approval of the same. The Ministry of the Environment, through the General Directorate of Environmental Territorial Planning,

[35] Chessman, Yuri (2022). The intergovernmental articulation and coordination mechanisms of National and Territorial policies in Peru.

[36] Tristán, MC., Saldaña, S., Francesconi, W., Quintero, M. (2021). Mecanismos de Retribución por Servicios Ecosistémicos Hidrológicos: estado de avance, cuellos de botella y aprendizajes de las iniciativas en el Perú. Documento de trabajo n.° 2, Ministerio del Ambiente, Alianza de Bioversity International y el CIAT.

rules and regulates territorial planning processes at the national level. The legal provisions establish the institutions responsible for the processes; however, there is a lack of institutional coordination platforms, which allow harmonising the objectives of the territorial planning from technical, environmental, and social criteria, as well as the efforts to carry them out participatory, with the necessary accompaniment and monitoring of its execution. This is an example of the importance of addressing the limited coordination between actors to reinforce the positive impacts in the territory.

Another aspect that deserves special attention is the absence of policies for the recognition and valuation of ecosystem services, which establish the responsibility to protect and conserve the ecosystems that produce them, as well as the way to reward the work of restoration and conservation of ecosystems. the same. An advance in this sense is Law 30215, Mechanisms for Remuneration for Ecosystem Services - MERESE, (LSE, 2014) which is fulfilled through the companies that provide water and sanitation services and must be used for the restoration and conservation of ecosystems that provide hydrological services, among others. The regulation of the Law establishes the conditions for the use of the collected funds. However, it is considered necessary to make the pertinent adjustments so that the communities involved in the care of the ecosystems have access to these resources without the need for complex processes to qualify their use; alternatively, some institutions support these communities in the formulation of projects to access these resources.

Based on the experiences that are being collected on the application of this Law, it is necessary to improve it.•The progress achieved opens a new range of technical and social needs and limitations that must be overcome, including the operationalization and financing of operation and maintenance, the evaluation of results and strengthening good governance platforms. Since MERESE resources are insufficient for the recovery needs of ecosystem services, it is necessary to design regulatory frameworks which facilitate other public actors could be engaged and committed.

Peruvian legislation lacks clear norms that establish the responsibilities of users and of the whole society in the conservation of ecosystems, especially those that provide essential services for humanity and are in conditions of vulnerability, due to natural phenomena, anthropic causes, or effects of climate change. Until the promulgation of the MERESE Law, the laws on environmental aspects have not considered the responsibility of society to pay for the services that nature provides us, through ecosystems and that it is necessary to preserve, restore what is deteriorated and improve the conditions of stability of the territory for the sustainable use of renewable natural resources.

To this situation, one must add the lack of regulations that establish the obligation of public and private institutions to protect, restore and conserve ecosystems linked to the provision of environmental services for direct consumption by society and that provide inputs and goods that are used in productive aspects. There is a lack of legislation that establishes the responsibility of the relevant authorities that establish the obligation to consider ecosystems in the regulatory frameworks of all activities that consume the services they produce. This situation constitutes an important barrier, which is defined as the Limited integration of EbA in regulatory frameworks.

8 Project Design

8.1 Project Objective

The aim of the project is to increase the resilience of communities, ecosystems and livelihood in the High Andean region affected by climate change through the establishment of public and private financing for investing on EbA measures and the support from multilevel landscape governance instruments.

8.2 Project's Approach to Address Barriers

Table 30: Overview how barriers are addressed

Outcome/ Output	Activities	Sub-activities	Barriers addressed
Outcome 1: Puna ecosystems are restored, conserved and better managed through the implementation of EbA measures complemented by CRVC			
Output 1.1. Investments for EbA measures and climate resilient value chains are implemented at the local landscape level	1.1.1. Setting up the basis for financing and implementing EbA measures and Climate Resilient Value Chains (CRVC)	1.1.1.1: Inform and identify communities, associations, cooperatives and Civil Society Organizations interested in participating in the project	Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing.
		1.1.1.2: Development of site-specific climate diagnostics and preparation of participatory intervention plans	Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing.
	1.1.2. Financing and implementing of EbA measures and Climate Resilient Value Chains	1.1.2.1 Implementation of Local initiatives financed by the Puna Facility	Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing. Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development
		1.1.2.2: Financial support through MIDAGRI	Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing. Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development
	1.1.3. Technical Assistance for implementing EbA measures and Climate Resilient Value Chains (CRVC) at local landscape level	1.1.3.1 Technical assistance for the refinement of proposals and Local initiatives implementation (including EbA implementation, business development	Barrier 3: Limited technical capacity prevents family farmers of accessing investment and in participating in decision-making processes

Outcome/ Output	Activities	Sub-activities	Barriers addressed
		and access to finance) through the Puna Facility	
		1.1.3.2 Technical Assistance through MIDAGRI	Barrier 3: Limited technical capacity prevents family farmers of accessing investment and in participating in decision-making processes
		1.1.3.3 Promote market access and economic opportunities for climate resilient and sustainable value chains	Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing. Barrier 3: Limited technical capacity prevents family farmers of accessing investment and in participating in decision-making processes
Output 1.2. The use of EbA knowledge is recovered and disseminated, and local monitoring committees and observation systems are implemented	1.2.1 Recover, innovate and scale up ancestral knowledge and practices	1.2.1.1: Capacity building of local experts for the transfer of ancestral and innovative knowledge linked to EbA and Climate Resilient Value Chains (CRVC) measures.	Barrier 3: Limited technical capacity prevents family farmers of accessing investment and in participating in decision-making processes Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled-up
		1.2.1.2: Production and dissemination of information materials on lessons learned from ancestral practices and innovation in a context of change	Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled-up
		1.2.1.3: Knowledge sharing among beneficiary communities with a gender perspective	Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled-up
		1.2.1.4: Facilitating intergenerational dialogue on ancestral practices and innovation in a changing context	Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled-up
	1.2.2 Implement community monitoring and observation systems to measure the impact of EbA measures and provide feedback on regional and national policies	1.2.2.1: Training and implementation of Community Monitoring Committees to develop local systems	Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial planning, government processes and M&E systems
		1.2.2.2: Development and implementation of a local data-driven information	Barrier 4 Limited capacity to integrate EbA and climate resilience into territorial

Outcome/ Output	Activities	Sub-activities	Barriers addressed
		management system using digital technologies innovation measures	planning, government processes and M&E systems
		1.2.2.3: Analyse collected information on the impact of EbA measures	Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial planning, government processes and M&E systems Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled-up
Outcome 2: Public and private financing for EbA measures and climate resilient livelihoods are accessible and being actively used by vulnerable communities in the Puna ecosystem			
Output 2.1. Financial mechanisms for the implementation of EbA measures and improvement of climate resilient livelihoods in the Puna ecosystem are established	2.1.1. Establish the Puna Facility for the long-term financing of EbA measures and Climate Resilient Value Chains	2.1.1.1: Preparation and continuous improvement of the allocation of resources of the Puna Facility	Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development
		2.1.1.2: Development and implementation of an innovative strategy to mobilize resources from the private sector and different donors	Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development
		2.1.1.3: Promote access and alignment of public investments and other government programmes for EbA and Climate Resilient Value Chains (CRVC) measures	Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing. Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development
	2.1.2. Strengthen capacities to develop and implement innovative mechanisms for EbA in high Andean ecosystems	2.1.2.1: Technical assistance to improve existing hydrological MERESE processes in the project areas.	Barrier 3: Limited technical capacity prevents family farmers of accessing investment and in participating in decision-making processes Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial planning, government processes and M&E systems Barrier 7: Limited institutional knowledge hinders the

Outcome/ Output	Activities	Sub-activities	Barriers addressed
			implementation of PES schemes
	2.1.3. Support the greening of microcredits to promote EbA and Climate Resilient Value Chains (CRVC)	2.1.3.1: Support to financial institutions in greening microcredit	Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development
		2.1.3.2: Raise awareness of greener microcredits to promote EbA and Climate Resilient Value Chains	Barrier 1: Smallholder farmers and associations have unequal participation in the agricultural value chain, lack economies of scale, limited commercial activity, access to markets and financing. Barrier 2: Insufficient supply of financial products and support for climate resilient/sustainable development
Outcome 3: EbA and climate resilience are mainstreamed into multilevel landscape governance instruments			
Output 3.1. Multilevel landscape governance is improved through strengthening of national capacity, regulatory frameworks and M&E systems	3.1.1 Strengthen the capacities for territorial planning and governance processes integrating EbA and climate resilience	3.1.1.1: Strengthen the capacities of relevant national, regional and local government stakeholders for the incorporation of EbA and Climate Resilient Value Chains measures, integrating the gender perspective in their processes and interventions in the territory	Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial planning, government processes and M&E systems Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled-up
		3.1.1.2: Strengthen participatory sectoral and territorial platforms for the articulation and scaling up of EbA measures and Climate Resilient Value Chains within the scope of the project	Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial planning, government processes and M&E systems Barrier 6: Limited alignment and coordination among stakeholders to reinforce positive impact on the territory Barrier 5: Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled-up
		3.1.1.3: Integration of EbA measures and Climate Resilient Value Chains in territorial	Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial

Outcome/ Output	Activities	Sub-activities	Barriers addressed
		planning and management instruments	planning, government processes and M&E systems
	3.1.2 Strengthen regulatory frameworks and monitoring and evaluation (M&E) systems at national level	3.1.2.1: Improving national regulatory frameworks linked to EbA measures and Climate Resilient Value Chains	Barrier 8: Limited integration of EbA and climate resilience approaches into regulatory frameworks
		3.1.2.2: Improve coordination of EbA monitoring and evaluation (M&E) systems at the national level linked to project and NDC purposes	Barrier 4: Limited capacity to integrate EbA and climate resilience into territorial planning, government processes and M&E systems

8.3 Envisaged Paradigm Shift in the Agriculture Sector and Ecosystem services

The table below describes this project activities' alignment with the ecosystem and ecosystem sectoral pathways and the four pillars of the GCF strategic plan. The same has been done for the agricultural sector.

For Ecosystems and Ecosystem Services, the programme is aligned with Pathway 1: *Ecosystem-based management of terrestrial and freshwater systems,* to achieve a paradigm shift in the landscape management of the SHAP region. The programme uses *transformational planning and programming* via the fostering of an enabling environment for EbA interventions for improved ecosystem services. The project also *catalyses climate innovation* through the support of the development of new mechanisms to finance EbA and resilient livelihoods. It *mobilises finance at scale* through securing public and private financing through the Puna facility, Payment for Ecosystem Services schemes, and other new financial products.

Figure 56: Alignment of sectoral EES activities with the GCF Strategic Plan

Ecosystems and Ecosystem services	Alignment with GCF Strategic Plan			
	Transformational planning & programming	Catalysing climate innovation	Mobilising finance at scale	Coalitions & knowledge to scale up success

Pathway 1: Ecosystem-based management of terrestrial and freshwater ecosystems	• Building with nature through the recovery of ancestral practices for strengthening agricultural value chains, or restoring traditional *Andenes* (EbA n.10) and Qochas (EbA n.2) • Enabling environment for EbA • Participatory multi-stakeholder processes to integrate EbA at multilevel planning processes (Output 2.1)	• Develop innovative PES Schemes for carbon sequestration	Mobilisation of private and public financing for EbA and resilient livelihoods through new financial mechanisms (Output 2.1): • Improvement of PES (MERESE) Schemes • Grants and repayable grants to the community • Development of new financial products such as microcredit.	• Participatory monitoring, evaluation, and learning • Knowledge exchange platforms based on intergenerational sharing of ancestral knowledge • Knowledge sharing among beneficiary communities with a gender perspective

For Agriculture and food security, the programme is aligned with Pathway 1: *Promoting Resilient Agroecology,* to achieve a paradigm shift in agricultural value chains in the region. The project uses *transformational planning and programming* via the promotion of EbA measures such as agroforestry and integrated soil fertility management. The project also *catalyses climate innovation* through the investment in climate-resilient value chains, which can require the input of resilient practices and technologies (e.g. EbA measures). It *mobilises finance at scale* through offering financial services for agricultural SMEs such as microcredits and grants and the support of innovative Payment for Ecosystem Services schemes (e.g.MERESE).

Figure 57: Alignment of sectoral Agriculture and Food Security activities with the GCF Strategic Plan

Agriculture and Food security	**Alignment with GCF Strategic Plan**			
	Transformational planning & programming	**Catalysing climate innovation**	**Mobilising finance at scale**	**Coalitions & knowledge to scale up success**
Pathway 1: Promoting Resilient Agroecology	• Integrated landscape management that uses EbA practices to make agriculture more resilient in a participatory way (Output 3.1) .	• Promoting new business & financing models that incentivise resilient inputs, practices, and technologies. (Output 2.1.)	• Financial services for SMEs (, microcredit, grants) (Output 2.1) • Supporting Payment for Ecosystem Services schemes.	• Knowledge platforms for sharing what technologies, management practices & business models are most suited for different agroecological and socioeconomic contexts. (Output 2.1)

8.4 Exit Strategy and Sustainability

Financial sustainability

Though smallholder farmers and associations: The support given to smallholder farmers to become creditworthy by the standards of local financial institutions will increase their capacity to continue with the climate-resilient sustainable agribusinesses initiated with project actions. This will be in the form of technical assistance provided to the selected Local initiatives will further enhance their business viability. Business-focused technical assistance, detailed in Section 3.3 of the Operating Manual, will cover areas such as: business establishment and formalization, budgeting and accounting, tax, legal requirements, optimization of operations, labor formalization, business strategy and business plan, marketing and sales, as well as a list of relevant service providers and templates of the main legal documents.

Furthermore, the Puna Facility will enable future access to commercial finance for the businesses supported. The use of repayable grants for non-subsistence businesses will create evidence of financial discipline that will enhance the recipients' attractiveness to lenders in the future. All selected Local initiatives, including subsistence ones, will receive comprehensive technical assistance on access to finance, in areas including: developing a fund-raising strategy; analysis of the positive financial implications of EbA and climate-resilient business investments to reduce the perceived risk for prospective lenders; preparation of a pitch deck to present business to prospective lenders; introduction to MFIs active in the region; explanation of the terms of any loan products offered by MFIs and support with loan applications; and, in subsistence communities, basic financial literacy training.

Similarly, the EbA measures that will be implemented by smallholder farmers and farmers' associations, that are complementary to the value chain investments in the form of Local initiatives, will require minimal maintenance and beneficiaries will be fully capacitated to perform such maintenance.

Through financial institutions: GCF funds will be used to transfer systemized methodologies to partner institutions (financial intermediaries) so they can autonomously continue financing Ecosystem-based Adaptation investments at the landscape and community levels in the SHAP. The project will thus work on the capital supply side to enhance the ability of MFIs to better serve the beneficiaries of the Puna Facility, through technical assistance in the following areas: introduction to Local initiatives that will need loans in the future for the continuation and expansion of a climate-resilient business; training of credit officers on each EbA and sustainable business measure with particular focus on the costs required and their impact on beneficiary communities' cashflows over a 5-year period or longer; training of credit officers on how the adoption of EbA and sustainable business practices alters the credit profile of individuals or associations, by generating an additional and more climate-resilient income stream, and interactive credit assessment exercises; support in designing tailored climate-resilient loan products; and training of credit officers on marketing and explaining the terms of the climate-resilient loans to prospective borrowers.

Through innovative payment for ecosystem services: GCF resources will initially be used to complement MIDAGRI´s investments via Local initiatives executed by communities in partnership with civil society organizations and local governments (component 1). Then as additional sources of funding become available through the water related MERESE (short term) private investors (short and medium term) or other payment for ecosystem service and VCUs (long term) will be included to eventually replace GCF funding and/or to cover any maintenance costs.

Behavioural changes

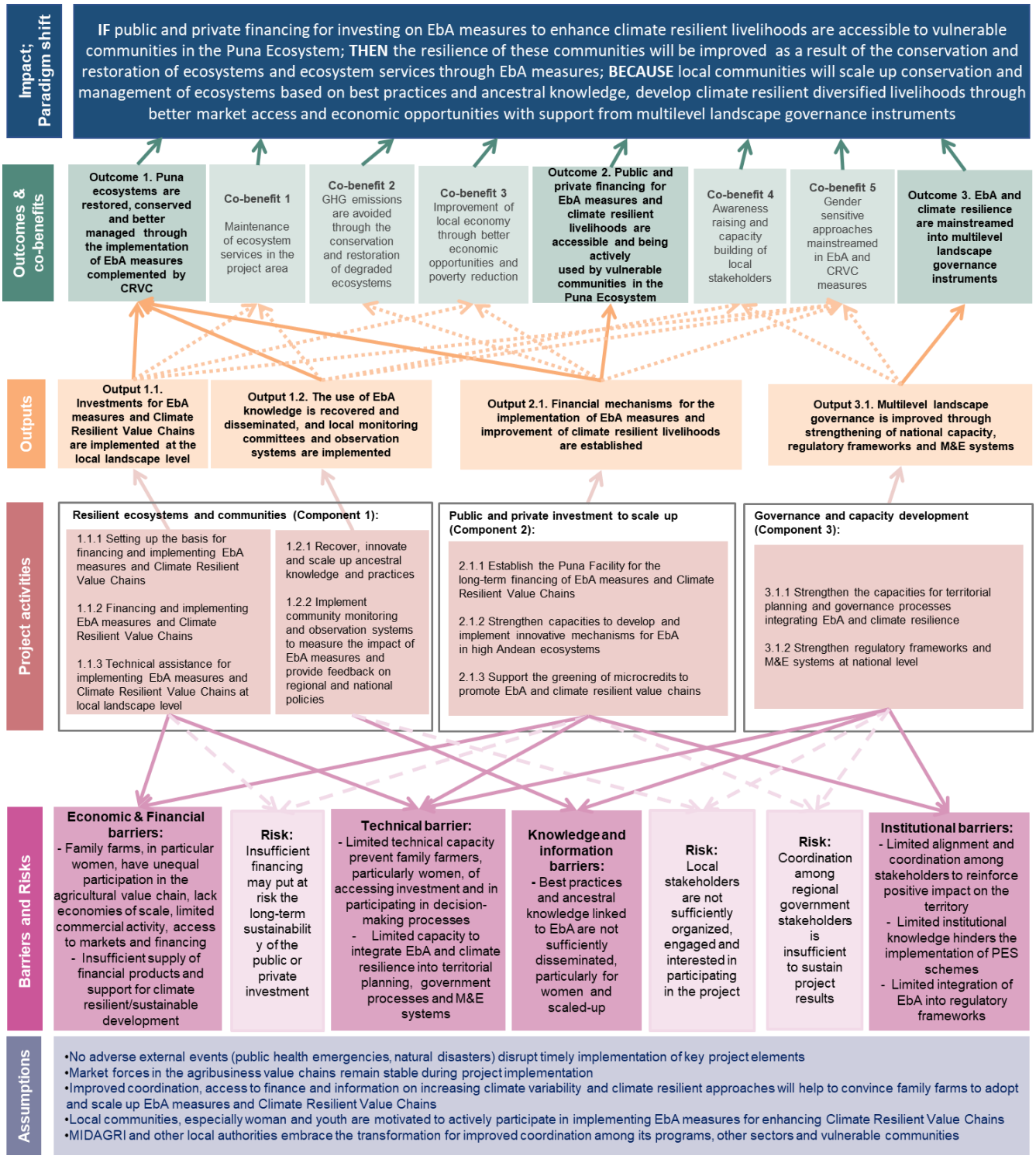
On individuals and organizations: Target populations will be trained on implementation and maintenance of EbA interventions so they can continue providing benefits long after the project has ended. They will also be trained on improved production practices and sustainable

business models to increase self-dependence and overall climate resilience. This will in turn conserve Puna ecosystem services in the long term.

On planning processes and institutions: The project aims at mainstreaming EbA and strengthening coordination capacity within MIDAGRI and between other sector and stakeholders in governance platforms that will continue operating and will then integrate climate change and enhanced coordination without additional cost.

8.5 Theory of Change

Figure 58: Theory of Change



8.6 Project Structure and Rationale

The project is comprised of three components:

Component 1 – Resilient ecosystems and communities

Component 1 will promote resilient Puna ecosystems and value chains by financing and co-financing climate-focused investments at local landscape level. By implementing investments on the ground, the aim is (i) to maintain or improve the provision of Puna ecosystem services for climate resilience of the high Andean population and (ii) to strengthening Climate Resilient Value Chains that are dependent on and impacting on those ecosystems. A series of structural interventions, technological packages, trainings, information materials and communities' exchanges to nurture dialogue will be implemented to co-produce knowledge and foster community monitoring to measure EbA impacts that then will result in investment on the ground.

Financing volume: EUR 59.02 million

Component 2 – Public and private investments for the scale up of EbA measures

Component 2 will establish a Facility (The Puna facility) to align and leverage public and private financing for EbA measures and climate resilient agribusiness at different and coordinated levels. The focus of this component is on mobilizing finance at different scales and with different sources, with impact beyond the specific landscape. The key feature of this component is its leverage potential financing and facilitate the mobilization of MIDAGRI investments, PES, private and financial institutions resources.

Financing volume: EUR 6.94 million

Component 3 - Multilevel governance of the territory for the incorporation of EbA measures

Component 3 will promote integrated landscape planning, governance platforms and policy improvement and coordination, fostering dialogue and improving coordination among stakeholders that intervene in the landscape (local, regional and national governments, rural communities, producer organizations, watershed committees, and MIDAGRI extension services, among others).The most adequate processes through effective participatory approaches or platforms for knowledge exchange, dialogue, coordination and consensus-building will be fostered according to local needs.

Financing volume: EUR 5.64 million

The following subsections provide a detailed overview of the three components, activities and sub-activities of the project. Each Activity and Sub-Activity is described in detail, including the contribution to the project Component, the budget allocation, the baseline, the deliverables, the technical justification, and the institutions involved.

8.6.1 Activity Sheets for Component 1

Output 1.1. Investments for EbA measures and Climate Resilient Value Chains are implemented at the local landscape level:

Table 31: Activity 1.1.1 Setting up the basis for financing and implementing EbA measures and Climate Resilient Value Chains

Activity 1.1.1: Setting up the basis for financing and implementing EbA measures and Climate Resilient Value Chains	
Contribution to project output	The following sub-activities are included: Sub-activity 1.1.1.1: Inform and identify communities, associations, cooperatives and Civil Society Organisations interested in participating in the project Sub-activity 1.1.1.2: Development of site-specific climate diagnostics and preparation of participatory intervention plans
Envisaged results	This activity will focus on creating a communication strategy to develop awareness among the local stakeholders about the project and create the basis for the implementation of IPLCs led Local Initiatives that comprises EbA measures and CRVC at landscape and/or micro water basin levels that will be financed by the Puna Facility. In this regard, IPLCs in their different forms of organizations (communities, community enterprises, associations, MSEs, cooperatives) will be able to receive technical support in order to participate in the call for proposals. The process of selecting beneficiaries has two important stages. The first is described in sub-activity 1.1.1.1 in which the districts of the prioritized project area (58 districts) will be visited to identify potential beneficiaries interested in participating in the Call for Proposals mechanism. Those IPLCs and their different forms of organizations willing to participate then will receive technical support in sub-activity 1.1.1.2 to develop participatory community diagnostics and plans and they will need to propose Local Initiatives where they prioritize EbA measures and Climate Resilient Value Chains that contribute to their resilience. In sub-activity 1.1.2.1, the potential beneficiaries will apply their Local Initiatives to the Puna Facility (managed by Profonanpe) to be evaluated based on a list of eligibility criteria that will be established in the Puna Facility Operations Manual.
Budget/ Co-finance	• **Total Activity Cost: EUR 2,506,495** • **GCF finance:** EUR 1,931,033 • **BMZ Co-finance:** EUR 575,462
Sub-activity 1.1.1.1: Inform and identify communities, associations, cooperatives and civil society organisations (CSOs) interested in participating in the project	
Description	This sub-activity aims to inform local authorities and ILPCs in their different forms of organizations (communities, community enterprises, associations, MSEs, cooperatives), hereafter project beneficiaries, about all project activities and specially Puna facility criteria within the 58 prioritised districts to identify potential project beneficiaries interested in participating, specifically in the call for proposals of the Puna Facility (see sub-activity 2.1.1.1 for more information on the establishment of the Puna Facility and sub-activity 1.1.2.1 on the operationalization) within the 58 prioritised districts. **A gender and culturally sensitive strategy for beneficiary engagement and communication** will be developed by a consulting service in coordination with the project's communication team, MIDAGRI, Profonanpe, Instituto de Montaña (IdM), and SERNANP. This strategy will comply with the different plans (Environmental and Social Management Plan (ESMP), Gender Action Plan (GAP) and Indigenous Peoples and Local Community Engagement Plan (IPLCEP)) developed based on the GCF Social and Environmental Safeguards and Gender and Indigenous Peoples Policies, as well as, on Free, Prior and Informed Consent (FPIC) principles to allow IPLCs to actively participate in the design, implementation and monitoring of their own Local Initiatives.

	As a first step, the communication channels of the 58 prioritised districts will be identified. This will serve as the input for implementing the communication strategy in the project area. The engagement strategy aims at ensuring adequate engagement and that the information of the project reaches all potential beneficiaries involved in the prioritised territories. It will also allow mapping other local relevant stakeholders to identify possible synergies. The strategy will include two avenues to reach the different beneficiaries according to their profile. First, GIZ will hire local CSOs to identify local communities, producers' associations and cooperatives in the process of formalization interested in participating in the project, specifically in the call for proposals for the non-repayable sub-window of the Puna Facility. Second, GIZ will hire promoters (in coordination with the local CSOs) to identify MSE, community enterprises, cooperatives and other producers' organizations interested in participating in the other two repayable sub-windows. The project team will consider the districts where MIDAGRI has interventions (co-financing) as a priority to start the implementation of the communication and engagement strategy. Once the communication and engagement strategy have been created, **information about the project activities** will be **disseminated** through radio commercials and written media in native languages (Spanish and Quechua) with information about the project. The project team (including amongst others communication staff and project partners) will also carry out information workshops to promote the project activities within the prioritized districts, as well as other activities identified in the communication strategy. Informative material of the project will be printed as an additional mean to disseminate the project information, for which a printing service will be contracted. Before engaging with communities, regional government and district municipality authorities will be contacted to identify specific local needs and priorities regarding climate change adaptation and avoid isolated or nonaligned actions. It will be also important to actively engage local authorities from the beginning to promote support and increase awareness for EbA funding and inclusion in planning instruments (sub-activity 3.1.1.3). To this end, the communication strategy will be in place, and it will be coordinated with municipalities, NGOs and local radio stations. At this stage, the eligibility criteria to apply to the Puna Facility (described in Operations Manual - Annex 21) will be disseminated and potential beneficiaries who meet the eligibility criteria will be encouraged by hired GIZ local promoters to prepare ideas. **Information workshops** will be developed in prioritised districts. The number of workshops will depend on the project's communication strategy. At the end of the information workshops, an initial list of communities, producers' associations, cooperatives, community enterprises and/or MSEs interested in participating in the project will be compiled. The team of **promoters hired** by GIZ will promote and deliver project information during field trips to hard-to-reach areas where communities have difficulty travelling and attending information workshops. The Promoters will be local and speak Quechua to ensure a higher outreach based on the high percentage of Quechua speaking potential beneficiaries in the target area of the project. Prior to reaching the different beneficiaries during the **field trips**, project promoters and local CSOs will receive intensive training from a team of experts composed by different experts of the different EEs on how to implement the beneficiary engagement and communication strategy. Once the initial list of potential project beneficiaries is completed, a follow-up visit by the promoters and local CSOs will be conducted to assess whether those interested meet the requirements for applying to the Puna Facility (based on the eligibility criteria for Puna Facility recipients shown in table 2 and the List of ineligible recipients in table 3 both in the Operation Manual (Annex 21). The first result of the visits will be a signed community agreement and/or association members agreement and/or cooperative members agreement, etc., where they express their interest and willingness to participate in the process to ensure a free, prior and informed consent (FPIC) of participants of the project. Attached to the agreement they also shall briefly develop

	(in a template) the climate problem in its territory and preliminarily indicate ideas of climate resilient interventions to tackle the problem. The second result of the visits will be a short documentation assessment on how potential beneficiaries meet the requirements to participate in the call for proposals of the Puna Facility. All communities, producers' associations, cooperatives, community enterprises and/or MSEs who agreed to participate will present to GIZ their signed community agreements giving their informed consent to participate in the project and an attached form for a Local initiative idea (including an simplified explanation of the climate problem and a proposal on how to solve the climate change problem/s based on the eligibility list of Ecosystem based Adaptation (EbA) measures and Climate Resilient Value Chains (CRVC) as shown in table 6 of the Operations Manual (Annex 21)) through the project promoters or local CSOs or through MIDAGRI´s Agricultural Agencies or the Local Government, which will be forwarded to GIZ. Once GIZ has received all the Local initiative ideas, a team of experts from GIZ, MIDAGRI, SERNANP and local authorities will evaluate and select the best proposed ideas. Then, for those pre-identified applicants with the best proposed ideas, climate diagnostics and intervention plans will be developed in sub-activity 1.1.1.2 to prioritize the adaptation measures for the initiatives that will apply to the Puna Facility. Information workshops and selection of best ideas process will repeat and start at least six months before each launch of call for proposals.
Baseline[37]	The activity will focus on 58 of the 91 districts prioritized in the project. Within these districts, 439 peasant communities, 77 producers' associations, 5 cooperatives, 2 community enterprises are expected to be eligible to participate in the activities.
Results	This sub-activity will identify the beneficiaries interested in participating in the project to start the process of accessing funding to implement EbA measures and CRVC to recover ecosystems and ensure climate resilient livelihoods. The expected results and/or products are: • 1 Communication and engagement strategy developed. • At least 100 Communities, associations, cooperatives and/or micro and small enterprises to be supported in 1.1.1.2 selected. • 1 Training for project staff on concept standardization implemented.
Justification	Ensure that project information reaches all actors involved in the prioritised territories to ensure FPIC from project participants. This will allow for the identification and selection of communities and CSOs interested in participating in the Puna Facility.
Institutions involved (include roles)	• **GIZ as EE:** Will coordinate the design and implementation of the communication and engagement strategy through the promoters and local CSOs. Will lead the idea selection process together with MIDAGRI and SERNANP. • **MIDAGRI:** Will participate in the coordination of the design and implementation of the communication and engagement strategy. Will participate in the idea selection process. • **SERNANP:** Will participate in the coordination of the design and implementation of the communication and engagement strategy. Will participate in the idea selection process. • **Profonanpe:** Will participate in the coordination of the communication and engagement design contributing with Puna Facility criteria explanations and with their communication and safeguards specialists. • **Subnational Governments:** Will participate in the coordination of the implementation of the sub-activity. • **Instituto de Montaña:** Part of the group of experts who will train, project staff, promoters and selected local CSOs on concept standardisation.
Sub-activity 1.1.1.2: Development of site-specific climate diagnostics and preparation of participatory intervention plans	

[37] Please note that this numbers are based on registered in the matrix of peasant and indigenous communities from MIDAGRI. The number could increase as there are others which are not registered.

Description	This sub-activity aims to support project beneficiaries to identify and prioritise through a participatory process resilient measures and Climate Resilient Value Chains in their territories through comprehensive climate diagnostics and intervention plans (refer to step 2). In this context, Indigenous Peoples and Local Communities and their other forms of organization such as MSEs, community enterprises, cooperatives, producer's associations and/or organizations whose idea were selected (sub-activity 1.1.1.1) will receive support from local promoters or CSOs in the development of participatory site-specific climate diagnostics to not only better understand climate and non-climate threats to ecosystem and livelihoods but also social and economic aspects. IPLC´s own concepts and perceptions will provide an empowering and culturally appropriate way for communities to assess climate change impacts on their territories and plan adaptation solutions that build on their traditional knowledge and may be combined with modern scientific findings. When developing diagnostics, it will be also important to identify the causes of vulnerability in the specific sites such as communal organization, gender roles and inequalities over resources uses and access to basic services, etc. As well as understand which are their livelihood strategies and how ecosystems and their services in its site support them. At the beginning of this sub-activity, the **methodology and guidelines to develop site-specific climate diagnostics and participatory intervention plans** will be developed with the support of Instituto de Montaña. The guidelines will consider intercultural and gender sensitive aspects for EbA and CRVA planning and implementation process to considerate the different territorial perspectives, motivations and needs. The methodology and guidelines will be also used to train and guide project promoters and local CSO technical experts hired in sub-activity 1.1.1.1. Before starting the work with project beneficiaries, the project **promoters and CSOs technical experts will be trained** (based on the previous developed methodology and guidelines) on the standardisation of the methodology and procedures to carry out site-specific climate diagnostics (including social and economic aspects) and participatory intervention plans. Instituto de Montaña will collaborate with the organization and implementation of the training workshops. These plans will describe in more detail the identified EbA measures and CRVC, including a list of necessary inputs such as materials, equipment and additional biophysical and social studies to be required for implementation|. Lastly, **the promoters and CSOs technical experts will start to work with the project beneficiaries** whose ideas were selected in sub-activity 1.1.1.1. These local communities, producers' associations, cooperatives and/or MSMEs who are potential applicants to the Puna Facility will receive further support in the development of their Local initiatives' applications. Communities, associations and/or cooperatives in the process of formalisation eligible for the non-repayable sub-window will receive support from the local CSOs' technical experts. Communities, associations and/or cooperatives eligible for the repayable sub-windows will receive support from promoters hired by GIZ. The support will include **developing site-specific climate diagnostics and intervention plans**. This will also include to support the process of identifying specific studies and/or licenses which will need to be developed and/or request during the refinement of their Local initiative proposals in case they are selected. The specific areas in each locality to be intervened with EbA measures and CRVC will be defined in this sub-activity and will depend on case-by-case (local consultations, site-specific climate diagnostics, and viability). For the development of an intervention plan per community, prioritization of EbA and CRVC will be held through a comprehensive and participatory process, where respective members of each IPLCs will be broadly consulted, ensuring active participation of women, young and elderly people during design phase, which will need to be ultimately approved by the respective decision-making body. This will ensure to promote the participation of local

	communities, from the design stage onwards and it will contribute to the continuity and sustainability of EbA measures and climate resilient practices. Along with this, the interested project beneficiaries in applying to the Puna Facility will already have the basis to prepare their Local initiatives to apply to the call for proposal. The interested project beneficiaries will receive in this regard support to be prepared to apply to the Puna Facility (refer to step 3). To continue fostering the participatory process, potential IPLCs beneficiaries must **designate "local researchers"** (composed by women and men), who will lead and facilitate the diagnostics and planification process inside its community and encourage the intergenerational dialogue among community members to recover men and women traditional knowledge, discuss their concerns and identify solutions together (activity 1.2.1). By this means, ownership of the implemented EbA measures and climate resilient agricultural practices will be reached, which is the basis of sustainability. Finally, local researchers will establish the community monitoring committees supported in activity 1.2.2. In this sub-activity, interventions in EbA and CRVC by different public and private actors (e.g., MIDAGRI (through its programmes), SERNANP and others) will be identified in order to determine early on whether a coordination/synergy with the potential Local initiatives is needed in the case the initiative is financed by the Puna Facility. The rationale behind is to seek for complementarity and avoid duplication in the same territory.
Baseline	Some local CSOs individually support the development of participatory intervention plans, but the measures are not always linked to improving the livelihoods of communities.
Results	Increase the probability of access to the Puna Facility and other private and public funding sources. Deliverables: • 1 Guideline (including participatory methodology) developed for site specific climate diagnostics and project intervention plans. • At least 100 intervention plans prepared. • 3 Training for project staff on site-specific climate diagnostics and participatory interventions plans implemented
Justification	Communities, associations and/or cooperatives need support to identify and develop participatory climate diagnostics and potential interventions to address climate risks through EbA and CRVC to apply for financial resources, including the Puna Facility.
Institutions involved (include role)	• **GIZ as EE:** Will coordinate the design of the methodology and guidelines and implementation through the promoters and local CSOs. • Promoters and CSOs technical experts: Will support the different project beneficiaries in the process of the development of the site-specific climate diagnostics and participatory intervention plans. • **MIDAGRI**: Territorial officials will accompany promoters and local CSOs' technical experts during the development of the site-specific climate diagnostics and participatory intervention plans. • **SERNANP**: Territorial officials will accompany promoters and local CSOs' technical experts during the development of the site-specific climate diagnostics and participatory intervention plans. • **Instituto de Montaña:** Will support the development of the guidelines to prepare site-specific climate diagnostics and intervention plans and will organize and implement the trainings for project staff, promoters and selected local CSOs on site-specific climate diagnostics and participatory intervention plans.

Table 32: Activity 1.1.2: Financing and Implementing EbA measures and Climate Resilient Value Chains

Activity 1.1.2: Financing and Implementing EbA measures and Climate Resilient Value Chains	
Contribution to project output	This activity will focus on promoting climate resilient Puna ecosystems and CRVC at landscape and water basin level that will support communities in the mid and long term to increase their adaptative capacities and improve the resilience of their ecosystems and livelihoods. The activity will provide financial support for Local initiatives through the Puna Facility (established under Activity 2.1.1) and through public resources (MIDAGRI's programmes). The two types of financial support are complementary and contribute to a general objective of improving the climate resilience of the local communities in the target territories. The following sub-activities are included: Sub-activity 1.1.2.1: Implementation of Local initiatives financed by the Puna Facility Sub-activity 1.1.2.2: Financial support through MIDAGRI
Envisaged results	This activity will contribute to the implementation of 127 Local initiatives, through GCF and BMZ funding and at least 8 public investment projects through MIDAGRI funding. At the end, the activity is expected to contribute to the conservation and/or restoration of 23,914 hectares within the Puna region.
Budget/ Co-finance	**Total Activity Cost: EUR 38,735,479** • **GCF finance:** EUR 16,937,871 • **BMZ Co-finance:** EUR 317,444 • **MIDAGRI Co-finance:** EUR 21,480,164
Sub-activity 1.1.2.1: Implementation of Local initiatives financed by the Puna Facility	
Description	This sub-activity is closely linked to Component 2 as through the in activity 2.1.1. established Puna Facility, GCF and BMZ funds will be channelled through activity 1.1.2.1. for Local Initiatives oriented to the high Andes regions of Peru, prepared in the previous sub-activity. GCF and BMZ funded grants will be channelled through a Financial Window to eligible recipients via a competitive selection process (open call for proposal) run by Profonanpe under the guidance of the Project Steering Committee. Complementary to the financial support, applicants will also receive Technical Assistance (TA) offered by the Puna Facility and in some cases Civil Society Organisations (CSOs) (see sub-activity 1.1.3.1). These grants will fund Local initiatives enabling the design and implementation of Ecosystem based Adaptation (EbA) measures and Climate Resilient Value Chain (CRVC) based on predefined lists as followed: 1. EbA measures: - Conservation and restoration of bofedales - Family Qochas - Integrated soil fertility management - Countor farming - Infiltration ditches - Sustainable grassland management - Conservation agriculture - Agroforestry - Forest restoration with native species - Andenes/Terraces restorations - Other complementary adaptation measures 2. Climate Resilient Value Chains (CRVC):

- High Andean crops (quinoa and potato)
- South American camelids (Alpaca and vicuñas)
- Complementary value chains (emerging Andean grains and tubers, guinea pigs, textile handcrafts and community tourism)

These adaptation options were pre-identified and validated in consultation with different stakeholders, including communities, producer associations and with sectoral experts in the target regions.

The **financial support** provided by the Financial Window will be divided into three Sub-Windows mainly:

a. Non-Repayable Grant Sub-Window for IPLCs with their different forms of organization (local communities, producers' associations and cooperatives in the process of formalization[38] (from here on CSOs supported applicant), applying with the support of local CSOs trusted by communities.
The Non-Repayable Sub-Window is meant to finance a maximum grant amount per Local initiative activities (including both EbA and CRVC interventions) of up to EUR 100,000.

b. Results-based Repayable Grant Sub-Window for micro and or/ small enterprises community enterprises and cooperatives permitted by law with commercial capacities and clear target markets. Hence:
- Formal/legal micro and/or small enterprises
- Formal/legal community enterprises according to the law Nº 24656
- Formal/legal Cooperatives according to the legislation in force.

The Results-based Repayable Sub-Window is meant to finance a maximum grant amount per Local initiative activities (including both EbA and CRVC interventions) of up to EUR 200,000.

c. Agroideas Matchmaking Sub-Window for formalized producers' organizations with commercial capacities and clear target markets, that are eligible for the MIDAGRI support programme Agroideas. Hence:
- Small and/or medium agricultural producers organized under any organizational form permitted by law: associations, native communities, peasant communities, limited liability companies, public limited companies, cooperatives and other forms allowed by law.

The principle underlying the differentiation between the different sub-windows is that the Non-Repayable Grant Sub-Window is meant to benefit communities, producer associations and cooperatives in the process of formalization without commercial capacities and clear target markets and the Results-based Repayable Grant Sub-Window is meant to benefit micro and/or small enterprises, community enterprises and cooperatives with commercial capacities and clear target markets. Moreover, the Agroideas Matchmaking Sub-Window – in line with the guidelines of the Agroideas programme – is meant to benefit formalized producers' organizations with commercial capacities and clear target markets conforming to the rules and regulations of the Agroideas programme.

Reflecting the fact that Non-Repayable Sub-Window beneficiaries lack the required level of preparedness and ability to submit and implement Local initiative proposals on their own, applicants of the Non-repayable Sub-Window will partner with qualified local CSOs to submit and implement approved Local initiatives (while ensuring that

[38] The Law No. 31335, law on the improvement of the association of agricultural producers in agricultural cooperatives was recently regulated on July 21, 2023. From this regulation some associations will migrate to cooperatives, regime in which they will be able to commercialize and have net benefits in an associative way, with which in the future they will be able to demonstrate the generation of income, but the process will involve some requirements that may not allow them to apply to sub-window 2 in the first call.

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	beneficiaries are proactively involved in the process and their capacity is built). **Error! Reference source not found.** in the Operations Manual (Annex 21)**Error! Reference source not found.** lists the eligible recipients for the three sub-windows in more detail. The selection process for the Local initiatives from preparation and approval for call for proposals to the signing of Local initiatives Agreements is described in the Operations Manual (see Annex 21) section 5. Within the process of evaluation and selection, the Local initiative selection criteria and scoresheet will include a gender representation criterion weighted with 20% and a gender quota of at least 30% of the selected Local initiatives should either support a women's association, cooperatives, organizations and/or a women led enterprise in order to ensure the equal access between men and women of the funds. It is expected that after implementing this sub-activity, 127 Local initiatives Grant Agreements will have been signed (with a total value of up to EUR 14.4 million), for the three sub-windows and a total of 23,914 hectares would have been restored and/or conserved. The whole process of the selection and evaluation of each of the Local initiatives is described in detail within chapter 5 of the Operations Manual. In summary, the process includes 10 steps from the preparation of the calls until the signing of the Local Initiatives Grant Agreements. Within this sub-activity Profonanpe will manage step 2 (Publication of the call) to 10 (signing). After the Local initiatives Grant Agreements have been signed, the disbursement and implementation will be monitored by the Puna Facility Management Unit. In the case of the monitoring to measure Local Initiative progress, Profonanpe will have one monitor per department that will make field visits to see local initiatives contract agreement performances (fulfillment of activities' plan, procurements, expenditure documents) to request disbursements to beneficiaries. Complementary in order to ensure a participatory community monitoring of the impacts especially of EbA measures of Local Initiatives, Instituto de Montaña will prepare and put in place through activity 1.2.2 the methodology and guidelines for the community monitoring (including Training of Trainers).
Baseline	Local communities, producers' associations, MSEs, producers' organizations and/ or cooperatives (formalized or in the process of formalization) do not have the necessary financial resources to implement EbA measures and CRVC that will help the conservation and restoration of Puna ecosystems.
Results	The expected results and/or products are: • 127 Local initiative Agreements signed.
Justification	Functioning and resilient ecosystems are the basis for climate adaptation, sustainable water and food security. Therefore, EbA measures and Climate Resilient Value Chains are necessary for rural, poor and vulnerable people to extreme weather events. It is necessary to conserve and restore the Puna ecosystems as well as to improve livelihoods in the region.
Institutions involved (include role)	• **Profonape as EE:** Will manage the Puna Facility through the Puna Facility Management Unit who will amongst others, ensure the operational coordination of the Puna Facility and report to the Project Management Committee (PMC). • **Independent Technical Assessment Committee:** Will evaluate the shortlisted Local initiatives proposals. • **Project Steering Committee (PSC):** Will provide amongst others strategic guidance and implementation oversight of the Puna Facility through review of progress and evaluation reports and provision of recommendations to the Project Management Committee.

	• **Project Management Committee (PMC):** Will revise and approve amongst others the final list of local initiatives evaluated by the FMU according to the established processes and criteria. • **MIDAGRI:** Executing Entity of the Project, part of the PSC and PMC. • **MINAM:** Project partner, part of the PSC and PMC. • **GIZ:** Executing Entity, part of the PSC and PMC.
Sub-activity 1.1.2.2: Financial support through MIDAGRI	
Description	In this sub-activity, MIDAGRI, through its programmes (AGRORURAL, Sierra Azul, Irrigation Subsector Program (PSI), (National Institute for Agrarian Innovation) INIA, Agroideas and National Forestry and Wildlife Service (SERFOR) and Agroperu Fund), will finance additional interventions in the SHAP area that in some cases will complement the 127 Local Initiatives financed by the Puna Facility in the same territory and will contribute to increase the resilience of High Andean populations to climate change. These will comprise three types of public interventions:(i) Public investment projects, which, on the one hand, include adaptation interventions such as the recovery of degraded High Andean grasslands, sowing and harvesting of water and technical irrigation to improve the efficiency of water resource application. These interventions are implemented directly by MIDAGRI´s programs: AGRORURAL, Sierra Azul and PSI. On the other hand, INIA and SERFOR will implement public investment projects that will contribute to research and technology transfer in High Andean livestock and sustainable use of the vicuña, among others. It is expected that at least eight (8) public investment projects are implemented directly by MIDAGRI. (ii) Agroideas Program Non-reimbursable funds for business plans, which require co-financing from producers, to strengthen the adaptive capacities of climate change resilient value chains including guinea pigs, camelids and High Andean crops. This includes the acquisition of agricultural technology (e.g., machinery, infrastructure, vehicles and tools) in order to reduce costs and improve production systems and agricultural productivity. They contribute to increasing the resilience of value chains. The producers' organisations who can prove to have been selected by Agroideas will be also eligible to apply to the third sub-window (Agroideas Matchmaking) of the Puna Facility to complement the financing of their business plans with financing from the Facility for Ecosystem based Adaptation measures. (iii) Individual credit lines and producer organizations credit lines provided by MIDAGRI through the Agrarian Development Bank (Agrobanco). The credits provided by MIDAGRI through Agrobanco have current characteristics that make them complementary to the financing provided by the Puna Facility. The main characteristic is that they must be returned within 18 months. So these credits are appropriate for businesses with fast return. An example of their complementarity application to the Puna facility, particularly in the case of the alpacas value chain, involves the credits as the working capital for alpaqueras cooperatives to collect the fiber and process it. This leads to a higher market price compared to individual farm sales. These same alpaqueros will be able to receive financing for EbA investments from the Puna facility whose benefits are seen in the longer term and will contribute to reducing the risks of climate change. In order to have a coordinated implementation between MIDARGIs programmes and the Puna Facility in the case operations are within the same territory, strong coordination and communication mechanisms will be fostered between MIDAGRI and the Puna Facility (through the Project Management Unit and the Territorial Implementation Unit), to effectively implement interventions within that territory.
Baseline	MIDAGRI has at least eight public investment projects that address the implementation of EbA and other adaptation measures.
Results	• At least 8 public investment projects implemented
Justification	In order to achieve a holistic territorial outcome and improve the resilience of communities, a holistic approach needs to be implemented that addresses the different adaptation needs that are currently addressed in parts by MIDAGRI.
Institutions involved	The entities, institutions or bodies involved are: • **MIDAGRI as EE**: Will implement their public investments in the project area.

(include role)	• **Project Management Unit:** Will serve as a space for MIDAGRI and Profonanpe to closely coordinate the implementation of the Local initiatives and public investment projects in a coordinated way at national level. • **Territorial Implementation Unit:** Will serve as a space for MIDAGRI and Profonanpe in the territory to closely coordinate the implementation of the Local initiatives and public investment projects in a coordinated way.

Table 33: Activity 1.1.3: Technical Assistance for implementing EbA measures and Climate Resilient Value Chains (CRVC) at local landscape level

Activity 1.1.3: Technical Assistance for implementing EbA measures and Climate Resilient Value Chains at local landscape level	
Contribution to project output	This activity will complement activity 1.1.2 and will ensure sustainability of the Local initiatives and government investments beyond the scope of the project by building capacities of direct project beneficiaries. The activity will be three folded. It will provide Technical Assistance (TA) complementary to sub-activity 1.1.2.1 for the refinement of proposals within the call for proposals for the Puna Facility and during Local initiative implementation (including TA for EbA and CRVC implementation, business development and access to finance). Complementary to sub-activity 1.1.2.2. it will also include the TA provided by MIDAGRI within their programs (which includes hiring extensionists and commercial coordinators, development of courses and events, among others). In addition, the project will also enhance organizational and entrepreneur skills, formalization and competences to access markets and develop economic opportunities for EbA and Climate Resilient Value Chains. Finally, the project will ensure women's access to technical assistance including financial education, and access to markets. The following sub-activities are included: Sub-activity 1.1.3.1 Technical assistance for the refinement of proposals and Local initiatives implementation (including EbA implementation, business development and access to finance) through the Puna Facility Sub-activity 1.1.3.2 Technical assistance through MIDAGRI Sub-activity 1.1.3.3 Promote market access and economic opportunities for climate resilient and sustainable value chains
Envisaged results	The envisaged result of this activity is a) provide TA packages to Puna Facility recipients complementary to the financial support, b) trained producers through TA provided by MIDAGRI and c) instruments that facilitate access to markets to project beneficiaries.
Budget/ Co-finance	**Total Activity Cost: EUR 9,819,038** • **GCF finance:** EUR 2,545,803 • **BMZ Co-finance:** EUR 331,389 • **MIDAGRI Co-finance:** EUR 6,941,845
Sub-activity 1.1.3.1 Technical assistance for refinement of proposals and Local initiatives implementation (including EbA implementation, business development and access to finance) through the Puna Facility	
Description	The objective of this sub-activity is to provide technical assistance that will accompany the financial support provided through the Puna Facility (sub-activity 1.1.2.1). The Puna Facility will offer **Technical Assistance (TA)** through a service provider hired by Profonanpe and in the case of the Non-repayable Sub-Window optionally in conjunction with the CSO supporting the applicant. The TA packages will be differentiated between: i) TA for the **refinement of the local initiative proposals**, provided by the TA provider and

	ii) TA for the **implementation of the local initiatives** provided by the TA provider and optionally in conjunction with the CSO in the case of the Non-repayable Sub-Window. During the refinement phase, the shortlisted Local initiatives will receive technical assistance from a service provider that will be hired by Profonanpe. This entails conducting workshops to be held at regular intervals before the submission of the full proposal to support applicants to refine their Local initiatives proposals and address the issues raised by the FMU during the evaluation of proposals for the shortlisting. The content of the workshops will vary depending on the type and content of the proposals as well as comments raised by the FMU (step 5 in the Operations Manual (Annex 21)). Once the agreement is signed with the applicants, the technical assistance during implementation phase will be provided by the service provider and the CSOs depending on each sub-window. The technical assistance topics will be focused in 3 areas: 1) EbA and CRVC implementation (including participatory approaches for planning, implementing, monitoring and reporting for EbA measures based on the community monitoring approach (for more information please see Sub-activity 1.2.2.1, as well as recovering un upscaling ancestral knowledge) 2) business development and 3) access to finance and markets (including financial literacy). The technical assistance will differ according to the sub-window: **Non-Repayable Sub-Window Technical Assistance** In the case of non-repayable sub-window during the refinement phase the TA service provider will offer a TA valued up to EUR 2,745 per proposal. For the implementation phase, the TA offered by the local CSO can be up to EUR 20,000 for each Local initiative, and the TA offered by the technical provider will be valued up to EUR 5,000 per Local initiative. **Results-based Repayable Sub-Window Technical Assistance** Each Local initiative in the repayable sub-windows will receive from the service provider TA valued up to EUR 2,745 during the refinement phase. For the implementation phase will receive from the service provider TA valued up to EUR 25,000 per Local initiative. **Matchmaking Agroideas Sub-Widow Technical Assistance** During refinement phase, eligible Agroideas proposals will receive from the service provider TA valued up to EUR 2,745; and for the implementation phase TA valued up to EUR 12,500.
Baseline	Potential funds recipients lack on technical capacities needed to fully develop in a high quality the Local initiative proposal and implement the Local initiatives following the standards needed. In addition, some of them also lack on basic capacities regarding business development and access to finance.
Results	The expected results and/or outputs are: • 127 tailored TA packages offered
Justification	Technical assistance is needed to build the capacity of local communities, associations and/or cooperatives not only on climate change and EbA related topics, but also on project implementation, business development and access to finance. Specifically, a high amount of TA is needed, as the TA also needs to consider the logistics to reach the local communities in the High Andes and cultural context such as language are to be considered. This will support the direct beneficiaries of the project in developing long-term and sustainable capacities to continue developing their businesses, access to other financial resources (e.g., microcredits) or other programs.
Institutions involved	• **Profonanpe as EE:** Will hire the TA service provider who will provide the TA for the refinement of the proposals and during Local initiative implementation. • **CSOs**: Will provide in some cases (for the Non-repayable Sub-Window) complementary technical assistance according to their expertise.

(include role)	
Sub-activity 1.1.3.2 Technical Assistance through MIDAGRI	
Description	In this sub-activity, MIDAGRI, through its programmes (INIA, SENASA, Agrorural, Sierra y Selva Exportadora and SERFOR), will provide technical assistance and technology transfer for the implementation of EbA measures and value chains. This includes hiring extensionists and commercial coordinators, development of courses and events, among others. The technical assistance topics foreseen include (1) commercial technical assistance; (2) technology transfer in value chains prioritised by the project, such as guinea pigs, pasture and forage, roots and tubers, Andean grains and legumes, and South American camelids; (3) technical assistance for the improvement of sustainable camelid breeding, including animal health actions; (4) technical assistance to subnational governments for the recovery and increase of water recharge for agricultural and other purposes, contributing to food security through ancestral practices of planting and harvesting water, including the implementation of *qochas*, construction of infiltration ditches, reforestation, revegetation and protection of grasslands in a scenario of climate change; (5) technical assistance for the sustainable use of the vicuña; and (6) strengthening the capacities of regional and local authorities in the management and good management practices of the vicuña and its habitats (health management, capture, shearing, repopulation, among others).
Baseline	MIDAGRI has decentralised offices, agricultural experimental stations (including demonstration plots) and extensionists.
Results	• 9,647 producers trained
Justification	To achieve an integrated result in the territory, meeting the objective of improving the resilience of the High Andean populations, it is necessary to implement a holistic approach that addresses the different adaptation needs that are currently being addressed by the different entities attached to MIDAGRI, in collaboration with the different local stakeholders.
Institutions involved (include role)	The entities, institutions or bodies involved are: • **MIDAGRI as EE:** through its programs INIA, SENASA, Agrorural, Sierra y Selva Exportadora and SERFOR will provide TA.
Sub-activity 1.1.3.3 Promote market access and economic opportunities for climate resilient and sustainable value chains	
Description	This sub-activity will focus in developing an enabling environment to support project beneficiaries in having a better market access for their Climate Resilient Value Chains. On the one hand, with project information the project will develop market studies for specific products (e.g., crops, fibre etc.) including prices, marketing strategy (e.g., demand, what characteristics the products must have, what is the demand, etc.). Under this sub-activity, the project team will also explore the potential for a partnership with the SIPAM project, and the online sales platform tool that was developed “Kusikuy”. Potential partnerships with MIDAGRI programs such as Agrorural, Sierra y Selva Exportadora will also be considered. On the other hand, the project will directly support commercial connections between producers and buyers for prominent businesses out of the recipients of the Puna Facility, including women led business. Based on the financial and technical support received through the Facility funds recipients will have an increasing productivity, diversification and better adaptative capacities, communities, associations, MSEs and cooperatives will be able to have enough production for their own consumption and to sell it in local markets.

	Therefore, the project will support commercial connections between producers and buyers (e.g. participating in local markets or fairs, connections with gastronomic routes, etc.) including the development of market studies for the producers. Besides, the project will support the beneficiaries with the logistic costs to participate in events that promote market access, such as: • Business conferences and fairs that are relevant for the value chains supported by the project. • Meetings with investors and buyers.
Baseline	Local communities, associations and/or cooperatives do not have enough market access to sell the products of their value chains. They also lack the technical capacity and information to increase the sales.
Results	• 1 Digital platform for sale of Puna products operating
Justification	Access to markets will create opportunities for rural population living in the high Andes to increase income through sales, production incentives, and income diversification. Access to markets will also increase access to financial services and will contribute to build resilience.
Institutions involved (include roles)	The entities, institutions or bodies involved are: • **GIZ as EE:** Will hire value chain experts to support the development of markets studies, support project beneficiaries to participate in events, fairs etc. • **MIDAGRI**: Will coordinate with GIZ to make use of existing fairs through their programs such as Agrorural, Sierra y Selva Exportadora.

Output 1.2. The use of EbA knowledge is recovered and disseminated, and local monitoring committees and observation systems are implemented:

Table 34: Activity 1.2.1: Recover, innovate and scale up ancestral knowledge and practices

Activity 1.2.1: Recover, innovate and scale up ancestral knowledge and practices	
Contribution to project output	This activity seeks to develop and strengthen the capacities of communities, local experts (called *yachachiqs*[39] or *kamayocs*[40]), and technical experts from national and regional institutions to increase the implementation of ancestral water and land management practices and technologies during project implementation and after project finalisation. This activity will also encourage the use and exchange of ancient knowledge and practices from both women and men in the Local Initiatives financed by the Puna Facility. In addition, it will promote dialogues on ancient practices and innovation within members of communities, building intergenerational memory (e.g., children, youth and adults) and fostering discussions on gender roles as well on women knowledge at the community level. In this sense, the project will support the recognition and appreciation of people's own values, knowledge and practices, improving their self-esteem and strengthening their identity with the territory. It will also expand on gender roles to reflect on their place within and in relationship with ecosystems. For this to be effective, studies and communication materials (printed, radio spots, videos, etc.) in native languages (Quechua and Spanish) will be produced to capture lessons learned and promote replication of success stories of Local initiatives within this project and other implemented initiatives (e.g. with Instituto de Montaña in NYC), especially in Natural Protected Areas (NPAs). Exchange between communities will be financed by the project to encourage peer-to-peer learning and ownership of implemented solutions. Of particular importance is the transfer of experience already gathered from recuperating ancient practices and promoting participatory agreements in the Nor Yauyos Cochas landscape reserve.

[39] A *yachachiq* is a master farmer who obtained his knowledge generational transfer and teaches their community about productive technologies for the good management of land, water, crops or animals.

[40] The Kamayoc is a master of the field, depository of an important accumulation of ancestral knowledge, carries the role of extensionist in the transfer of his knowledge to the Andean producers.

	The following sub-activities are included: Sub-activity 1.2.1.1: Capacity building of local experts for the transfer of ancestral and innovative knowledge linked to EbA and Climate Resilient Value Chains (CRVC) measures Sub-activity 1.2.1.2: Production and dissemination of information materials on lessons learned from ancestral practices and innovation in a context of change Sub-activity 1.2.1.3: Knowledge sharing among beneficiary communities including a gender perspective Sub-activity 1.2.1.4: Facilitating intergenerational dialogue on ancestral practices and innovation in a changing context
Envisaged results	Local experts are aware of and empowered about how to identify, design and implement EbA measures based on ancestral knowledge.
Budget/ Co-finance	**Total Activity Cost: EUR 3,202,868** • **GCF finance:** EUR 2,332,702 • **BMZ Co-finance:** EUR 454,939 • **SERNANP Co-finance:** EUR 415,226
Sub-activity 1.2.1.1: Capacity building of local experts for the transfer of ancestral and innovative knowledge linked to EbA and Climate Resilient Value Chain (CRVC) measures	
Description	This sub-activity aims to strengthen the capacities of local experts (*yachachiqs*, *kamayocs*[41], rural talents and local extensionists, among others) and support the recognition of their skills in the implementation of EbA ancient techniques and climate resilient agricultural practices. This will create future opportunities for local experts while increasing the application and replication of ancestral practices and EbA measures in other communities and territories. The role of local experts is to teach and transfer knowledge, using a peasant-to-peasant methodology, to implement and manage ancestral and innovative techniques for small irrigation systems, installation of greenhouses, animal breeding, cultivating pastures, and growing crops. This sub-activity will be implemented in close coordination with SERNANP and MIDAGRI through its National Agrarian Innovation Institute (INIA). GIZ will identify in coordination with SERNANP and INIA local experts in all of the 91 districts of the project, including i) entities at national and subnational level, ii) local CSOs working in the territory, and iii) local community and/or producers' association leaders that can potentially collaborate in the transfer of local knowledge (*yachachiqs*, *kamayocs*, rural talents and local extensionists). A capacity building programme for local experts will be developed (considering information produced in sub-activity 1.2.1.2), tailored to the profile (e.g., level of education and technical capacities) of the identified local experts and ancestral and innovative knowledge. The programme will contain training modules with content related to: • **Climate change:** Site-specific climate diagnostics, hazards associated with climate change, guidelines from the nationally determined contributions (NDC) of Peru. • **EbA:** Identification of EbA measures based on ancestral knowledge, implementation, and community monitoring.

[41] For MIDAGRI, the yachachiq, kamayoc and rural talents are first-line providers of agricultural extension in the territory.

	• **CRVC:** Entrepreneurship and access to public and private financing programmes. All modules will include cross-cutting approaches such as gender and interculturality. The methodology considered for the different modules will include Agricultural Field School[42] (AFS), face-to-face and virtual workshops. The implementation of the capacity building programme for local experts will be carried out according to a detailed schedule of activities and tasks. The project will also promote the registration of local experts in the National Register of Agricultural Extension Service Providers (RNPSEA), which is managed and progressively implemented by INIA. Being registered in the RNPSEA will generate future benefits for service providers, such as: access to information, future training, and opportunities to be part of extension services through sector public programmes and projects. In addition, the professional certification of this local experts will be promoted. This will increase their labour opportunities to become field technicians.
Baseline	Best practices and ancestral knowledge linked to EbA are not sufficiently disseminated and scaled up in the region. Ancestral practices and knowledge on EbA are being lost due to: • The processes of migration of young people. • The lack of appreciation and recognition of the value of such knowledge and technologies by national, regional, and local institutions; and
Results	The expected deliverables are: • At least 910[43] local experts trained
Justification	Since limited economic opportunities and climate change are impacting in migration of the youth, it is important to ensure the transfer of knowledge of ancestral and innovative solutions linked to EbA and CRVC measures in different communities, as in some of the cases the promoted knowledge does not consider ancestral knowledge. This will also allow to preserve the important deep connection with the environments and reliance on local ecosystems. The rural Quechua populations use practices that date back to the Inca culture, which nowadays, their application contributes to resilience against the effects of climate change.
Institutions involved (include roles)	• GIZ as EE: Will coordinate the consultancy to develop training modules and implement capacity building and to support local experts in getting registered and certified. • MIDAGRI, through its specialized technical agencies such as INIA, or its programs such as Agrorural and Fondo Sierra Azul, among others will provide information on existing local experts. In addition, MIDAGRI will support the registration and will lead the certification process of local experts. • SERNANP, through the General Directorate of Natural Protected Areas (DGANP) and their protected area local officers will provide experiences from NPAs and provide lists of local experts within this area. • Instituto de Montaña as EE: will contribute with its experiences and best practices.
Sub-activity 1.2.1.2: Production and dissemination of information materials on lessons learned from ancestral practices and innovation in a context of change	

[42] Escuelas de campo en beneficio de la agricultura familiar de Apurímac - Noticias - Servicio Nacional de Sanidad Agraria del Perú - Gobierno del Perú (www.gob.pe)

[43] This number is based on the assumption on the number of the training of at least 10 leading producers/Yachachik on average in each of the 91 beneficiary districts, as well as members of technological NGOs, universities and other key local actors.

Description	This sub-activity aims to document and produce communication materials (printed, digital, radio spots, videos, etc.) in native languages to capture lessons learned and promote replication of successful implementation of EbA and CRVC experiences within and outside (e.g., experiences of NYC and implementation of EbA measures) the implementation of Local initiatives financed by the Puna Facility. This sub-activity will begin by **identifying and systematising** successful past experiences and lessons learned from communities that combine ancestral and innovative practices when implementing EbA measures and climate resilient agricultural practices. This will include successful experiences from the Nor Yauyos Cochas Landscape Reserve. Other existing systematisations of ancestral practices will be revised such as the ones developed by MIDAGRI[44], ENCONTRAR Platform[45], Encuentro de Saberes Small Grants Program-GEF[46]. The systematisation will also include new experiences generated by IPLCs in general, and with a special focus on the ones generated by women groups during the project. Informative **materials** of successful experiences and lessons learned will be **produced** in Quechua and considering gender perspective, including brochures, videos, radio commercials, and others, to promote replicability. In order to do so the produced materials will be **disseminated**. One of the dissemination spaces will be the participatory sectoral and territorial platforms identified in sub-activity 3.1.1.3, as well as web pages and events organised by the partner institutions of the project.
Baseline	Poor availability of information on ancestral practices in Spanish and English, but even less is available in Quechua.
Results	The expected deliverables are: • 2 sets of communication materials in native languages on lessons learned from ancestral practices and innovation are published. • At least 5 dissemination events about lessons learned from ancestral practices and innovation carried out
Justification	Ensure the dissemination of lessons learned from ancestral practices and innovation to promote their replicability during and after project implementation.
Institutions involved (include roles)	• **Instituto de Montaña (IdM) as EE:** Will be in charge of the development and dissemination of materials. In addition, it will coordinate with Profonanpe on the systematization of experiences from the Local initiatives. • **MIDAGRI,** through their programs: Will provide experiences to be systematized by IdM. • **SERNANP**: Will provide experiences to be systematized by IdM. • **Regional Governments:** Will provide experiences to be systematized by IdM. • **Profonanpe:** Will provide information from the Local initiative and coordinate with IdM on the systematization of experiences. • **Sectoral/Territorial governance platforms:** Will serve as a space to disseminate material.
Sub-activity 1.2.1.3: Knowledge sharing among beneficiary communities with a gender perspective	
Description	This sub-activity aims to support the recognition and appreciation of IPLCs ancestral practices regarding to the management of agriculture, livestock, water and ecosystems, contributing to to promote the participation and leadership of Indigenous Peoples and Local Communities in recovering ancestral knowledge and encouraging a collective reflection on gender roles. The project will promote and facilitate exchanges between local communities who have been selected to receive funds from the Puna Facility (through sub-activity 1.1.2.1 and 1.1.3.1) or are being supported by MIDAGRI (through sub-activity 1.1.2.2. and 1.1.3.2) to foster peer to peer learning and to share innovations and practices developed between communities. An

[44] repositorio.midagri.gob.pe
[45] Plataforma EncontrAR - Agricultura familiar andina (encontrarandes.org)
[46] PPD Perú – Programa de Pequeñas Donaciones (ppdperu.org)

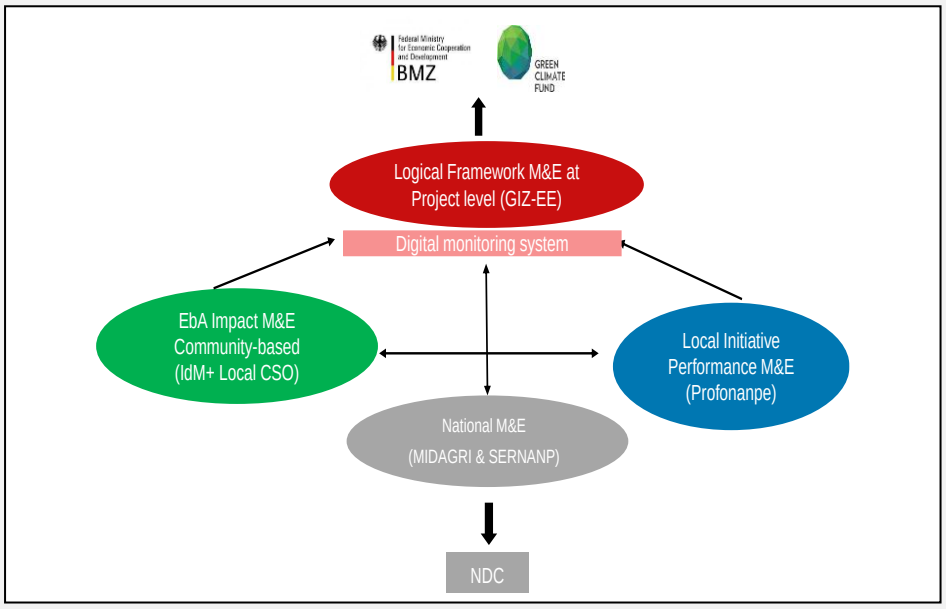
	attention on the different gender roles and knowledge regarding the management of agriculture, livestock, water and ecosystems will be paid to avoid the exclusion of women participants and their skilled knowledge, and rather, highlight their contribution to build climate resilience inside communities. At least one exchange among women IPLCs from different communities will also be promoted, (e.g agropastoralist, artisan women networks, etc) who possess substantive knowledge and skills in these different fields. These exchanges can work as space for women empowerment and inspiration. As part of this sub-activity, a community knowledge sharing plan with a gender perspective will be developed. This plan will define the implementation strategy, both interregional and intraregional exchanges, and the methodology for selecting experiences and means of exchange (meetings, workshops, internships, and others).
Baseline	Project beneficiaries are poorly connected and do not have access to places to exchange information and learn more about ancestral technology recovery, innovation and gender.
Results	The expected results and/or products are: • 1 Knowledge exchange plan with gender perspective developed • A report of an exchange between IPLC women leaders from different local initiatives. • 1 Report on community exchanges with gender perspective developed •
Justification	Ensuring peer-to- peer learning and ownership of solutions with a gender perspective, among beneficiaries, will allow the project beneficiaries to exchange on similar challenges, find joint solutions, improve trust and strengthen networks.
Institutions involved (include role)	• **Instituto de Montaña (IdM) as EE:** Will develop the knowledge exchange plan with a gender perspective, systematize lessons learned and coordinate with MIDAGRI, SERNANP and Profonanpe the community exchanges. • **MIDAGRI**, **Profonanpe and SERNANP**: Will provide lists of participants and coordinate with IdM. • **Local Governments:** Will participate in the knowledge exchange by accompanying project beneficiaries, providing support.
Sub-activity 1.2.1.4: Facilitating intergenerational dialogue on ancestral practices and innovation in a changing context	
Description	This sub-activity aims to build intergenerational memory (children, youth and adults) on ancestral practices and innovation in a context of change (climate, markets, and others) in selected beneficiaries of each Puna Facility call. An intergenerational dialogue on ancestral practices and innovations strategy and implementation plan will be prepared, containing the methodology, means and instruments (videos, books, games, others). Local researchers (composed by women and men) in each community will be trained to facilitate the intergenerational dialogue on site with the participation of women, children, youth, adults, and older adults. The spaces to carry out these dialogues could be schools or farmer field schools. Intergenerational dialogues will serve to recover and considerate different gender perspectives, roles, knowledge embedded within communities during the design, implementation and monitoring phases of the Local Initiatives that will be implemented in sub-activity 1.1.2.1. The intergenerational dialogue plan will be implemented through workshops, surveys, and other activities, depending on each selected community design. The results and achievements of the sub-activity will be systematised and disseminated.
Baseline	Intergenerational dialogue happens at home, among parents, children and grandparents when they are all present, usually in daily life. As youth migrate,

	intergenerational relations weaken. Ancestral practices and innovation in a changing climate are poorly promoted by schools.
Deliverables	Expected results and/or products are: • 1 Intergenerational Dialogue Plan developed • 1 Systematization report on conducted intergenerational dialogues developed
Justification	Building intergenerational memory at the community level on ancestral practices and innovation in a context of change will be important to ensure that this knowledge does not get lost and to build a connection within the communities.
Institutions involved (include roles)	• **Instituto de Montaña as EE**: Will develop and implement the intergenerational Dialogue Plan and systematize knowledge. • **Ministry of Education (MINEDU)**, through local schools: Will support in the coordination of the intergenerational exchange and implementation. • **MIDAGRI through INIA and SERNANP** (in the case of Natural Protected Areas): will support in the coordination and implementation of the intergenerational exchange.

Table 35: Activity 1.2.2: Implement community monitoring and observation systems to measure the impact of EbA measures and provide feedback on regional and national policies

Activity 1.2.2: Implement community monitoring and observation systems to measure the impact of EbA measures and provide feedback on regional and national policies.	
Contribution to project output	This activity will be implemented in alliance with the local communities and local CSOs implementing Local Initiatives. The EE Instituto de Montaña will conduct a Training of Trainers (ToT) methodology for local CSOs that will support beneficiary communities that were selected in Puna Facility's Non-repayable Grant Sub-Window and will provide technical assistance to facilitate the participatory design of indicators and protocols for participatory community monitoring. This activity will build upon Community Monitoring Committees (CMC) that applicants to the Puna Facility have to commit to form when applying their Local Initiatives. These Committees that will be composed by "local researchers" women and men (designated previously in subactivity 1.1.1.2) will lead the participatory monitoring process designed based on each community knowledge and interest. Then CMC will inform to member´s community about its Local Initiative progress. Within this activity, the capacities of local researchers and committees will be strengthened through facilitation, dialogue, training, dialogue and other capacity-building measures. This will enable knowledge weaving and co-production to understand how traditional practices and, scientific findings can explain the ecosystem functions and the effectiveness of EbA. Target populations will establish climate vulnerability social and biophysical indicators based on local knowledge, as the observation of fauna and/or flora species as indicators of the ecosystem health, and other indicators based on men and women community member's interest. Local researchers elected by communities will prepare and lead the development of participatory intervention plans (sub-activity 1.1.1.2) and a baseline in their own communities, including conditions and trends of ecosystem services in the surrounding peatlands, wetlands and grasslands. This includes establishing complementary indicators to the ones already proposed within the Local initiatives implementations plans and respective monitoring systems which will amongst others monitor rough estimates on water availability; the provision of fodder, fibre and food; and other relevant ecosystem services. Committees will learn and discuss how to develop local indicators and technical protocols to assess changes in ecosystem service provision over time as the EbA measures are implemented and mature. The data produced by the local monitoring system will feed regional and national institutions studies and research on impacts and effectiveness of EbA interventions, thus contribute to policy decision making processes.

	Follow-up on this activity will be coordinated at all levels of intervention, including from the local (community) level, in coordination with the national actors responsible for M&E systems and the NDCs. The following sub-activities are included: Sub-activity 1.2.2.1: Training and implementation of Community Monitoring Committees to develop local monitoring systems Sub-activity 1.2.2.2 Development and implementation of a local data-driven information management system using digital technologies innovation measures Sub-activity 1.2.2.3: Analysis of collected information on the impact of EbA measures
Envisaged results	Local monitoring committees and observation system established, local data-driven information management system is developed and implemented and collected information is analysed
Budget/ Co-finance	**Total Activity Cost: EUR 3,249,964** • **GCF finance:** EUR 2,738,790 • **BMZ Co-finance:** EUR 394,251 • **SERNANP Co-finance:** EUR 116,923
Sub-activity 1.2.2.1: Training and implementation of Community Monitoring Committees to develop local monitoring systems	
Description	This sub-activity seeks to make project beneficiaries aware of the impact of climate change and poor landscape management on high Andean ecosystems, as well as the benefits obtained and the causal relationship between the implementation of EbA measures and their impacts on the recovery and conservation of their ecosystems and ecosystem services. Local Researchers (composed by women and men) designated in sub-activity 1.1.1.2 will form Community Monitoring Committees (CMC). CMC will collect information about the impact of the implemented EbA measures in a context of climate change through indicators proposed together with community members. Local researchers will lead and facilitate the community monitoring process since the selection of indicators to assess socio-economic, ecosystem and ecosystem service impacts. This sub-activity will allow beneficiary communities to take a proactive role in monitoring their own progress and building climate resilience. CMC will participate in trainings and dialogue for selecting sites for monitoring, setting a baseline information for their Local Initiative and collecting data using an app that will be developed in sub-activity 1.2.2.2. Data collected then will feed into a data-driven information management system that will be also developed in sub-activity 1.2.2.2. This system will be connected to the Puna Facility monitoring system and to the project monitoring system. The information produced by the system will be used to report to MIDAGRI and SERNANP national monitoring systems that contributes to the NDCs. Therefore, discussions among all executing entities need to be conducted to agree guidelines and indicators for community monitoring.

	 During this sub-activity, community monitoring protocols will be discussed with local researchers in each community in the frame of the agreed guidelines and provided to the information system responsible (sub-activity 1.2.2.2). Thus, a capacity building plan will be prepared by Instituto de Montaña to monitor the planned EbA measure's impacts in the selected recipients of the Puna Facility. This plan will include detail capacity building methodologies for monitoring, cover technical support during the information collection stage in coordination with Profonanpe. Trainings will take place in local communities (in situ). The work will be carried out together with fund recipients under the Results-based repayable and Agroideas Matchmaking sub-window and the local CSOs that are supporting communities/producers' associations and cooperatives under the process of formalization under the non-repayable sub-window. Local CSOs will provide support in the territory and will bring permanent assistance to the community monitoring committees.
Baseline	Working with community local researchers is a strategy for developing good quality participatory monitoring systems. This has been proved for example in a case of the Nor Yauyos Cochas Landscape Reserve, where communities led the implementation of mountain EbA measures, taking ownership of them and laying the groundwork for sustainability. Nevertheless, community monitoring is not yet a streamlined approach in the High Andes. In addition, the linkage of the produced information to an institutional information system is still a current challenge and therefore, the information cannot be used for policy decision making.
Results	The expected results and/or products are: • 1 Community monitoring guideline developed • 1 Baseline report developed • 3 Yearly Reports of community monitoring progress.
Justification	Empowering members of High Andean communities to actively participate in monitoring their own progress and generating valuable data and information plays a crucial role in helping them make more informed decisions regarding their adaptive strategies.
Institutions involved (include roles)	• Instituto de Montaña as EE will develop and implement a training of trainers program to build capacities on EbA impact monitoring. In addition, IdM will also develop guidelines. • Profonanpe as EE: Will coordinate with IdM to complement and in some cases to fed into their monitoring systems of the performance of Local initiatives. • GIZ: will contribute with its technical advisors and the M&E expert. • MIDAGRI and SERNAP: will contribute with their monitoring specialists.

Sub-activity 1.2.2.2: Development and implementation of a local, data-driven information management system using digital technology innovation measures	
Description	This sub-activity aims to develop a Cloud based system that will store the data and information provided by the community monitoring committees (sub-activity 1.2.2.1). This information should be related to the baseline condition of the ecosystems and their ecosystem services (prior Local Initiative implementation); and the outcomes of the selected EbA measures and CRVC. The materials and equipment to be used for monitoring will be procured by GIZ and will be provided to the community monitoring committees when needed. The development of this sub-activity includes the following: The development of the Cloud based System will be fed with local community data, generated by the community monitoring committees, which must be later hosted in one of the existing MIDAGRI´s and/or SERNANP´s national monitoring system. This system will be identified during implementation (sustainability condition). The decision about where this will be hosted should be taken based on an assessment of the existing systems of MIDAGRI and/or SERNANP and/or other competent institutions. The Cloud based System will include data collection tools and protocols for processing and sharing information. For data collection it will be developed an app to facilitate data gathering by the community monitoring committees. Consideration should be given to hiring a specialist consultancy from a research specialized institution such as universities or other scientific centres at the beginning of this activity to support the establishment of this information gathering process that will be hosted in an existing national monitoring system. Consideration should be given to hiring a specialist consultancy from a research specialized institution such as universities or other scientific centres at the beginning of this activity to support the establishment of this information gathering process that will be hosted in an existing national monitoring system. The collected data will be processed and can be used to provide feedback on local, regional and national policies or as a source for analysis linked to sub-activity 1.2.2.3.
Baseline	There are some existing systems that can host information from the local context. These systems lack on in the field generating data.
Results	The expected results and/or products are: • 1 Protocol to feed Information Management Systems with local data developed • 1 existing governmental Information Management Systems fed with local data
Justification	Ensure the availability of data produced by the local monitoring system for community decision making and the preparation of evidence for EbA impact and effectiveness studies for future regional and national decision making on the national adaptation goals. In addition, it is important that in the territory gathered information can be transferred to the institutional level to improve decision making.
Institutions involved (include roles)	• GIZ as EE will hire a consultancy to develop the Cloud based system and app, will buy materials and equipment for EbA community monitoring. Will coordinate with the • Instituto de Montaña as EE will contribute to the discussion of indicators needed for the community monitoring committees. • Profonanpe as EE: Will contribute to the discussion of indicators needed for the community monitoring committees. • MIDAGRI and SERNANP as EE: Will contribute to the discussion of indicators needed for the community monitoring committees and assess which national monitoring system will be suitable to host the Cloud based system. It will also contribute to the design of the Cloud based system. • Specialist consultancy from university or research centers: Will be hired to support the establishment of this information gathering process (e.g., data processing and quality control).

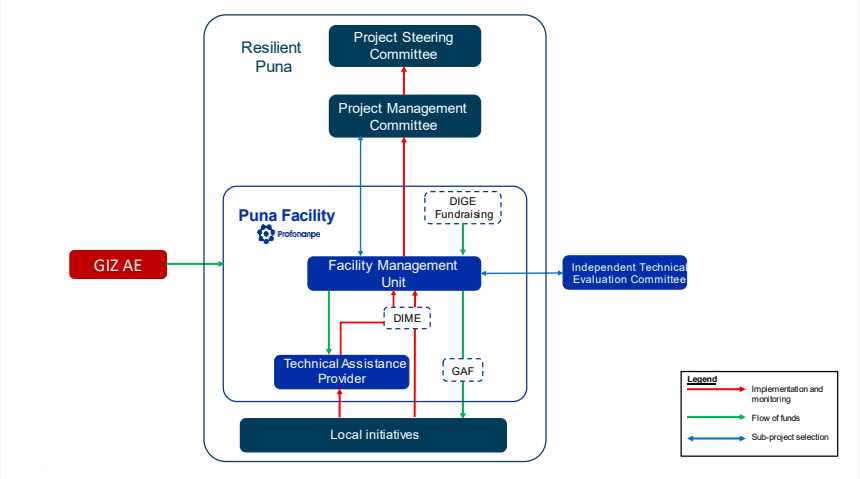
Sub-activity 1.2.2.3: Analyse collected information on the impact of EbA measures	
Description	This sub-activity aims to improve evidence of EbA effectiveness while at the same time increasing the knowledge and understanding of EbA measures for future decision-making processes (increasing community awareness and values about EbA, donor investment in EbA and support to strengthen and further mainstream the integration of EbA across relevant ministries and public investments). Therefore, this sub-activity will develop studies and research using data generated by the community monitoring committees, thus contributing to the dissemination of coupled indigenous and scientific knowledge. Under this sub-activity, research on the effects of EbA measures will be prioritised. For this, following objectives must be taken into account: impact measurement of EbA measures (carbon sequestration, ecosystem recovery and water regulation), cost-benefit analysis, cost risk reduction in business operations, cost effectiveness and the type of ecosystems to be investigated (peatlands, wetlands, grasslands, others). The generated evidence about EbA impact will be used to increase awareness and the engagement of potential investors in the Puna Facility (sub-activity 2.1.1.2) and the integration of EbA measures into policy and budgetary processes (sub-activities of component 3). In addition, a methodology for assessing carbon stock changes resulting from the implementation of EbA measures in the Puna ecosystem will be developed in coordination with MIDAGRI and MINAM. This will create the basis to prepare the national and local actors to improve the carbon inventory in the high Andean zone, especially the basis for considering how the implementation of adaptation NDCs that contribute to the conservation/maintenance of Puna ecosystems also contribute to climate change mitigation. Under this sub-activity, the methodology will be tested in at least one area within the Natural Protected Area System with committed communities that obtain conservation agreements signed (under the Puna Facility in sub-activity 1.1.2.1). As part of the preparation of studies, the information generated by the community monitoring committees and fed in the Cloud based System will be taken into account. Alliances with research centres, scientific and university entities will be sought for this purpose. The results of studies and research will be disseminated. Results generated during the execution of the project must be disseminated through the corresponding channels such as webpages, events, emails, journals, seminars, regional platforms according to the project objective.
Baseline	There is not enough information from the local level that supports the understanding of the impact of the EbA measures in the region.
Results	The expected results and/or products are: • At least 1 study on the impact of EbA measures completed
Justification	Generate scientific evidence on the impacts and effectiveness of EbA interventions, to contribute to political decision-making processes, and increase attractiveness of investors, etc.
Institutions involved (include roles)	• GIZ as EE: Will hire universities or Scientific entities or Research Centers to produce studies. • MIDAGRI and SERNANP: Will support in the organization of dissemination events and will be available to discuss results of the studies. • Instituto de Montaña and Profonanpe: Will provide feedback to the evidence produced and will support with the dissemination of the results. • Universities, scientific entities and/or research Centers: Will be addressed to support the analysis of data provided by community monitoring committees and the Cloud based System.

8.6.2 Activity Sheets for Component 2

Output 2.1. Financial mechanisms for the implementation of EbA measures and improvement of climate resilient livelihoods in the Puna ecosystem are established

Table 36: Activity 2.1.1: Establish the Puna Facility for the long-term financing of EbA measures and Climate Resilient Value Chains (CRVC)

Activity 2.1.1: Establish the Puna Facility for the long-term financing of EbA measures and Climate Resilient Value Chains	
Contribution to project outputs	To unlock investment for EbA measures in Puna ecosystems and Climate Resilient Value Chains, this activity will establish the "Puna Facility", managed by Profonanpe. The Puna Facility will be composed of the financial window that will have three sub-windows (linked to activity 1.1.2): • Non-repayable sub-window • Results-based repayable sub-window • Matchmaking Agroideas To secure women led Local initiatives, at least 30% of the selected Local initiatives financed by the Puna Facility should either support a women's association, cooperative, enterprise and/or organization or be women led. In addition, to engage with the private sector and other international donors, a sustainable financial strategy will be developed by Profonanpe with the support of the technical advice of GIZ during the firsts years of implementation to mobilise resources from the private sector and different donors. In this regard, Profonanpe will receive support to develop a sustainable financing strategy which will include criteria for selecting the companies (for example, companies committed to social and environmental responsibility, without potential conflicts, linked to CRVC and key ecosystems), criteria for selecting demonstration sites, and an effective communication and marketing strategy to engage with the private sector. The sustainable financial strategy will be validated with the different private stakeholders and then approved by the Resilient Puna Project Steering Committee. Finally, in order to increase the use of public funds for actions related EbA and CRVC, the activity will seek to increase the mobilisation of resources from public programmes for the High Andean population and their associated ecosystems. To this end, access to and alignment of investments from MIDAGRI and SERNANP and other government programmes will be promoted for EbA and CRVC measures through the development of dissemination material (e.g. Flyers) to facilitate the access to public financing. The following sub-activities are included: Sub-activity 2.1.1.1: Preparation and continuous improvement of the allocation of resources of the Puna Facility Sub-activity 2.1.1.2: Development and implementation of an innovative strategy to mobilise resources from the private sector and different donors Sub-activity 2.1.1.3: Promote access and alignment of public investments and other government programmes for EbA and Climate Resilient Value Chain (CRVC) measures
Envisaged results	The envisaged result of this activity is to on the one hand have the Puna Facility Management Unit established, lessons learned from the call for proposals are systematized and Profonanpe has interested investors (either private or international donors through signed MoUs) to fund the Puna Facility. And on the other hand, access

	to public finance is increased and increased executions of public funds for actions/measures related to climate change adaptation are visible.
Budget/ Co-finance	**Total Activity Cost: EUR 3,892,611** • **GCF finance**: EUR 3,431,869 • **BMZ Co-finance**: EUR 460,742
Sub-activity 2.1.1.1: Preparation and continuous improvement of the allocation of resources of the Puna Facility	
Description	To unlock investment in Puna ecosystems and CRVC, an innovative financial mechanism will be established and will be called “Puna Facility”. The name "Facility" is based on its role as facilitator in leveraging, mobilising and channelling different financial resources. In this context, the Facility is at the centre of the financial exit strategy, opening the possibility of channelling additional resources from multiple sources. This facility will target local communities, producers’ associations, cooperatives, SMEs, community enterprises and producer’ organizations for them to apply to the Facility to finance Local initiatives with EbA measures and CRVC that enable adaptation to climate change. The operationalization of the Puna Facility from the awarding of Local initiatives and the provision of technical support to the selected applicants will be carried out in component 1 through sub-activity 1.1.2.1 and sub-activity 1.1.3.1 respectively. Through the sub-activity 2.1.1.1. with the technical support of GIZ, Profonanpe as EE will establish a Facility Management Unit which will be responsible for coordinating the Puna Facility under the supervision of Profonanpe's Monitoring and Evaluation Department. It will also coordinate with the Administration and Finance Management to grant funds and report on Local initiatives, and with the Innovation and Strategic Management Directorate to coordinate the leveraging of funds for the facility. The FMU will also coordinate the establishment of the Independent Technical Evaluation Committee, which will involve the selection and hiring of its members. It will also manage the selection and contracting of the technical assistance provider organization. Next to the management structure of the Facility (see image below), the Governance structure of the project through the Project Steering Committee and Project Management Committee will also play an important role in addition to their roles and responsibilities related to the overall project. On the one hand, the Project Steering Committee will provide strategic guidance and implementation oversight of the Facility and approve modifications or updates that may be required. On the other hand, the Project Management Committee will revise and approve, amongst others, the final list of local initiatives evaluated by the Independent Technical Evaluation Committee (for more information please see Table 2 “Roles and responsibilities” in Annex 21). 

	Next to the objective of this sub-activity in establishing the Puna Facility, within this activity the call for proposals will be prepared and a continuous improvement of an efficient Puna Facility will be ensured. For the proposed project, this will mean that in the course of the project life, at least three calls for proposals will be prepared (including development of needed templates, forms for the proposals, etc.) and launched (through communication materials and selection of platforms to advertise the calls for proposals, including a webpage, radio commercials in close coordination with sub-activity 1.1.1.1). After the call cycles are finalized, lessons learned will be systematized and if required, processes will be improved for the subsequent calls. Lessons learned from Local initiative implementation will be continuously systematized to ensure a continuous improvement of the Puna Facility. The information will be also used for the knowledge management of the facility. This will include updating for example the website for the dissemination of the initiatives and their results or to coordinate knowledge exchange workshops. The knowledge management of the Local initiative will be closely coordinated between Profonanpe, GIZ and Instituto de Montaña in charge of sub-activity 1.2.1.2.
Baseline	Profonanpe has been accredited by the Green Climate Fund (GCF) since 2016. As the only environmental fund in Peru, they are currently managing two GCF projects: 1) "Building the Resilience of Wetlands in the Province of Datem del Marañón" (FP001), with a GCF grant of a total of $6,240,000, and 2) "Peruvian Amazon Eco Bio Business Facility" (Amazon EBBF) (FP193), with a GCF grant of a total of $8,972,400. Additionally, Profonanpe has extensive experience in designing and managing various environmental funds, including a Regional Water Fund in Piura, a competitive fund for Payments for Ecosystem Services (PES) in high Andean ecosystems, and a MERESE fund for Arequipa.
Results	The expected results and/or products are: • Puna Facility Management Unit established. • 1 Report on systematized lessons learned developed.
Justification	More financial resources and technical capacity are needed to ensure the restoration and conservation of the Puna ecosystems, as well as to guarantee local stakeholders' livelihoods.
Institutions involved (include roles)	The entities, institutions or bodies involved are: • **Profonanpe as EE:** Will be responsible to establish the Management Structure of the Puna Facility including hiring staff for the FMU, independent technical assessment committee and TA service provider. • **Facility Management Unit (FMU):** Will amongst others, ensure the operational coordination of the Puna Facility and report to the Project Management Committee (PMC). • **Independent Technical Assessment Committee:** Will evaluate the shortlisted Local initiatives proposals. • **Project Steering Committee (PSC):** Will provide amongst others strategic guidance and implementation oversight of the Puna Facility through review of progress and evaluation reports and provision of recommendations to the Project Management Committee. • **Project Management Committee (PMC):** Will revise and approve amongst others the final list of local initiatives evaluated by the FMU according to the established processes and criteria. • **MIDAGRI:** Executing Entity of the Project, part of the PSC and PMC. • **MINAM:** Project partner, part of the PSC and PMC. • **GIZ:** Executing Entity, part of the PSC and PMC, will coordinate together with Profonanpe the knowledge management of the implementation of the Local initiatives. • **Instituto de Montaña** as EE in charge of sub-activity 1.2.1.2. will closely coordinate with Profonanpe the knowledge management of the implementation of the Local initiatives.

Sub-activity 2.1.1.2: Development and implementation of an innovative strategy to mobilise resources from the private sector and different donors	
Description	This sub-activity aims to facilitate and secure funding through leveraging, mobilising and channelling financial resources from the private sector and other donors for EbA investments in Puna ecosystems and climate-resilient value chains as part of the project's financial exit strategy. For this sub-activity, it is necessary to develop a sustainable financing strategy for the mobilization of future funds through Profonanpe. Therefore, the engagement of potential investors such as, private sector actors and different donors will be crucial to ensure the sustainability of the Puna Facility and EbA and CRVC measures. In this regard, the project will support Profonanpe in extending their fundraising plan towards a sustainable financing strategy which also includes an EbA and CRVC approach for the high Andes ecosystems. In order to elaborate the financing strategy, first a mapping of potential private sector actors and different donors will be conducted as it will be key to have a portfolio/directory of potential donors and their projects or initiatives that integrate EbA and CRVC measures in the High Andean areas. In addition, for the selection of companies to be targeted by the strategy, consideration should be given to those businesses interested based on CSR and that depend on the ecosystem services provided by the Puna ecosystems. For instance, those that benefit from the camelids fibre produced in the upper parts of the watersheds or those who benefit from water provision and regulation ecosystem services in the lower parts of the watersheds. Other type of businesses can be those who are part of the value chains promoted by the Puna Facility. For example, businesses that buy products to small producers. In addition, a narrative will be developed based on results from Puna Facility´s Local initiatives systematizations and on the results of the studies developed in sub-activity 1.2.2.3. This will show how EbA measures reduce costs and risks in business operations and provide opportunities and benefits to the operation of various industries (e.g. hydroelectric, cement, water, mining, agro-industrial, etc.). If there is common interest, events will be organized to attract the interest of several companies and/or international donors and to disseminate communication materials to inform on the effectiveness and impact of EbA measures. Travel to show good practices will be also coordinated. The strategy will also include a publicity and communication strategy. If the interests of the companies do not match with the Puna Facility, the project will facilitate the investments directly with potential beneficiaries. This will include providing information on local CSOs working with local communities, producers' associations, cooperatives, MSEs, community enterprises and producers' organizations
Baseline	**Profonanpe** doesn't count with **a** strategy **that** details **the forms, routes and key actions for accessing financing** for Andean ecosystems and value chains.
Results	The expected results and/or outputs are: • At least two MoUs to secure new funding sources for the Puna Facility are signed
Justification	By developing a sustainable financing strategy Profonanpe will have the needed instruments to facilitate the leveraging, mobilisation and channelling of financial resources from the private sector and/or other international donors which includes an EbA and CRVC approach to secure the sustainability of the Puna Facility and overall fundings of Profonanpe.
Institutions involved (include roles)	The entities, institutions or bodies involved, are: • **GIZ as EE**: Will hire an advisor to support directly Profonanpe in developing a sustainable financing strategy and be responsible for the organization of events, site visits etc. to facilitate the matchmaking with potential donors. • **Profonanpe as the TA recipient and EE:** Will develop in coordination with GIZ the strategy and actively participate in events. In addition, it will also ensure that

	systematized lessons learned from the implementation of Local initiatives are used for information material etc., coordinate site visits.
Sub-activity 2.1.1.3: Promote access and alignment of public investments and other government programmes for EbA and Climate Resilient Value Chains (CRVC) measures	
Description	The objective of this sub-activity is to increase the mobilisation of resources from public programmes related to sub-activity 1.1.2.2 and other government programmes for the High Andean population and their associated ecosystems. In coordination with MIDAGRI this sub-activity will develop simplified materials (e.g. flyers) out of guidelines for potential beneficiaries to access the different support options provided by MIDAGRI programmes and services; and other relevant government programmes that contribute to the implementation of EbA and/or CRVC measures, in both online and printed user-friendly versions to facilitate rural population access to government support (these materials should contain diagrams and flow charts that are orientated for producers). These materials will also support local governments in their alignment with the national government. In addition, there will be workshops for producers and local[47] governments to disseminate the information on the different public programmes. Promoters will be hired (the same as for 1.1.1.1 sub-activity) to support beneficiaries explaining the requirements of different public programs and how to access them. This will be carried out in coordination with the General Directorates, programmes and funds of MIDAGRI (Agroideas, Sierra Azul, Sierra y Selva Exportadora, AgroBanco, Catastrophic Insurance, Rural and Indigenous Women's Fund), Regional Government (ProCompite) and MIDIS (social programmes)[48]. As part of this, the simplified materials (flyers) for accessing the different public programs will be presented.
Baseline	Although significant effort has been placed in making financial resources available to the most vulnerable populations, the available funds present only a small fraction of what would be needed to meet the real needs. Access to public programs is still limited for the disperse populations in the SHAP and most communities do not meet the established technical, financial, or institutional requirements.
Results	The expected results and/or products are: • Dissemination material (e.g., Flyers) developed • 1 Final report about the increased execution of public funds for actions/measures related to climate change adaptation developed
Justification	To bring the State and vulnerable populations living in the high Andean areas together so they can access the services of MIDAGRI's public programmes that promote water and food security in the territories. In this way, ensure the sustainability of EbA interventions and resilient value chains in a context of water scarcity.
Institutions involved (include roles)	The entities, institutions or agencies involved are: • GIZ as EE: Will be support MIDARI in the development of simplified materials and the organization of informative workshops and will also hire promoters to support beneficiaries access public programs. • MIDAGRI as EE: will coordinate with its Programs and General Directorates, and Affiliated Agencies to deliver their public services in the target territories. • Profonanpe as EE: as the Puna Facily will be hosted in Profonanpe will need to coordinate with MIDAGRI to have a coherent and synergetic intervention in the territory, sharing each other potential beneficiaries and interventions.

[47] In some cases, government programmes are designed to work with local governments to serve producers.

[48] In particular, the National Action Platforms for Social Inclusion Programme (PAIS), which is located in the most remote localities of the project and is designed to facilitate and coordinate the provision of services for programmes, projects and activities in social, economic and productive areas of public and private entities, in order to improve the quality of life of the rural and dispersed rural population.

Table 37: Activity 2.1.2: Strengthen capacities to develop and implement innovative mechanisms for EbA in High Andean ecosystems

Activity 2.1.2: Strengthen capacities to develop and implement innovative mechanisms for EbA in High Andean ecosystems	
Contribution to project output	The activity will seek to overcome the barriers faced by public water utilities that have established or are willing to establish a mechanism for payment for ecosystem services (MERESE) schemes. Therefore, activities will be focused on strengthening stakeholders' capacities to identify and overcome bottlenecks and gaps in the implementation of MERESE Local water utilities will receive technical support in planning, evaluation and selection of intervention projects; development of agreements with communities; and analysis of gender aspects to be included in MERESE´s processes. Trainings for water utility officers should secure women officials participation. The related sub-activities will be developed in close coordination with the Ministry of Environment and the National Superintendence of Water Supply and Sanitation of Peru (SUNASS). The following sub-activities are included: Sub-activity 2.1.2.1: Technical assistance to improve existing hydrological MERESE processes in the project areas
Envisaged results	The offer and effectiveness of innovative mechanisms for EbA measures in the region will increase due to the support for capacity building and support in setting up the basis for use of innovative mechanisms such as carbon markets.
Budget/ Co-finance	**Total Activity Cost: EUR 1,279,762** • **GCF finance**: EUR 1,095,363 • **BMZ Co-finance**: EUR 184,399
Sub-activity 2.1.2.1: Technical assistance to improve existing hydrological MERESE processes in the project areas	
Description	This sub-activity aims to strengthen water utilities capacities to identify and overcome bottlenecks and gaps for the implementation of the hydrologic MERESE (Retribution Mechanism for Ecosystem Services) and thus mobilise financial resources not only for the conservation of High Andean ecosystems but also to increase water availability. The idea is to engage water utilities men and women officers that implement MERESE in key watersheds of the project as a complementary intervention to the Resilient Puna project and other public-private initiatives. The sub-activity will first include technical assistance for hydrologic MERESE which are already underway, such as the MERESEs Arequipa (1), Lima (1), Cusco (2), and Apurimac (1). In the project target area five water utilities have in place hydrologic MERESE: EMUSAP Abancay, SEDAPAR Arequipa, EMAPA Cañete, EMSAPA CALCA and SEDACusco in Cusco. For more information on these water utilities see Annex 2d. Since the hydrological MERESE is being gradually implemented in the target area without having all their phases in place, this sub-activity will provide the technical assistance that will be focused on: a) the establishment and/or strengthening hydrologic MERESE's good governance platforms; b) development of methodological tools for implementation, c) provision of technical information for the identification of water MERESE intervention; d) contributing to design of a monitoring system,e)supporting the capacity development for the implementation of different implementation modalities as described under Section 3.1 in Annex 2d, f) establishment of contractual agreements with communities, g) development of EbA public investment projects, and h) analysis of gender aspects to be included in MERESE´s processes and i) systematization of learning experience at the end of the process. To consolidate the implementation of MERESE in each region, the specific

	technical assistance package will be assessed on a case-by-case basis according to the needs of each MERESE. [49] In addition, the capacities of water utilities personnel will be developed, in following areas: • Development of public investment projects: Identification, formulation and evaluation of projects within which MERESE funds can be channelled. Support in developing specific studies (e.g. hydrological, soil and vegetation). • EbA approach: Climate risk assessment, ecosystem evaluation, prioritisation of adaptation measures. • Gender and intergenerationally: Improve gender and intergenerational awareness and tools for gender and intergenerational mainstreaming. • Participatory processes: In order to facilitate good governance platforms and to enable the communities to prioritise and implement EbA measures.
Baseline	Limited knowledge to understand the functioning and management of MERESE and therefore to design projects oriented to the conservation, recovery, and management of ecosystems. On the other side, limited capacities and methodologies to monitor and evaluate the impacts of the green investments on the hydrologic ecosystem services.
Results	The expected results and/or products are: • 1 Capacity Building Program for water utilities personal developed • Technical assistance (e.g., EbA approach and public investment) implemented in at least 3 MERESE
Justification	Strengthen stakeholder capacities to identify and overcome bottlenecks and gaps in the implementation of hydrologic MERESE which is a financial mechanism for channelling funds to conserve or restore ecosystem and services in the upper watersheds to make water available to downstream users.
Institutions involved (include roles)	• GIZ as EE: Will provide technical assistance and capacity training programs to SUNASS and water utilities from the different departments of the target project areas that already have hydraulic MERESE on the way. • SUNASS: National Superintendence of Water Supply and Sanitation will contribute with the contents needed for training programs and will engage its officials and EPS officials in the training programs • Water utilities (EPS): will contribute with the contents needed for training programs and will engage its officials. MINAM: through the General Directorate of Environmental Economy and Finance Will contribute with the contents needed for training programs. • SERNANP: In case of watersheds where MERESE coincide with Natural Protected Areas.

Table 38: Activity 2.1.3: Support the greening of microcredits to promote EbA and Climate Resilient Value Chains (CRVC)

Activity 2.1.3: Support the greening of microcredits to promote EbA and Climate Resilient Value Chains (CRVC)

[49] Also, the operationalization and diversification of MERESE schemes to leverage funds from beneficiaries of these services downstream to local communities upstream is one of the economic benefits of the project. EPSs will be supported to operationalize the MERESE scheme in their watershed with a potential of mobilizing USD 5-6 million by following EPS, EMAPA CAÑETE S.A., EMPSSAPAL S.A., EMUSAP ABANCAY S.A.C., SEDA CUSCO S.A.).

Contribution to project output	This activity will focus on two main topics: (1) Supporting the greening of microcredit lines and business models and (2) supporting the dissemination of green financial products and services. In order to increase the supply of microfinance products and services to finance integrated EbA and CRVC initiatives, the project will support either the development of specific financial products or the greening of existing financial products for EbA measures and CRVC (aligned with the lists of EbA measures and CRVC developed in sub-activity 1.2.1.1) in Puna ecosystems. This will include the incorporation of gender-sensitive aspects in financial products to promote EbA and Climate Resilient Value Chains. The design will include a diagnostic identifying gender gaps and needs. Microcredit institutions officials will receive training to increase the capacity of MFIs to finance businesses with EbA measures with a gender approach. In addition, a communication strategy to disseminate the green financial products will be developed and implemented, raising awareness regarding the requirements and conditions, with a focus on the beneficiaries of the project. The following sub-activities are included: Sub-activity 2.1.3.1: Support to financial institutions in greening microcredits Sub-activity 2.1.3.2: Raise awareness of greener microcredits to promote EbA and Climate Resilient Value Chains
Envisaged results	Potential beneficiaries of the project will see an increase in the offer of financial products and services to support the implementation of EbA measures and CRVC.
Budget/ Co-finance	**Total Activity Cost: EUR 1,560,2467** • **GCF finance**: EUR 1,361,947 • **BMZ Co-finance**: ERU 198,300
Sub-activity 2.1.3.1: Support to financial institutions in greening microcredits	
Description	This sub-activity aims to develop and introduce greener microcredits for financing not only Resilient Puna beneficiaries but also beneficiaries in other regions interested in implementing EbA measures and CRVC (aligned with the lists of EbA measures and CRVC developed in sub-activity 1.2.1.1) within the Puna ecosystems. Microfinance institutions (MFIs) with a presence in the project area and with interest on expanding their credit portfolio to small-scale farmers for adaptation measures will be selected (e.g. Caja rural los Andes, Caja Cuzco, Microfinance BBVA Foundation-Confianza), and technical assistance will be provided to either adjust existing products (including existing financial products for women) or develop new ones, incorporating the EbA approach in the financial risk analysis for prioritised value chains. In order to achieve this, first, MFIs' portfolio will be analysed (e.g. late payment, debts, rate, deadlines) to identify the value chains prioritised in the project with the greatest exposure to climate risks. Then mitigation activities (EbA measures) will be proposed and included in the value chain business model to reduce these climate risks and thus reduce the negative economic impacts that climate events have on agricultural producers and the credit portfolio of microcredit institutions. In parallel, market demand studies will also be carried out including diagnostics for identifying gender gaps and needs for accessing to microcredits. Demonstrating the viability of the proposed EbA and CRVC measures business model is essential. Therefore, concrete and tailor-made business models will be developed using the information generated and analysed in activity 1.2.2. In addition, demonstration sites will also be identified to showcase good practice and serve as models to be replicated and scaled up Based on the results of the analysis, the microcredits to be adapted will be identified, as well as gender aspects to be included. During the adaptation phase, management tools (including digital tools, guidelines, and protocols) will be

	modified to include the EbA approach. This will include aspects such as sustainability and climate risk management criteria and development of tools for credit analysis based on agro-climatic and risk reduction information. The option of developing new green microcredit lines will be assessed by each microfinance institution based on their product development strategy.
Baseline	Scarcity of financial products appropriate to the characteristics of the rural population, the financial services market does not work efficiently. Such "green credit lines" that do exist but are usually limited to clean energy and energy efficiency loans and not for EbA and Climate Resilient Value Chains. MFIs lack of understanding regarding how climate change will impact their loan portfolios, and of the financial implications of EbA measures and climate-resilient value chains, as they are unable to assess the impact of climate change on baseline profitability
Results	The expected results and/or products are: • At least 2 business model EbA and CVCR by specific chain (according to the Project catalogue) elaborated • At least 2 adapted microcredits for EbA and CVCR business models developed and disseminated with microfinance institutions
Justification	MFIs cater to some of the most vulnerable populations, so if they promote sustainable adaptation products and services, they can target those who need them the most and act as a multiplier of climate resilience outcomes
Institutions involved (include roles)	• **GIZ as EE:** Will provide technical assistance to the MFIs so they can create or adapt their credits oriented towards Ecosystem-based Adaptation (EbA) options and Climate Resilient Value Chains. • **Microfinance institutions** will create or adapt credits for climate adaptation measures and Climate Resilient Value Chains.
Sub-activity 2.1.3.2: Raise awareness of greener microcredits to promote EbA and Climate Resilient Value Chains	
Description	This sub-activity aims to promote the greener microcredits (either adapted or developed in the previous sub-activity) and includes the development and implementation of an awareness campaign for potential clients, with a focus on the project beneficiaries selected by the Puna Facility. As a first step, field personnel of financial institutions, which will promote the adapted or new developed greener microcredits will receive capacity building in order to get to know the adapted products and their benefits. This will include building the knowledge of the promoters on the requirements and conditions of the greener microcredits. Next, the risk management of financial institutions will be strengthened (treatment of climate risks in the loan portfolio). Training will be provided to credit officers of financial institutions regarding EbA approach, climate risks, and innovation to make businesses more sustainable. A particular focus will be placed on the costs involved and their impact on cash flows over a period of at least five years, as well as recognising the risk factors faced by their clients. This will involve interactive credit assessment exercises. Subsequently, the greener microcredits will be disseminated through different channels. This will include a launch event and an awareness campaign for the population of the project areas, especially for the beneficiaries of the Puna Facility. This will provide them other sources for financing their present and future EbA measures and CRVA. Through the technical support (e.g. in areas of business development and financial literacy) received from the Puna Facility it is expected, that the potential microcredit clients may have increased the viability of their businesses and strengthen their financial knowledge.

	Financial institution front office and field personnel will also be trained to effectively market and disburse loans to beneficiaries in remote rural areas in the High Andean zone. Credit officers from these institutions will receive training on the EbA approach, climate risks, gender considerations for rural financial market and innovative strategies to promote greater sustainability in businesses. Subsequently, the greener microcredits will be disseminated through different channels. This will include a launch event and an awareness campaign for the population of the project areas, especially for the beneficiaries of the Puna Facility. This will provide them other sources for financing their present and future EbA measures and CRVA.
Baseline	In the rural areas there is a lack of awareness of available financial services, and the financial implications of EbA and climate-resilient value chains. The long distances between lenders and borrowers causes, a limited knowledge on the part of the financial institutions of the lending opportunities in the puna, as well as high transaction costs.
Results	The expected results and/or products are: • 1 Sustainability strategies for financial institutions developed • Al least 2 specific financial products for EbA and CVCR business models disseminated through awareness campaigns with microfinance institutions
Justification	Awareness campaigns will allow rural population to access to user-friendly financial information to acquire products and services oriented to finance climate resilient practices for adaptation.
Institutions involved (include roles)	• **GIZ as EE:** Will support microfinance institutions in launching events and awareness campaigns for potential clients and will support microfinance institutions with trainings for their front office and field personnel. • **Microfinance institutions:** Will create/adapt and offer credit lines tailored to rural population vulnerable to the impacts of climate change.

8.6.3 Activity Sheets for Component 3

Output 3.1. Multilevel landscape governance is improved through strengthening of national capacity, regulatory frameworks and M&E systems

Table 39: Activity 3.1.1: Strengthen the capacities for territorial planning and governance processes integrating EbA and climate resilience

Activity 3.1.1: Strengthen the capacities for territorial planning and governance processes integrating EbA and climate resilience	
Contribution to project output	The approaches that will be promoted by the proposed project require progressive development of capacities of national public officers, local actors, and subnational governments to promote the replicability and sustainability of the changes introduced by the project. Therefore, in order to promote the mainstreaming of EbA and climate resilience approaches at landscape and water basin levels into the national, regional and local planning processes (i.e. development plans, including budgets and further public investment project planning), official capacities at different levels (national, regional and local) will be strengthened and gender perspectives will be considered. Through this activity the project will enable that lessons learned from the community's experiences in EbA and CRVC planning and implementation are

	considered and scaled up in the agenda of government platforms[50] and in local and regional governments plans.. The sub-activities include: Sub-Activity 3.1.1.1: Strengthen the capacities of relevant national, regional and local government stakeholders for the incorporation of EbA and CRVC measures, integrating the gender perspective in their processes and interventions in the territory. Sub-activity 3.1.1.2: Strengthen participatory sectoral and territorial platforms for the articulation and scaling up of EbA measures and CRVC within the scope of the project. Sub-activity 3.1.1.3: Integration of EbA measures and CRVC in territorial planning and management instruments
Envisaged results	The capacity of local stakeholders at different levels, including relevant government entities and local communities, will be increased. EbA measures and CRCV will be further integrated into territorial planning and management instruments at the local and national level.
Budget/ Co-finance	**Total Activity Cost: EUR 3,378,395** • **GCF finance**: EUR 2,253,705 • **BMZ Co-finance**: EUR 709,642 • **SERNANP Co-finance**: EUR 415,048
Sub-Activity 3.1.1.1: Strengthen the capacities of relevant national, regional and local government stakeholders for the incorporation of EbA and CRVC measures, integrating a gender perspective in their processes and interventions in the territory	
Description	This sub-activity aims to strengthen the capacities of relevant public officials working in thematic and geographical areas of the project at the national, regional, and local levels. The identification of specific participants will be based on pre-assessed capacity needs (for more information see Annex 2h) defined in through a participatory approach with SERNANP as part of MINAM and MIDAGRI. MIDAGRI and SERNANP personnel (women and men) in charge of national programmes and rural extension services will be trained to further include and strengthen EbA and CRVA at landscape and water basin levels, promote traditional practices and integrate a gender consideration into agricultural extension programs so officials would be able to recognize the very different needs and roles that men and women farmers have in agriculture. This will gradually influence on taking more action on women roles and thus reducing gender inequalities in the agricultural sector. Training topics will include integrating the following approaches into processes in the territory (e.g., investment projects, budgets, etc.) to provide sustainability of public interventions of the public stakeholders in the territory: o EbA and CRVC: Climate risk assessment, territorial, landscape and water basin approach, ecosystem monitoring and evaluation, prioritisation of adaptation measures, identification of indicators that match with the respective monitoring system. o Gender awareness and intergenerationally: Improve gender and intergenerational awareness among public officials and develop tools for gender and intergenerational mainstreaming in their processes and interventions in the territory. In order to provide capacity building, as a first step, content and materials will be developed for online and/or presential training modules. The material will include

[50] Platforms refer to formally established spaces where diverse public and private stakeholders convene to discuss about issues relevant to them.

	examples and case studies to facilitate learning during the trainings and will be updated based on lessons learned generated by other project experiences and those generated during project implementation (based on the data generated in activity 1.2.2.).
Baseline	Limited capacities of public officials at different levels to mainstream the following issues in public policies: (1) gender, 2) EbA and 3) analysis of climate information to generate evidence and decision-making in adaptation policies.
Results	• Online and/or presential training modules on how to mainstream Gender and EbA/CRVC approaches are developed • • At least 605 relevant government officials from the national (SERNANP and MIDAGRI officials), regional (5 regional government officials) and local (at least 50 local governments) trained. •
Justification	Technical capacity building of public officials is relevant to strengthen their competences for the design and replicability of EbA and climate resilience value chains.
Institutions involved (include roles)	• **GIZ as EE:** Will support the ministries in de design and implementation of training modules for national and subnational public officials. • **Instituto de Montaña as EE:** Will provide inputs from their past and present experience to develop the contents of the training modules. • **MIDAGRI as EE:** through its Directorates-General, programmes and affiliated public bodies will contribute and participate in de design and implementation of training modules. • **SERNANP as EE:** will contribute and participate in de design and implementation of training modules. • **Subnational governments:** will participate of training modules
Sub-activity 3.1.1.2: Strengthen participatory sectoral and territorial platforms for the articulation and scaling up of EbA measures and Climate Resilient Value Chains within the scope of the project	
Description	This sub-activity has three specific objectives: (1) Promote the participation of IPLCs in decision-making processes at the local and regional platforms[51], (2) disseminate successful local communities, producers' associations, SMEs´, cooperatives' experiences for scaling up EbA and CRVC measures, specially the one led by IPLCs women organizations and (3) coordinate public and private interventions in EbA and CRVC measures at landscape and water basin level of each territory integrating a gender approach. The first step within this sub-activity involves identifying and giving priority to established sectoral and/or territorial platforms that hold official recognition and social acceptance in each territory. These platforms will serve as forums where diverse public, private, and civil society organizations in the project area convene to foster dialogue, address concerns, and collaborate on coordinated efforts related to EbA investment and CRVC, both at the landscape and water basin levels. It is expected that the choice of platforms will be made with field information collected during the first stage of the project implementation. Potential platforms include CGRAs, CAR, CAM, Good Governance platforms of MERESE, Natural Protected Areas Management Committees, the Council of Basins, and others. Second, gaps and needs of the sectoral and territorial platforms will be identified, as well as their mechanisms of action (instruments). The objective of this is to identify opportunities to improve their participatory processes, consideration of

[51] Ibid

	climate risk vulnerabilities in their planning processes, and prioritisation of adaptation solutions, and to promote agreements among platform members for future funding. As part of the sub-activity the project will provide support to relevant partners (e.g. SERNANP, MIDAGRI) on the moderation of the platforms and advice on how to develop participatory mechanisms to involve local communities, producers' associations and cooperatives in the sectoral or territorial platform decision-making processes. Additionally, advise on how to exchange available data and information produced by each institution (e.g climate, hydrological, finance, etc.) will be provided. The project will support the participation of IPLCs in its different forms of organizations to bring to the platforms their best practices and concerns when implementing EbA measures and Climate Resilient Value Chains. Participation of women in these spaces of dialogue and decision making will be supported and facilitated. Finally, successful EbA and CRVA experiences that have emerged because of the implementation within the project at landscape and water basin level (through the implementation of activities in component 1) will be disseminated. The selection of experiences will be based on indicators and results on EbA and CRVC impacts. The overarching goal is to promote wider dissemination, replication, and potential scaling at regional and national levels, leveraging the prioritized sectoral and territorial platforms.
Baseline	Limited articulation to implement EbA interventions and sustainable economic activities that are resilient to climate change at landscape or watershed level. Lack of participatory channels to engage communities in the decision-making processes.
Results	• Participatory mechanisms to involve communities/associations/cooperatives in the sectoral or territorial platform decision making processes are developed
Justification	Territorial/sectoral platforms involving different stakeholders serve to exchange information, raise issues and solutions on climate change impacts and to scale up best practices and lessons learned from local experiences.
Institutions involved (include roles)	• **GIZ as EE:** Will conduct a study to identify territorial platforms to work with this activity and analyse their gaps and needs. Will also support partners on the moderation of the platforms and will support the participation of local community and producer associations representatives to bring their best practices and lessons learned on implementing EbA and Climate Resilient Value Chains. • **MIDAGRI as EE:** Through its territorial managers and its institutional governance platform (CGRA), Basin Councils, etc. will participate and moderate territorial/sectoral platforms. • **SERNANP as EE**: Through the Management Committees of the Natural Protected Areas will participate and moderate territorial/sectoral platforms. • **Subnational governments:** Regional and local Governments will participate of the sectoral/territorial platforms. • **Other public-private stakeholders** as part of the sectoral/territorial platforms.
Sub-activity 3.1.1.3: Integration of EbA measures and Climate Resilient Value Chains (CRVC) in territorial planning and management instruments	
Description	This sub-activity aims at increasing influence on subnational governments (regional and local) through their planning and budgeting instruments in order to leverage and increase public finance in EbA measures and CRVC in the medium and long term. The specific tasks assigned to this sub-activity will vary based on the level of intervention, encompassing local and regional levels, as outlined below.

	Technical assistance will be provided to local and regional government officers interested in developing or improving their development plans and budgeting instruments by incorporating EbA measures, gender and CRVC. ○ Local and/or Regional Concerted Development Plans: the technical assistance for local and regional officers will be focused in improving their participatory process and the prioritisation and planification of adaptation measures at landscape and water basin level. Additionally, climate risk analysis will be developed in territorial plans. Based on prior identification, the project will support local and/or regional governments in developing climate risk and vulnerability studies as part of the preparation of their local, regional or basin development plan. ○ Local Climate Change Plans and/or Regional Climate Change Strategies: Technical support to local or regional technical officers will be focused in developing participatory Regional Climate Change Strategies and/or Local Climate Change Plans to prioritize and integrate EbA and Climate Resilient Value Chains measures into those climate change instruments. ○ Regional and local Budget & investment projects: technical support to local and regional technical officers to prioritize and design EbA and Climate Resilient Value Chains within the local and regional public budgets, including budget for EbA M&E. ○ Natural Protected Areas´ Master plans: the technical assistance for SERNANP will be focused in integrate the EbA approach in the participatory process of updating master plans. Support to update their climate risk and vulnerability studies will be done
Baseline	Territorial planning and management instruments do not integrate EbA measures and CRVC.
Results	• Framework planning and projects documents at the regional and local levels with a EbA/CRVC and gender approach are developed
Justification	Integrating EbA and climate resilient practices into territorial planning and management instruments at different levels will allow public officials to develop adaptation interventions though EbA related investment projects, and thus multiply and scale up EbA measures.
Institutions involved (include roles)	• **GIZ as EE:** will identify local and regional governments interested in improving development plans and budgeting instruments by incorporating EbA measures, gender and CRVC. Will also hire technical consultants to give specifical support to develop climate risk and vulnerability studies as part of the inputs to improve the Local and/or Regional Concerted Development Plans and the master plans for natural protected areas. • **MIDAGRI:** Through their specialists will collaborate to align local and regional objectives with national sectoral climate change adaptation targets. • **SERNANP:** Will lead the participatory process to update the master plans for Natural Protected Areas including the EbA approach. • **Subnational Governments (Local and Regional):** Will lead climate risk analysis processes at the local level and incorporate climate risk analysis into their regional and local concerted development plans.

Table 40: Activity 3.1.2: Strengthen regulatory frameworks and monitoring and evaluation (M&E) systems at national level

Activity 3.1.2: Strengthen regulatory frameworks and monitoring and evaluation (M&E) systems at national level	
Contribution to project output	The activity aims to provide technical support to MIDAGRI and SERNANP to improve the regulatory framework for the promotion and implementation of EbA measures and CRVC in the High Andean areas of the country, as well as ensuring

	the participation of IPLCs in resolutions related to their participation in decision making process for the management of the territory and its ecosystems. In addition, it will provide technical support for the national long-term M&E systems of the different government entities to measure impact of EbA interventions and ensure data disaggregation by gender. Partnerships will be established with local universities and research institutes to support the monitoring of progress resulting from the interventions implemented by the different actors in the territory. This activity will also support MIDAGRI in improving its agricultural policy monitoring and evaluation efforts while complying with 4 Peru's NDC targets to which the project will contribute to: i) (AGRI7- Natural grassland management to secure feed for livestock and reduce vulnerability to climate change; ii) AGRI11 - Management of wild South American camelids (vicuñas) considering the effects of climate change; iii) AGRI16.- Implementation of business strategies that incorporate risk and opportunity management in the face of climate change; iv) AGU2 - Implementation of interventions related to planting and harvesting water for agricultural water security in watersheds vulnerable to climate change. The sub-activities include: • Sub-Activity 3.1.2.1: Improving national regulatory frameworks linked to EbA measures and Climate Resilient Value Chains. • Sub-activity 3.1.2.2: Improve coordination of EbA monitoring and evaluation (M&E) systems at the national level linked to project and NDC purposes.
Envisaged results	National regulatory frameworks and M&E systems will be improved.
Budget/ Co-finance	**Total Activity Cost: EUR 2,263,055** • **GCF finance**: EUR 1,727,847 • **BMZ Co-finance**: EUR 535,208
Sub-Activity 3.1.2.1: Improving national regulatory frameworks linked to EbA measures and climate-resilient value chains	
Description	This sub-activity aims to improve the regulatory framework at the national level (norms, laws, budget, and investment guidelines) for the promotion and implementation of EbA measures and CRVC in the High Andean areas of the country. The sub-activity will develop proposals or draft standards based on the assessment of legal barriers related to ecosystem restoration and conservation, agricultural productive uses, sowing, and harvesting of water, IPLCs participation, among others. It will also include studies required for explanatory statements. Subsequently, consultancies to improve norms, plans, strategies will be made and will work in close coordination with the Regulatory offices in MIDAGRI and SERNANP. As a third step, an Advocacy Plan will be developed for regulatory or legislative entities. In addition, a work plan will be developed in coordination with the Planning and Budget Offices of MIDAGRI and SERNANP to adjust or update budget programs and investment guidelines at national level. Then, these documents will be used by the ministries and regional and local governments to increase the allocation of public resources for EbA projects and CRVC.
Baseline	National regulatory frameworks do not recognize and value the importance of ecosystems and ecosystem services. There are limited norms, strategies, plans that integrate EbA and climate resilient approaches to address climate change in the high Andes of Peru.
Results	The expected results and/or products are: • Regulatory framework which includes the promotion EbA and CVCR interventions in the high Andean areas of the country are developed

Justification	Regulatory frameworks are important since they provide the bases from which governments respond to address climate change. Therefore, public interventions to adapt to climate change can be developed with public resources allocation.
Institutions involved (include roles)	• **GIZ as EE:** Will help MIDAGRI and SERNANP to prioritize the most important regulations to improve the mainstreaming EbA in the sectoral planning and budgeting. Also, will contribute to develop the explanatory statements and update the most critical budget programs to include EbA approach. • **MIDAGRI**: Through its General Directorates, Regulatory, Planification and Budget Offices and will lead the periodization process and the updated of the most important regulations to mainstreaming EbA in the agricultural sector. • **SERNANP:** Will lead the periodization process and the updated of the most important regulations to mainstreaming EbA in the NPA system. • Other regulatory entities of the Peruvian State
Sub-activity 3.1.2.2: Improve coordination of EbA monitoring and evaluation (M&E) systems at the national level linked to project and NDC purposes	
Description	This sub-activity aims to support the nationwide monitoring systems with adequate protocols and measurement methodologies that allows MIDAGRI and SERNANP systematically collect, analyse data and information in order to detect the impacts of EbA interventions. This will allow policy makers to understand whether or in what extent EbA public investments are meeting their results, as well as monitor EbA effectiveness and evaluate progress towards the national adaptation climate contributions (NDCs). To this end, technical advice will be provided to MIDAGRI and SERNANP for the integration of the EbA approach and aspects of NDCs in its monitoring and evaluation processes and consider data disaggregation by gender. This sub-activity will be closed coordinated with the General Directorate of Climate Change and Desertification of MINAM that manages the Monitoring System for Mitigation an Adaptation measures (SIMOM). The sub-activity will, therefore, include an assessment (including functionalities and processes) of the existing monitoring systems in the ministries and the preparation of a Roadmap to strengthen them. Community monitoring systems supported in activity 1.2.2 will also contribute with data and information to the national systems. This will be an exercise of exchanging information (data, tools for collecting data, interpretations, etc) from the local perspective and knowledge to national level and vice-versa. The project will also support MIDAGRI in the improvement of its reporting system for the NDCs in the agricultural and water NDCs to which the project will contribute to, by the development of adequate protocols and methodologies to gather field information and measure the impacts of MIDAGRI interventions and report MIDAGRI´s NDCs progress implementation. To this regard, close coordination with the newly MIDAGRI´s Agriculture and Irrigation Commission on Climate Change (CSARCC) created by Ministerial Resolution N° 0187-2023-MIDAGRI will be promoted. All actions mentioned above will be mainly coordinated with the General Directorate of Climate Change and Desertification of MINAM. By the development of adequate protocols and methodologies to measure the impacts of EbA interventions on water and agriculture. In this regard, support will be also provided to recently created MIDAGRI´s Agriculture and Irrigation Commission on Climate Change to improve three NDC indicators where the Puna Resilient project is contributing to: NDC (AGRI 7), NDC (AGRI 11) and NDC (AGRI 16). SERNANP will also be supported in reporting progress on NDC (BOS1) within the scope of the project. Actions mentioned above will be also coordinated with other institutions such as SENAMHI, ANA, INAIGEM, SUNASS, and others for potential synergies.
Baseline	Monitoring and Evaluation systems at the national level do not have the tools needed to monitor EbA interventions agricultural sector. Therefore, National entities

	do not register or keep track of progress in climate change adaptation intervention impact.
Results	• NDC Monitoring system in the national scope with adequate protocols and methodologies to measure the impacts of EbA interventions on water and agriculture is implemented. •
Justification	Increasing EbA investments for water purposes requires, among other things, sufficient reliable information on benefits or positive impacts of interventions, such as, for example, increased infiltration for aquifer recharge, maintenance of flows in times of low water and conservation of moisture in the soils. Therefore, is vital for the country to have monitoring systems that specify whether the projects are meeting its objectives or not, and thus provide insights for ongoing policy/decision-making processes.
Institutions involved (include roles)	• GIZ as EE: Will provide technical advice to MIDAGRI and SERNANP for the integration of the EbA approach into M&E systems related to NDCs. • Instituto de Montaña: Will contribute to the design of the protocols to integrate community monitoring data M&E systems. • MIDAGRI: Through its technical Directorates implementing Monitoring and Evaluation systems for ecosystems, and MIDAGRI´s Agriculture and Irrigation Commission on Climate Change. • SERNANP Will contribute to the design of protocols in the case basins where Local initiatives occur Natural Protected Areas. • MINAM and affiliated entities such as SENAMHI and INAIGEM: Will contribute to the validation of information and design of the protocols. • SUNASS: Will contribute to the design of protocols in the case basins where Local initiatives occur in the areas of EPS.

8.7 Project Locations and Target Area Selection

The Puna region is located in the central and southern part of the country's Andean region, starting from the Pasco Region and encompassing a vast area occupied by the political regions of Junín, Huancavelica, Ayacucho, Apurimac, Cusco, Arequipa, and Puno. Due to these reasons and financial limitations for project implementation, it was necessary to conduct an assessment exercise of potential intervention areas to prioritize those with the highest likelihood of intervention success. The process was carried out in two stages, detailed below. **For more information refer to Annex 16b of this Funding Proposal package, which is a detailed explanatory note.**

In the first stage of target area selection, a set of criteria was established for analysing and defining priority actors and intervention areas. The following criteria were considered:

- **Vulnerable communities:** i) altitude above 3500m above sea-level, including a buffer zone ranging up to 2800m above sea level.
- **Ecosystems:** i) presence of Puna ecosystems (peat bogs, grasslands and wetlands) and ii) areas with a greater surface area of degraded land.
- **Climate change:** i) closest districts to areas with high deglaciation rates and ii) very high risk of agriculture and livestock drought and high climatic vulnerability

Based on the results of this first stage, the project partners decide to focus their actions on areas of concentration of priority areas in the southern Andean zone, aiming to achieve greater impact by concentrating efforts in a limited area to enhance intervention efficiency. A total of 91 districts in the regions of Apurimac, Arequipa, Cusco, and Puno were prioritized. As a strategic measure, the Nor Yauyos Cochas Landscape Reserve (NYC) in Lima region was included in the project due to its extensive experience in implementing EbA measures, involving local stakeholders, international cooperation, and the development of MERESE payments, to improve practices and scale them up in the areas covered by the project.

In the **second phase** of area prioritization, the effort was focused on assessing the enabling conditions for the implementation of the project, including social, economic, and environmental factors that may favor or hinder the fulfilment of the project's objectives. In this stage, the objective was to identify the area of intervention with the best enabling conditions to achieve the expected impacts of the project.

The criteria used to assess the enabling conditions in each of the factors considered in this phase were the following:

Table 41: Criteria to assess enabling conditions

Criterion	Weighing	Variable	Prioritization
Social factors			
1. Institutional capacity of potential local partners	20%	Number of organizations, communities, cooperatives registered by the Ministry of Agricultural Development and Irrigation that are present in the district.	Number of organizations registered in the district.
1. Governance	15%	Presence of conflicts registered in the Ombudsman's Database	Maximum rating for conflict-free districts
2. State institutional capacity	25%	Presence of MIDAGRI programs (AGRORURAL, IDEAS) and/or presence of ANP/SERNANP	The largest number of institutions present.
Economic factors			
1. Presence of livelihoods with the potential to improve resilience to climate change	10%	Density of camelids (alpacas and vicuñas) in the district is an indicator of the livelihood of Puna communities.	Top priority will be given to districts with a high density of camelids (alpacas and vicuñas)
2. Potential sustainability of participating in the mechanism of payment for	20%	Variable: Presence of Service Provider Companies that have established rates within the MERESE framework	Priority for districts that have a Water and Water and Sanitation Service Provider (EPS) that has

environmental services – MERESE			established MERESE rates.
Ecological factors			
1. Conservation urgency	10%	a) Degraded hectares of wetlands 5%, b) Degraded hectares of grasslands 5%.	A. Higher priority given to larger degraded areas.

Overall, based on the results of the prioritization process, the project will have activities within 91 districts (see Appendix II- Project intervention districts). However, 33 of them will receive only capacity-building related activities. The main project's operations, e.g., the Puna Facility activities, will be implemented in 58 out of the 91 districts, covering 4,116,475 ha. Of these 58, 13 districts have Natural Protected Areas (ANP), and the other 45 do not have them. The 58 districts are located in 23 provinces across 5 regions and 7 prioritized river basins, situated above 3,500m above sea level (masl), and a buffer zone of 2800m above sea-level, in the Puna region of Peru, mentioned below:

1. Apurimac Region, 10 districts located in the Alto Apurimac basin .
2. Arequipa Region, 12 districts located in the Quilca - Vitor - Chili basin and Ocoña basin - Cotahuasi sub-basin.
3. Cusco Region, 23 districts located in the Vilcanota - Urubamba basin and Inambari basin.
4. Puno Region, 9 districts located in the Azángaro basin – Coata sub-basin.
5. Lima Region, 4 districts located in the Cañete basin.

Department	Total districts identified for the Project	Districts for capacity-building activities	Districts prioritized to be eligible for the Puna Facility	Basins
Apurímac	23	10	10	Intercuenca Alto Apurimac
Arequipa	26	14	12	Vitor Quilca Chili, Subcuenca Cotahuasi- Ocoña
Cusco	29	6	23	Vilcanota-Urubamba, Inambari
Lima (Yauyos)	4	N/A	4	Cañete
Puno	9	N/A	9	Azángaro, subcuenca Coata
Total	**91**	**33**	**58**	

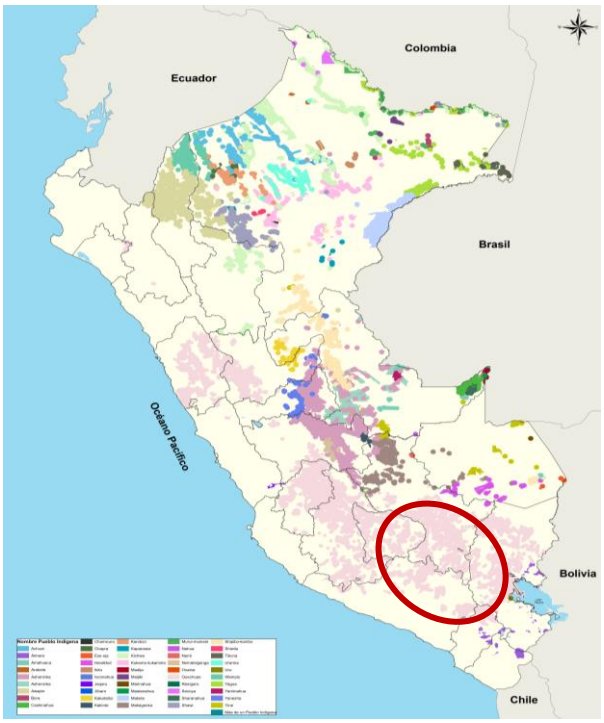
An additional 33 districts will be beneficiaries of capacity-building only, totalling to 91 districts. These 91 districts cover 5,314,607 ha in total. According to the 2017 census, the 58 districts where the Puna Facility will operate have a total population of 434,109 people. (INEI, 2017).

Number of project intervention districts	Population	Area (ha)
33 (capacity building)	132,940	1,198,132
58 (Puna Facility and capacity building)	434,109	4,116,475
91 (Total)	567,049	5,314,607

The 58 districts were selected considering the high risk to drought faced by ecosystems located in the Puna region of the Peruvian Andes, above 3,500 masl. These areas are characterized by their high vulnerability to the effects of climate change and are inhabited by rural communities living in poverty. These communities engage in subsistence farming, grazing, and the care of South American camelids, such as alpacas and vicuñas.

Figure 59: Map showing the project intervention districts and Map of Indigenous Peoples in Peru (Quechua in light pink) [52]

Source: own



Source: Ministry of Culture (2023)

A more detailed explanation of the district prioritization methodology can be found in Annex 16b of this Funding Proposal Package.

8.8 **Project Logical Framework**

The project's logical framework is available in a separate document. Please refer to the Theory of Change and Logical Framework folder submitted.

8.9 Project Budget and Source of Finance

Table 42: Budget Breakdown

Component / Activity	**Total** (EUR)	**GCF** (EUR)	**BMZ** (EUR)	**MIDAGRI** (EUR)	**SERNANP** (EUR)
Output 1.1	**52,686,994**	21,654,201	2,610,785	28,422,010	-
Activity 1.1.1	2,520,485	1,907,964	612,521	-	-

[52] 91 districts: 58 districts to be eligible to the Puna Facility and 33 districts for capacity building.

Activity 1.1.2	40,477,625	17,273,978	1,723,483	21,480,164	-
Activity 1.1.3	9,688,884	2,472,259	274,780	6,941,845	-
Output 1.2	6,271,571	4,773,096	966,326	-	532,150
Activity 1.2.1	2,961,744	2,038,108	508,410	-	415,226
Activity 1.2.2	3,309,827	2,734,988	457,916	-	116,923
Sub-Total Component 1	***58,958,570***	***26,427,298***	***3,577,111***	***28,422,010***	***532,150***
Output 2.1	7,172,421	6,054,158	1,118,265	-	-
Activity 2.1.1	4,605,178	3,869,370	735,808	-	-
Activity 2.1.2	1,080,130	896,385	183,745	-	-
Activity 2.1.3	1,487,113	1,288,402	198,711	-	-
Sub-Total Component 2	***7,172,421***	***6,054,158***	***1,118,265***	***-***	***-***
Output 3.1	5,570,473	3,934,842	1,220,583	-	***415,048***
Activity 3.1.1	3,347,339	2,200,942	731,349	**-**	415,048
Activity 3.1.2	2,223,134	1,733,900	489,234		**-**
Sub-Total Component 3	***5,570,473***	3,934,842	1,220,583	***-***	***415,048***
Total Value	***71,701,459***	***36,416,296***	***5,915,957***	***28,422,010***	***947,197***

*Please note that this table does not consider PMC, contingency and monitoring costs.

9 Summary of selected EbA measures

9.1 Selection process of EbA measures

Since the concept note stage, different steps were taken to identify and select the best options of ecosystem-based adaptation (EbA) measures that will be implemented through the project in the target area. First, a preliminary EbA catalogue[53] was developed by reviewing 36 publications (technical and scientific) related to EbA measures and nature-based ancestral practices in the project region. Then, through stakeholder consultations (please refer to Annex 7- SEP), the list was refined by checking which ones were relevant for the project area, which

[53] The preliminary EbA Catalogue is available as supplementary material to the Feasibility Study.

ones the consulted stakeholders have experience and have been tested on-the-ground and which ones were to have higher chances of beneficiaries' adoption (for example Amunas, even though they are relevant for the project outcomes, during the stakeholder consultations it was learnt that these were not used in the project area, the same as Waru Warus).

Finally, based on the Environmental Social Impact Assessment (ESIA), the list was revised and modified. For example some EbAs were not included in the final list as they require activities that would not be in line with the risk category of the project like micro reservoirs as these require larger infrastructure as compared to Qochas. The list was reduced to 10 EbAs that were analyzed to have the highest chances of adoption and the highest adaptation impact to increase resilience of value chains and livelihoods in the project region. Once the EbAs were selected a detailed analysis of their suitability for each district and each value chain was developed using a geospatial analysis which is fully detailed in the "Geospatial analysis for EbA implementation" report submitted as supplementary material.

The selected EbA measures are detailed below.

9.2 Prototypes of selected EbA measures

9.2.1 Bofedal restoration and conservation

<table>
<tr><th colspan="2">EbA 1: Bofedal restoration and conservation</th></tr>
<tr><td>Description and purpose</td><td> 
Bofedales are dense vegetation grasslands, composed of sedges, small herbaceous semi-woody plants, and permanent or seasonal grasses, arranged as compact grass carpets resembling cushions (known as kunkush) and developed on saturated peaty or permanently wet organic soils along the year (HELVETAS Swiss Intercooperation, 2017; Lorini, 2014; Rivera et al., 2014). This type of wetland can be found at the bottom of ravines or in flat areas. They are not isolated ecosystems, and can be found next to pastures and shrublands, interacting with each other. (Chamorro, Salcedo, Flores, & Jorge, 2021)

 
They are considered high altitude wetlands or permanently wet grasslands and one of the most important ecosystems of the Peruvian high Andean arid and semi-arid zones (HELVETAS Swiss Intercooperation, 2017). However, they are extremely fragile ecosystems due to their dependence on water, climate variation sensitivity, glacial retreat, and anthropogenic pressures such as mining, landscape fragmentation, road and dam construction, the introduction of exotic species, environmental pollution, overgrazing and drainage for</td></tr>
</table>

	expansion of productive activities (HELVETAS Swiss Intercooperation, 2017). The high biological diversity and ecological complexity of *bofedales* make them one of the most productive ecosystems on the planet. *Bofedales* are an important sink of carbon and other pollutants. They retain rainwater and regulate runoff flows caused by irregular rainfall, maintaining soil moisture. Soil moisture, in turn, facilitates the regeneration of grasslands or forest species, which helps to contain the effects of rising temperatures and high evapotranspiration. (HELVETAS Swiss Intercooperation, 2017).
Climate rationale	The restoration and conservation of wetlands and their potential use for Andean camelid livestock would increase the resilience of communities in the face of climate change, helping to recover the necessary balance in the relationship between soil, pasture and livestock. Wetlands are the main source of food for high Andean livestock and a strategic social and economic element for camelid producers. A spatial analysis of Andean *bofedales* in the Aymaras region in Bolivia shows community income has been reduced by up to 50% due to the decline of their livestock, having lost *bofedales* and barley crops, main sources of food (HELVETAS Swiss Intercooperation, 2014). Moreover, receding glaciers in the SHAP regions means that there is less water in main basins. Wetlands' water regulation functions in times of low water represent an important measure to tackle water security in the region for consumption and livestock activities.
Benefits	Wetlands provide a number of ecosystem services that would be restored along with the restoration of *bofedales.* In terms of provisioning services, they provide water and fodder for livestock, as well as biofuel for local communities (known as *champa)* (Chamorro, Salcedo, Flores, & Jorge, 2021). They also provide important regulatory services for the SHAP ecosystem, such as carbon capture, flood control, erosion control, water quality and purity, as well as water storage. In terms of cultural services, they provide scenic beauty, and are important eco-tourism sites.
Limitations	- Applicable only on large land extensions to properly manage rotational grazing and regenerate pastures in the wetlands and surrounding area. - The total area must have an appropriate carrying capacity to support local livestock activity. - Resting plots (fallow lands) should be, unused for one or two years, limiting livestock activity in the area.
Key issues that affect success	- Degree of uncontrolled animal grazing - Level of acceptance at a local level, due to potential replacements of livestock types or changes in livestock production. - Related to the point above, communal agreements and commitment and coordination of workforce. - Level of soil salinization
Complementary practices	Due to their interaction with surrounding pastures and the fact that livestock and other herbivores graze on both, appropriate pasture management is necessary (Chamorro, Salcedo, Flores, & Jorge, 2021)

Complementary climate-resilient value chains	This EbA measure was determined to be complementary to the three value chains: “Vicuñas/Alpacas”, “High Andean crops” and “Community-based tourism”. As explained above, *bofedales* have an important water regulation function that is important for the health and provision of food and water for vicuñas and alpacas. Through their improvement of soil moisture they also improve grassland and pasture regeneration, important for both livestock and crop farming activities (Chamorro, Salcedo, Flores, & Jorge, 2021). They are also a recreation and eco-tourism site due to their aesthetic value (FAO, 2022).
Cost and materials	Estimated cost: EUR 470.00[54] per ha Costs were estimated based on literature review and previous experiences in the region, they may vary during project implementation.
Methodology/approach	Actions taken to restore *bofedales* fall into active restoration and passive restoration. Active restoration includes actions to modify the landscape to recover *bofedales* and associated pastures, such as (Chamorro, Salcedo, Flores, & Jorge, 2021): - Transplanting/propagating vegetation patches from vulnerable areas (susceptible to erosion or drying) to another appropriate area. These will expand and accelerate the regeneration of the area. - Transplanting/propagating grass shoots. For this measure to work, appropriate livestock management (especially for cows) needs to occur to avoid overgrazing. The species Festuca dollichopylla is the most commonly used for this type of transplanting as it adapts to less humid areas of the bofedal. - Planting mixed pastures with species that tolerate drier conditions to regenerate surrounding pastures. The goal is to divert livestock and other herbivores to these areas to allow for the recovery of bofedales. - Water management, such as through the construction of small drains from the centre of the wetlands to drier patches. Passive restoration involves actions to promote the natural recovery of pastures of the *bofedales*, including (Chamorro, Salcedo, Flores, & Jorge, 2021) - Grazing closure in rainy seasons - Restrict access for cows, sheep, goats, horses, donkeys, pigs and mules. - Replacement and maintenance of fences restricting livestock access.
Lessons learnt	- Capacity building is essential at community levels (in conservation and restoration techniques, monitoring and site selection), as an intimate knowledge of the landscape is required. - Long-term planning is crucial to the success of wetland conservation and restoration due to the coordination required with complementary measures such as livestock management and water management.

[54] FAO. (2022) Restauración hidrológica de bofedales en el Parque Nacional Huascarán. Available online in Restauración hidrológica de bofedales en el Parque Nacional Huascarán (fao.org)

	- Plan activities according to rainy seasons to enhance soil coverage and pasture regeneration. (Ochoa-Sánchez, Suárez Robalino, Ochoa-Tocachi, & Calle, 2021)
Potential indicators	Per hectare: - Increase in soil-plant system humidity (bulk density gr/cm3 of soil during the dry season). - Increase in spring flow due to infiltration produced by the wetland system (l/s). - Improvement in water regulation at the source (decrease in base flows l/s - month). - Appearance of new springs (number and/or volume in l/s).
Key references to research and studies	Buenas Prácticas en Conservación y Restauración de Humedales Altoandinos (Fondo Protección del Agua and Ministerio del Ambiente, Agua y Transición Ecológica del Ecuador, 2021) Manual de buenas prácticas en manejo y restauración de bofedales en Junín, Peru (Wetlands International and Asociación Ecosistemas Andinos, 2021) Hartman, B. D., & Cleveland, D. A. (2018). The socioeconomic factors that facilitate or constrain restoration management: Watershed rehabilitation and wet meadow (bofedal) restoration in the Bolivian Andes. *Journal of Environmental Management*, *209*, 93–104.

9.2.2 Qochas

EbA 2: Qochas	
Description and purpose	*Qochas* are reservoirs in natural depressions or lagoons of pre-Inca origin (Moran et al., 2018;). They can be natural or man-made, but both are beneficial for rainwater storage purposes, particularly in the dry months.  Family *qochas* contribute to both "water seeding" (promoting water infiltration and aquifer recharge), and "water harvesting" or rainwater collection. In both situations, family *qochas* are a key strategy to increase resilience to climate change in high Andean communities, as an EbA measure associated with other practices such as grassland management, restoration with native species or planting natural grasses, improving water supply by favouring rainwater capture, storage and infiltration.

	 The implementation of *qochas* is an effective way to store and filtrate water, recovering depleted springs and maintaining the humidity of the natural grassland. *Qochas* allow for water availability during drier periods (June-August), helping to guarantee crops and livestock (Rivera, Sierra, & Urviola, 2014).
Climate rationale	*Qochas* are usually built in the headwaters of watersheds with irregular rainfall regimes (Moran, Villanueva, & Varillas, Inventario de tecnologías de manejo de agua para la agricultura familiar, 2018). Their purpose is to store water in times of abundant rainfall to regulate the flow of streams, recharge aquifers and provide water in times of low water (Moran et al., 2018). *Qochas* also improve water quality as it infiltrates subsoils and is cleaned. (FONCODES Peru, 2015) In addition, the stored water is used to feed springs and wetlands (Rivera et al., 2014) for irrigation of high-altitude crops such as potatoes, barley, pastures and watering for livestock and human consumption (Moran, Villanueva, & Varillas, Inventario de tecnologías de manejo de agua para la agricultura familiar, 2018). Given the high evaporation rates in the area, *Qochas* also have a thermo-regulating effect through the maintenance of surrounding humidity. This effect contributes to the recovery and maintenance of wetlands, as well as creating a microclimate allowing to reduce the incidence of pasture and crop frosting during the drier periods (Dirección Desoncentrada de Cultura de Cusco, 2019) (FONCODES Peru, 2015). *Qochas* can thus help tackle climate change and anthropogenic pressures. For example, reduced and irregular seasonal precipitation and variation in rainfall patterns; increased temperature ranges (increased maximum and decreased minimum temperatures); overgrazing, burning of grasslands, soil compaction, and other poor agricultural practices (HELVETAS Swiss Intercooperation, 2017)
Benefits	*Qochas* provide a number of ecosystem services. They provide provisioning services through rainwater collection, and regulatory services through maintenance of soil fertility, erosion control and hydrological control (through water infiltration). A supporting service they offer is soil conservation, as well as being home to local fauna and flora such as *qoya*, *chillingua* and wild duck populations (FONCODES Peru, 2015)
Limitations	- Requires extensive local hydrological and landscape knowledge to implement effectively. - Requires long-term maintenance. -

Key issues that affect success	- High technical knowledge of water potential of the area, both projected and in the present. This includes aquifer recharge capacity, hydro-geological connectivity and geology. - Peat and sandy soils can increase land preparation costs - Social conflict within communities and complex tenure
Complementary practices	Regeneration of surrounding pastures is necessary to avoid soil erosion into the *qocha*, as well as to maintain the soil humidity (through increased soil cover) (FONCODES Peru, 2015).
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to the three value chains: "Vicuñas/Alpacas", "High Andean crops" and "Community-based tourism". *Qochas* are a way to support the regeneration of pastures and wetlands and have an important water and thermoregulation effect in the local ecosystem. For more information on the methodology used, refer to technical report.
Cost and materials	- Large and medium rocks for the building of the dam - Clay (to avoid water filtrating through the dam) - Humid/moist patches of autochthonous grass - Soil (for the grass) (FONCODES Peru, 2015) Estimated cost: EUR 5,000.00 per *qocha*[55]. Costs were estimated based on literature review and previous experiences in the region, they may vary during project implementation.
Methodology/approach	There are multiple types of *qochas* used for different purposes: - For water storage- they are characterised by making the edges and the base of the qocha as impermeable as possible to avoid water infiltration. With the start of the rainy period, water is stored quickly and evaporates slowly. These should be built in clay or silt soils. - For water infiltration and aquifer recharge- The base of the qocha is permeable to allow for easy water infiltration into the subsoil. These should be built on porous rock or other permeable bases. - Mixed use- Only the borders of the qocha are made permeable, while the base of the qocha is impermeable. This allows for a balance between storing water and water infiltration. (FONCODES Peru, 2015) The use of local materials will be prioritized in the Local initiatives. The characteristics of the local materials to be used in small rustic dams such as compacted earth, clays, stones and champas are framed in the typology of "loose materials" whose criteria of use are given because they do not need special soil foundations, are of low height and it is possible in its construction the massive use of local labor and equipment of common use (Proyecto Glaciares +, 2018).

[55] Proyecto Glaciares +. GUÍA TÉCNICA — Diseño y Construcción de Pequeñas Presas Rústicas en Lagunas Periglaciares.

Lessons learnt	- Raising awareness and building technical capacity is essential for communities to understand the value of *qochas*. Sometimes they lose interest when water disappears due to infiltration, as they wish for water to be stored for longer. - It is sometimes difficult for communities and families to set aside areas to build *qochas*, as surface area for livestock grazing is sometimes preferred in the short-term. - Not all areas are appropriate for the construction of *qochas*. Technical expertise is required for the location and construction of the dam to ensure quality, stability, good operation and maintenance. (FONCODES Peru, 2015)
Potential indicators	The most accurate way to measure the effectiveness of a *qocha* is hydrological balance, using: - Evapotranspiration (mm) - Percolation (mm) - Water Run-off (mm) - Soil humidity (mm) This is according to the CUBHIC 2.0 method developed by Forest Trends and CONDESAN in the Peruvian Andean context
Key references to research and studies	Siembra y Cosecha de Agua- FONCODES Peru Qochas rusticas: manual técnico (Programa de Adaptación al Cambio Climático Peru) CUBHIC 2.0: Qochas- Documento Metodológico (CONDESAN, Forest Trends, Imperial College London)

9.2.3 Integrated Soil Fertility Management

EbA 3: Integrated Soil Fertility Management	
Description and purpose	 Integrated Soil Fertility Management (ISFM) is defined as "a set of practices, necessarily involving the use of fertilizers, organic inputs and improved germplasm, combined with knowledge of how to adapt these practices to local conditions, aimed at maximizing the agronomic use efficiency of applied nutrients and improving crop productivity" (Vanlauwe, et al., 2010). Fertilizer use is a key aspect of ISFM. Nutrients must be added to a cropping system to compensate for nutrient removal in the form of harvested produce. ISFM is driven by the efficient use of applied nutrients, which not only maximizes the value of fertilizers, but also minimizes nutrient loss to the environment. ISFM can regenerate degraded soils and maintain soil fertility by maximizing organic fertilizer sources and minimizing the loss of

	nutrients. It aims to use sustainably and efficiently available nutrient resources harvesting low-cost techniques such as organic fertilization, manuring, composting, nitrogen-fixing crops, seed priming and water harvesting (Liniger, Studer, Hauert, & Gurtner, 2011). *Majadeo* is an ancestral practice of soil fertilization using herds. The process starts with herd grazing, in which the animals are guided to feed on specific plots of land designated to be eaten flush in less than four hours. By grazing the herd, the cattle sleep for several days in a single site and then plant crops there, taking advantage of the fresh manure on the ground (Tapia, Fries, Mazar, & Rosell, 2007) Green manure is a specific crop that is grown for the purpose of being placed on the soil while it is still green. This type of crop is usually planted in the unoccupied land between the main crops. While growing, they act as a soil cover, preserving the soil structure with their root system, preventing erosion and nutrient washing, suppressing weed growth and enriching the soil with nitrogen. Once incorporated into the soil, the plant residues decompose and become a natural fertilizer that can be placed under the soil or on the soil surface. The most frequently used green manure is leguminous plants due to their high nitrogen fixing capacity that favours soil fertilization. Because these plants are fast-growing and adapt to different climatic conditions and soil types, they are used to protect the soil and maintain its organic content, and in some cases, to replenish the vegetative cover (Rosenfeld & Rayns, 2011)  ISFM fosters the regeneration and recovery of soil properties by increasing the soil organic matter (SOM) and biomass, improving the water holding capacity and soil moisture, and fixing nitrogen and other nutrients in the soil, resulting in more climate-resilient crops (Liniger, Studer, Hauert, & Gurtner, 2011). Harnessing the characteristics of manure and compost, ISFM reduces reliance on external inputs, enhances soil fertility, and recovers farm resources, which is relevant for the livelihoods of small-scale farmers. Besides that, the seed priming reduces germination time and ensures more uniform plan establishment, resulting in more insect- and fungus resistance crops. Furthermore, nitrogen-fixing crops such as leguminous plants have two beneficial effects: on the one hand, it incorporates nitrogen into the soil, and on the other hand, provides fodder and food. Additionally, all these practices foster the soil's biological activity while improving the soil's properties (Liniger, Studer, Hauert, & Gurtner, 2011).
Climate rationale	The improvement of soil fertility would increase resilience against climate change, this being the sustenance for plant growth and the optimization of crop yields. All of this would promote food security and the environmental sustainability of agricultural systems. The greater efficiency of the agronomic use of nutrients and the improvement of crop

	productivity contributes to minimizing the extraction of soil nutrient reserves and the degradation of its physical and chemical properties, which leads to land degradation and soil erosion (Bayu, 2020).
Benefits	Restoration of degraded soils and adopting conservation practices present significant potential for reducing greenhouse gas emissions, enhancing carbon sequestration, and building resilience to climate change. Nutrient management is essential for optimizing crop production while minimizing environmental impacts, and it involves balancing soil nutrient withdrawal with nutrient addition. Proper nutrient management prevents over-application, improves nutrient use efficiency, and considers the overall environmental cost. Climate change mitigation efforts include reducing greenhouse gases in the atmosphere and enhancing their sinks, such as increasing soil organic carbon through mineralization of organic matter (Bayu, 2020).
Limitations	- Applicable in areas with low and rapidly declining soil fertility - Unsuitable for rangelands - Transportation is a heavy burden at steep inclines - Source of weeds and pests
Key issues that affect success	- Limited or decreasing water availability - Availability and access to inputs (manure, compost, etc.) - Access to financial services and micro-credits - Access to knowledge-intensive ISFM -
Complementary practices	- Agroforestry and ISFM interact through the use of tree prunings as organic inputs to the soil. - Agroforestry trees are often nitrogen-fixing and recycle nutrients back to the soil through prunings and litterfall. - Trees' deep roots allow them to retrieve nutrients from lower soil layers, giving them a competitive advantage over annual crops. - Care must be taken to integrate trees and field crops without compromising the main agricultural enterprises. - Strategic placement of trees along field and farm boundaries can be beneficial. - Trees can serve as orchard-woodlots, with prunings used as fodder for livestock and their manure applied to field crops. - Exceptions exist, such as successful cereal and legume establishment beneath certain trees in semi-arid climates. - Close integration may require excessive labor, but certain crop-tree combinations have proven effective. - Multistory tree gardens in humid tropical regions may operate differently. - (Liniger, Studer, Hauert, & Gurtner, 2011)
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: “High Andean crops” value chain. Improved soil fertility would increase resilience to climate change, underpinning plant growth and optimising crop yields. This would promote food security and environmental sustainability of agricultural systems.
Cost and materials	- High-yielding, drought-tolerant seeds - Nitrogen-fixing crops

	- Mineral fertilizer - Green manure, farmyard manure, compost manure - Crop residue Estimated cost: EUR 1,710.94[56] Costs were estimated based on literature review and previous experiences in the region, they may vary during project implementation.
Methodology/approach	The methodology/approach of ISFM involves the combined use of various practices and interventions to improve soil fertility, enhance crop productivity, and promote sustainable agricultural systems. The key components and principles of ISFM are (Liniger, Studer, Hauert, & Gurtner, 2011): - Soil analysis: conducting soil tests to determine the nutrient status and pH of the soil. This helps identify nutrient deficiencies and pH imbalances, enabling targeted and efficient nutrient management. - Nutrient management: applying the right amounts of mineral fertilizers based on the soil analysis to meet the specific crop requirements. Nutrient management aims to optimize nutrient use efficiency while minimizing environmental impacts. - Organic inputs: utilizing organic resources such as farmyard manure, green manure, compost, and crop residues to improve soil organic matter content and nutrient availability. Organic inputs contribute to soil health and help sustainably replenish nutrient levels. - Legume incorporation: introducing leguminous crops or trees into the farming system to fix atmospheric nitrogen and enhance soil fertility. Legumes play a crucial role in nitrogen cycling and reduce the need for synthetic nitrogen fertilizers. - Crop rotation and intercropping: practicing diverse crop rotations and intercropping to enhance nutrient cycling, reduce pest and disease pressure, and improve overall soil health. - Good seed selection: using high-yielding and disease-resistant seed varieties to improve crop performance and yield. - Efficient water management: Implementing practices to optimize water use and reduce water wastage, such as proper irrigation methods and water-saving techniques. - Soil erosion control: implementing measures to prevent soil erosion and maintain good soil cover, such as contour plowing, terracing, and agroforestry. - Scouting and pest management: Regularly monitoring crops for pests and diseases and implementing timely and appropriate pest management strategies.
Lessons learnt	ISFM has shown promising results in addressing food and pest challenges faced by smallholder farmers. Numerous studies, including long-term ones, have reported increased yields and benefits resulting from ISFM interventions. These positive outcomes are mainly attributed

56 MEBA https://unepmeba.org/wp-content/uploads/2020/01/Microfinance_for-Ecosystem_based_Adaptation_EN.pdf

	to improved nutrient use efficiency achieved through synergistic effects involving various mechanisms. However, Local adaptation is influenced by the interaction between biophysical, biological, and economic factors. Gaps still exist in the understanding of these interactions and processes. Improving the adoption of ISFM requires suitable policies to improve accessibility of fertilizers and seeds (Mugwe, Ngetich, & Otieno, 2019).
Potential indicators	Per hectare: - Increased infiltration rate. Increased retention and transport capacity of water/minerals - Increased stability of aggregates - Increase in organic matter (organic Cy N) - Soil ph level - Increased availability of nutrients. - Abundance and diversity of soil fauna.
Key references to research and studies	Liniger, H., Studer, R. M., Hauert, C., & Gurtner, M. (2011). *Sustainable Land Management in Practice – Guidelines and Best Practices for Sub-Saharan Africa.* TerrAfrica, World Overview of Conservation Approaches and Technologies (WOCAT) and Food and Agriculture Organization of the United Nations (FAO). Mugwe, J., Ngetich, F., & Otieno, E. O. (2019). Integrated Soil Fertility Management in Sub-Saharan Africa: Evolving Paradigms Toward Integration. In M. Dietrich, M. Borrello, & O. Harman, *Handbook of the Historiography of Biology.* Springer International Publishing. Rosenfeld, A., & Rayns, F. (2011). *Sort Out Your Soil: A practical guide to green manures.* Cotswold Seeds.

9.2.4 Contour farming

EbA 4: Contour farming	
Description and purpose	 Contour farming is a practice with various techniques, which in general prevent the loss of topsoil on slopes affected by erosive effects. It manages crops on contour lines by furrowing perpendicular to the terrain slope to reduce the runoff velocity and thus its dragging capacity (HELVETAS Swiss Intercooperation, 2017). Unlike intensive hillside farming, whose furrows are parallel to the slope accelerate erosive effects, contour furrows contain the runoff by being arranged transversely or obliquely to the hill. Contour furrows are local adaptation measures in scenarios of the high variability of precipitations in which seasonal, concentrated, and intense rainfall occurs, triggering erosive processes. Likewise, furrows allow retaining moisture in the soil for contexts with considerable drought periods. When soils are well-drained, and slopes are gentle (<6%), it is more convenient to use strip cultivation which consists of establishing two types of crops: one of

	protective type with denser vegetation and one of a shorter cycle (PDRS, 2014) The dimensions and shapes of the furrows depend on the crop, rainfall intensity, changes in topography, soil permeability and slope. However, it is recommended that the furrow slope does not exceed 10% to favour infiltration and decrease water erosion. In this way, contour farming also contributes to correcting poor agricultural practices while reducing landslide risks and the effects caused by heavy rainfall. By improving water infiltration into the soil, reducing erosion, maintaining the fertile soil layer and retaining nutrients, contour furrows increase crop yield and plot productivity (HELVETAS Swiss Intercooperation, 2017).
Climate rationale	Contour farming is a sustainable tool for water and erosion management: it helps to intercept and reduce runoff, while allowing more water to infiltrate underground. This retention of water in the grooves or contours helps to reduce water erosion and increases. These benefits will contribute to the sustainable management of crops, helping to strengthen the resilience of communities.
Benefits	- Contour farming helps prevent soil erosion by reducing the flow of water down slopes. The rows of crops act as barriers, slowing down water runoff and allowing it to infiltrate the soil, which reduces the risk of soil erosion and loss. - By slowing down water runoff, contour farming promotes water infiltration and retention in the soil. This enhances water availability for plants, especially during dry periods, and reduces the need for irrigation. - The reduced erosion and better water retention of contour farming help retain nutrients in the soil, preventing them from being washed away. This contributes to improved soil fertility and nutrient availability for crops. - Contour farming reduces the sediment and nutrient runoff into water bodies, helping to protect nearby streams, rivers, and lakes from pollution. This practice supports overall environmental conservation and water quality. - By preventing soil erosion, contour farming helps maintain the stability of slopes, reducing the risk of landslides and further soil degradation. (USDA-NRCS, 2017)
Limitations	- Effective on slopes between 2 and 10%, and on slopes between 30 to 120m long. On slopes longer than 120m, the volume of overland flow exceeds the capacity of the ridges to contain it. - Manual ploughing is required - Not well suited to rolling topography with slope irregularity - (USDA-NRCS, 2017)
Key issues that affect success	- The furrows might be destroyed during harvesting activities, requiring rebuilding - Heavy rainfall might cause the furrows to rupture, which can overflow to the furrow below, and so on

Complementary practices	Contour farming can be combined with other conservation practices: - Digging infiltration ditches across slopes to divert rainwater - Growing small strips of vegetative barriers (stiff plants) across the slope - Leaving slash in the field for soil protection (residue management) - Bringing in material to cover and protect the soil (mulching) - Growing hedges of bushes and trees across the slope (alley cropping and hedgerow planting) - (USDA-NRCS, 2017)
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: "High Andean crops" value chain. Contour farming can lead to cost savings for farmers by reducing the need for erosion control measures and conserving water, which can also translate to lower irrigation costs.
Cost and materials	- A-frame - Stakes for contour line delineation - Spirit/bubble level Estimated cost: EUR 260.25[57] Costs were estimated based on literature review and previous experiences in the region, they may vary during project implementation.
Methodology/approach	To implement contour farming, the beds for farming along the contour with the use of an A-frame is first constructed. This will require: a topographic survey of field, layout of a baseline contour with markers, using an A-frame, preparation of field borders to allow room for farm equipment to turn/manoeuvre, and plan to perform all farming activities parallel to baseline contour(s) (GIZ, 2019).
Lessons learnt	- There is a limit to which contour farming can tackle runoff and erosion. In very steep slopes, complementary measures are needed (Gúzman, 2015)
Potential indicators	Per hectare: - Reduction of runoff (in flow and speed of the water current and dragging of the soil). - Increased infiltration rate. Increase in the capacity of retention, distribution and transport of water - Preservation of soil organic matter - Increase in crop yield
Key references to research and studies	HELVETAS Swiss Intercooperation. (2017). *Catálogo ed medidas AbE para recuperar servicios exositstémicos hídricos en un contexto de cambio climático en proyectos de inversión de agua y saneamiento, riego y energía.*

57 MEBA https://unepmeba.org/wp-content/uploads/2020/01/Microfinance_for-Ecosystem_based_Adaptation_EN.pdf

	USDA-NRCS. (2017). Conservation Practice Standard: Contour Farming (Code 330). United States Department of Agriculture, Natural Resources Conservation Service. Raudes, M., Sagastume, N. (2009). *Manual de Conservación de Suelos*. Programa para la Agricultura Sostenible en Laderas de América Central. Carrera de Ciencia y Producción Agropecuaria. Escuela Agrícola Panamericana, El Zamorano, Honduras.

9.2.5 Infiltration ditches

EbA 5: Infiltration ditches	
Description and purpose	 Infiltration ditches in agriculture are a soil conservation technique used to manage water runoff and promote water infiltration into the soil. These ditches are shallow, broad-based channels or depressions strategically constructed along the contour lines of the land. The primary objective of infiltration ditches is to slow down the flow of water during heavy rainfall events, allowing it to infiltrate into the soil gradually. This helps prevent soil erosion, reduces surface runoff, and enhances soil moisture retention (HELVETAS Swiss Intercooperation, 2017).  By intercepting and controlling water flow, infiltration ditches help to mitigate the negative impacts of water erosion, such as gully formation and topsoil loss. The ditches also facilitate the capture of sediment and nutrients, preventing them from being carried away by runoff and polluting water bodies. Additionally, infiltration ditches contribute to sustainable water management by recharging groundwater and reducing the risks of flooding during heavy rainfalls (HELVETAS Swiss Intercooperation, 2017).
Climate rationale	Infiltration ditches contribute to soil conservation, water management, and enhanced resilience (see below).
Benefits	- Infiltration ditches enhance water conservation by promoting water infiltration and reducing surface runoff. This aids in maintaining soil moisture levels, which are crucial during periods of water scarcity. - Infiltration ditches help manage excessive water runoff by allowing water to infiltrate into the soil gradually, thus reducing the risk of flooding in agricultural fields.

	- Infiltration ditches facilitate groundwater recharge by directing water into the soil, replenishing aquifers, and contributing to long-term water availability for crops. - Infiltration ditches help trap sediment and nutrients from runoff, reducing nutrient losses and minimizing environmental pollution. - (Locatelli, et al., 2020)
Limitations	- On steep slopes, infiltration trenches may be challenging to construct and maintain. The rapid flow of water can lead to erosion within the trenches, making them less effective in controlling runoff. - In small or irregularly shaped fields, there may not be enough space to construct infiltration trenches effectively. In such cases, alternative soil conservation practices like contour farming or terracing may be more appropriate.
Key issues that affect success	- As infiltration trenches fill over time, their positive effects diminish. Labour-intensive maintenance is required. - High maintenance costs (Locatelli, et al., 2020)
Complementary practices	Restoring native vegetation (such as native grass species) has a similar effect on runoff and soil loss reduction.
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: “Vicuñas/Alpacas”, and “High Andean crops” value chains. By reducing the risk of soil degradation and preserving fertile topsoil, these ditches support the sustainable grazing practices for vicuñas and alpacas by maintaining healthy pastureland, as well as ensuring the availability of nutrient-rich soils for high Andean crops.
Cost and materials	- Geotextiles, mulch, or vegetation for stabilizing the sides of the ditches and preventing erosion. - Grass seeds or vegetation for planting in and around the ditches to enhance soil stability and erosion control. Estimated cost: EUR 1,250.00[58] . Costs were estimated based on literature review and previous experiences in the region, they may vary during project implementation.
Methodology/approach	- Excavate ditches along natural contour lines - Grade the bottom of ditches for uniform water infiltration - Implement erosion control measures such as vegetation cover - Perform regular maintenance to keep ditches free from debris and sediment build-up
Lessons learnt	The effect of vegetation cover on trenching effectiveness confirms the importance of including vegetation management along with trenching to provide greater runoff reduction compared to trenching alone. It is recommended to improve or recover the vegetation cover to reduce

58 Costs assessed by GIZ during research and project preparation process

	erosion between the trenches and prevent them from clogging (Locatelli, et al., 2020).
Potential indicators	Per hectare: - Increase in the flow of springs as a result of the infiltration produced by the trenches (l/s). - Improvement in water regulation at the source (decrease in base flows l/s - month). - Appearance of new springs (number and/or volume in l/s). - Less soil erosion (Tn/ha or reduction of soil deposits in the lower part). - Increase in humidity of the soil plant water system as a result of localized infiltration (ha *bofedales*; apparent density gr/cm3 of soil in dry season).
Key references to research and studies	HELVETAS Swiss Intercooperation. (2017). *Catálogo de medidas AbE para recuperar servicios ecosistémicos hídricos en un contexto de cambio climático en proyectos de inversión de agua y saneamiento, riego y energía.* Locatelli, B., Jan-Markus Homberger, Ochoa-Tocachi, B. F., Bonnesoeur, V., Román, F., Fabián Drenkhan, & Buytaert, W. (2020). *Impactos de las zanjas de infiltración en el agua y los suelos: ¿Qué sabemos?*

9.2.6 Sustainable grassland management

EbA 6: Sustainable grassland management	
Description and purpose	 Approximately 12% of Peru's territory is covered by pristine natural grasslands. These grasslands encompass about 70% of the agricultural surface in the high Andean zone, with prominent distribution in regions such as Puno, Cusco, Ayacucho, and Arequipa. These grasslands hold significant importance as they play a vital role in safeguarding the soil from erosion and promoting effective water infiltration, thereby regulating the flow of runoff water. Moreover, they form the very foundation of livestock production in the country, predominantly supporting the livelihoods of peasant communities (Rivera, Sierra, & Urviola, 2014). It is a holistic approach that aims to preserve and enhance the ecological health, productivity, and resilience of grassland ecosystems. It involves implementing practices that ensure the long-term conservation of native vegetation, proper grazing management, erosion control, and water resource protection (HELVETAS Swiss Intercooperation, 2017).
Climate rationale	Healthy and well-managed grasslands act as carbon sinks, sequestering carbon dioxide from the atmosphere, thus contributing to

	climate change mitigation (Bai & Cotrufo, 2022). Additionally, sustainable practices such as rotational grazing enhance grassland resilience to extreme weather events, such as droughts and floods, making them better equipped to withstand the challenges posed by a changing climate. Moreover, preserving native vegetation and protecting water resources within grasslands supports climate adaptation by ensuring a reliable supply of water for both ecosystems and human needs (FAO, Fighting climate change with grasslands: Vast potential seen in pastures, 2010).
Benefits	Sustainable grasslands management offers a multitude of benefits for both the environment and communities. It promotes soil conservation, preventing erosion and enhancing soil health, while serving as a vital carbon sink, contributing to climate change mitigation. By protecting water resources and promoting proper grazing practices, it ensures reliable water supply and supports the livelihoods of livestock-dependent communities. Biodiversity conservation is fostered, preserving unique plant and animal species within grassland ecosystems. Additionally, sustainable management strategies increase grassland resilience to climate change, mitigating the impacts of extreme weather events (USDA, 2012).
Limitations	- Conservation goals may clash with the expansion of agricultural activities to meet growing food demands.
Key issues that affect success	- Incorrectly determining the carrying capacity of the grassland, leading to overgrazing - Weak community organisations - Soil texture - Physiography (flat plots are prone to cold waves)
Complementary practices	- *Bofedales* restoration and conservation - Implementation of *qochas* that are strategically placed to support livestock distribution while minimizing environmental impact. - Other erosion control measures, such as infiltration ditches, or terraces
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: "Vicuñas/Alpacas" value chain. Well-managed grasslands provide abundant and nutritious forage for vicuñas and alpacas, supporting their health and productivity. By implementing rotational grazing and preventing overgrazing, sustainable grassland management ensures a continuous supply of high-quality feed for these camelid species. Additionally, conservation of native vegetation and proper soil management in grasslands contribute to ecosystem health, creating a favourable environment for vicuñas and alpacas. Sustainable grassland practices enhance grassland resilience to climate change impacts, helping these value chains adapt to changing weather patterns and prolonged droughts.
Cost and materials	- Fencing to facilitate rotational grazing. - Seeds for native grasses Estimated cost: EUR 571.50[59]

59 Costs assessed by GIZ during research and project preparation process.

	Costs were estimated based on literature review and previous experiences in the region, they may vary during project implementation.
Methodology/approach	 In the Puna region, a key measure involves replacing other livestock species like sheep, goats, or cattle with alpacas and llamas, which are ideally suited to ecological zones above 3,800 meters above sea level (Ramos, 2010). South American camelids have distinct advantages over other livestock in the Andes, as they graze without uprooting pastures and their padded hooves prevent soil compaction. Moreover, llamas and alpacas can forage in areas unsuitable for agriculture, making them complementary grazing options. Llamas prefer higher pastures on slopes, while alpacas favour shorter pastures in flat areas, expanding local livelihood opportunities (Lichtenstein, 2009). As llamas and alpacas consume significantly less water than other livestock, promoting their population recovery can help communities adapt to potential future water shortages.  In the planning phase, pasture sites are delineated, the carrying capacity is established, as well as the daily consumption per animal. The phenological calendar is also defined. Pastures are then fenced and enclosed, using locally-sourced materials wherever possible.  Natural grasses are replanted. The main forage species used for sustainable grassland management are *chilligua* (*Festuca dolichophylla*), *cora cora* (*Carex ecuadorica*), *totorilla* (*Scirpus rigidus*), *layo* (*Gomphrena meyeniana*), *sillu sillu* (*Alchemilla pinnata*), and *kunkuna* (*Disticia muscoides*) (Rivera, Sierra, & Urviola, 2014) Rotational grazing is established to allow grasses and forbs to recover between grazing periods. Stocking rates are adjusted based on grassland productivity and seasonal conditions to avoid resource depletion (Rivera, Sierra, & Urviola, 2014).
Lessons learnt	Grass and forb varieties for pasture enhancement could also be introduced. Some varieties tested by the National Institute of Agrarian

	Innovation (INIA) include: alfalfa (*Medicago sativa*), red clover (*Trifolium pratense*), Italian rye grass (*Lolium multiflorum*), English rye grass (*Lolium perenne*), orchard grass (*Dactylis glomerata*), oats (*Avena*), and common vetches (*Vicia*) (Mamani, Palomino, & Inca, 2011).[60] White clover (*Trifolium repens*) has been determined to be an invasive species.[61]
Potential indicators	Per hectare: - Grassland area recovered (ha) - Increase in soil-plant system moisture (apparent density gr/cm3soil in dry season) - Increase in the flow of springs as a result of the infiltration produced by the meadows (l/s) - Improvement in water regulation at the source (decrease in base flows l/s - month) - Appearance of new springs (Number and/or volume in l/s). - Reduction of the rate of erosion (tn/ha or savings in the actions of removing sediments)
Key references to research and studies	Mamani, G. M., Palomino, A. V., & Inca, A. P. (2011). *Producción de pasturas en los valles interandinos.* Lima: Ministerio de Desarrollo Agrario y Riego, Instituto Nacional De Innovación Agraria. Rivera, J. B., Sierra, L., & Urviola, V. (2014). *Manejo de pastos naturales altoandinos.* PACC Perú.

9.2.7 Conservation agriculture

EbA 7: Conservation agriculture	
Description and purpose	 Conservation agriculture is a sustainable farming approach that aims to improve crop yields, protect the environment, and enhance the long-term viability of agricultural systems. It is based on three core principles: minimal soil disturbance, permanent soil cover, and diversified crop rotations. Conservation agriculture promotes practices that work together to conserve soil, water, and biodiversity while reducing the use of external inputs like tillage and synthetic fertilizers (Liniger, Studer, Hauert, & Gurtner, 2011).

[60] Note that the project will not promote any use of Invasive Alien Species and the project follows the guidelines established in the National Action Plan for Invasive Alien Species in Peru (2121-2026).

[61] For a datasheet of all species considered by INIA, consult the *Especies forrajeras_vs2* supplementary document.

	Conservation agriculture minimizes soil disturbance through reduced or no-tillage practices. Conventional plowing and tilling can lead to soil erosion, loss of organic matter, and disruption of soil structure. By disturbing the soil as little as possible, the natural structure and organic matter content are preserved, promoting soil health and fertility (SUSTAINET-EA, 2010).  Maintaining continuous soil cover is a critical aspect of conservation agriculture. Crop residues, cover crops, or other organic materials are left on the soil surface after harvest or planting. This practice protects the soil from erosion caused by wind and water, reduces evaporation, and enhances water infiltration into the soil, thus improving water-use efficiency (SUSTAINET-EA, 2010). Conservation agriculture encourages the practice of rotating crops over time, rather than planting the same crop repeatedly. Diversified crop rotations help break pest and disease cycles, improve soil nutrient balance, and support overall ecosystem health. Different crops have varying root structures and nutrient demands, which can help improve soil structure and fertility (SUSTAINET-EA, 2010).
Climate rationale	By emphasizing practices like minimal soil disturbance, permanent soil cover, and diversified crop rotations, conservation agriculture contributes to carbon sequestration by promoting the accumulation of organic matter in the soil, reducing the concentration of carbon dioxide (CO2) in the atmosphere. Moreover, it helps mitigate greenhouse gas emissions commonly associated with traditional agricultural practices like ploughing and synthetic fertilizer use, thus lessening the agricultural sector's impact on global warming (ECAF, 2017). Additionally, conservation agriculture's water conservation features, such as maintaining continuous soil cover, enhance water-use efficiency, helping farmers cope with climate-induced water scarcity and extreme weather events. The focus on soil health and diversified crops fosters resilience to climate variability, enabling farmers to better adapt to changing conditions. By controlling erosion and soil degradation, conservation agriculture preserves soil nutrients and contributes to sustainable and climate-smart farming practices, ultimately supporting the long-term viability of agricultural systems amidst climate challenges (ECAF, 2017).
Benefits	- Conservation agriculture practices promote soil organic matter accumulation, reduce erosion, and enhance soil structure, leading to improved soil health and long-term productivity. - Permanent soil cover and minimal soil disturbance reduce water evaporation and improve water infiltration, making conservation agriculture more resilient in regions facing water scarcity. - Diverse crop rotations and reduced chemical inputs foster biodiversity and support beneficial insects and microorganisms,

	contributing to ecosystem services like pollination and natural pest control. - By increasing soil organic matter content, conservation agriculture contributes to carbon sequestration, helping mitigate climate change. - Over time, conservation agriculture can lead to cost savings through reduced labor, fuel, and machinery expenses. (IRR & ACT, 2005)
Limitations	- Andean smallholders have diversified livelihood strategies. Households engage in many income-generating activities on and off the farm, these strategies are often time intensive and conservation agriculture practices need to fit into existing livelihood systems (Alwang, Norton, Barrera, & Botello, 2013).
Key issues that affect success	- Increased inputs costs in the short run - Competing uses for ground cover crops. Organic cover crops are often used as feed by smallholder farmers. Convincing them that the crop provides more value as a cover can be challenging. - Limited access to necessary inputs. No-till farming implements such as direct seeders suitable for undulating, relatively small fields specific to High Andes may not be available. - Conservation agriculture is knowledge-intensive - Strong cultural ties to traditional farming methods may make it challenging to adopt conservation agriculture. Changing long-standing practices can require considerable effort in terms of education and community engagement. (Alwang, Norton, Barrera, & Botello, 2013)
Complementary practices	- For fields on eroded hillsides, contour ditches can be used to harvest water. - Vegetative strips can slow runoff, and catch sediment that has been eroded uphill. They can also provide fodder for animals. - Stone lines can also be used to slow runoff if there are loose stones available in the field. (IRR & ACT, 2005)
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: “High Andean crops” value chain. The adoption of conservation agriculture principles can improve soil health, reduce erosion, and enhance water-use efficiency. These practices lead to the sustainable production of high-quality crops.
Cost and materials	- Implementing reduced or no-tillage practices requires specialized equipment, such as no-till seed drills or planters - Maintaining permanent soil cover involves managing crop residues or cover crops. The cost of cover crop seeds or the machinery for residue management (mulchers, choppers, etc.) needs to be considered. - Conservation agriculture relies on organic inputs like compost, animal manure, or green manure to improve soil fertility and organic matter content. - For farmers using cover crops to maintain soil cover during fallow periods, the cost of cover crop seeds should be factored in. - Transitioning from conventional farming practices to conservation agriculture may involve costs related to education, capacity building, and adjusting farm management practices.

	(IRR & ACT, 2005) Estimated cost: EUR 1,528.13 per ha[62.]
Methodology/approach	The three defining principles of conservation agriculture (minimum soil disturbance, crop residue retention, and crop diversification), can be broken down as follows: - Reduce or eliminate conventional tillage, as it can lead to soil erosion, compaction, and loss of organic matter. Adopt minimum tillage or no-till practices to disturb the soil as little as possible. - Ensure that the soil remains covered at all times, even after crop harvests, to protect it from erosion, evaporation, and extreme weather conditions. - Leave crop residues on the soil surface or plant cover crops to provide continuous cover. - Implement crop rotations that involve planting different crops in sequence. Diverse crop rotations help break pest and disease cycles, improve soil health, and optimize resource use. - Include nitrogen-fixing crops or cover crops in the rotation to enhance soil fertility. - Apply water-efficient irrigation practices, such as drip irrigation or mulching, to optimize water use and reduce water loss through evaporation. - Enhance water infiltration by maintaining soil structure and cover, preventing runoff and erosion. - Utilize crop rotations, biological control, and other sustainable pest management practices to maintain balanced ecosystems. - Use organic inputs like compost, animal manure, and green manure to improve soil fertility and nutrient cycling. (IRR & ACT, 2005)
Lessons learnt	A study conducted in the highlands of Ecuador from 2008 to 2017, shows that several conservation agriculture practices are profitable compared to conventional methods over the medium term. Although initial gains were limited, improvements in soil health eventually led to higher profitability, making conservation agriculture practices more advantageous over the entire crop rotation. Despite these positive results, adoption of conservation agriculture remained low among producers, partly due to the lack of agricultural extension services and farmers' reluctance to forgo using crop residues for animal feed (Barrera, Delgado, & Alwang, 2021).
Potential indicators	Per hectare: - Increase in soil organic matter - Increased water retention and transport capacity - Increased availability of nutrients - Abundance and diversity of soil fauna (biodiversity) - Erosion reduction rate - Improvement of the soil structure and rooting area - Runoff reduction. Increased infiltration

62 MEBA https://unepmeba.org/wp-content/uploads/2020/01/Microfinance_for-Ecosystem_based_Adaptation_EN.pdf

	- Increase in crop yield
Key references to research and studies	Alwang, J., Norton, G. W., Barrera, V., & Botello, R. (2013). Conservation Agriculture in the Andean Highlands: Promise and Precautions. In S. Mann (Ed.), *The Future of Mountain Agriculture* (pp. 21–38). Springer Berlin Heidelberg. Barrera, V. H., Delgado, J. A., & Alwang, J. R. (2021). Conservation agriculture can help the South American Andean region achieve food security. *Agronomy Journal*, *113*(6), 4494–4509. IRR, & ACT. (2005). *Conservation agriculture: A manual for farmers and extension workers in Africa.* Nairobi: International Institute of Rural Reconstruction; African Conservation Tillage Network.

9.2.8 Agroforestry

EbA 8: Agroforestry	
Description and purpose	Agroforestry is a sustainable land management system that integrates the cultivation of trees, crops, and/or livestock in a mutually beneficial manner. It is a holistic approach that harnesses the ecological interactions between trees and agricultural components to optimize productivity, enhance ecosystem services, and promote environmental conservation. In agroforestry systems, trees are intentionally integrated into the farming landscape, either interspersed within agricultural fields, forming hedgerows, small forests or established as dispersed trees across the landscape (Raskin & Osborn, 2019).  Créditos: Programa Bosques Andinos, Helvetas Perú There are several agroforestry practices, each with its unique features and benefits. One common approach is "alley cropping," where rows of trees or shrubs are planted alongside rows of annual crops. These trees provide shade, windbreak, and act as living fences, while the crops benefit from reduced erosion, improved soil fertility from the tree litter, and better microclimates. In "silvopasture," trees are integrated into grazing lands, providing shelter for livestock and enhancing forage quality through tree leaf and pod fall. "Forest gardening" is another agroforestry practice that mimics natural forest ecosystems by growing a variety of edible crops, herbs, and trees together, creating diverse and self-sustaining food systems (Raskin & Osborn, 2019).
Climate rationale	By integrating trees into agricultural systems, agroforestry acts as a carbon sink, sequestering CO2 from the atmosphere and enhancing soil health and fertility. It fosters biodiversity, regulates water flow, and improves climate resilience, making it an effective strategy for

	combating climate challenges. Additionally, agroforestry reduces deforestation, promotes sustainable land use, and creates more favourable microclimates for crops and livestock, contributing to climate-smart agriculture and overall environmental conservation efforts (Climate-ADAPT, 2023).[63, 64]
Benefits	- The presence of trees in agroforestry systems enhances soil fertility and structure. Tree roots stabilize the soil, reduce erosion, and increase nutrient cycling, leading to healthier and more productive soils. - Agroforestry supports biodiversity by providing diverse habitats for plants, animals, and beneficial insects. These systems help conserve and restore natural ecosystems, promoting ecosystem resilience and supporting wildlife. - Trees in agroforestry systems regulate water flow, reducing runoff and soil erosion. They also help conserve water resources by reducing evaporation and improving water infiltration into the soil. - Agroforestry provides farmers with multiple income streams from tree products (such as fruits, nuts, timber, and medicinal plants) alongside traditional crops and livestock. This diversification reduces economic risks and improves livelihoods. - Trees in agroforestry systems help stabilize slopes and prevent soil erosion, preserving valuable topsoil and preventing sedimentation of water bodies. (Raskin & Osborn, 2019)
Limitations	- The presence of trees in agroforestry systems can create microclimates that may favour certain pests and diseases. Effective pest and disease management strategies need to be in place to minimize potential impacts on both trees and crops. - Tree-based agroforestry systems, often have longer maturation periods before farmers can fully benefit from tree products like fruits or timber. This can pose challenges for farmers seeking more immediate returns on investments.
Key issues that affect success	- Establishing agroforestry systems may require significant initial investments, especially when planting trees and integrating them into existing agricultural landscapes. In some cases, farmers may face competition for land use between crops, livestock, and trees. - Successful agroforestry implementation requires knowledge and technical expertise about suitable tree species, spacing, and management practices. Access to extension services and training is vital for farmers to effectively manage agroforestry systems. - In some agroforestry systems, particularly alley cropping, there may be competition for water, light, and nutrients between trees and crops, which could affect crop yields. (Gold, et al., 2018)

[63] Note that the project will not promote any use of Invasive Alien Species and the project follows the guidelines established in the National Action Plan for Invasive Alien Species in Peru (2121-2026).

[64] A list of suitable agroforestry species for the project can be found in the separate *especies de árboles* spreadsheet

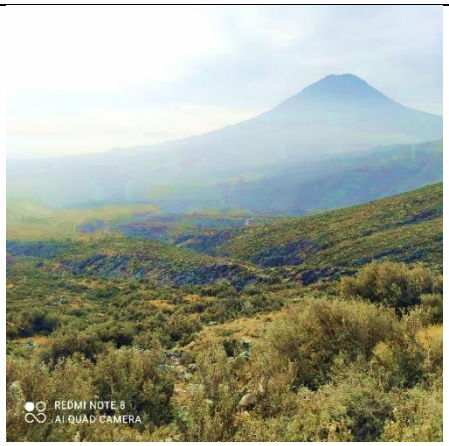
Complementary practices	Both conservation agriculture and agroforestry share common principles and goals, making them highly complementary when integrated together (Wekesa & Jönsson, 2018). - In alley cropping, trees or shrubs are planted in rows alongside rows of crops. This agroforestry practice can be integrated with conservation agriculture principles, such as minimal soil disturbance and permanent soil cover. The tree rows provide valuable organic matter through their leaves and improve soil health while reducing soil erosion and runoff. - Planting trees as windbreaks in conservation agriculture systems helps reduce wind erosion, especially on fields with vulnerable soils. The trees also provide shade, contributing to microclimate regulation and enhancing crop resilience. - Silvopasture integrates trees into grazing lands. Combining silvopasture with conservation agriculture practices like reduced tillage and diversified crop rotations can enhance soil fertility, reduce erosion, and improve forage quality for livestock. - Trees with extensive root systems, such as nitrogen-fixing species, can be strategically planted in conservation agriculture systems to stabilize soils, prevent erosion, and improve nutrient cycling. - In agroforestry systems, diverse plantings can encourage beneficial insects and natural enemies of pests. This can be further enhanced by implementing Integrated Pest Management strategies, aligning with conservation agriculture's focus on minimizing pesticide use.
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: "Vicuñas/Alpacas", and "High Andean crops" value chains. Agroforestry can provide valuable benefits as it offers shade and windbreaks for alpacas and vicuñas, creating more favourable microclimates in the often-harsh high-altitude environments. Trees in agroforestry systems can also supply fodder, medicinal plants, and other resources that enhance the nutrition and well-being of the animals. Moreover, the integration of agroforestry can improve soil fertility and water retention, leading to enhanced crop yields.
Cost and materials	- Tree seedlings - Fencing (if required) - Mulching materials and tree guards - Irrigation infrastructure if needed Estimated cost: EUR 474,50[65]
Methodology/approach	The methodology and approach depend on which agroforestry practice is used (Gold, et al., 2018). Alley cropping:

65 Arrica & Yangenn (2005) Análisis de la viabilidade económica y la adopción de la agroforestería en los Andes del Norte de Perú: Estudio de caso realizado de barreras vivas en la microcuenca La Encañada, Cajamarca, Perú

	Tree rows are planted at wider intervals, creating alleys where annual crops can be cultivated. Trees provide beneficial services, such as improving soil fertility through leaf litter and reducing soil erosion. During planting, proper spacing and site preparation are essential to ensure optimal growth and resource utilization for both trees and crops. As the agroforestry system matures, regular maintenance, including pruning, mulching, and weed control, is carried out to maximize productivity and minimize competition between trees and crops. Silvopasture: Trees are strategically planted in pasturelands, providing shelter and reducing heat stress for grazing animals. Proper spacing and management are crucial to avoid competition between trees and forage. Livestock are rotated within the silvopasture system to prevent overgrazing and allow forage and trees to thrive. Silvopasture enhances soil fertility through tree litter and manure deposition. Regular monitoring and maintenance are conducted to ensure the sustainable coexistence of trees and livestock. Windbreaks Trees are selected based on their ability to withstand wind and provide effective protection. They are planted perpendicular to the prevailing winds to create a shield that reduces wind speed and prevents soil erosion, crop damage, and stress on livestock. Proper spacing and height of the trees are considered to optimize wind reduction without causing shading or competition with crops. Windbreaks not only offer valuable wind protection but also provide additional benefits like improved microclimates, increased biodiversity, and potential sources of income through tree products. Regular maintenance and pruning ensure the continued effectiveness of the windbreaks. Forest farming Suitable tree species that provide a canopy structure for shade-loving crops and support biodiversity are selected. The tree canopy is managed to allow filtered sunlight to reach the lower layers, creating microclimates that favour diverse plant growth. Understory crops are cultivated in harmony with the trees. The practice may also involve incorporating beneficial plants and natural pest control methods to enhance ecosystem health.
Lessons learnt	There are roughly 76 native agroforestry species in use in the Andean region of Peru used for food, medicine, timber, or agroecological services. Species include *aliso* (*Alnus acuminata*), *chachacomo* (*Escallonia myrtilloide*), *chilca* (*Baccharis salicina)*, *queñua* (Polylepis spp), colle (Budleja coriaceae), *quishuar* (*Buddleja incana*), (Cornelius, Cerrón-Macha, del Castillo, & C., 2020).
Potential indicators	Per hectare: - Coverage area with agroforestry crops (ha) - Erosion reduction rate (t/ha). - % of families that implement the measure. - Reduction of the runoff coefficient (Ce = gauged base flow/estimated flow of precipitation). - Suspended material entering sand traps: (weight of filtered solid/lt of water)

	- Reduction of mass movement events.
Key references to research and studies	Cornelius, J. P., Cerrón-Macha, J. M., del Castillo, J. D., & C., V.-Q. J. (2020). *Agroforestry species of Peru: Reference list and contribution to prioritization for the conservation of agroforestry genetic resources. Working Paper number 305.* Lima: World Agroforestry. Gold, M., Mason, A., Cernusca, M., Walter, D., Jose, S., Zamora, D., . . . Godsey, L. (2018). *Training Manual for Applied Agroforestry Practices.* University of Missouri, The Center for Agroforestry. Raskin, B., & Osborn, S. (2019). *The Agroforestry Handbook.* The Soil Association.

9.2.9 Forest restoration with native species

EbA 9: Forest restoration with native species	
Description and purpose	 Forest restoration with native species is a conservation and reforestation approach that focuses on restoring degraded or deforested areas using tree and plant species that are native to the region or ecosystem. The goal of this restoration method is to recreate or approximate the original forest structure and composition that existed before degradation occurred. Forest restoration with native species involves carefully selecting appropriate tree species that are well-adapted to the local climate, soil conditions, and ecological characteristics (Dirección Desconcentrada de Cultura de Cusco, 2019). These native species help to promote ecological balance, support biodiversity, enhance soil health, and contribute to the overall restoration of ecosystem functions and services. By restoring forests with native species, this approach aims to revitalize degraded landscapes, protect habitats for wildlife, mitigate climate change by sequestering carbon, and provide valuable ecosystem benefits to local communities and the environment (HELVETAS Swiss Intercooperation, 2017).
Climate rationale	Forests sequester carbon dioxide and enhance ecosystem resilience. Native forests support biodiversity and provide crucial habitat for various species, contributing to ecological balance and climate resilience. Furthermore, these restored forests regulate water flow, prevent soil erosion, and moderate local microclimates, helping communities cope with extreme weather events. By conserving genetic diversity and promoting ecosystem services, forest restoration with native species offers a climate-smart solution to combat climate change and create sustainable environments (Thomas, et al., 2014).
Benefits	- Protecting the soil from water and wind erosion;

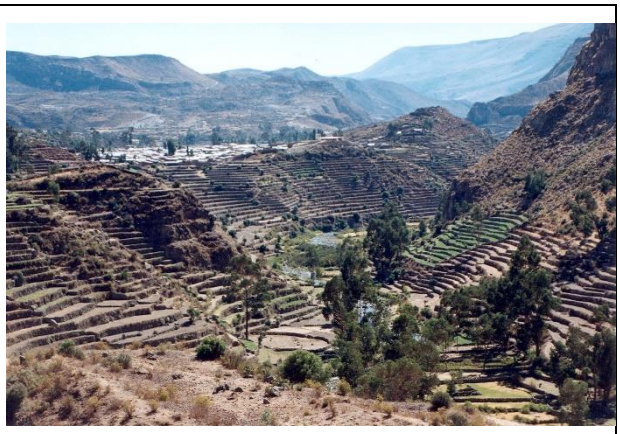
	- Regenerating soil through the recycling and fixation of nutrients and carbon; - Regulating microclimate and stabilizing sudden temperature changes; - Holding soil and environmental moisture; - Intercepting, capturing, infiltrating, and regulating rainwater; - Mitigating effects of heavy rains and prolonged droughts.
Limitations	- Lack of communal agreements - Limiting soil conditions (pH, fertility, compaction, salinity)
Key issues that affect success	- High costs associated with nursery production, plantation establishment, and silvicultural management - Proper environmental conditions for tree propagation (connectivity, slope, moisture, precipitation, temperature, etc.) - Community-led management - Permanent technical assistance - Existing native forest patches or relicts
Complementary practices	- Agroforestry (silvopasture, and forest farming) - Creating and maintaining wildlife corridors
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: “Vicuñas/Alpacas”, and “Community-based tourism” value chains. Restoring native forests in their natural habitats provides essential ecosystem services such as shade and protection from extreme weather, creating more favourable microclimates for camelid species. Additionally, native forests offer abundant forage resources, medicinal plants, and natural shelter, enhancing the well-being and productivity of the animals. Restored native forests contribute to scenic landscapes and biodiversity, attracting ecotourists interested in experiencing the unique Andean ecosystem and observing native wildlife. Moreover, forest restoration fosters cultural and environmental appreciation, adding value to community-based tourism initiatives.
Cost and materials	- Native tree seedlings, nursery materials (e.g., pots, soil, water, and shade structures, etc.) - Planting equipment Estimated cost: EUR 1,125.00 per hectare (MINAM, 2019)
Methodology/approach	- Identify suitable areas for restoration by assessing factors such as ecological conditions, soil type, hydrology, and existing land use. Prioritize degraded or deforested lands where native forest restoration can have the most significant impact. - Collect seeds or vegetative materials from local native species and establish a nursery. Nurture seedlings until they reach an appropriate size for planting. - Clear invasive species, debris, and weeds from the restoration site. Use low-impact techniques to minimize disturbance to the soil and surrounding ecosystem. - Carefully plant native tree seedlings in the restoration area, following appropriate spacing and planting techniques to optimize growth and establishment. - Implement a maintenance plan to ensure the survival and growth of newly planted trees. Monitor and control invasive species,

	provide adequate watering, and protect seedlings from grazing animals and other threats. - Regularly monitor the progress of the restoration project to assess tree growth, survival rates, and ecosystem development. (FAO, 2019)
Lessons learnt	Reforestation should be done with the following native trees, locally referred to as "water callers": *Lloque* (*Kageneckia lanceolata*), *Sauco (Sambucus peruviana HBK) Huaranhuay* (*Tecoma sambucifolia*), *Aliso* (*Alnus acuminata*), *Q'olle* (*Buddleja coriacea*), *Quishuar (Buddleja incana), Chachacomo* (*Escallonia resinosa*), *Queñua (Polylepis incana), Japur (Gynoxys oleifolia Musch* , *Tayanka* (*Baccharis*) and *Qeuña* (*Polylepis racemosa*). By planting native species, reforestation intends to avoid the spreading and dominance of *Eucalyptus globulus* and *Pinus patula*. Likewise, in headwaters and the vicinity of springs, it is intended to replace the presence of *Eucalyptus globulus* with "water callers" native species (Dirección Desconcentrada de Cultura de Cusco, 2019).
Potential indicators	Per hectare: - % annual survival - Growth rate. Increase in height (m) and diameter (cm) - Coverage. Average density. (m2/ha)
Key references to research and studies	HELVETAS Swiss Intercooperation. (2017). *Catálogo ed medidas AbE para recuperar servicios exositstémicos hídricos en un contexto de cambio climático en proyectos de inversión de agua y saneamiento, riego y energía.* Dirección Desconcentrada de Cultura de Cusco (2019). *Sistematización de experiencias que han recuperado e inmplementado conocimientos y saberes ancestrales o tradicionales en las buenas prácticas de adaptación al cambio climático en la región de Cusco*. Ministerio de Cultura. Cusco.

9.2.10 Andenes/terraces restoration

EbA 10: *Andenes*/terraces restoration	
Description and purpose	 *Andenes*, also known as Andean terraces or Andean agriculture terraces, are a traditional farming technique used in the Andean region of South America. These terraces are a form of agricultural adaptation to the steep and mountainous landscapes of the Andes. *Andenes* are man-made, stepped or sloping platforms constructed on the hillsides. They are designed to retain water, prevent soil erosion, and create flat areas for cultivating crops in areas with challenging topography. The terraces are usually built using stone walls or earth

	embankments, forming a series of ascending steps on the mountain slopes. These terraces have been used by indigenous communities for centuries and are primarily used for cultivating traditional crops like potatoes, quinoa, maize, and other native Andean crops. The terraces not only maximize arable land in the mountainous regions but also help capture and utilize water efficiently, contributing to agricultural productivity and supporting livelihoods in these challenging environments. Furthermore, *Andenes* are considered an important cultural heritage, reflecting the ingenuity and sustainable agricultural practices of the Andean people (HELVETAS Swiss Intercooperation, 2017). The primary construction materials used for building these terraces are stones, which are stacked to form retaining walls that create the characteristic  stepped or sloping platforms. The sturdy stone walls provide stability to the terraces, preventing soil erosion on the steep hillsides and maximizing arable land in the challenging mountainous landscapes. In some cases, earth embankments or wooden elements are utilized for construction, and live plants or vegetation may be incorporated to reinforce the structure further. These terraces are designed to create flat areas for cultivating traditional crops like potatoes, quinoa, and maize, contributing to agricultural productivity and supporting the livelihoods of the Andean communities (HELVETAS Swiss Intercooperation, 2017).
Climate rationale	The Andean highlands experience a wide range of climatic conditions, including variable precipitation, temperature fluctuations, and the potential for soil erosion due to steep slopes. The construction of *Andenes* allows for water capture and retention, addressing water scarcity and variability in the region. The terraces slow down the flow of rainwater, allowing it to seep into the soil and recharge groundwater, thus supporting crop cultivation during dry periods. Additionally, they prevent soil erosion by reducing surface runoff and controlling sediment movement downslope (Willems, et al., 2021).

Benefits	 By creating stepped or sloping platforms, *Andenes* prevent soil erosion on steep slopes, conserving valuable topsoil and protecting against environmental degradation. Secondly, they serve as an ingenious water management system, capturing and retaining rainwater. This helps to alleviate water scarcity and provides a reliable water supply for crops during dry periods. The terraces also contribute to microclimate regulation, offering varying temperature and moisture conditions on different levels, which safeguards crops from extreme weather events and enhances agricultural productivity. Additionally, *Andenes* preserve native Andean crops, like potatoes and quinoa, which are well-adapted to high-altitude conditions and support local food security and traditional livelihoods. As a cultural heritage, *Andenes* reflect the resourcefulness and sustainable agricultural practices of the Andean communities, showcasing their ability to adapt to and thrive in challenging climates (Llerena, Inbar, & Benavides, 2004). The stepped or sloping design of the terraces also creates microclimates, providing different temperature and moisture conditions on each level. This microclimate regulation helps protect crops from extreme weather events, such as frosts or heavy rains, and contributes to enhanced agricultural productivity (Llerena, Inbar, & Benavides, 2004).
Limitations	- Lack of communal agreements - The local availability of construction materials, such as stones, sand, grave, clay, etc. for restoration.
Key issues that affect success	- Building and maintaining *Andenes* require significant labour and effort, as the terraces need regular upkeep, such as repairing stone walls, clearing debris, and controlling weeds. This can be demanding, especially in remote and rugged mountainous areas with limited access to modern tools and machinery.
Complementary practices	- Conservation agriculture
Complementary climate-resilient value chains	This EbA measure was determined to be complementary to: “High Andean crops” and “Community-based tourism” value chains. The terraces’ water management capabilities ensure a reliable water supply during dry periods, mitigating water scarcity risks and supporting agricultural productivity. Additionally, the preservation of traditional crops on *Andenes* enhances the authenticity and cultural significance of the High Andean crops, attracting consumers seeking unique and sustainable products. The historic and aesthetic appeal of *Andenes* provides a distinctive experience for ecotourists interested in witnessing traditional agricultural practices in the

	Andean region. The terraces' contribution to biodiversity conservation and scenic landscapes aligns with community-based tourism principles, while engagement with local communities and learning about the rich cultural heritage of *Andenes* enhances the overall community-based tourism experience. Moreover, income diversification opportunities arise from visitors exploring *Andenes*, bolstering local economies and promoting sustainable tourism practices.
Cost and materials	- Stone and construction materials for the terraces, as well as any channels, or irrigation systems - Soil improvement matter (if applicable) - Seeds or seedlings for crops (Kendall & Rodríguez, 2009) Estimated cost: EUR 610.2166
Methodology/approach	- Evaluate the condition of the existing *Andenes* and the surrounding environment. Identify areas of erosion, structural damage, and other issues that need attention. - Repair and reconstruct damaged retaining walls and terraces to ensure stability and prevent further erosion. - Restore and improve water management features, such as channels, check dams, and irrigation systems, to capture and distribute water effectively across the terraces. - Reintroduce native Andean crops on the restored terraces (Kendall & Rodríguez, 2009)
Lessons learnt	Some lessons learned from a 2021 mapping study conducted by MIDAGRI on Peru's *Andenes*: - Social and work organization have historically played a central role in the development of the Andean region. Although the organization of peasant communities may have weakened in recent times, their invaluable experience in managing climate diversity remains a crucial strategy against the ever-present climate risks. Recognizing and promoting this indigenous knowledge is of utmost importance. - An essential element in this context is the peasant community. The majority of terraced platforms are situated on communal land, subject to communal or private exploitation. While individual land tenure predominates, a significant portion of areas are cultivated collectively. Reviving terraced platforms individually requires substantial labor, making collective efforts such as *minga*, *ayni*, *minkas*, and other communal practices the preferred approach for restoration and cultivation. Through these joint endeavours, communities unite their efforts to work on the terraced platforms, reinforcing their cooperative spirit. (MIDAGRI, 2021)
Potential indicators	Per hectare: - Erosion reduction rate (t/ha).

66 Posthumus, Helena & Graaff, Jan (2005). Cost-Benefit Analysis of bench terraces, a case study in Peru. Land Degradation & Development – LAND DEGRAD DEV. 16. 1-11. 10.1002/ldr.637.

	- Suspended material entering sand traps: (weight of filtered solid/lt of water) - Reduction of the runoff coefficient at the micro-watershed level (Ce = gauged base flow/estimated precipitation flow). - Reduction of mass movement events.
Key references to research and studies	Kendall, A., & Rodríguez, A. (2009). *Desarrollo y perspectivas de los sistemas de andenería de los Andes centrales del Perú.* Institut français d'études andines. Llerena, C. A., Inbar, M., & Benavides, M. A. (2004). *Conservación y abandono de andenes.* Lima: Universidad Nacional Agraria La Molina ; Universidad de Haifa. MIDAGRI. (2021). *Andenes para la vida: inventario y caracterización de andenes en los Andes tropicales del Perú.* Lima: Ministerio de Desarrollo Agrario y Riego, Centro de Estudios Regionales Andinos "Bartolomé de Las Casas.". Willems, B., Levya-Molina, W.-M., Taboada-Hermoza, R., Bonnesoeur, V., Román, F., Ochoa-Tocachi, B. F., . . . Walsh, D. (2021). *Impactos de andenes y terrazas en el agua y los suelos: ¿Qué sabemos? Resumen de políticas, Proyecto "Infraestructura Natural para la Seguridad Hídrica".* Lima: Forest Trends.

Potential environmental and social risks of selected EbA measures

Table 43: Potential environmental risks of EbA measures

Proposed EbA measure	Potential environmental risk	Mitigation measure	Activities/Subactivities
EbA 1. Conservation and Restoration of bofedales	Bofedales enclosure to prevent livestock entry can inhibit in/out migration of wildlife.	1. Diagnostics will evaluate if there are wildlife uses. If there are necessity of barrier implementation. 2. Bofedales restoration plans must identify and attempt to correct the watershed level root causes of the degradation. and to restore original hydrological flows and conditions. 3. Ensure perimeter barriers prevent livestock entry but facilitate other wildlife species emigrations between bofedales. 4. Maintenance requirements must be planned and implemented. 5. Future biological monitoring will be implemented	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2 The measure 3, 4 and 6 will be addressed in sub-activity 1.1.2.1 (The Local initiatives will include budget to implement necessary mitigation measures planned). 1. In sub-activity 1.1.3.1Technical assistance will be done to review the risk of the local initiatives and to design mitigation actions. The measure 5 will be addressed in Activity 1.2.2,
	Damage to bofedales from increased sediment loading due to upstream or in bofedal drainage modifications	6. Implement in-stream sediment barriers or curtains to minimize sediment dispersal.	
EbA 2. Family qochas	Deviation of watercourses and affect the availability of water for other water users in the upper and middle reaches	1. Interventions should also be evaluated and designed with a water basin approach to avoid qochas can affect water availability in the surrounding area and/or downstream. 2. Close coordination with the National Water Authority (ANA) and accompaniment to approval of water use process if needed. 3. Additional studies will be done, if it would be required by ANA. 4. Facilitation of agreements between water users.	The measures 1, 8, 9 and 10 will be addressed in sub-activity 1.1.1.2. The measures 2, 3, 4 and 7 will be addressed in sub-activity 1.1.3.1. The measure 5 and 11 will be addressed in sub-activity 1.1.2.1 (The Local initiatives will include budget to implement necessary mitigation measures planned). The measure 6 will be addressed in Activity

Proposed EbA measure	Potential environmental risk	Mitigation measure	Activities/Subactivities
		5. Tools to manage water passages will be included in the design and implementation. 6. Monitoring water availability and agreements will be done.	1.2.2[67].
	Poorly made qochas can lead to erosion, landslides, and failure to reserve water after a period.	7. Soil and water studies should be a requirement during the planification phase of the measures. 8. Ensure that qochas are not build in sloping areas.	
	Access to transport equipment and materials could facilitate greater public access but could affect or degrade sensitive areas.	9. Family qochas are small and don't require big equipment. In any case, at the planning phase, confirm access requirements during application screening. 10. Identification if there are sensitive areas that need to be protected. 11. Ensure access removal or controls if nearby sensitive areas are at risk.	
EbA 3. Integrated Soil Fertility Management	Animal manure composting and leachate can affect nearby drainage and water quality.	1. Diagnostics will evaluate the possible areas to implement the measure. 2. Planning and prioritization will ensure all composting and storage areas are located away from drainages. 3. Lachate collection systems are implemented and employed.	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2. The measure 3 will be addressed in sub-activity 1.1.2.1
EbA 4. Contour Farming	Altered drainage patterns can affect adjacent lands.	1. Careful planning will be done. 2. Installation of drainage systems and controls will be implemented.	The measures 1 will be addressed in sub-activity 1.1.1.2. The measure 2 will be addressed in sub-

[67] Activity 1.2.2: Implement community monitoring and observation systems to measure the impact of EbA measures and provide feedback on regional and national policies.

Proposed EbA measure	Potential environmental risk	Mitigation measure	Activities/Subactivities
			activity 1.1.2.1
EbA 5. Infiltration ditches	The establishment of infiltration ditches causes initial soil disturbance which in some cases may increase erosion. Esta medida requiere de mantenimiento para evitar riesgos.	1. Ensure local context analysis prior to trench construction. 2. Soil and geological surveys would be done 3. Ditches work best when vegetation cover is also managed. Planning will seek to associate this measure with EbA 6, EbA 7, EbA 8 or EbA 9, to ensure adequate vegetative cover	The measures 1 and 3 will be addressed in sub-activity 1.1.1.2. The measures 2 will be addressed in sub-activity 1.1.3.1.
EbA 6. Sustainable grassland management	Pasture rotation and fencing to restore pastures can close off other wildlife such as vicuñas or put pressure on overgrazing and increase carrying capacity in other areas.	1. The carrying capacity of the natural pastures will be evaluated and taken into account in pasture management planning, as well as the use of the pasture by other wild species such as vicuñas. 2. Complementary adaptation measures will be taken into account to avoid food shortages. 3. Ensure perimeter barriers prevent livestock entry but facilitate other wildlife species emigrations between fencing. 4. Pastures will be evaluated periodically to ensure that their productivity is not affected.	The measures 1, 2 and 3 will be addressed in sub-activity 1.1.2.1 (The Local initiatives will include budget to implement necessary mitigation measures planned). The measure 4 will be addressed in Activity 1.2.2.
EbA 7. Conservation Agriculture	None, this type of action will respect environment and the social contribution of farmers, it is an objective of the activity.		
EbA 8. Agroforestry	Planting of non-native tree species (that may be preferred by landowner/users) can lead to introduction of pests and diseases.	1. Ensure the use of native tree species only. For this purpose, information will be provided on the properties and characteristics of native species suitable for agroforestry in the identified sites.	The measures 1, 2, 3 and 5 will be addressed in sub-activity 1.1.2.1 (The Local initiatives will include budget to implement necessary mitigation measures planned). The measure 4 will be addressed in Activity 1.2.2.
	Crops may be affected by shade reducing production volumes. Trees may compete with crops for water and soil nutrients.	2. Identify and prioritize appropriate (shade tolerant) food crops. 3. Identify the specific objectives (e.g. obtain tree products, fruit, erosion control etc) in order to	

Proposed EbA measure	Potential environmental risk	Mitigation measure	Activities/Subactivities
		evaluate the benefits in contrast to decrease production. 4. Identify and measure impacts of this measure.	
	Trees can attract larger predators (cats, owls) that prey on small animals and livestock.	5. Identify risks and potential animals, communicate with stakeholders, identify mitigation.	
EbA 9. Forest restoration with native species	Increased risk of wildfires.	1. Site selection to consider risk to surrounding infrastructure and properties.	The measures 1 will be addressed in sub-activity 1.1.1.2. The measure 2 will be addressed in Activity 1.1.2.1. The measures 3 will be addressed in sub-activity 1.1.3.1. The measures 4 will be addressed in sub-activity 1.1.3.1.
	Reforestation of non-native tree species (that may be preferred by landowner/users) can lead to introduction of pests and diseases or negative impacts of soil and water.	2. Reforested activities only include planting native species.	
	Increased risk of harbouring pests and predators	3. Evaluate risks and designed mitigation measures with landowners and users. 4. The presence of pests and diseases will be monitored to take immediate action when necessary.	
EbA 10. Restoration of Andenes/Terraces	Abandoned terraces promote erosion processes, including extreme cases of landslides.	1. New terraces will not be promoted. 2. The EbA 10, will be implemented in areas not located in risk zones. To do that specifical geological and soil studies will be done. 3. Ensure terraces have the potential to articulate with existing agricultural or tourists' activities so people will not abandon them.	The measures 1 and 3 will be addressed in sub-activity 1.1.1.2. The measure 2, will be addressed in sub-activity 1.1.3.1.

Table 44: Potential social risks of selected EbA measures

Proposed EbA measure	Potential social risk	Mitigation measure	Activities/Subactivities
Eba 1. Conservation and Restoration of bofedales	Conflicts over use among community members of the area for restoration works, related employment opportunities and benefits in conducting the work.	1. Diagnostics will identify actual users of the land. 2. Confirm landowners and users and obtain documented approval of works from all parties prior to start. 3. People who will be in charge of the work to be carried out, will be designated. 4. Community monitoring will monitor compliance with agreements	The measures 1 will be addressed in sub-activity 1.1.1.2 . The measures 2 and 3 will be addressed in activity 1.1.2.1 during the development of proposals. The measure 4 will be addressed in Activity 1.2.2 ,
	Conflicts between upstream and downstream water users over interruption or alteration of water flows and water quality during and after the restoration works.	1. In the diagnostics identification of all the local water uses and users will be done. 2. Facilitation of water sharing agreements 3. Obtain approval of local community water board (not ALAs) if needed. Identify downstream water users within 2 kms and communicate work plans, schedules and potential impacts prior to start.	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2 . The measure 3 will be addressed in activity 1.1.2.1 during the development of proposals.
EbA 2. Family qochas	Conflicts over water use, for fear that availability among members of one location or availability of water in the lowlands may decrease.	1. In the diagnostics, possible areas for the implementation of the qochas will be identified, as well as their potential beneficiaries. 2. The prioritization of the qochas to be included in the local initiatives will be done in a participatory manner. 3. The construction of qochas should be reported to and agreed with all parties involved. 4. Communitiy monitoring of water availability and distribution will be implemented.	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2 . The measure 3 will be addressed in activity 1.1.2.1 during the development of proposals. The measures 4 will be addressed in activity 1.2.2 .
EbA 3. Integrated Soil Fertility Management	Conflicts over ownership and use of the project site among community members, the resulting benefits and related employment	1. In the diagnostics, possible areas for the implementation of EbA 3 will be identified, as well as their potential beneficiaries and if the necessary manpower is available for implementation. 2. The prioritization of the sites to be included in the local initiatives will be done in a participatory manner. 3. People who will be in charge of the work to be carried out, will be	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2 . The measures 3 and 4 will be addressed in activity 1.1.2.1 during the development of proposals.

Proposed EbA measure	Potential social risk	Mitigation measure	Activities/Subactivities
	opportunities. Very labour-intensive measure required to create for example organic fertilizer. Sufficient manpower may not be available for implementation.	designated. 4. Confirm landowners and users of the site. Obtain documented approvals from all parties over all aspects of the work and benefits prior to start. 5. Soil studies will be conducted. 6. Community monitoring will monitor impacts and compliance with agreements	The measures 5 will be addressed in activity 1.1.3.1 during the refinement of proposals. The measure 6 will be addressed in Activity 1.2.2,
EbA 4. Infiltration Ditches	Conflicts over ownership and use of the project site among community members, the resulting benefits and related employment opportunities.	1. In the diagnostics, possible areas for the implementation of EbA 4 will be identified, as well as their potential actual users and beneficiaries and if the necessary manpower is available for implementation. 2. The prioritization of the sites to be included in the local initiatives will be done in a participatory manner. 3. People who will be in charge of the work to be carried out, will be designated. 4. Confirm landowners and users of the site. Obtain documented approvals from all parties over all aspects of the work and benefits prior to start. 5. Community monitoring will monitor compliance with agreements	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2 . The measures 3 and 4 will be addressed in activity 1.1.2.1 during the development of proposals. The measure 5 will be addressed in Activity 1.2.2 ,
EbA 5. Contour Farming	Conflicts over ownership and use of the project site among community members, the resulting benefits and related employment opportunities. If the contour farming can be implemented depends on the type of soil.	1. In the diagnostics, possible areas for the implementation of EbA 5 will be identified, as well as their potential actual users and beneficiaries. 2. Soil studies to confirm suitability for Eba implementation will be conducted. 3. The prioritization of the sites to be included in the local initiatives will be done in a participatory manner. 4. Confirm landowners and users of the site. Obtain documented approvals from all parties over all aspects of the work and benefits prior to start.	The measures 1, 3 and 5 will be addressed in sub-activity 1.1.1.2 . The measures 4 and 6 will be addressed in activity 1.1.2.1 during the development of proposals. The measures 2, 5 and 7 will be addressed in activity 1.1.3.1 during the refinement of proposals.
	Very labour intensive as	5. The necessary manpower is available for implementation will be	The measure 8 will be addressed in

Proposed EbA measure	Potential social risk	Mitigation measure	Activities/Subactivities
	a proper design of the measure is needed, sufficient manpower may not be available for implementation. Potential conflicts among community members over-compensation and benefits. No gender consideration and no opportunities proposed to women	evaluated. 6. People who will be in charge of the work to be carried out, will be designated in a participatory way. 7. Define clear labour requirements, gender repartition and compensation policies. 8. Community monitoring will monitor compliance with planning and agreements	Activity 1.2.2 ,
EbA 6. Sustainable grassland management	Conflicts over use ownership and use of the project site among community members, the resulting benefits and related employment opportunities.	1. In the diagnostics, possible areas for the implementation of EbA 6 will be identified, as well as their potential actual users and beneficiaries and if the necessary manpower is available for implementation. 2. The prioritization of the sites to be included in the local initiatives will be done in a participatory manner. 3. People who will be in charge of the work to be carried out, will be designated. 4. Confirm landowners and users of the site and obtain documented approvals from all parties over all aspects of the work prior to start. 5. Community monitoring will monitor compliance with planning and agreements	The measures 1, and 2 will be addressed in sub-activity 1.1.1.2 . The measures 3 and 4 will be addressed in activity 1.1.2.1 during the development of proposals. The measure 5 will be addressed in Activity 1.2.2 ,
EbA 7. Conservation Agriculture	Conflicts over ownership and use of the project site among community members, the resulting benefits and related employment opportunities.	1. In the diagnostics, possible areas for the implementation of EbA 7 will be identified, as well as their potential actual users and beneficiaries and if the necessary manpower is available for implementation. 2. The prioritization of the sites to be included in the local initiatives will be done in a participatory manner. 3. People who will be in charge of the work to be carried out, will be designated.	The measures 1, and 2 will be addressed in sub-activity 1.1.1.2. The measures 3 and 4 will be addressed in activity 1.1.2.1 during the development of proposals. The measure 5 will be addressed in

Proposed EbA measure	Potential social risk	Mitigation measure	Activities/Subactivities
		4. Confirm landowners and users of the site. Obtain documented approvals from all parties over all aspects of the work and benefits prior to start. 5. Community monitoring will monitor compliance with planning and agreements	Activity 1.2.2.
EbA 8. Agroforestry	Conflicts over ownership and/or use of the project site among community members, the resulting benefits and related employment opportunities.	1. In the diagnostics, possible areas for the implementation of EbA 8 will be identified, as well as their potential actual users and beneficiaries and if the necessary manpower is available for implementation. 2. The prioritization of the sites to be included in the local initiatives will be done in a participatory manner. 3. People who will be in charge of the work to be carried out, will be designated. 4. Confirm landowners and users and obtain documented approval of works and benefits by all parties prior to start. 5. Need to be clear on what the specific objectives are (e.g. obtain tree products, fruit, erosion control etc) in order to evaluate who will be the beneficiaries. 6. Community monitoring will monitor compliance with planning and agreements	The measures 1, 2 and 5 will be addressed in sub-activity 1.1.1.2. The measures 3 and 4 will be addressed in activity 1.1.2.1 during the development of proposals. The measure 6 will be addressed in Activity 1.2.2.
EbA 9. Forest restoration with native species	Conflicts over ownership and use of the project site among community members, the resulting benefits and related employment opportunities.	1. In the diagnostics, possible areas for the implementation of EbA 9 will be identified, as well as their potential actual users and beneficiaries and if the necessary manpower is available for implementation. 2. The prioritization of the sites and natives species to be included in the local initiatives will be done in a participatory manner. 3. Process people who will be in charge of the work to be carried out, will be designated. 4. Requires prior landowner and land user approval of area to be restored, community compensation for loss of existing land use will be agree if it would be necessary.,	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2. The measures 3 and 4 will be addressed in activity 1.1.2.1 during the development of proposals.
	May reduce economic value of land lost from agro production or timber forest products.		

Proposed EbA measure	Potential social risk	Mitigation measure	Activities/Subactivities
EbA 10. Restoration of Andenes/ Terraces	Conflicts over ownership and/or use of the project site among community members, the resulting benefits and related employment opportunities	1. In the diagnostics, possible areas for the implementation of EbA 10 will be identified, as well as their potential actual users and beneficiaries and if the necessary manpower is available for implementation. 2. The prioritization of the sites to be included in the local initiatives will be done in a participatory manner. 3. People who will be in charge of the work to be carried out, will be designated. 4. Requires prior landowner and land user approval of restored.	The measures 1 and 2 will be addressed in sub-activity 1.1.1.2. The measures 3 and 4 will be addressed in activity 1.1.2.1 during the development of proposals.

10 Summary – Key Climate Resilient Value Chains Analysis

10.1 Selection of Value Chains

10.1.1 Product overview

Agricultural activity is defined as the production, breeding or cultivation of plants or animals, or the maintenance of agricultural land in a suitable condition for pasture or crops. According to the last National Agricultural Census of 2012, 2,213,506 agricultural units were registered in Peru. In terms of agricultural area, this involved 38,742,465 ha, which represents an average of 17.5 ha of land per AU.

According to the 2012 Agricultural Census, in the provinces prioritized by the Resilient Puna project in Arequipa, Apurímac, Cusco, Lima and Puno, there is an agricultural area of 145,728 ha, of which 79% is located in the Suni region and only 21% in the Puna region. The crops with the largest area in the Suni region are alfalfa, starchy maize and native potato (13% of the crop area in the Suni region each) followed by fodder oats with 11% and white potatoes with 9%, beans occupy an area of 6%, other important crops are hard yellow maize, grain barley and quinoa with 4%, 4% and 3% of the crop area in the Suni region, respectively.

In the Puna region, there are fewer cultivated areas, however, native potato crops stand out with 22%, followed by fodder crops such as fodder oats with 17% and alfalfa with 10%. Bitter potato and white potato varieties occupy 7% and 6% respectively. Other important crops in the Puna region include rye grass (6%), quinoa (4%) and grain barley (4%).

10.1.2 Territorial overview

The Andes are very valuable spaces in terms of genetic, biological, and cultural diversity in relation to their altitude. Excluding the coastal and jungle regions, there are eight natural regions in the Andes:

1. **Maritime Yunga**: From 500 to 2300 masl on the western flank of the Peruvian Andes, equivalent to a pre-montane to low montane altitudinal level.
2. **Fluvial Yunga**: From 1000 to 2300 masl on the eastern flank, equivalent to a low montane floor.
3. **Quechua**: From 2300 to 3500 masl, equivalent to a high mountain floor.
4. **Suni**: 3500 to 4000 masl, equivalent to a subalpine floor.
5. **Puna**: From 4000 to 4800 masl, equivalent to an alpine floor.
6. **Janca**: From 4800 to 6768 masl, equivalent to a snow floor.
7. **High Jungle Region**: From 400 to 1000 masl
8. **Selva Baja Region**: From 83 to 400 masl

It should be noted that in the Puna region there are only 239,948 ha of agricultural land at the national level, compared to the Suni region, which has around 1,273,852 ha.

Table 45 Hectares of agricultural land per Andean natural region. Source: INEI (2012).

Altitudinal Floor	Hectares of agricultural land at national level
Costa	**1,406,441**
River Yunga	**820,740**
Quechua	**1,572,767**

Altitudinal Floor	Hectares of agricultural land at national level
Suni	**1,273,852**
Puna	**239,948**
Janca	**1,948**
Rupa Rupa (high forest)	**626,613**
Omagua (lowland rainforest)	**832,215**
Maritime Yunga	**350,484**
Total	**7,125,008**

The project has prioritised 58 districts for intervention, based on 91 districts initially identified as high priority in the in the regions of Apurimac, Arequipa, Cusco, Puno, and the Nor Yauyos Cochas Landscape Reserve (NYC) due to climate risk to drought in agricultural and livestock lands (GRACC-MIDAGRI Plan data); key ecosystems (ha of bofedals, glaciers, humid puna, dry puna); area of influence to areas with deglaciation; land degradation and elevation (3,500 masl).

The 58 districts prioritized by the project respond to social criteria (# of organizations, presence of the state, conflict); economic criteria (MERESEs potential and presence of camelids) and ecological criteria (greater number of hectares of degraded wetlands and grasslands).

The Resilient Puna project prioritizes the territories of Lima, Apurímac, Cusco, Puno, and Arequipa, which fall within the natural regions of Suni and Puna, situated between 3,500 masl and 4,000 masl. In these areas, there is currently a total agricultural area of 145,728 ha.

Table 46 Hectares of agricultural land in the districts prioritised by the Resilient Puna proposal in Peru. Source: INEI (2012).

	Apurímac	Arequipa	Cusco	Lima	Puno	Total
Sunni	12,348	5,745	54,784	3,184	38,454	**114,514**
Puna	1,048	2,483	12,020	22	15,641	**31,214**
Total	**13,396**	**8,227**	**66,804**	**3,206**	**54,095**	

10.1.3 Identifying project-relevant value chains

At the regional level, in the districts prioritized by the Resilient Puna project, Apurímac has a higher proportion of cultivated area of potato, starchy maize and beans. In the case of Arequipa, crops such as alfalfa are more important than other crops. It is followed by starchy maize, fodder oats, potatoes and green beans. In the case of Cusco, there is a greater diversification of crops such as different varieties distributed equally between potatoes, starchy maize, cocoa, coffee and in Puno, the cultivation of native potatoes, fodder oats and alfalfa stand out.

Livestock production in the SHAP is characterized by the presence of both native and introduced animals. Among the former, there are South American camelids (alpaca, vicuña, llama and guanaco) and guinea pigs (*Cavia porcellus*); both have been domesticated throughout the Andean territory and now there are improved breeds as a result of the implementation of technologies. The latter include animals such as sheep, which have been widely distributed in the Andes for both wool and meat. There are also cattle, goats and pigs in the lower areas, as well as poultry.

High Andean production of South American camelids is mainly based on extensive grazing of natural grasslands, mainly *bofedales*, humid puna grasslands and dry puna grasslands. According to MIDAGRI's Annual Livestock and Poultry Statistics Review 2021, the camelid population (units) in the departments of Resilient Puna is as follows:

Table 47 Camelid population (units) in the Resilient Puna departments. Source: MIDAGRI (2021).

DEPARTMENT	ALPACA	LLAMA	VICUÑA
APURÍMAC	212,220	72,280	12, 849
AREQUIPA	471,546	94,372	45,243
CUSCO	673,731	144,965	7,966
PUNO	2,030,525	359, 415	25,475
LIMA	46,625	18,780	1,365
NATIONAL TOTAL	4,484,888	1,075,425	166,428

According to CENAGRO (2012), the alpaca population in the Suni region was 25,593 heads; in the Puna region the total was 50,068 heads. Puno is the department with the highest percentage of representation in both regions; 50.4% in the Suni region and 45.8% in the Puna region. Likewise, the departments selected by the project represent 76% and 77.5% respectively of the average number of alpaca heads.

10.1.4 Multiple-criteria decision analysis on value chain selection

The project focuses on vulnerable communities - mainly small farmers and *alpaqueros* - dependent on High Andean ecosystems, located above 3500 masl. Priority is given to the higher elevations.

To identify intervention districts, a set of priority districts was identified using a multi-criteria spatial analysis method that integrated climatic and ecosystem criteria. The first stage considered the following criteria: a) vulnerable communities: i) altitude above 3500 masl, including a buffer zone up to 2800 masl); b) ecosystems: i) presence of Puna ecosystems and ii) areas with the largest area of degraded land; c) climate: i) presence of glaciers with high or very high risk of glaciation and ii) presence of agricultural and livestock lands with high or very high risk of drought and high climate vulnerability.

For the selection of value chains in the selected territories, economic criteria were defined (demand prospects of national and international markets, comparative advantages of production, opportunities for job creation); social criteria were considered (inclusion of disadvantaged groups, food security, the need to improve working conditions, impact of the value chains on local institutions, impact of the value chains on surrounding communities); Environmental criteria were assessed (Impact of the value chains on the environment and of the environment on the chains, compensation for eco-systemic services, "green" opportunities) and Institutional/pragmatic criteria were taken into account (National policy priorities, opportunity for public investment funds, evidence of own initiatives of value chain actors, synergies with other programs).

Complementarity with EbA measures:

- Are the value chains complementary with potential EbA measures selected for the project?

Innovation:

- Is there a potential for innovation?

- What type of innovation is promoted: commercial, technological, institutional?

Market:

- Is there sustained and promising demand?
- In what type(s) of market: local, national or international?
- Is it an emerging, established or declining market?
- Is it a mass or a niche product?
- Do they demand fresh or value-added product?
- Are the actors articulated and do they conduct formal or informal business?

Profitability:

- How profitable is the product? What is the level of profitability?
- How expensive is the technology to add value?
- What is the price behaviour?
- Is there a high or low investment required to go into business?

Production:

- Is there sufficient volume and is it in the required quality?
- What are the problems with higher volume or better-quality product?
- Does it occur all year round or at a specific time? In which months of the year?
- Are there many, few or no production risks?

Technology:

- Is it possible to add value, what kind and in which link of the chain?
- Does the required technology exist?
- Is the necessary infrastructure in place?
- Are there technical quality standards or protocols?
- Are the technologies environmentally friendly and do they prevent deforestation?

Institutionality:

- Are there public or private organizations working in the value or product chain?
- Are they part of prioritized value chains in regional or local government?

Partnership:

- Are producers organized in associations, cooperatives or committees?
- Are they new or established organizations?

Coverage

- It includes a significant number of male and female producers
- It includes a significant number of geographical area or scope.

Table 48 MCDA matrix for value chain selection

Crops	Production Suni	Production Puna	EbA	Innovation	Market	Profitability	Technology	Institutional	Partnership	Coverage
Alfalfa	13%	10%	+	+	+	+	+	+	+	++
Maize	13%	17%	+	+	+	+	+	+	+	++
Native Potato	**13%**	**22%**	**++**	**++**	**++**	**+**	**++**	**++**	**++**	**++**
Fodder Oats	11%	17%	+	+	+	+	+	+	+	++
White potato	9%	6%	+	+	+	+	+	+	+	+
Broad beans	6%	6%	+	+	+	+	+	+	+	+
Barley	4%	4%	+	+	+	+	+	+	+	+
Quinoa	**3%**	**4%**	**++**	**++**	**++**	**+**	**++**	**++**	**++**	**+**
Yellow potato		7%	++	++	+	+	+	+	+	+
Rye Grass		6%	+	+	+	+	+	+	+	+
Camelids	**50,4%**	**45,8%**	**++**	**++**	**+**	**+**	**+**	**++**	**++**	**++**

The project stakeholder validation workshop identified the need to incorporate a subset of additional emerging value chains ground-truthed as supplementary for smallholder family farmers in the High Andes (particularly women), who practice subsistence agriculture but also engage in a variety of other activities to supplement their income and ensure food security. These have been grouped as Andean grains and tubers (kiwicha, cañihua, tarwi, oca, and mashua), guinea pig rearing, textile handicrafts, and community-based tourism.

These nutritious and resilient crops serve as food sources and hold commercial value in various markets. Guinea pig rearing provides an alternative income stream due to the high demand for this traditional protein source. Textile handicrafts capitalize on the artisanal skills and cultural heritage of the farmers, opening doors to local and international markets. Lastly, community-based tourism harnesses the natural beauty and cultural richness of the region, generating income from sustainable tourism practices. The strategic selection of these complementary value chains is intended to uplift the livelihoods of smallholder farmers, enhance their economic resilience, and foster sustainable development within their communities.

10.1.5 Multiple-criteria decision analysis on EbA measure selection per value chain and surface area suitability

The multicriteria analysis for value chains used inputs from stakeholder consultations including local/regional community consultations (described in Annex 7: SEP) as well as a technical workshop that took place in June 27th and included 42 experts from various organisations, as well as an extensive literature review on agricultural resilience in the SHAP region. The EbAs that were mentioned from the stakeholder consultations that would increase resilience of value chains were given a higher weighting (2) than those purely identified in literature (1). The table below details the EbA measures considered for the three value chains and their weighting.

Table 49 MCDA matrix for EbA measure selection for each value chain

#	EbA measure	Abbreviation	Value Chain 1 Vicuñas/Alpacas	Value Chain 2 High Andean Crops	Value Chain 3 Community-based tourism
1	Restoration and conservation of *bofedales*	Rbf	2	2	2
2	Family *Qochas*	Qo	2	2	2
3	Infiltration trenches	Zin	2	1	0
	Integrated soil fertility management	Mfs	0	2	0
	Contour farming	Agc	0	1	0
6	Sustainable pasture management	Mp	2	0	0
7	Conservation agriculture	Acs	0	1	0
8	Agroforestry	Agf	1	1	0
9	Restoration of forests with native species	Rbq	1	0	1
10	*Andenes* and terrace restorations	Rat	0	2	2

The result of this analysis shows the level of suitability of hectares per district, per EbAs and value chain. For example, conservation and restoration of *Bofedales* was identified as a suitable measure to make Value Chain 1 “Vicuñas/Alpacas” production more resilient, rated as “2”. Other EbA measures determined as suitable for Value Chain 1 are: *Qochas* (EbA 2), infiltration trenches, sustainable pasture management, restoration of forests with native species, restoration of *andenes* and terraces.

Complementary value chains for each EbA measure have been identified in *9.2 Prototypes of selected EbA measures.* The benefits of EbA measures for each value chain are also specified in the table below.

Table 50 Climate change impacts, EbA measures, and EbA measure benefits for each selected value chain. Source: own elaboration.

Value chain	Climate change impacts	EbA measures	Other adaptation measures	Benefits
High Andean crops: Quinoa, potato	Reduced water availability and changes in rainfall patterns lead to water stress affecting productivity and quality. Potato is a crop highly sensitive to water deficit, as its roots cannot tolerate water stress; drought can cause yield losses of up to 85% and frost causes crop burn, which can lead to losses of entire farms. Changes in maximum and minimum temperatures lead to crop losses and damage. As the temperature rises, exceeding the optimum threshold for the crop, the production and yield of quinoa is reduced, for example, when the maximum temperature rises by 1 °C in Puno, production is reduced by 112. 2 Mt and yield by 169.1 kg/ha and by raising rainfall by 300 mm, production is reduced by 75.78 Mt and yield by 127 kg/ha (Carrasco, 2016). Climatic events that put agricultural production at risk, such as frosts, droughts and hailstorms that generate risks of production losses and loss of	• Restoration and conservation of wetlands • *Qochas* • Infiltration ditches • Integrated soil fertility management • Contour farming • Conservation agriculture • Agroforestry • Restoration of *andenes* and terraces	• Technified irrigation. • Geotank • Water bags • Hyperlocalised Weather Alert • Integrated pest management techniques. • Crop rotation • Solar pumping • Productive diversification (guinea pigs) • Seed bank (native potatoes). • Acquisition of improved seed.	EbA measures ensure the provision of ecosystem services. • The water regulation functions of wetlands towards the basins in times of low water levels represent an important measure to make a significant contribution to the challenges of water security, integrated water resources management, and ensuring adequate water availability for human supply (SDG06). • Qochas contribute to both "water seeding", associated with infiltration and aquifer recharge, and "water harvesting" or rainwater harvesting. Previous experiences (PACC-PERU, MINAM) have shown how the implementation of qochas are effective in storing and infiltrating rainwater, recovering depleted springs and maintaining the humidity of the natural grassland, making water available during the period of scarcity (June-August), helping to guarantee crops. • Improved soil fertility would increase resilience to climate change, underpinning plant growth and optimising crop yields. This would promote food security and environmental sustainability of agricultural systems. • Infiltration trenches contribute to capture surface runoff, reducing surface runoff, as well as soil losses partially or totally through erosion and degradation, and helping to recharge the groundwater table.

Value chain	Climate change impacts	EbA measures	Other adaptation measures	Benefits
	genetic diversity of native potatoes (Practical Solutions, 2018). Studies show that a high concentration of carbon dioxide in areas where potato crops are grown reduces the chlorophyll in the plant as well as in the specific leaf area. Another consequence is that when carbon dioxide is high, the rapid ageing of the leaf may be due to increased photosynthesis and increased use of nitrogen for carbohydrate production (Practical Solutions, 2018). Heavy rainfall erodes the soil and reduces its productive capacity. Changes in temperature and humidity generate a higher incidence of pests and diseases.			• Contour farming is a sustainable tool for water and erosion management: it helps to intercept and reduce runoff, while allowing more water to infiltrate into the subsoil. This retention of water in the furrows or contours helps to reduce water erosion and increases moisture (Natural Resources Conservation Services, 2020). These benefits will contribute to sustainable crop management, helping to strengthen the resilience of communities. • Agroforestry reduces the vulnerability of communities to climate change by diversifying production and improving crop quality by contributing to both nutrient cycling and soil and water conservation, reducing erosion and intercepting surface runoff, while allowing more water to infiltrate into the ground. • Forest restoration: forests help to intercept, capture, infiltrate and regulate rainwater, mitigating the effects of torrential rains and prolonged droughts; they also protect the soil from water and wind erosion, improving soil quality and helping soil regeneration, nutrient fixation and carbon sequestration. Finally, they play a strategic role in climate regulation, stabilising sudden changes in temperature. • Agricultural terraces are of great importance in a context of climate change, reducing soil erosion and optimising water use, thanks to the water retention capacity they generate, which allows crops to be irrigated less often. In a scenario of low provision of water, technologies to increase efficiency within the

Value chain	Climate change impacts	EbA measures	Other adaptation measures	Benefits
				irrigation systems is crucial. Solar pumping, geotanks and sprinkler and srip irrigation systems are also crucial to water management. Improved soil fertility would increase resilience to climate change, underpinning plant growth and optimising crop yields. This would promote food security and environmental sustainability of agricultural systems. Sustainable pest management and other adaptation practices will maintain and/or increase productivity and product quality in a changing climate context. Diversifying production will increase the resilience of producers in the event of a climatic event affecting economic activity.
South American Camelids: Alpaca, vicuña	Drought reduces the natural productivity of the pastures that feed vicuñas and alpacas, leading to overgrazing and conflict over the use of pastures. The Helvetas study "Water management and climate change: Spatial analysis study of the bofedales in the region of the Aymaras sin Fronteras commonwealth" (2014), indicates how community income has been reduced by up to 50% due to the loss of their livestock, as they have lost bofedales and barley crops, their main sources of food. Abrupt changes in rainfall, as well as melting glaciers are	• Restoration and conservation of bofedales • Qochas • Infiltration ditches • Sustainable management of natural pastures • Agroforestry • Forest restoration with native species	• Protection modules (hutches) • Vicuña watering troughs • Technified irrigation. • Geotanks. • Integrated animal health management. • Productive diversification	EbA measures will improve water harvesting during the rainy season for distribution in times of drought by supplementing water from rainfall. This, together with efficient irrigation technologies, will improve and make sustainable use of water resources for fodder production: • The restoration and conservation of wetlands and their potential use for Andean camelid livestock would increase the resilience of communities in the face of climate change, helping to recover the necessary balance in the relationship between soil, pasture and livestock. Wetlands are the main source of food for high Andean livestock and a strategic social and economic element for camelid producers. • Qochas contribute to both "water seeding", associated with infiltration and aquifer recharge, and "water harvesting" or rainwater

Value chain	Climate change impacts	EbA measures	Other adaptation measures	Benefits
	creating chaos in both the alpaca community and the communities that raise them. One of the main problems currently faced by alpaca producers is the lack of water (rainfall), which has a direct impact on the production of pasture and fodder for feeding the herd. This has led them to incur expenses that they did not have before for the breeding of the animals. In addition, extreme temperature conditions are making the herd more vulnerable to disease and contributing to an increase in new-born mortality rates. High mortality in times of drought (30-50% in the worst cases detected). Also, alpacas give birth only during the first three months of the year, during the rainy season. This reliable season, which moderates temperatures, has now become erratic. In addition, alpacas are sensitive to cold; sudden changes in temperature, including cold snaps, have resulted in the death of thousands of animals. Rising temperatures and low rainfall have reduced pastures and led to increased incidence			harvesting. In both situations, qochas are a key strategy to increase resilience to climate change in high Andean communities, as an EbA measure associated with other practices such as grassland management, restoration with native species or planting natural grasses, improving water supply by favouring the capture, storage and infiltration of rainwater. • Infiltration trenches contribute to partially or totally capture surface runoff, reducing surface runoff, as well as soil losses due to erosion and degradation, and helping to recharge the groundwater table. This practice allows the recovery of soils that would otherwise be unproductive, positively impacting communities and reducing their vulnerability to erosion and degradation. Water infiltration contributes not only to groundwater recharge and water supply in the lower part of the basin, but also contributes to the benefit of nearby vegetation, such as grass growth, helping to reduce vulnerability to the effects of climate change on local communities. • Forest restoration: forests help to intercept, capture, infiltrate and regulate rainwater, mitigating the effects of torrential rains and prolonged droughts; they also protect the soil from water and wind erosion, improving soil quality and helping soil regeneration, nutrient fixation and carbon sequestration. Finally,

Value chain	Climate change impacts	EbA measures	Other adaptation measures	Benefits
	of pests and diseases. This is likely to have a negative impact on vicuña populations (Kasterine and Lichstenstein, 2018). Climate change also influences the spatial dynamics between pastures, grazing areas and vicuña habitat, since as grazing areas are degraded, vicuñas need to cover a larger area with lower quality pastures and migrate to higher elevations where they find better pastures (Korswagen, 2015). Climate stresses reduces productivity and fibre quality. Changes in temperature and humidity generate a higher incidence of diseases, especially scabies in vicuñas and alpacas. But also, other respiratory and stomach diseases.			they play a strategic role in climate regulation, stabilising sudden changes in temperature. • Grassland vegetation cover protects soils from the effects of erosion, reduces evaporation as well as runoff. This not only improves carbon sequestration, helping to mitigate greenhouse gas emissions from livestock production, but also contributes to improved soil quality by increasing soil porosity and water retention capacity (DDCC, 2019). Its sustainable management contributes to increasing communities' resilience to climate change by buffering the effects of extreme events and is also a strategic social and economic element for camelid producers, as a source of food and survival for Andean vicuñas and alpacas. Diversifying production will increase the resilience of producers in the event of a climatic event affecting economic activity.

10.2 Characterisation of direct beneficiaries in in the target area

The direct beneficiaries of the project are primarily Andean Indigenous People and Local Communities from vulnerable rural regions in the high Andean regions (for detailed beneficiary numbers, refer to section D.1.3 in the FP). In the majority of cases, project's direct beneficiaries are Indigenous People and Local Communities engaged in agriculture and animal husbandry activities in the high Andean zones. Both economic activities are essentially for their subsistence and have a high dependency on climate (70% of agricultural activity depends on rainy season). IPLCs in this part of the Andes as was mentioned in the previous section are organized in peasant or local communities, and in other forms to manage local development, administer common resources or provide services to each other (refer to the list below). These forms of organizations will be regarded as potential recipients of funding from the Puna Facility, as outlined in section B.4.4 (Funding Proposal).

10.2.1 Peasant or Local Communities

IPLCs in the Andes region, including the SHAP area, are mostly geopolitically organized in peasant or local communities., which are a strong part of the Andean culture as they are descendants of the original peoples of Peru. According to the General Law of Peasant Communities, Law N° 24656, they are organizations of public interest, with legal existence and legal personality, recognized by the State and protected by Peru's Political Constitution, with rights over natural resources and the territory they occupy. Peasant communities are made up of families united by ancestral, cultural, social and economic ties, who have communal ownership of the territories they inhabit. They are managed democratically, with a Communal Assembly with a Communal Board elected for periods of one to two years, assisted by Commissions or committees that deal with specific matters, such as the distribution of plots and resources for use and exploitation by their members, the control and follow-up of the activities that compromise the conservation of communal property, as well as the behaviour of its members. Many communities have dominion over large tracts of territory, which in some cases occupy an area larger than a district. In these cases, they are divided into Annexes, which are directed by Local Administration Boards – JAL.

10.2.2 Community Enterprises

According to the General Law of Peasant Communities, Law N° 24656, communal enterprises are Peasant Communities themselves that, using their legal status, organise and administer their economic activities in a business manner, by generating productive units of communal goods and services, to ensure the well-being of their members and contribute to the development of the community as a whole. A peasant community can constitute one or more communal enterprises.

10.2.3 Associations

According to article 80 of the Peruvian Civil Code, an association is a stable organisation of natural or legal persons, or both, which through a common activity pursues a non-profit purpose. In many cases, community's members tend to form different types of producer associations according to a specific economic activity, for example: artisans associations, alpaca associations, quinoa producer associations, etc. Once registered in a formal or legal point of view, the association acquires autonomy with respect to its members, becoming a subject of law distinct from that of its members, by virtue of such autonomy it has a defined structure and organisation and, in accordance with them, in order to form its social will it is necessary that its members have been constituted in a general assembly, with the formalities and guarantees required by its statute and the law.

For many years the Ministry of Agricultural Development and Irrigation has promoted producer associativity, which comprises a process of voluntary grouping of individuals, organisations or enterprises working in a coordinated and concerted manner to achieve their goals. It seeks the most effective use of the factors of production and better income from associative marketing. It also allows for economies of scale, access to better markets and improved incomes.

10.2.4 Cooperatives

According to the new Law “Improvement of the associativity of agricultural producers in agrarian cooperatives - Law N° 31335”, agricultural cooperative is a society of persons that can also be the same members of a community who carry out agricultural and / or forestry and / or livestock activity, who have joined voluntarily through a jointly owned and democratically controlled company that complies with cooperative principles. The agricultural cooperative of is constituted with the purpose of providing services related to the agricultural and / or forestry and / or livestock activity that its members carry out, practicing cooperative acts with them. Among the services that the cooperative can provide to its members are the supply of products and services, marketing, processing, transformation, productive and post-productive services in general, value-added services, financing, and technical advice, as well as any other related or complementary service that contributes to the realization of its object.

The agricultural cooperative acquires the status of legal entity from its registration in the public registers. To enjoy the benefits established in this law, the Agrarian Sector and another entity of the executive power, must prove its registration in the National Registry of Agricultural Cooperatives in charge of the Ministry of Agricultural Development and Irrigation (MIDAGRI).The agricultural cooperative uses as its name the words "agricultural cooperative" plus the distinctive name it chooses, being able to incorporate in its denomination the line of cultivation, livestock, or forestry to which it is dedicated.

With this new Law, civil associations regulated by the Civil Code may freely transform themselves into cooperatives by adopting the user cooperative and the agricultural cooperative type.

10.2.5 Small and Micro Enterprises (SMEs)

The Micro and Small Enterprise (MSE) is the economic unit constituted by a natural or legal person, under any form of organisation, whose purpose is to carry out activities of extraction, transformation, production, commercialisation of goods or provision of services. MSEs must be placed in one of the following business categories, established according to their annual sales levels: i) Micro Enterprise: Annual sales up to the maximum amount of 150 UIT; ii) Small Enterprise: Annual sales above 150 UIT and up to a maximum amount of 1700 UIT. The benefits of the regime established by the State for MSEs are based on these levels of annual sales and the fulfilment of other requirements.

11 Project Implementation

11.1 Organisational structures and implementation arrangements

Accredited Entity – Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is a German-based private, limited liability, non-profit company owned by the Federal Republic of Germany; it is the Accredited Entity (AE) of this project, while the same GIZ with its management structure in Peru will operate as an Executing Entity (see next section). To avoid conflicts of interest,

these two functions - accreditation and implementation function - are strictly separated, with different management structures within GIZ.
As the AE, GIZ will assume oversight responsibility of the project, as defined in the Accreditation Master Agreement (AMA) between GCF and GIZ (AE). As AE, GIZ will administer project funds on behalf of the GCF and will provide oversight guidance and quality assurance of Profonanpe and Instituto de Montaña as EEs receiving GCF funds through its relevant head office units.
In order to implement the Project, GIZ will need to establish legal arrangements with MIDAGRI, SERNANP, Profonanpe and Instituto de Montaña - see Figure 3 below):

- The German Federal Ministry for Cooperation and Development (BMZ) will commission GIZ with the implementation of the GCF project (amended commissioning agreement). The GCF will transfer funds based on the Funded Activity Agreement (FAA) to the Accredited Entity GIZ.
- GIZ Peru (as EE) will receive an internal task assignment from the AE for the implementation of the project.
- GIZ (AE) will amend an existing implementation agreement with the MIDAGRI as the political partner of the project and Executing Entity executing activities with own funds (related to the BMZ commission and signed between GIZ and MIDAGRI).
- SERNANP as an Executing Entity executing activities with own funds will be signed a cooperation agreement with GIZ (AE).

Finally, GIZ (AE) will sign with Profonanpe and Instituto de Montaña grant agreements (i.e., subsidiary agreements), based on GIZ standard operating procedures. These subsidiary agreements establish the legal basis on which GIZ makes the GCF Proceeds available to Instituto de Montaña to implement project activities and Profonanpe to set up, manage and operate grant disbursement through the Puna Facility, in accordance with the AMA and FAA.
Executing Entity - Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (GIZ Peru)

GIZ has been active in Peru since over 50 years and currently employs approximately 210 staff members, most of them Peruvian nationals. Specifically, GIZ Peru has been working on climate change and biodiversity issues in Peru since 2003 and current technical assistance in the sector amounts to approx. EUR 60 million.
In its capacity as an EE, GIZ will lead, and provide overall management of, the Technical Assistance (TA) to the project at national and subnational levels. It will be responsible for:

- Liaising with government institutions for overall coordination and alignment of objectives, managing technical assistance activities and ensuring full compliance with the expected project results and that adequate monitoring and evaluation procedures are implemented.
- Ensuring compliance with the Social and Environmental Safeguards, the Environmental and Social Management Plan (ESMP), the Gender Action Plan (GAP) and the Indigenous Peoples and Local Communities Engagement Plan (IPLCEP).
- Providing technical assistance to MIDAGRI and SERNANP to mainstream Ecosystem based Adaptation (EbA), climate resilience and gender aspects in all their programmes and to improve coordination between their operational units and collaboration with other sectors.
- GIZ Peru, will also provide technical assistance to Profonanpe to improve their capacities to sustainable manage and promote the Puna Facility.
- Technical assistance for the promotion of the "Mechanism for Remuneration for Ecosystem Services (MERESE)" schemes will also be under the responsibility of GIZ Peru and in close coordination with MINAM.

GIZ Peru, will also act as the technical secretariat within the Project Steering Committee and as the executive coordination within the Project Management Committee as well as the Implementation Unit, including the territorial teams.

In their role as technical secretariat GIZ Peru will keep the Steering Committee and the Management Committee informed in a timely manner about the main decisions or recommendations made by the GCF in the framework of the project implementation.

GIZ as an EE will be responsible for a GCF budget of Euro 19.165 million.

Executing Entity – Profonanpe

Profonanpe Is a non-profit private law institution organized under the laws of the Republic of Peru in accordance with Decree Law No. 26154. It is the only environmental fund in Peru and a direct access entity accredited before the GCF, with extensive experience in the management of environmental funds (Regional Water Fund in Piura, MERESE for Arequipa, etc.). Its mandate is to provide stable, long-term funding and to develop and implement innovative strategies for the conservation and management of protected areas. Its local, national and international partnerships with donors, its experience in managing environmental funds, and its strong fiduciary standards will ensure efficient and effective delivery of results.

Profonanpe will be responsible for the management of the "Puna Facility" (which will be set up under activity 2.1.1.) a competitive fund, which will provide through sub-activity 1.1.2.1. non-repayable and repayable grants, through calls for proposals aimed at promoting Local initiatives to implement Ecosystem based Adaptation measures and Climate Resilient Value Chains. In addition to the financial support, the Puna Facility will also provide Technical Assistance (through sub-activity 1.1.3.1) through a service provider for the implementation of the Local initiative, access to finance and business development.

In order to manage the Facility, Profonanpe will set up a Facility Management Unit (FMU). Among its functions[68] will be to:

- Ensure that all activities promoted and developed by the Puna Facility are in accordance with the strategic guidelines established by the Project Steering Committee.
- Ensure submission of information to the Project Management Committee in case any modifications or updates are required at the operational or strategic level of the Puna Facility.
- Develop the terms of reference for the calls for proposals.
- First review of applications and pre-selection according to the terms of reference and established criteria and proposal for evaluation by the Project Management Committee (shortlist).
- Negotiate Local Initiative Grant Agreements.
- Monitor the execution of funded Local initiatives.

Under the supervision of GIZ AE, Profonanpe will ensure that all GCF and GIZ fiduciary standards are followed, complying with the stipulations of the Grant Agreement, always within the legal framework of the project (AMA, FAA).

Profonanpe will also participate in the Project Management Committee (PMC) and will be part of the Territorial Implementation Units (TIU).

In addition, it will liaise and coordinate with other project partners to guarantee the integral fulfilment of the expected results of the project.

Profonanpe as an EE will be responsible for a GCF budget of EUR 19.175 million.

Executing Entity (own contributions) – Ministry of Agricultural Development and Irrigation of Peru (MIDAGRI)

[68] For more information please see Annex 21 Operations Manual chapter 3.

MIDAGRI is the Peruvian government institution in charge of the agricultural sector. It was created by Law 9711 on January 2, 1943. Its main function is to supervise and regulate the country's agricultural sector. The main objectives of MIDAGRI are: i) Strengthen producers' organizations and promote their integration under watershed and production chain management approaches; ii) Promote technological innovation and training linked to the business management of agricultural producers, providing technical assistance; iii) Establish an agricultural information system to enable economic agents to make efficient management decisions; iv) Facilitate agricultural producers' access to legal, administrative, management, financial, technical assistance, health and other services that will enable them to improve their management capacity; v) To facilitate the linkage of small-scale agriculture with the market economy through the establishment of policies for the appropriate use of natural resources.

MIDAGRI as the main political partner of the project will also act as an Executing Entity executing activities through own funds through following relevant programs Agrorural, Sierra Azul, SERFOR, PSI, SSE, INIA, SENASA and Agroideas.

In addition, amongst his function in the project MIDAGRI will:

- Chair the Project Steering Committee and participate in the Project Management Committee and Territorial Implementation Unit.
- Coordinate with the project partners to guarantee the integral fulfilment of the expected results of the project.
- Ensures the efficient execution of its co-financing in its sector through the aforementioned programs and contribute to the achievement of the project's activities.
- Lead coordination with aforementioned programs and the attached public bodies: SERFOR and INIA within the project structure and in the territory.
- Internally, MIDAGRI will set up a sectoral commission to guarantee the coordination and harmonization of the interventions and co-financing of its units with the implementation of the project.

Executing Entity (own contributions) – The National Service of Natural Protected Areas (SERNANP) of the Ministry of the Environment (MINAM)

SERNANP is a specialized technical public agency attached to the Ministry of the Environment, in charge of directing and establishing technical and administrative criteria for the conservation of Natural Protected Areas (NPAs) and ensuring the maintenance of biological diversity. SERNANP is the governing entity of the National System of Natural Areas Protected by the Peruvian government (SINANPE), and as the technical-normative authority, it carries out its work in coordination with regional and local governments and landowners recognized as private conservation areas. It leads SINANPE with ecosystemic, integral and participatory perspective with the aim of sustainably managing its biological diversity and maintaining the ecosystemic services that provide benefits to society.

SERNANP will act as an Executing Entity executing project activities with own funds and amongst its functions it will:

- Coordinate with the project partners to guarantee the integral fulfilment of the expected results of the project.
- Participating in both the Project Management Committee (PMC) and Territory Implementation Units (TIU).

In particular, SERNANP will co-finance and participate in the execution of the activities implemented within the Natural Protected Areas that are part of the project and together with MIDAGRI in the buffer zones.

Executing Entity (GCF-funds). Instituto de Montaña (IdM)

IdM is a non-profit organization that works for the conservation of the natural, cultural and spiritual values of mountain peoples and ecosystems. They have been working in the Andes since 1995 and in Peru they have programs in the highlands of Ancash, Piura, Junín and Lima.

It will act as Executing Entity, by contributing and scaling up its experience in the implementation of EbA measures in the Nor Yauyos Cochas Landscape Reserve to the other regions of the project. It will use participatory tools for participatory design, implementation and monitoring of EbA measures, which contribute to the ownership and sustainability of the Local initiatives supported by the project.

It will place special emphasis on facilitating the implementation of quality participatory processes through coordination with local CSOs supporting beneficiary communities, producers' associations and cooperatives in the process of formalization during Local initiative implementation. These processes are intergenerational dialogue on ancestral practices and innovation, knowledge sharing with a gender perspective, and community monitoring to estimate the impacts of EbA measures. Capacity building of trainers (local CSOs and other stakeholders) will facilitate the training of villagers on the causal relationship between implemented activities and their impacts, and the benefits obtained. Capacity building will ensure a common understanding of concepts and working methodologies to facilitate participatory planning, implementation and monitoring processes that promote ownership and thus sustainability of EbA measures.

Amongst its functions in the project IdM will:

- Participate in the Project Management Committee and in the territory as part of the Territorial Implementation Units
- Liaise and coordinate with other project partners to guarantee the integral fulfilment of the expected results of the project.

IdM as an EE will be responsible for a GCF budget of EUR 1.65 million.

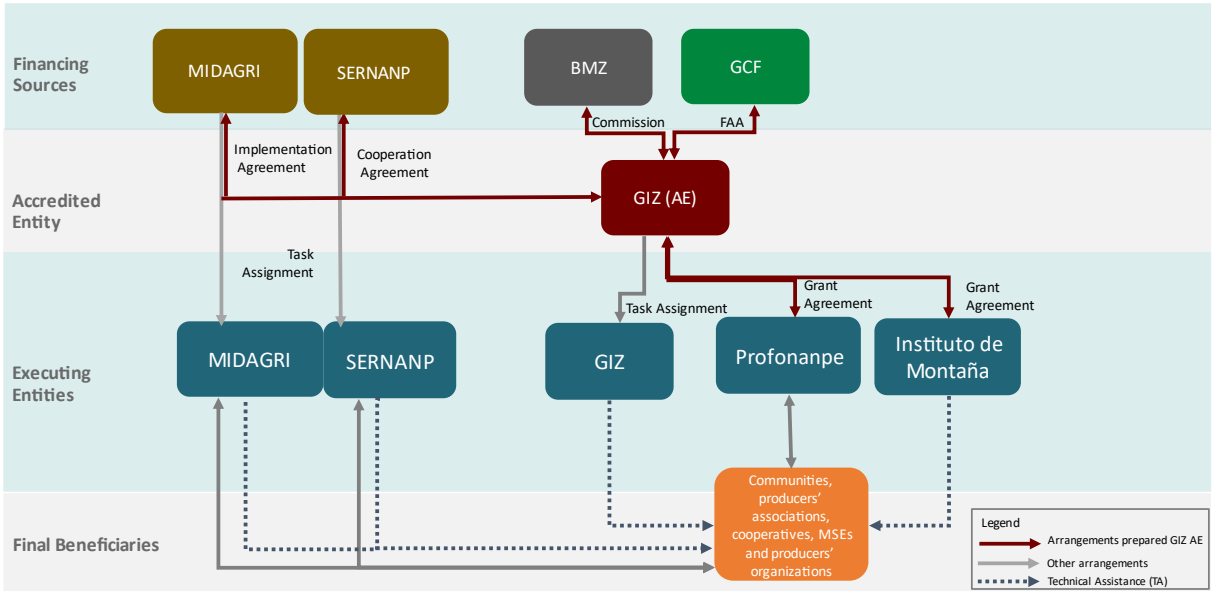
11.2 Legal and Contractual Agreements

The graph below illustrates the contractual arrangements foreseen between the main partners of the project. The German Federal Ministry for Cooperation and Development (BMZ) will be commissioning GIZ with the implementation of the overall project (commissioning agreement). GCF will transfer funds based on a Funded Activity Agreement (FAA) to the Accredited Entity GIZ. GIZ Peru (as EE) will receive an internal task assignment from the AE for the implementation of the project.

Furthermore, in order to implement the Project, GIZ will need to establish legal arrangements with MIDAGRI, SERNANP, Profonanpe and Instituto de Montaña :

- GIZ (AE) will amend an existing implementation agreement with the MIDAGRI as the political partner of the project and Executing Entity executing activities with own funds (related to the BMZ commission and signed between GIZ and MIDAGRI).
- SERNANP as an Executing Entity executing activities with own funds will sign a cooperation agreement with GIZ (AE).
- Finally, GIZ (AE) will sign with Profonanpe and Instituto de Montaña grant agreements (i.e., subsidiary agreements), based on GIZ standard operating procedures. These subsidiary agreements establish the legal basis on which GIZ makes the GCF Proceeds available to Instituto de Montaña to implement project activities and Profonanpe to set up, manage and operate grant disbursement through the Puna Facility, in accordance with the AMA and FAA.

Figure 60: Contractual arrangements

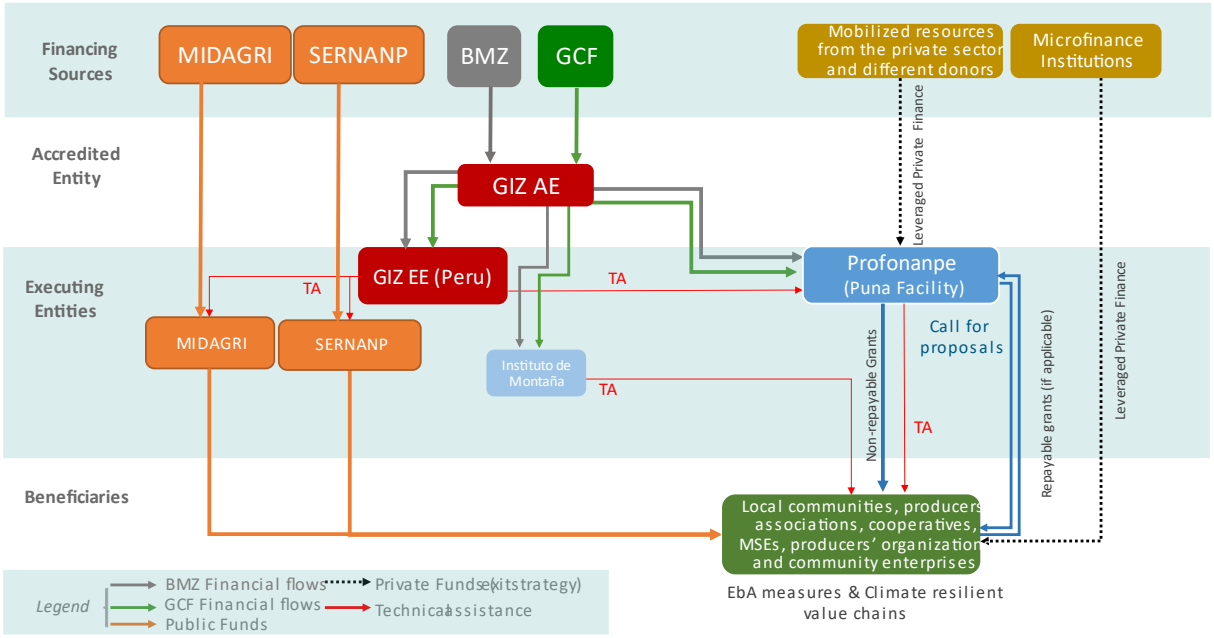


11.3 Flow of Funds Structure

The figure below depicts the overall flow of funds for the project. Funds from GCF will be transferred to GIZ as AE, who will then transfer funds through the Puna Facility (manage by Profonanpe (in its role as EE) to the beneficiaries and directly to GIZ Peru and Instituto de Montaña (in their respective role as EEs). The Government of Peru through SERNANP and MIDAGRI will provide co-financing.

Additional funds either from Microfinance Institutions (MFIs) (as a result from the provided TA within the activity 2.1.2) or mobilized resources from the private sector and different donors (as a result of the TA provided to Profonanpe within sub-activity 2.1.1.2) could be leveraged. These funds will either flow directly through the MFIs to the project beneficiaries or through the Puna Facility to continue financing Local initiatives. For the later, initial discussions have already started with the Government of Canada who has expressed their interest in channelling funds through the Puna Facility.

Figure 61: Flow of funds



Puna Facility Funding Windows

GIZ will make GCF proceeds available to Profonanpe to then channel funds to Indigenous Peoples and Local initiatives in their different form of organization (e.g., local communities, producers' associations, cooperatives (formal and in the process of formalization), Micro and/or Small Enterprises (MSEs), community enterprises and producers' organizations) to finance Local initiatives combining EbA measures and the development of Climate Resilient Value Chains based on predefined eligible EbA measures and CRVC.

Grant disbursements channelled through the Puna Facility will be through call for proposals (up to three within the project implementation) and will be differentiated by three sub-windows based on the recipient of the funds. Mainly:

a. **Non-Repayable Grant Sub-Window** for formal/legal Indigenous Peoples and Local Communities in their different forms of organization (communities, producers' associations and cooperatives in the process of formalization) (from here on IPLCs), applying with the support of local CSOs.
   The Non-repayable Sub-Window is meant to finance a maximum grant amount per Local initiative activities (including both EbA and CRVC interventions) of up to EUR 100,000.
b. **Results-based Repayable Grant Sub-Window** for micro and or/ small enterprises community enterprises and cooperatives permitted by law with commercial capacities and clear target markets. Hence:
   - Formal/legal micro and/or small enterprises
   - Formal/legal community enterprises according to the law Nº 24656
   - Formal/legal Cooperatives according to the legislation in force.

   The Repayable Sub-Window is meant to finance a maximum repayable grant amount per Local initiative activities (including both EbA and CRVC interventions) of up to EUR 200,000.
c. **Agroideas Matchmaking Sub-Window** for formalized producers' organizations with commercial capacities and clear target markets, that are eligible for the MIDAGRI support programme Agroideas. Hence:
   - Small and/or medium agricultural producers organized under any organizational form permitted by law: associations, native communities, peasant communities, limited liability companies, public limited companies, cooperatives and other forms allowed by law.

   The Agroideas Matchmaking Sub-Window is meant to finance a maximum results-based repayable grant amount per Local initiative activities (including only EbA measures) of up to EUR 75,000.

The Financial Window aims to support up to 127 local initiatives over 5.5 years for a total disbursed grant amount of up to EUR 14.4 million. Preliminary[69] information on the breakdown of the grants between sub-windows can be found in the table below.

Table 51*51* Preliminary grant breakdown per sub-window

Sub-Window	**Funding instrument**	**Cost per project in EUR up to**	**Estimated # of Local initiative**	**Estimated Grants in EUR per Sub-Window up to**	**Funding source**
Non-repayable Grant	Non-repayable grants	100,000	75	7,500,000	GCF and BMZ
Results-based Repayable Grant	Results-based repayable grants	200,000	24	4,800,000	GCF and BMZ
Matchmaking Agroideas	Results-based repayable grants	75,000	28	2,100,000	GCF and BMZ
Total			**127**	**14,400,000**	**GCF and BMZ**

11.4 Governance Structure

The project will follow a Governance structure as shown in **Error! Reference source not found.**. Following bodies will be established:

Project Steering Committee (PSC)
The highest level of governance will be overseen by a Steering Committee consisting of GIZ Peru, MIDAGRI and MINAM.
MIDAGRI through the Vice Minister of Family Agriculture Development and Agrarian Infrastructure will chair the PSC meetings. The substitute is the General Director of the General Office of Planning and Budget of MIDAGRI. Specifically, PSC participating members will include:

- MIDAGRI Vice-Minister of the Vice-Ministerial office for Family Farming Development and Agrarian Infrastructure.
- MINAM Vice-Minister of the Vice-Ministerial office for Strategic Development of Natural Resources, which will provide the required climate guidance and its alternate will be the General Directorate of Climate Change and Desertification.
- Legal representative in Peru of the GIZ as a GCF Accredited Entity;
- The PSC will provide policy and strategic guidance to the Project Management Committee (PMC), while ensuring compliance with the Funding Proposal approved by the GCF, the legal agreements, policies and requirements of the GCF, and the climate and national socio-economic development objectives.

As part of the responsibilities the PSC will:

- Acknowledge proposed tools, directives and/or standards presented by the PMC and advocate for their inclusion in public policy.
- Encourage national authorities to take ownership of actions addressing climate issues and ensure project coherence within the international and national contexts.

[69] The distribution of the grants per sub-window could change during project implementation based on the development and lessons learned from the first and second call cycle.

- Provide guidance for the fulfilment of legal agreements.
- Monitor compliance with the project's commitments to social and environmental safeguards, the indigenous people's policy, and the objectives and implementation of the respective plans (ESMP, IPLCEP and GAP).
- Ensure effective inter-institutional and inter-sectoral coordination, as well as collaboration with civil society.
- Resolve any disputes that arise within the Project Management Committee and holds decision-making authority for their resolution.
- Annually approve the project Annual Operating Plan (AOPs), evaluate and provide approval for the execution of the AOPs (technical and financial execution reports).
- Provide strategic guidance for project management and provides feedback on the POA, based on systematic reporting of outcome and impact indicators.
- Oversee the timely and adequate delivery of the respective contributions of the partners to the project.
- Supports process transparency and the harmonization of working approaches in the territory.

The Project Steering Committee (PSC) will establish a Technical Secretariat, operated by GIZ Peru. The Secretariat will provide technical information to the members of the PSC and will serve as a bridge between the PSC members and the Project Management Committee (PMC). In addition, it will coordinate (before, during and after) all related aspects of the PSC sessions.
PSC members have the option to organize extended PSC meetings where non-permanent PSC members can participate, for example for accountability and/or consultation with the NDA (Ministry of Economy and Finance), as well as to seek inputs on project-related matters with other stakeholders such as national, regional, and local authorities, donors, community and producer organizations, women's groups, Indigenous Peoples representatives, NGOs, private sector representatives, and thematic experts.

Project Management Committee (PMC)
The Project Management Committee (PMC) will be responsible for overseeing and coordinating the project's execution among the Executing Entities and ensuring its implementation within the designated territory. The PMC will also provide regular reports to the Steering Committee.

It is the decision-making body for the management and implementation of the project. The PMC will be coordinated by GIZ Peru and will have its offices within MIDAGRI. If necessary, thematic working groups could be created to coordinate cross-cutting activities in depth (e.g., on safeguards, gender, financial management or EbA/value chains, etc.).

The PMC will additionally be responsible to:

- Review, reflect, and systematize lessons learned from the project, proposing their integration into tools, directives or standards to be considered by Executing Entities.
- Generate proposals in response to changes, effects, or events in the project areas that may be attributable to climate change, based on intersectoral reviews with experts and agreements with the GCF.
- Mobilize timely technical expertise from EEs and other stakeholders when project development issues are identified.
- Timely share guidelines with the PSC and offer feedback to enhance project coherence on both national and international levels, while also facilitating the flow of information from the territories to the PSC.
- Supervise the implementation and compliance with Social and Environmental Safeguards and Gender policies (i.e., ESMP, GAP and IPLCEP).
- Ensure compliance with project management directives, guidelines, and information flow among Executing Entity members.
- Coordinate and ensure the timely implementation of activities by each Executing Entity in the designated territory outlined in the Annual Operating Plan, systematically informing the PSC and promoting a common understanding among Executing Entities regarding the theory of change and its mainstreaming across all project activities.
- Foster inter-institutional and inter-sectoral coordination and collaborate with civil society.
- Oversee technical and budgetary project progress, aligning with approved plans, budgets, and indicators related to territorial needs outlined in Annual Plan documents.
- Provide technical feedback on Terms of Reference (ToRs) and other selection processes for regional coordinator positions in Territorial Implementation Units.

- Lead mid-term and final evaluations of the project.

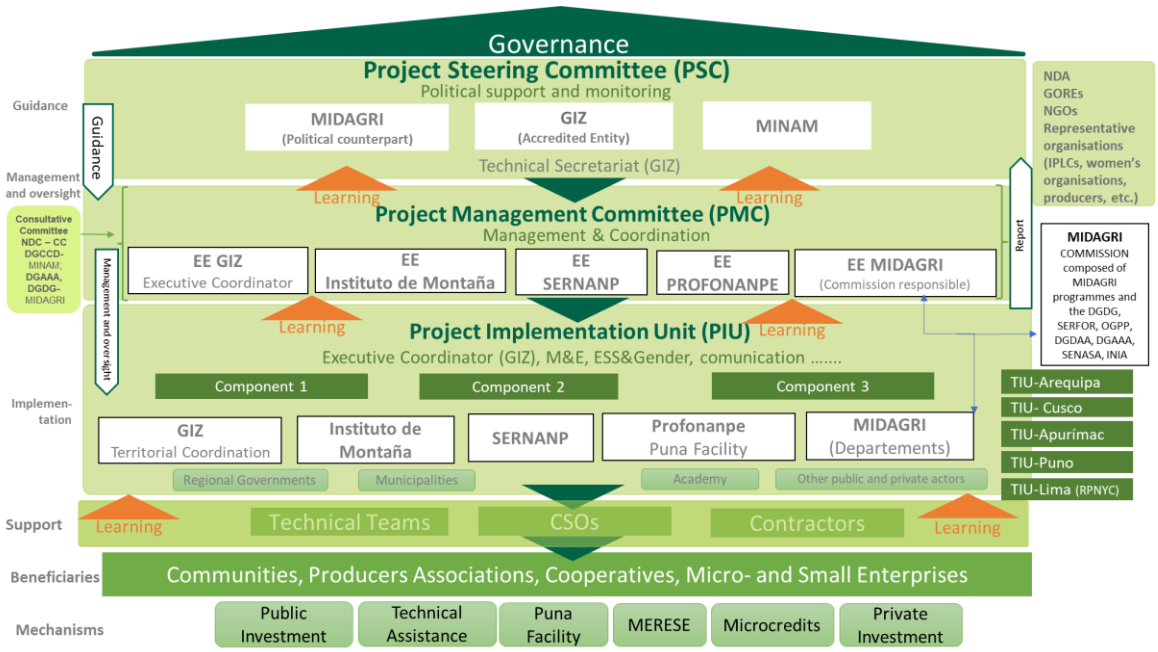
Permanent PMC members will include according to the entity:

- MIDAGRI as an EE with a technical personal and financial person designated by MIDAGRI.
- GIZ as an EE with the project manager, technical manager and financial manager.
- Profonanpe as an EE with a technical manager and financial manager.
- SERNANP (MINAM) as an EE with a technical manager and financial manager.
- Instituto de Montaña as an EE with a technical manager and financial manager.

Likewise, a Consultative Committee will be established. It will be invited to participate in the Project Management Committee (PMC) meetings through following members: the General Directorate of Climate Change and Desertification (DGCCD) of MINAM; the General Directorate of Agricultural Environmental Affairs (DGAAA) and General Directorate of Livestock Development (DGDG) of MIDAGRI, each with directorate and technical representatives; providing technical assistance on the project issues related to climate change, within the framework of its institutional competencies, including those corresponding to the implementation, monitoring, evaluation and reporting of nationally determined contributions (NDC). The Management Committee will issue the corresponding meeting invitation and agenda.

When necessary, extended Management Committee meetings can also be held, including the following MIDAGRI´s programs, MINAM´s General Directorates, National Institute for Glacier and Mountain Ecosystem Research (INAIGEM), National Service of Meteorology and Hydrology of Peru (SENAMHI). Other public or private entities, women's groups and/or Indigenous Peoples and Local Communities representatives, according to the subject to be addressed at the respective meeting.

Figure 62: Governance Structure



Coordination of the Project Implementation Unit (PIU)

The governance structure will also include a Project Implementation Unit. The Coordination of this level will be in charge of GIZ, and its responsibilities will include:

- Ensuring consistency, providing feedback, and validation of learnings made by territorial teams, local communities, organizations and institutions around ecosystem management, conservation and restoration, territorial governance and the coordination of collaborative efforts at institutional and social levels.
- Systematizes knowledge about changes/events occurring in the intervention areas that could be attributable to climate change and the effects they generate in populations and ecosystems.

- Transmits in a timely and appropriate manner PSC orientations regarding to the national and international context and, where appropriate, follows up on their implementation by the territorial teams.
- Executes the recommendations of the PMC and ensures that the recommendations of the Territorial Implementation Units (TIUs) are discussed and addressed.
- Ensures compliance with the Social and Environmental Safeguards and Gender policies (i.e., ESMP, GAP and IPLCEP).
- Promoting a common understanding of the theory of change and mainstreaming it in all project activities by the territorial teams to ensure adaptive project management in order to foster information exchange and synergies among project experts and advisors.
- Guaranteeing the harmonized work with stakeholders in each territory and an adequate identification of the tasks and additional requirements that must be addressed in connection with the project.
- Ensuring the implementation of the project in accordance with the project proposal approved by the GCF.
- Coordinating and integrating the Territorial Annual Operating Plan into the general Annual Operating Planning of the project to be reviewed by the PMC and approved by the PSC.
- Coordinating the M&E system and monitoring the technical and budgetary progress of the project, in accordance with the approved Annual Operating Plan and budget. Including monitoring of a timely implementation in the territory and systematically informs the PMC in this regard.
- Preparation of project reports.
- Overseeing the progress of the indicators in charge of each EEs in the monitoring system and ensures that the implementation progress reports are consistent with the reports to be provided to the GCF.
- Ensuring exchanges among territorial teams to assess the project progress, challenges and lessons learned in each territory.

Territorial Implementation Unit (TIU)

For an efficient, coordinated and articulated implementation in the territory, the executing entities will be formed into implementation units in each region of the project area, coordinated by the GIZ. Part of the responsibilities of the TIU will include:

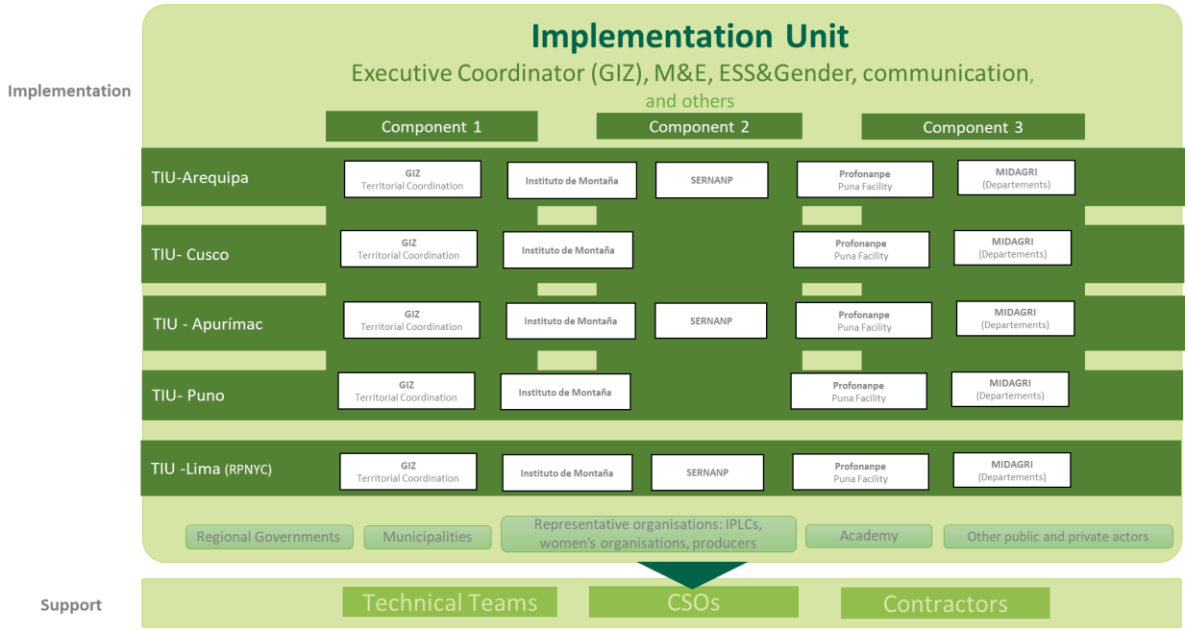
- Generate knowledge and learning regarding the project implementation, and the engagement with beneficiaries, public-private stakeholders, and other issues related to project implementation.
- Identify, record, report changes/events occurring in the intervention areas that could be attributable to climate change and the effects they generate in populations and ecosystems.
- Implement PMC guidance regarding the national and international context in project actions.
- Follows PSC and PMC guidance.
- Comply with the Social and Environmental Safeguards and Gender policies (i.e., ESMP, GAP and IPLCEP).
- Participate in the Regional Agricultural Management Committees (CGRAs) meetings to inform, and coordinate issues of interest for the region and the Project.
- Participate/promote dialogue/working groups or other coordination bodies, when needed.
- Promote strategic alliances with local governments, regional governments, private sector, civil society organisations, to generate synergies during project implementation.
- Coordinate the implementation of project activities in each territory, according to the Project's management instruments.
- Prepare territorial Annual Operating Plan to feed the project Annual Operating Plan, in accordance with the approved Logical Framework. Report the progress of goals, indicators, bottlenecks, etc. to the PIU Coordinator.
- Promote the participation of beneficiaries in the different public-private financing mechanisms and identify the needs of actors in the territory linked to the project's themes.
- Supervise and monitor the implementation of project activities in the territory.
- Identify other local and regional initiatives that may have potential synergies with the interventions planned by the project and inform the PIU Coordination.
- Identify the potential private sector financing in the territories and report to the PIU Coordination.

Part of the members of the Territorial Implementation Unit:

- GIZ: With regional technical coordinator.
- MIDAGRI: With regional technical specialists of capacity , Sierra Azul, Agrorural, Serfor
- SERNANP: With regional technical specialists.
- Profonanpe: With regional technical specialists.
- Instituto de Montaña: With regional technical specialists.

Depending on the specific approaches and developments in the implementation of the project in each of the territories, TIUs may occasionally invite other participants such as representatives of Indigenous Peoples and Local Communities, women's groups, producers' associations cooperatives, civil society organizations, local governments and regional governments to participate in the meetings. At the request of a specific TIU and depending on the fulfilment of the TIU's work plan, the TIU coordinator may authorize the regular inclusion of one or more of these representatives.

Figure 63: Structure of the Territorial Implementation Unit



11.5 Knowledge Management

Present the project's Knowledge Management Plan by filling out the template below.

Table 52: Knowledge Management Plan

A. Knowledge Required and created by the Project
A.1. What knowledge is required by the Project during implementation?
- Knowledge of ancestral agriculture and landscape management practices including technologies and organizational structures. - Technical EbA knowledge - Local institutional knowledge
A.2. What processes and individuals will contribute to generating, processing and disseminating this knowledge?
Output 1.2 will ensure that the use of EbA knowledge is recovered, disseminated and that local monitoring committees and observation systems are implemented. This will be achieved through facilitating intergenerational dialogues on ancestral practices, capacity building of local experts for ancestral and innovative knowledge linked to EbA and climate-resilient value chains. Under output 3.1., activities will ensure the incorporation of experiences from local planning processes in dialogue and consensus-building platforms at the watershed (meso) level to influence regional planning and budget allocation for EbA practices.

A.3. Who are the key beneficiaries of the project-created knowledge?
- The rural population in the project target region - National, provincial and district level government agencies - Private sector organizations involved in the Climate Resilient Value Chains
B. Knowledge Products
B.1. What knowledge products will be created/supported by the Project?
Under Output 1.2: - A capacity-building program for local experts will be developed and implemented. - Informative materials in native languages of lessons learned from ancestral practices and innovation produced. - Dissemination of lessons learned from ancestral practices and innovation (events and/or dissemination spaces) - Intergenerational Dialogue Plan (and accompanying actions) - An Information Management system so that community monitoring committees can enter their data
B.2. How are the different needs of project beneficiaries addressed (e.g. gender, ethnic and educational backgrounds)?
- Outreach, extension/technical support at the community-level, workshops and capacity building activities will be socially inclusive, aware of culturally diverse contexts and norms, and take into consideration local knowledge. Where necessary, the project will ensure the availability of translators (either from within the community or from external sources, if necessary) to facilitate the dissemination of knowledge and information. - Output 1.2 will also ensure that knowledge sharing amongst beneficiary communities have a gender perspective. - Opportunities for collaboration with other stakeholders (e.g. CSOs) will be sought out to strengthen stakeholder outreach and the engagement of various ethnic groups and vulnerable households.
C. Knowledge Mainstreaming and Sustainability
C.1. How is the project's knowledge management approach linked to complementary information channels (e.g. government, donors, CSOs)?
Lessons learned and information sharing activities will be conducted at the policy-making level to inform national stakeholders and policy makers on Project progress and the key lessons learned that can support the implementation of EbA measures and Climate Resilient Value Chains.
C.2. How will knowledge benefits be sustained beyond the lifetime of GCF funding?
The long-term sustainability of programme interventions is enhanced by the focus on individual and institutional capacity building, both of the implementation entities and the key beneficiaries. Measures focused on institutional strengthening at the provincial, district and local levels form an essential element of the individual activities, given local capacities and the generally low level of knowledge on sustainable practices. Government entities and programme beneficiaries will have improved their knowledge and skills for the implementation of EbA measures and Climate Resilient Value Chains, and thus it is likely they will continue to support such measures after project completion.

12 Project Funding Justification

12.1 Justification for GCF Funding Request, Choice of Instruments and Concessionality

While the government has increased its focus on climate finance, efforts to channel budgetary or other public resources to climate resilience in the high puna are still limited and scattered. The government's annual spending on climate change has been below USD 300 million for the past decade. For comparison, public investment on infrastructure has averaged USD 5.4 billion over the past five years and total public investment USD10.6 billion.[70] The World Bank estimates at USD 45 billion Peru's

[70] World Bank (November 2022). *Peru: Country Climate and Development Report*.

investments needs in climate change mitigation and adaptation to 2030, with the biggest priorities identified in the transport, water and energy sectors. The government has increased public spending aimed at managing natural resources sustainably, from 1.9% of the total national budget in 2008 to 5.4% in 2018 (IDB, 2020). However, national resources remain insufficient due to the global environmental and climate crises, as shown in national environmental performance indicators (ranked from 0 to 1, where 1 signifies the highest possible score), for example the agriculture sector scores 0.3 with a regional average in LAC of 0.45, on the other hand the forest sector scores 0.26 with a regional average in LAC of 0.57 (IDB, 2020).

The required investment for climate adaptation needs cannot be met with the national budget alone. With the economy expected to slow down, inflation risk, relatively high unemployment, public debt on the rise and persistent political instability, it will be difficult for the government to rise to the climate investment challenge. In this context, the government is making a substantial effort to co-finance the proposed GCF project, matching the GCF contribution almost dollar for dollar (~1:1 co-finance ratio). GCF resources are crucial to achieve innovative coordination between private and public actors to scale the impact of interventions at the ecosystem and local community levels. The resources will also allow overcoming barriers to accelerate the implementation of existing but underdeveloped financial instruments (i.e., MERESE) and will generate capacities in rural population to access available financing (public and private). The proposed financial and technical support mechanisms, including business development, microfinancing and increased participation in specific Climate Resilient Value Chains (CRVC) will improve production systems and make them more resilient.

Available resources from the international community are also limited. Peru received USD 923 million in climate-focused official development assistance (ODA) in 2021, the majority in mitigation. Of this, only USD 13 million was ear-marked by the OECD to the agriculture (excluding forestry) and livestock sub-sectors.[71] It is possible that other ODA was channeled to these sectors via financial institutions and ear-marked as ODA to the financial sector. Still, agriculture and livestock draw a small minority of climate ODA to Peru. In the high puna, ODA directed at the project's target beneficiaries has been extremely limited.

Private sector financing of CRVC in the puna has been almost absent to date (see section 7.2 in the Feasibility Study (Annex 2a)). Universal and municipal banks in Peru focus primarily on large enterprises and/or urban borrowers. MFIs focus on MSME lending but only one (Confianza) has a meaningful presence in the target areas, as do a few small rural banks. Lending to CRVC is constrained by several barriers: (i) the inherent high risk of agricultural and livestock activities, exacerbated by climate change; (ii) logistical difficulties in reaching borrowers in the high puna (long distances and remote locations); (iii) limited financial literacy of prospective borrowers; (iv) limited understanding – by both borrowers and lenders – of the climate change impact on high puna economic activities, and how EbA and CRVC can mitigate such impact and improve creditworthiness; and (v) prevalence of informal businesses with limited collateral. As a result of these barriers, loan supply to the target beneficiaries is extremely limited and loan terms are inadequate to EbA measures and CRVC (short maturities, very high interest rates, inflexible repayment schedules). For example, capex loans offered by MFI Confianza have a maximum maturity of 3 years only and interest rates in the 60-70% range. One state-backed financial institution, Agrobanco, offers at least on paper concessional loans (with "low" rates of 20-30%) to the project's target beneficiaries, but in practice the organization is severely undercapitalized and operationally dysfunctional.

A significant portion of the GCF grant (EUR 21.6 million) is for technical assistance and capacity building activities that do not lead directly to financial reflows for beneficiaries. The use of grants for these activities is justifiable on a public-good basis. The remaining EUR 19.217 million portion of the GCF grant is to fund the establishment and operation of the Puna Facility, which will disburse repayable and non-repayable grants to revenue generating Local initiatives. A detailed financial analysis has been conducted (see Annex 3) to determine the financial IRR of Local initiatives in the three windows of the Facility, with and without GCF grants. The analysis is based on prototype Local initiatives in the alpaca and native potatoes sectors representative of the majority of Local initiatives to be funded by the Facility. Detailed assumptions were developed both for business-as-usual scenarios (not incorporating EbA and CRVC practices) and climate-resilient scenarios where beneficiaries invest in and implement the recommended mix of EbA measures and CRVC practices. The transition from business-as-usual to

[71] OECD climate ODA data, 2021.

EbA/CRVC generates positive FIRRs without grants in all prototype's Local initiatives, ranging from 8.4% (for alpaca breeding in the Non-repayable Grant Sub-Window) to 25.8% (native potatoes in the Repayable Grant Sub-Window). Still, grants are considered essential for the widespread adoption of EbA/CRVC among target beneficiaries, for the following reasons:

i) In the **Non-repayable Grant Sub-Window**, (i) the beneficiaries live in poverty to the extent of often abandoning the high puna and moving to urban areas in search of jobs (see section D.4.2). (ii) They have virtually no savings, and certainly not to the tune of the EUR 125,000 and EUR 139,000 per beneficiary group required to implement the transition to EbA/CRVC (in native potatoes and alpacas, respectively). (iii) Beneficiaries have limited financial literacy and almost no access to finance; when finance is available, it is offered by micro-finance institutions at prohibitive rates and for short maturities that are unsuitable to the timeline of CR transition (the payback period for the EUR 125,000 investment is approximately 8 years). (iv) Beneficiaries do not have the knowledge to implement EbA measures nor the financial resources to pay for technical services provided by private experts in order to gain that knowledge. GCF non-repayable grants not only cover a significant portion (80%) of the EBA/CRVC investment but fund the technical assistance necessary to correctly implement the measures and put EBA/CRVC-adopting businesses on a sustainable path of cash generation, building their future bankability.

ii) In the **Results-based Repayable Grant Sub-Window**, (i) beneficiaries have limited savings, but certainly not to the tune of the EUR 257,000 and EUR 283,000 per farmer group required to implement the transition to EbA/CRVC. (ii) They have limited financial literacy and almost no access to finance; when finance is available, it is offered by micro-finance institutions at prohibitive rates and for short maturities that are unsuitable to the timeline of transition. (iii) Beneficiaries do not have the knowledge to implement EbA and have limited financial resources to pay for technical services provided by private experts in order to gain that knowledge. Considering the attractiveness of the business model over the long term, however, non-repayable grants would be too concessional. To minimize concessionality, a repayable grant is therefore introduced, with the benefits that (a) beneficiaries start building a track record in managing repayments that enhances their future bankability with MFIs and other financial institutions, (b) repayment terms are negotiated at project approval to suit the Local initiatives cashflow profile (unlike MFIs' rigid repayment schedules), (c) there is no interest charge (unlike the MFIs' prohibitive rates) and (d) repaid amounts flow back into the Facility, which will use it to support additional future Local initiatives. In addition to the repayable grant, beneficiaries also receive technical assistance. The combination of financial and technical assistance will put them on a path to full commercial bankability.

iii) In the **Agroideas Matchmaking Sub-Window**, for which only existing formal businesses qualify, a very significant investment is required, to the tune of EUR 245,000 in our prototype Local initiative. While the applicants are formalized and may have some access to finance, it is not for this sort of amounts and would carry the prohibitive conditions imposed by MFIs. To alleviate the funding gap, the government's Agroideas program will provide non-repayable grants covering 80% of the value chain portion of the investment (e.g., construction of greenhouses, cultivated pastures and alpaca shearing equipment). The GCF grant will be repayable and therefore less concessional. It will cover 80% of the EbA portion of the investment, will carry no interest and will have repayment schedules tailored to the individual Local initiative. Financial and technical assistance provided by Agroideas and GCF will put these businesses on a solid footing, increase their creditworthiness and likelihood of sourcing affordable commercial loans in the future.

The project strongly contributes to the GCF identified sectoral paradigm shift enablers. The government of Peru sees GCF financing in the form of grants as essential to achieve changes in the geographical and temporal scale required to face the challenges of accelerated change in climate and the loss of ecosystems and their climate services. In this regard, GCF funding is required to contribute to the GCF sectoral paradigm shift enablers.

At the project level, in the business-as-usual scenario, MIDAGRI will contribute with EUR 28.67 million that it has pledged in co-financing, focusing on the short-term productivity aspects, neglecting the value of the ecosystem services as a long- term solution for the high Andean communities and for other beneficiaries of Puna ecosystem services. It would focus on isolated investments and activities financed from different programs (Agrorural, Agroideas or Sierra Azul) without looking for synergies and impact programs. Participation of local communities on the decision-making process would be limited and

CSOs that have gained the trust and engagement of communities from experience working with them would not be involved. The MERESE (payment for ecosystem service) scheme would continue being innovative on paper but non-functional on the ground and little investment would reach target communities. Other climate-relevant Puna ecosystem services such as carbon sequestration would not be considered nor valued. GCF financing would fill an important gap in climate finance for the most vulnerable populations in Peru and promote a sector transformation towards conservation of Puna ecosystems and corresponding services.

12.2 Financial and Economic Analysis

As noted in Annex 3 Economic and Financial Analysis summary, the financial IRR of Local initiatives supported by the Puna Facility is positive even without grants; GCF grants further increase the financial IRR (see table below). However, grants remain essential for the implementation of the Local initiatives for reasons including: subsistence nature of the beneficiaries in the Non-repayable Sub-Window and generally low income for other beneficiaries; no or limited savings to self-fund the initial EbA/CRVC investment; no or limited access to finance to fund EbA measures and CRVC; prohibitive interest rates and other terms of MFI loans; limited financial literacy; lack of beneficiaries' resources to hire technical experts in lieu of the Puna Facility's technical assistance. Importantly, the concessionality of Puna Facility grants is significantly minimized in the Results-based Repayable and Agroideas Matchmaking Sub-Windows through the repayment feature. All Local initiatives funded by the Puna Facility will be financially self-sustaining in the long-term, with no need for further concessionality. This will make them more bankable in the eyes of lenders – bankability will be enhanced also through technical assistance to both Puna Facility beneficiaries and, on the supply side, MFIs. Repayable grants will also instill financial discipline in the recipients, making them more attractive future borrowers.

Table 53. FIRR by Local initiative

Local initiative type	FIRR without grant	FIRR with grant
Non-repayable – Native potatoes	12.6%	121.8%
Non-repayable – Alpacas	8.4%	63.7%
Repayable – Native potatoes	25.8%	84.3%
Repayable – Alpacas	17.1%	48.1%
Agroideas – Alpacas	19.5%	56.8%

The economic IRR of the project is 8.2%, which is more than 2 percentage points above the 6% Peru social discount rate estimated by the World Bank and the Ministry of Economy and Finance. The economic NPV, based on the 6% social discount rate, is a positive EUR 11.9 million. Sensitivities have been run on two assumptions: (i) downside sensitivity to the already conservative CO2 shadow prices and (ii) the change in GHG reduction volume and economic benefits of sub-projects during the initial 3 calls for proposals. The analysis shows that the EIRR is positive even with extremely low CO2 prices and with a 30% drop in emission savings volume and income generated by the initial calls for proposals. The EIRR remains above the social discount rate of 6% and the economic NPV is therefore positive if the emission savings volume and economic benefits do not drop more than 10%, even at carbon prices substantially lower than the base case assumption of EUR 60/t.

13 Project Impacts and Benefits

13.1 Climate Change Adaptation Benefits

13.1.1 Methodology for assessing the climate vulnerabilities and resilience impacts

Estimation of direct and indirect beneficiaries

Total Beneficiaries

Resilient Puna will contribute to increased resilience of 60,715 (30,088 women) direct and 2,011,856 (1,005,928 women) indirect beneficiaries for the ARA 1 and 2.

ARA 1: Most vulnerable people and communities

- **Core indicator 2: Direct and indirect beneficiaries (female/male) reached (number of individuals)**

Resilient Puna will contribute to increased resilience of 60,715 (men: 30,088 , women: 30,088) direct and 2,011,856 (men: 1,005,928, women: 1,005,928) indirect beneficiaries.

- **Supplementary indicator 2.1 Beneficiaries (female/male) adopting improved and/or new climate resilient livelihood options (number of individuals)**

The total number of direct beneficiaries under Core 2 Direct beneficiaries reached and Supplementary 2.1 Beneficiaries (female/male) adopting improved and/or new climate-resilient livelihood options is 60,715 (30,088 women).

ARA 2: Health, well-being, food and water security

- **Supplementary indicator 2.2 Beneficiaries (female/male) with improved food security (Unit: number of individuals)**
  The targeted support will also improve food security for 45,463 (22,732 women) beneficiaries.

ARA 4: Ecosystem and ecosystem services

- **Core indicator 4**: Hectares of natural resource areas brought under improved low-emission and/or climate-resilient management practices (Unit: hectares) (Disaggregation: type of natural resource areas; and results area)
  - **Supplementary indicator 4.1:** Hectares of terrestrial forest, terrestrial non-forest, freshwater and coastal marine areas brought under restoration and/or improved ecosystems (Unit: hectares)

Type of natural resource areas	Land use type	Associated EbA measure	Number of hectares
Terrestrial forest	Forest	EbA 9	44
Terrestrial non-forest	Inland wetlands (bofedales)	EbA 1	996
	Annual cropland	EbA 3, EbA 4, EbA 5, EbA 7, EbA 8	3,302
	Grassland	EbA 6	19,443
	Other	EbA 10	129
		TOTAL	**23,914**

- **Supplementary indicator 4.2:** Number of livestock brought under sustainable management practices (Unit: number of livestock)
  The overall number of livestock (LSU) in the with-project scenario under sustainable management practices is 8,854 LSU.

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13.2 Economic Co-benefits

The Co-benefit 3 will be “Improvement of local economy through better economic opportunities and poverty reduction”. The indicator designed to measure this co-benefit will be “Number of producers, of whom 50% are women have confirmed an improvement in their income from Climate Resilient Value Chains”. This co-benefit will be done through implementation of the following activities: 1) Activity 1.1.2 will contribute to reduce climate risks supporting the implementation of Local initiatives involving EbA and climate-resilient value chains, helping to maximise economic sustainable opportunities; 2) Activity 1.1.3 will give technical assistance for implementation and promote market access for Local initiatives and integration of climate

change adaptation skills into their livelihoods and 3) Activity 2.2.3 will contribute to reduce the barriers to finance for EbA and CRVC.

The project's contribution to the SDG's is presented in the table below (from an economic point of view):

Table 54: Summary of project economic co-benefits and their contribution to the SDGs

SDG	Relevant SDG target	How the project contributes to SDG
SDG 1 End poverty in all its forms everywhere	Target 1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	By promoting EbA measures and CRVC, the project will support the livelihoods of the most vulnerable people in the Puna region through the EbA measures and the support to Climate Resilient Value Chains in Component 1 and the improvement of the access to finance in Component 2. This will contribute to reduce their vulnerabilities to climate-related events and build their resilience through increased income and capacity building.
SDG 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Target 2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	The implementation of EbA measures and promotion of CRVC will support the increase in agricultural productivity within the Puna region, increasing the income of small-scale producers and supporting the diversification of their livelihoods.
SDG 10 Reduce Inequality within and among countries	Target 10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average	By increasing economic opportunities for most vulnerable High Andean communities, the Local initiatives supported by the project will contribute to the sustainable growth of the population most vulnerable income trying to reach the average income reducing the inequalities.

13.3 Environmental Co-benefits

The project activities will result in two environmental Co-benefits. The maintenance of ecosystem services in the area benefited by the project has been considered as co-benefit 1 of the project. This environmental co-benefit will be achieved because of the accomplishment of outcome 1 of the project "Puna ecosystems are restored, conserved and better managed to support climate resilient livelihoods, through the implementation of EbA measures". This outcome will contribute to maintain or improve a range of ecosystem services provided by the Puna ecosystems which bring benefits to population throughout the watershed. The indicator to measure this outcome will be "Area within the project target districts that are important for ecosystem services where EbA measures are implemented". The goal for this co-benefit was estimated in 23,914 ha of Puna ecosystems conserved, restored or sustainably managed. This environmental co-benefits contribute to: i) Provisioning services which consist of fiber, fuel, food and fresh water; ii) Regulation services that include climate regulation, water regulation,

water purification and erosion protection, resulting in the regulation of greenhouse gases, climatic processes, water storage, groundwater recharge and discharge, retention, recovery and removal of excess nutrients and pollutants and peat blanket protecting the underlying soils from erosion; iii) Supporting services provided by these ecosystems include biodiversity, soil formation, nutrient recycling and carbon storage; iv) Cultural services present in the SHAP are educational, recreational, landscape beauty, spiritual and inspirational. The project will seek to ensure the long-term provision of these services through the three project components: i) implementation of EbA alternatives and training on sustainable business options and monitoring of ecosystem conditions; ii) increased access to technical assistance and finance, to invest in EbA measures, and iii) mainstreaming of the EbA concept into extension programs and improved participatory planning at the local and basin level.

The second environmental co-benefit considered is the GHG emission reduction, the goal for this co-benefit was estimated in 407,657 tCO2e in 15 years analysed. The details are described in section 13.3.1.

Also, taking into account the sustainable development goals (SDGs), the project contributes as follows (from an environmental point of view):

Table 55: Summary of project environmental co-benefits and their contribution to the SDGs

SDG	Relevant SDG target	How the project contributes to SDG
SDG 6 Ensure availability and sustainable management of water and sanitation for all	Target 6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	The implementation of EbA measures in the Puna ecosystems will contribute to the protection and restoration of water related ecosystems including grassland, peatlandas and wetlands, that will contribute to ensure availavility of water for sanitation for all.
SDG 13 Take urgent action to combat climate change and its impacts	Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	By promoting EbA measures and CRVC, the project will support the most vulnerable people in the Puna region to reduce their vulnerabilities to climate-related events and build their resilience. The project will contribute to maintain or improve the ecosystems services that will increase the population resilience and to improve the adaptative capacities of the people in the Puna.
	Target 13.2 Integrate climate change measures into national policies, strategies and planning	By promoting the integration of EbA approach in the national regulations and frameworks and the regional and local planning instruments.
SDG 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land	Target 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	By support the implementation of EbA measures that conserve, restore and/or manage in a sustainable way Puna ecosystems (Peatlands, grasslands and wetlands as in the high andes)

SDG	Relevant SDG target	How the project contributes to SDG
degradation and halt biodiversity loss	Target 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	By support the implementation of EbA measures that conserve and restore Puna ecosystems (Peatlands, grasslands and wetlands in the high andes), including their biodiversity in Natural Protected Areas.

13.3.1 Methodology for assessing GHG emissions reduction

The project recognizes as a valuable co-benefit the reduction of GHG emissions. The proposed intervention measures aim to prevent emissions from existing carbon sources, like livestock, crops, and forest management, and contribute to carbon sequestration in soil and vegetation, through forest management, agroforestry, and wetland restauration.

GHG reductions are calculated using the methodology presented in the IPCC Good Practice Guidance for LULUCF, applied though the tool EX-ACT (version 9.4) developed by FAO. This methodology was chosen due to its widespread recognition, general applicability in both the baseline and with-project scenarios, and the availability of relevant data. The tool will be used for an ex-ante approach to determine the potential GHG savings from the project, including inside the scope all EbA measures and the two value chains impacted: livestock (vicuñas and alpacas) and Andean crops.

The analysis requires setting up a baseline, and two future scenarios: without and with project. The scenario without project replicates the current trends into a future scenario, that will be contrasted with a scenario impacted by the project. The net emission reduction will be the difference between the two scenarios.

The Resilient Puna project will be distributed among the departments of Apurimac, Arequipa, Cusco, Lima, and Puno. Given that the Resilient Puna Project is articulated in a financial scheme, the Puna Facility, the interventions that supported will belong to a given set of options, but its distribution is still unknown. The scope proposed is at Local initiative level, based on the "implementation probability" that an intervention will happen in the defined territory. To determine the probability, a cartographic analysis has been performed, including all districts and measures, defining the areas with high potential to apply each of the measures and distributing the total budget among the likelihood.

The project activities considered inside the calculation scope are displayed in the table below **Error! Reference source not found.**Table 56_– Project activities included inside the scope for the GHG calculation

Value chain	Activity	Implementation probability (%)	Units	Mitigation impact	EX-ACT Module
Ecosystem based Adaptation	EbA 1: Bodefal restauration and conservation	3.3%	996 ha	Increase of carbon in soils (capture).	6.Inland wetlands
	EbA 2: Family Qochas	0.6%	17 qochas	No direct mitigation impacts.	
	EbA 3: Integrated soil fertility management	7.9%	662 ha	Increase of carbon in vegetation and soils (capture).	3 Cropland Management

Value chain	Activity	Implementation probability (%)	Units	Mitigation impact	EX-ACT Module
	EbA 4: Contour farming (TA)	1.2%	675 ha	No direct mitigation impacts.	
	EbA 5: Infiltration ditches	1.8%	213 ha	Considered together with EbA 1.	
	EbA 6: Sustainable grassland management	77.2%	19,443 ha	No direct mitigation impacts in carbon soil for reduction of overgrazing. Reductions or emissions for livestock are expected.	4.Grassland and livestock
	EbA 7: Conservation agriculture	2.0%	193 ha	No direct mitigation impacts.	
	EbA 8: Agroforestry	5.1%	1,559 ha	Increase of carbon in vegetation and soils (capture).	2.Land use Management 3. Cropland management
	EbA 9: Reforestation with native species	0.3%	44 ha	Increase of carbon in vegetation and soils (capture).	
	EbA 10: Andenes/Terraces restauration	0.5%	130	No direct mitigation impacts.	
Livestock (vicuñas and alpacas)			6,416 heads	Reduction of emission sources due to less emitting livestock species.	4. Grassland and livestock
Andean crops			6,041 ha	Increase of carbon in vegetation and soils (capture).	3. Cropland management

GHG sequestration figures are estimated according to the following parameters:

Table 57:58 59 Inputs required to perform the GHG calculations in EX-ACT according to the project proposed activities.

Category	Sub-category	Variable	Value	Source
1. General parameters	Project site and duration	Climate	Warm temperature	IPCC Guidelines for National Greenhouse Gas Inventories (2016), Climate zones
		Moisture	Moist	
		Soil type	Wetlands soils	Harmonised World Soil database
		Implementation phase	5 years	Concept Note
		Capitalization phase	10 years	
2. Land-use changes	1.	Initial land-use	Annual cropland: 1,559 ha	Field research/ cartography
		Final land use	Agroforestry: 1,559 ha	EbA measures
		Fired used?	No	Assumption
3. Cropland management	3.1. Annual crop systems	Main season crop – baseline/ without project	Potatoes: 662 ha	Field research/ cartography
		Main season crop – with project	Potatoes + Quinoa (minor crop): 331 ha Potatoes + Legumes (minor crop): 331 ha	EbA measures
		Tillage management – Baseline, without project	Reduced tillage	Field research
		Tillage management – with project	No tillage	EbA measures
		Input of organic material – baseline/ without project	Low C input	Field research
		Input of organic material – with project	High C input, with manure	EbA measures
		Residue management	Retained	Field research/ EbA measures
		Yield – baseline/ without project	Potatoes: 7.73 t/ha.yr	Field research
		Yield – with project	Potatoes: 10 t/ha.yr Quinoa: 18 t/ha.yr Legumes: 16.8 t/ha.yr	EbA measures
		Agroforestry systems	Agroforestry	EbA measures

	3.2. Perennial crop systems	Tillage management – Baseline, with/ without project	No tillage	Field research/ EbA measures
		Input of organic material – with project	High C input, with manure	EbA measures
		Residue management	Retained	Field research/ EbA measures
		Residue/ biomass burning	No	Assumption
4.1 Grassland and Livestock	4.1.2. Grassland management	Grassland management – start	Severely degraded	Field research
		Grassland management –without project	Severely degraded	Field research
		Grassland management – with project	Severely degraded	EbA measures
		Area	19,443 ha	EbA measures
		Fire management and periodicity – without/ with project	No	Assumption
		Yield at - start	0.16533 t/ha.yr	Field research
		Yield at - without project	0.085 t/ha.yr	Field research
		Yield at - with project	0.5 t/ha.yr	EbA measures
	4.2. Livestock and manure management	Livestock categories/species – start/ without project	Llamas and Alpacas – Low productivity 19,443 heads	Field research
		Livestock categories/species – with project	Llamas and Alpacas – High productivity: 6,416 heads	EbA measures
5. Forest management	5.1. Forest degradation & management	Type of forest vegetation that will be managed	Subtropical mountain systems	Global ecological zones. FAO (2015)
		Forest degradation level – Start	Large	Field research
		Forest degradation level –Without project	Extreme	Assumption
		Forest degradation level – With project	Moderate	EbA measures
		Fire occurrence, periodicity, impact – Start/ Without/ With project	No	Assumption
		Forested area (ha)	44 ha	Field research/ cartography
6. Inland wetlands	6.1.3. Organic soil management practices associated with other LUC	Land use cover – Start/ without project	Degraded land: 996 ha (SOC: 85 tC/ha)	Field research/ cartography
		Land use cover – With project	Grassland: 996 ha (SOC: 124 tC/ha)	EbA measures
		Fire used?	No	Assumption
		Burning of biomass	No	Assumption

		Area under drainage – Start/ without/ with project	0 ha	Assumption
		Fire on soil	No	Assumption

13.3.2 Overall GHG Mitigation Impacts of the Project

The overall mitigation impact from the project quantified by EX-ACT is a reduction of 407,657 tCO2e in the 15 years analysed, which include five years of implementation phase and ten years of capitalisation phase. It is measured against a scenario without project that would have increased by 93,9051 tCO2e the GHG emissions in the areas of intervention.

The gross fluxes corresponding to the different activities with a direct mitigation impact are presented in Table 60. The numbers reflected correspond to the impact during the 15 years considered for analysis in a total area of intervention of 23,914 ha. The details on the calculations can be found in Annex 22.

Table *60*:Summary of project emission reductions

Value chain	Activity	Scenario without project	Scenario with project	Balance
Ecosystem based Adaptation	EbA 1: Bodefal restauration and conservation	0	-142,447	-142,447
	EbA 2: Family Qochas	No direct mitigation impacts, considered together with EbA 1.		
	EbA 3: Integrated soil fertility management	11,373	-77,734	-89,107
	EbA 4: Contour agriculture (TA)	No direct mitigation impacts.		
	EbA 5: Infiltration ditches	No direct mitigation impacts, considered together with EbA 1.		
	EbA 6: Sustainable grassland management	No direct mitigation impacts in carbon soil stocks.		
	EbA 7: Conservation Agriculture	No direct mitigation impacts.		
	EbA 8: Agroforestry	15,401	-120,619	-136,020
	EbA 9: Reforestation with native Species	1,804	-1,804	-3,608
	EbA 10: Andenes/Terraces restauration	No direct mitigation impacts.		
Value Chain 1: Camelids (vicuñas and alpacas)		65,327	28,853	-36,474
Value Chain 2: high Andean Crops		Considered in EBA 3- Integrated Soil Fertility Management		
Value Chain 2: high Andean Crops		No direct mitigation impacts.		
Total emissions, tCO2-e		**93,905**	**-313,751**	**-407,657**
Total emissions, tCO2-e/ha		**4.1**	**-13.8**	**-18.0**
Total emissions, tCO2-e/ha/yr		**0.3**	**-0.9**	**-1.2**

13.4 Social Co-benefits

The Co-benefit 4 will be Awareness raising and capacity building of local stakeholders. Awareness raising and capacity building in EbA and gender approach and CRVC are mainstream in all the components to strengthen capacities to integrate climate change adaptation into planning and actions. In component 1, activities focus on the beneficiaries - they will be trained and supported through the activities 1.1.1 and 1.1.3.

Ancient knowledge and local expertise will be integrated through the activities 1.2.1. Local reflecting capacities, community monitoring and reporting will be trained and supported in activity 1.2.2. Institutional capacities will be reinforced through Component 3 and Component 2. In activities 2.1.2 EPS officials will receive technical assistance and training and in activity 2.1.3. Microfinance company officers also will be trained.

Within Component 3, activity 3.1.1 public officials will be trained and in activity 3.1.2 support will be provided to strengthen monitoring systems so that lessons learned can be incorporated into decision-making processes.

Table 61: Summary of project social co-benefits and their contribution to the SDGs

SDG	Relevant SDG target	How the project contributes to SDG
SDG 13 Take urgent action to combat climate change and its impacts	Target 13.3 Improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning.	Through the project activities lessons learned will be systematized and provided to increase awareness raising and promote replication of proven interventions. By recovery ancient knowledge and strengthened institutional and human capacities to mainstream EbA and CRVC, the project will contribute to systematic learning culture and ensuring that generated knowledge informs others in an engaging and accessible manner. Supporting community monitoring at the base of the project monitoring system will contribute to national monitoring systems and will help incorporate lessons learned into local and national decision making.

13.5 **Gender Co-benefits**

Gender is an important aspect when considering climate change vulnerabilities and adaptation in the context of agriculture and environment. The mainstreaming of gender approach within all the project activities will promote gender equality. For this purpose, the project includes a gender action plan with specific activities and indicators that will measure the application of gender approach in a cross-cutting manner.

Co-benefit 5 “Gender sensitive approaches mainstreamed in EbA and CRVC measures” will be measured trough the indicator “Number of innovative Local initiatives (including EbA and CRVC) with a gender-sensitive approach implemented”.

The impact of designing local initiatives with a gender-sensitive approach will reflect on the equally enhancing for men and women of benefits in the local economy. This will be measured in co-benefit 3 “Improvement of local economy through better economic opportunities and poverty reduction”, where the indicator designed to measure this co-benefit will be “Number of producers, of whom 50% are women have confirmed an improvement in their income from Climate Resilient Value Chains”.

The project’s contribution to the SDG’s is presented in the table below (from a gender point of view):

Table 62: Summary of project gender co-benefits and their contribution to the SDGs

SDG	Relevant SDG target	How the project contributes to SDG
SDG 5 Achieve gender equality and empower all women and girls	Target 5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life	Measures have been designed to promote greater participation and leadership of women, such as minimum participation quotas, as well as indicators that measure women's participation in decision-making process and the economic benefits of Local initiatives.

14 Project Risk and Mitigation Approaches

For probability: High has significant probability, Medium has moderate probability, Low has negligible probability

For impact: High has significant impact, Medium has moderate impact, Low has negligible impact

Prohibited practices include abuse, conflict of interest, corruption, retaliation against whistle-blowers or witnesses, as well as fraudulent, coercive, collusive, and obstructive practices

The following table provides an overview of the main technical and operational, financial and governance risks associated with the project. Avoidance and/or mitigation measures are also presented for each risk.

Table 63: Overview of Project Risks

Insufficient financing may put at risk the long-term sustainability of the public or private investment		
Category	Probability	Impact
Technical and operational	Low	Medium
Description		
Insufficient public or private financial flows may put at risk the long-term sustainability of the project. Market intake for EbA measures and Climate Resilient Value Chains, especially those promoted via microfinancing may be insufficient. Fluctuations in the market value of cash products (e.g., South American camelid fiber, quinoa) may limit economic activity and entrepreneurship.		
Mitigation Measure(s)		
From project onset, activities will focus on increasing engagement of private entities (hydroelectric generation enterprises, agribusiness, cement, beverage, fiber and other industry) to leverage and mobilize resources for EbA and CRVC. A communication strategy will be developed to make the case for potential expected losses in these industries if Puna ecosystems are not conserved. Public funding will be increased by building official capacities in MIDAGRI and SERNANP and triggering operation and improving functionality of the hydrological MERESE scheme. The promotion of microfinancing for EbA will be done at both the offer and the demand side. Once microfinance institutions are trained in adjusting existing and/or developing microcredits to support EbA measures and/or Climate Resilient Value Chains they will continue promoting through their own channels. Local communities, producers' associations, cooperatives, MSEs, community enterprises and producers' organizations will be strengthened on business development and access to finance (including financial literacy) to ensure successful income-generating activities. Income diversification will be promoted through technical and financial support to avoid over indebtedness and stimulate investment.		

Local stakeholders are not sufficiently organized, engaged and interested in participating in the project

Category	Probability	Impact
Technical and operational	Low	Low
Description		
Participation from local stakeholders in the project activities may not be as high as expected due to the lack of interest due to the lack of interest This could happen due to various factors, e.g., not seeing the value of EbA measures or the perception that the Puna Facility does not have an added value to the region. Moreover, there is a risk of 'consultation fatigue' in the districts where other initiatives may have taken place.		
Mitigation Measure(s)		
The project has been designed in close coordination with key local stakeholders, and local consultations with potential project beneficiaries have been caried out to ensure that their interests and views are being addressed in the project. Continuous engagement with relevant stakeholders at all levels will help promote dialogue and ongoing capacity building to facilitate the engagement. The project will develop adequate communication and engagement strategies to ensure reaching out and continuously communicating to stakeholders and potential project beneficiaries about the project interventions throughout the planed project implementation. In addition, the project will emphasize documentation and dissemination of information to facilitate capacity building and knowledge exchange among local stakeholders, which will foster interest in participating in the project activities.		

Coordination among regional government stakeholders is insufficient to sustain project results		
Category	Probability	Impact
Technical and operational	Low	Low
Description		
Coordination among government stakeholders is insufficient and the lack of interest and ownership of the project may limit the sustainability of project results.		
Mitigation Measure(s)		
The project is aligned with the priorities of the Government of Peru, and it has been developed in close coordination with Government institutions that will have a key role in its implementation, e.g., MIDAGRI and Profonanpe. Extensive consultations and meetings with government actors and key stakeholders have been carried out during the project design phase. Component 3 of the project will be focusing on strengthening multilevel governance to ensure that the national institutions will have the technical capacity needed to carry out the activities after project completion.		

Risk of continuity due to political instability		
Category	Probability	Impact
Governance	Low	Medium
Description		
The project is constructed on the assumption of sustained commitment from the Government of Peru to fulfil its NDC goals and from MIDAGRI to continue its open and proactive engagement. Political instability in Peru may affect project continuity.		
Mitigation Measure(s)		
GIZ has carried out a consistent engagement process since it was requested to support the Peruvian government to access GCF financing for this project and will continue to do so throughout project inception and implementation. This approach provides a great strength that allows the project to persist		

despite the changes in government administration and ensures continuity, as it can be evidenced from the recent change in administration without affecting the project construction process.

Maladaptation and degradation of ecosystems and social structures		
Category	Probability	Impact
Technical and operational	Medium	Medium
Description		
Improved economic opportunities in the SHAP may lead to increased pressure on ecosystems (e. g., number of cattle heads increases as a result of business-oriented approaches). Moreover, the support to certain Value chains such as crops may result in maladaptation if they contributed to ecosystems degradation (e.g., use of pesticides). Social structures may continue to deteriorate because of increased ecosystem degradation.		
Mitigation Measure(s)		
All proposed agricultural interventions are intended to increase productivity while ensuring that the carrying capacity of Puna ecosystems is not exceeded. The promotion of sustainable landscape management practices, soil amendments, ancestral and modern technologies for water and soil conservation, exclusion zones and communal reserves, among others, will ensure resource conservation for future generations. Business activities will focus on increasing economic output while decreasing environmental impact. The diagnostic for planning will start from local social characteristics and cultural values that could have an influence on risks and environmental dynamics. Social structures will be strengthened through Outputs 1.2 and 3.1., bringing local successful experiences into planning and decision-making at macro scales. Project beneficiaries will be trained on community-based monitoring processes and indicators. Ecosystem-monitoring capacities of the communities and government partners will be reinforced, integrating the best available science to determine limits in carrying capacity or intensity of agricultural activities.		

Difficulties and delays in unlocking technical and financial support		
Category	Probability	Impact
Technical and operational	Medium	Low
Description		
Access to MIDAGRI programs as well as technical and financial support from the Puna Facility will be on a voluntary basis. This may limit the ability of the project to meet its targets or have sufficient concentration of interventions to show tangible results. Unlocking of public financing via MERESE schemes may require lengthy negotiations beyond the life of the project.		
Mitigation Measure(s)		
MIDAGRI has committed about 35 percent of project funds. Through the improved coordination obtained from component 3, a more streamlined approach for execution of MIDAGRI's funds will be operational. The project will provide support for project beneficiaries and MIDAGRI officers to facilitate the communication materials for the application process. Complementarity will be ensured with the Puna Facility through the project's Governance Structure as the Project Steering Committee and Project Management Committees will have an active role within the governance structure of the Facility. Participation of all relevant stakeholders (GIZ, Profonanpe, MIDAGRI, MINAM) since project conceptualization is ensuring alignment throughout preparation, planning and execution of activities to meet targets. Lessons learned from project execution will be integrated into the procedures of the coordination unit. Local initiatives implementation will be supported by Technical Assistance and in some cases by the support of qualified CSOs and financed by the Puna Facility will be planned as to maximize concentration of positive impacts on ecosystem services. Concerning the MERESE mechanisms, the project will work in watersheds with potential of MERESE at different stages of evolution. Through a systematic and modular approach, the project will build capacities in EPS according to their needs. Those		

who are already collecting tariffs but do not know how to plan, design, develop, and implement interventions, will be invited to contribute to the Puna facility. For those MERESE where agreements between parties have not been reached, support will be provided to negotiate and finalize such agreements. All this will unlock immediate funds for implementation. EPS in earlier stages will take longer to fund activities but through the gained experience in the modular approach a speedier process will result.

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16 Appendices

Appendix I- Methodology for historic and future climate change trends

16.1 Historical trend analysis

Historical trends were examined for extreme weather indices, temperature, precipitation and discharge data using the non-parametric rank-based Mann-Kendall (MK) test (Kendall, 1975; Mann, 1945). This approach was chosen because it makes no assumption about the distribution of the data. Hence, this distribution-free test is useful for monotonic trend detection, because hydro-climatic series are not normally distributed. In addition, because the MK test is based on sign differences rather than values, it is robust to the effect of extreme values and outliers (Helsel and Hirsch, 2002). This test was found to be an excellent tool in similar applications by various researchers. For example, Burns et al. (2007) applied the MK test for trend detection in temperature, precipitation and runoff in New York State, USA. The MK test is based on the difference ($x_i - x_j$) between successive years of data for a given period. A test statistic (S) is estimated as the summation of signs (–1; 0; +1) as:

$$S = \sum_{i=1}^{n-1} \sum_{i=j=i+1}^{n} sign(xi - xj)$$

A Z value is then computed to estimate the significance level of the trend. The significance level will increase with number of identical successive signs. In this work, in order to differentiate the confidence associated with each statistic, the significance level $p < 0.01$ or 99% confidence level, was used. The slope of each trend was estimated using the non-parametric Sen method (Sen 1968), which calculates the median of all possible pairwise slopes, referred to hereafter as Sen's slope (Helsel and Hirsch, 2002). A positive value of Sen's slope indicates an upward trend (i.e. increasing with time), whereas a negative value indicates a downward trend (i.e. decreasing with time).

Future trends are expressed by comparing future means (2035-2065) with historical means using the following reference periods (1981-2005 mean base period for T and P, 1981-2020 for FD, R10 and SPI3 and 1982-2016 for discharge).

For precipitation (P), maximum temperature (Tx), minimum temperature (Tn), discharge (Q) and drought (SPI3) analysis are made in annual averages and seasonal averages (SPI3 only summer). Extreme event indices are analysed at the annual level.

Seasons are referred to astronomical seasons for the southern hemisphere, in other words, austral seasons, which are summer (DJF), autumn (MAM), winter (JJA) and spring (SON).

16.2 Projections

Annual and seasonal climatologies of Tx, Tn and Pr were calculated for the HISTORICAL experiment (from 1981 to 2005), RCP4.5 and RCP8.5 (from 2036 to 2065 in both scenarios). Both climatologies were compared to generate the changes that would occur in the variables analyzed through a subtraction of their annual and seasonaly climatologies; that is, Equations 1 and 2 were used.

Equation 1

$$\Delta Ti = \bar{Ti}(2036\text{-}2065) - \bar{Ti}(1976\text{-}2005)$$

Where,

ΔTi = Average annual temperature change to 2050 (2036-2065) compared to 1976-2005 in the temporal aggregation i (monthly, annual, seasonal, semi-annual, etc.) in °C.

$\overline{Ti}$**(2036-2065)** = Multi-year average temperature in the years 2036-2065 in the temporal aggregation i (monthly, annual, seasonal, semi-annual, etc.) in °C.

$\overline{Ti}$**(1976-2005)** = Multi-year average temperature in the years 1976-2005 in the temporal aggregation i (monthly, annual, seasonal, semi-annual, etc.) in °C.

Equation 2:

$$\Delta Pi = \frac{\overline{Pi}(2036-2065) - \overline{Pi}(1976-2005)}{\overline{Pi}(1976-2005)} * 100\%$$

Where

ΔPi = Change in multiannual average rainfall to 2050 (2036-2065) compared to 1976-2005 in i (monthly, annual, seasonal, semi-annual, etc) en %.

$\overline{Pi}$**(2036-2065)** = Multi-year average of precipitation in the years 2036-2065 in i (monthly, annual, seasonal, semi-annual, etc) en mm.

$\overline{Pi}$**(1976-2005)** = Multi-year average of precipitation in the years 1976-2005 in i (monthly, annual, seasonal, semi-annual, etc) en mm.

16.3 Equations used to calculate trends and their significance

Sen Slope

If there is a linear trend in a time series, then the "correct" slope can be estimated using a non-parametric procedure developed by Sen (1968) (Drápela & Drápelová, 2011)

The linear model is written as follows:

$$f(t) = Qt + B$$

Where, Q is the slope and B is the constant. To estimate the slope Q, the slopes of all pairs are calculated with the following equation:

$$Q_i = \frac{x_j - x_k}{j - k}, i = 1,2,\ldots.N, j > k$$

The slope estimator Sen is the median of these N value of Qi; that, is as follows:

$$Q = \begin{cases} Q_{\frac{N+1}{2}} \\ \frac{1}{2}\left(Q_{\frac{N}{2}} + Q_{\frac{N+2}{2}}\right) \end{cases}$$

Then, a 100 (1-α)% confidence interval is obtained around the slope with a non-parametric technique based on normal distribution. This method is valid if N is small, unless there are many bindings. To obtain the value of B, the original equation is solved from the equation of the original model of the slope of Sen, with which it remains to calculate xi - Qti. The median

of the values obtained would be the estimated B. Estimates for the constant B at 99% and 95% confidence intervals are calculated in a similar way (Drápela & Drápelová, 2011).

Mann Kenall test

The computational procedure for this test is as follows: the data values are considered as an ordered time series. Each value is compared with all the subsequent data values. If a data value from a later time period is greater than the data value from a previous time series, the S statistic increases by 1. However, if the data value from a later time period is less than the previous data, S decreases by 1 (Drápela & Drápelová, 2011). The net result of all these provides the final value of the statistic S. Thus, the calculation is shown with the following equation and function:

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^{n} sgn(x_j - x_k)$$

$$sgn(x_j - x_k) = \begin{cases} +1 & if \quad x_j - x_k > 0 \\ 0 & if \quad x_j - x_k = 0 \\ -1 & if \quad x_j - x_k > 0 \end{cases}$$

Functions used in the Mann-Kendall test when there are less than 10 data points. xj and xk are the annual values in years j and k (j is greater than k).

For series of less than 10 data, the S test is used and for time series with 10 or more data, a normal approximation given by the calculation of Z is used. The variance in this case, is calculated as shown in Equation 6, where q is the number of linked groups and tp is the number of data in the p-th group.

$$VAR(S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{q} t_p(t_p - 1)(2t_p + 5) \right].$$

$$Z = \begin{cases} \dfrac{S-1}{\sqrt{VAR(S)}} & if \ S > 0 \\ 0 & if \ S = 0 \\ \dfrac{S+1}{\sqrt{VAR(S)}} & if \ S < 0 \end{cases}$$

Where, xj and xk are the annual values in years j and k (j is greater than k). A positive value of Z indicates a positive trend; while a negative value will indicate a negative trend. The Z statistic has a normal distribution. To find out or test whether it has a positive or negative monotonic trend at a significance level α, Ho is rejected if:

$$|Z| > Z_{1-\alpha/2}$$

Where, Z1-α / 2 is obtained from cumulative normal distribution tables.

Appendix II- Project intervention districts

UBIGEO	DEPARTAMENTO	PROVINCIA	DISTRITO	TIPOLOGIA DE AGRICULTURA FAMILIAR				Priorización 7.06
				AFS subsistencia Pobreza Extrema	AFT_I Transicion I Pobreza	AFT_II Transición II Riesgo de caer en pobreza extrema	AFC probabilidad de caer en condición de pobreza menor al 10%	
030101	APURIMAC	ABANCAY	ABANCAY	1366	292	276	77	Elegible Puna facility
030103	APURIMAC	ABANCAY	CIRCA	493	84	71	27	Fortalecimiento de capacidades
030104	APURIMAC	ABANCAY	CURAHUASI	2545	497	427	101	Fortalecimiento de capacidades
030106	APURIMAC	ABANCAY	LAMBRAMA	968	125	105	56	Elegible Puna facility
030107	APURIMAC	ABANCAY	PICHIRHUA	924	125	97	28	Fortalecimiento de capacidades
030109	APURIMAC	ABANCAY	TAMBURCO	368	86	62	19	Elegible Puna facility
030301	APURIMAC	ANTABAMBA	ANTABAMBA	440	133	159	80	Elegible Puna facility
030303	APURIMAC	ANTABAMBA	HUAQUIRCA	215	60	50	29	Elegible Puna facility
030305	APURIMAC	ANTABAMBA	OROPESA	254	91	74	61	Elegible Puna facility
030501	APURIMAC	COTABAMBAS	TAMBOBAMBA	1958	212	138	40	Fortalecimiento de capacidades
030503	APURIMAC	COTABAMBAS	COYLLURQUI	1653	121	38	11	Fortalecimiento de capacidades
030504	APURIMAC	COTABAMBAS	HAQUIRA	1777	103	89	20	Elegible Puna facility
030506	APURIMAC	COTABAMBAS	CHALLHUAHUACHO	836	100	44	18	Fortalecimiento de capacidades

030701	APURIMAC	GRAU	CHUQUIBAMBILLA	810	178	113	59	Elegible Puna facility
030702	APURIMAC	GRAU	CURPAHUASI	499	71	36	12	Fortalecimiento de capacidades
030703	APURIMAC	GRAU	GAMARRA	851	176	85	18	Fortalecimiento de capacidades
030704	APURIMAC	GRAU	HUAYLLATI	545	28	14	0	Fortalecimiento de capacidades
030705	APURIMAC	GRAU	MAMARA	174	33	18	16	Fortalecimiento de capacidades
030706	APURIMAC	GRAU	MICAELA BASTIDAS	232	52	27	10	Fortalecimiento de capacidades
030707	APURIMAC	GRAU	PATAYPAMPA	181	51	17	2	Elegible Puna facility
030708	APURIMAC	GRAU	PROGRESO	369	39	27	7	Elegible Puna facility
030711	APURIMAC	GRAU	TURPAY	202	49	27	11	Fortalecimiento de capacidades
030714	APURIMAC	GRAU	CURASCO	301	38	28	11	Fortalecimiento de capacidades
040404	AREQUIPA	CASTILLA	CHACHAS	89	97	88	23	Elegible Puna facility
040406	AREQUIPA	CASTILLA	CHOCO	209	110	78	19	Elegible Puna facility
040408	AREQUIPA	CASTILLA	MACHAGUAY	73	58	104	59	Fortalecimiento de capacidades
040409	AREQUIPA	CASTILLA	ORCOPAMPA	145	76	99	58	Elegible Puna facility
040410	AREQUIPA	CASTILLA	PAMPACOLCA	255	173	267	114	Fortalecimiento de capacidades
040414	AREQUIPA	CASTILLA	VIRACO	198	143	203	67	Fortalecimiento de capacidades
040501	AREQUIPA	CAYLLOMA	CHIVAY	478	129	94	33	Fortalecimiento de capacidades
040502	AREQUIPA	CAYLLOMA	ACHOMA	270	157	152	54	Fortalecimiento de capacidades

040503	AREQUIPA	CAYLLOMA	CABANACONDE	696	392	329	84	Fortalecimiento de capacidades
040506	AREQUIPA	CAYLLOMA	COPORAQUE	451	159	90	24	Fortalecimiento de capacidades
040509	AREQUIPA	CAYLLOMA	ICHUPAMPA	187	131	109	33	Fortalecimiento de capacidades
040510	AREQUIPA	CAYLLOMA	LARI	261	134	125	48	Fortalecimiento de capacidades
040511	AREQUIPA	CAYLLOMA	LLUTA	429	400	407	79	Fortalecimiento de capacidades
040512	AREQUIPA	CAYLLOMA	MACA	504	144	120	28	Fortalecimiento de capacidades
040513	AREQUIPA	CAYLLOMA	MADRIGAL	237	99	131	27	Fortalecimiento de capacidades
040518	AREQUIPA	CAYLLOMA	TUTI	176	65	53	24	Fortalecimiento de capacidades
040519	AREQUIPA	CAYLLOMA	YANQUE	320	81	52	18	Elegible Puna facility
040603	AREQUIPA	CONDESUYOS	CAYARANI	128	48	48	6	Elegible Puna facility
040604	AREQUIPA	CONDESUYOS	CHICHAS	58	64	89	49	Fortalecimiento de capacidades
040607	AREQUIPA	CONDESUYOS	SALAMANCA	150	107	113	6	Elegible Puna facility
040801	AREQUIPA	LA UNION	COTAHUASI	345	134	99	21	Elegible Puna facility
040806	AREQUIPA	LA UNION	PUYCA	576	167	90	15	Elegible Puna facility
080201	CUSCO	ACOMAYO	ACOMAYO	1162	183	98	22	Elegible Puna facility
080305	CUSCO	ANTA	HUAROCONDO	1700	208	153	38	Elegible Puna facility
080306	CUSCO	ANTA	LIMATAMBO	1677	224	121	33	Elegible Puna facility
080307	CUSCO	ANTA	MOLLEPATA	616	146	99	30	Fortalecimiento de capacidades

080401	CUSCO	CALCA	CALCA	1430	562	627	139	Elegible Puna facility
080403	CUSCO	CALCA	LAMAY	1119	141	72	16	Elegible Puna facility
080404	CUSCO	CALCA	LARES	2009	186	90	19	Elegible Puna facility
080405	CUSCO	CALCA	PISAC	1453	166	81	11	Elegible Puna facility
080406	CUSCO	CALCA	SAN SALVADOR	1503	100	46	5	Elegible Puna facility
080505	CUSCO	CANAS	LAYO	1012	234	181	54	Elegible Puna facility
080601	CUSCO	CANCHIS	SICUANI	4288	541	319	53	Elegible Puna facility
080602	CUSCO	CANCHIS	CHECACUPE	854	130	114	46	Elegible Puna facility
080604	CUSCO	CANCHIS	MARANGANI	2074	165	92	34	Elegible Puna facility
080605	CUSCO	CANCHIS	PITUMARCA	1014	180	108	32	Elegible Puna facility
080606	CUSCO	CANCHIS	SAN PABLO	1100	137	69	26	Elegible Puna facility
080701	CUSCO	CHUMBIVILCAS	SANTO TOMAS	3560	390	234	77	Elegible Puna facility
080706	CUSCO	CHUMBIVILCAS	LLUSCO	947	31	9	4	Fortalecimiento de capacidades
080708	CUSCO	CHUMBIVILCAS	VELILLE	1081	206	116	36	Fortalecimiento de capacidades
080908	CUSCO	LA CONVENCION	SANTA TERESA	1137	380	312	39	Fortalecimiento de capacidades
081101	CUSCO	PAUCARTAMBO	PAUCARTAMBO	1625	439	360	90	Elegible Puna facility
081103	CUSCO	PAUCARTAMBO	CHALLABAMBA	1446	208	91	28	Elegible Puna facility
081204	CUSCO	QUISPICANCHI	CCARHUAYO	592	65	66	26	Elegible Puna facility

081206	CUSCO	QUISPICANCHI	CUSIPATA	1047	161	90	20	Elegible Puna facility
081209	CUSCO	QUISPICANCHI	MARCAPATA	804	148	102	42	Elegible Puna facility
081210	CUSCO	QUISPICANCHI	OCONGATE	2646	338	249	65	Elegible Puna facility
081212	CUSCO	QUISPICANCHI	QUIQUIJANA	2114	259	131	24	Elegible Puna facility
081301	CUSCO	URUBAMBA	URUBAMBA	1419	437	406	65	Fortalecimiento de capacidades
081306	CUSCO	URUBAMBA	OLLANTAYTAMBO	1430	383	311	60	Elegible Puna facility
081302	CUSCO	URUBAMBA	CHINCHERO	1328	455	379	41	Fortalecimiento de capacidades
210209	PUNO	AZANGARO	POTONI	292	131	128	29	Elegible Puna facility
210301	PUNO	CARABAYA	MACUSANI	354	82	117	128	Elegible Puna facility
210302	PUNO	CARABAYA	AJOYANI	38	18	26	14	Elegible Puna facility
210305	PUNO	CARABAYA	CORANI	472	66	59	35	Elegible Puna facility
210306	PUNO	CARABAYA	CRUCERO	210	84	78	42	Elegible Puna facility
210802	PUNO	MELGAR	ANTAUTA	484	143	123	22	Elegible Puna facility
210806	PUNO	MELGAR	NUÑOA	235	141	195	135	Elegible Puna facility
210808	PUNO	MELGAR	SANTA ROSA	554	175	160	53	Elegible Puna facility
211202	PUNO	SANDIA	CUYOCUYO	932	44	14	2	Elegible Puna facility
151021	LIMA	YAUYOS	MIRAFLORES	12	20	16	40	Elegible Puna facility
40119	AREQUIPA	AREQUIPA	SAN JUAN DE TARUCANI	No tiene registro	No tiene registro	No tiene registro	No tiene registro	Elegible Puna facility

40514	AREQUIPA	CAYLLOMA	SAN ANTONIO DE CHUCA	2	2	2	1	Elegible Puna facility
40804	AREQUIPA	LA UNIÓN	HUAYNACOTAS	495	267	129	40	Elegible Puna facility
40805	AREQUIPA	LA UNIÓN	PAMPAMARCA	249	74	82	33	Elegible Puna facility
151007	LIMA	YAUYOS	CARANIA	32	19	10	9	Elegible Puna facility
151018	LIMA	YAUYOS	LARAOS	63	51	58	28	Elegible Puna facility
151030	LIMA	YAUYOS	TOMAS	55	12	14	3	Elegible Puna facility

Appendix III- Relevant Baseline Projects and programmes in the Sector

What are the key baseline projects at in the country? Baseline projects include recent and ongoing projects. Include specific mention (as relevant) of GEF, Adaptation Fund, CIF and NAMA projects, as well as donor projects (bilaterals (including GIZ)), UN, World Bank, development banks, etc.).

Table 64: Baseline projects and programmes

Project Title: Ecosystem Based Adaptation in Mountain Ecosystems (UNDP/IUCN)	
Funding entity	BMU (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany) through the International Climate Initiative (IKI).
Implementing partners	International Union for Conservation of Nature and Natural Resources (IUCN) - Switzerland United Nations Development Programme (UNDP)
Timeframe	11/30/2010 to 6/29/2016
Total budget	11.500.000,00 € (including co-financing)
Geographical scope	Mountain areas in Uganda, Nepal, Perú (Nor Yayos-Cochas Landscape Reserve (Lima and Junin Regions))
Project objectives and components	**Objective:** to strengthen national, regional and local capacities to implement EbA measures and reduce community vulnerability, emphasizing mountain ecosystems. **Component 1: Development of EbA tools and methodologies** The EbA approach was conceptualized and methodologies necessary to implement the project and for decision-making (basic criteria for site selection for example) were developed in a toolbox. Methodologies highlighted the importance of local participation in the process of designing and implementing the measure for sustainability. **Component 2: Application of methodologies and tools at ecosystem-level** Identification of areas to implement EbA measures within the NorYauyos-Cochas reserve through a series of water and agriculture vulnerability studies, adaptation capacity assessments and stakeholder mapping. **Component 3: Implementation of pilot EbAs at ecosystem-level** This included communication and sensitization, capacity-building, the implementation of EbA measures, monitoring and evaluation in the prioritized areas, participatory development of planning instruments for communities, for the protected area and for the involved regional government. **Component 4: Promotion of EbA at national levels and mainstreaming into planning processes.** This consisted of a communications and dissemination strategy, presenting arguments in favor of the EbA approach, such as a cost-benefit analysis of EbA measures. Actions promoted integration of EbA in national and regional strategies, programs and policies for adaptation to climate change.
Linkage/relevance for GCF project	This project serves as a “pilot” for this GCF project. The proposed GCF project builds on the lessons learnt from this first project, specifically regarding the planning process and implementation of EbA measures for better water management and agriculture in the Andes, resulting in enhanced community resilience. The Puna Facility, established under Activity 2.1.1 of this project will also fund EbA activities. Moreover, in a similar manner to the UNDP/IUCN project, this GCF project’s component 3 proposes activities such as strengthening territorial and governance processes through integrating EbA

	measures and strengthening participatory sectoral platforms for scaling up EbA measures.
Achieved results / impacts	• Improved water availability and management, as well as the rehabilitation of grasslands in Canchayllo and Miraflores, with knock-on benefits on biodiversity. • Three prioritized EbA actions in three pilot sites: a) management of vicuñas for the extraction of animal fibre. b) Community management of natural grasslands, including livestock c) sustainable water resources management, including rehabilitation of ancestral water infrastructure and restoration of wetlands and grasslands (UNDP, 2014). • Strengthened local capacities and knowledge related to climate adaptation and the importance of ecosystem services. This includes park rangers, small landowners and municipal-level workers. • Creation of interest groups and committees made up of academics and rural communities that has reinforced locally led action. • Validity of EbA as an adaptation measure to be invested in at regional and national levels as well as "proof-of-concept". (UNDP, IUCN, UNEP and Mountain Institute, 2016) • The EbA approach was incorporated into subnational and national policy instruments, such as the Junin and Lima Regional strategy to face climate change, climate change law, INDC, among others.

Project Title: Seventh Operational Phase of the GEF Small Grants Programme in Peru (UNDP)	
Funding entity	GEF-7
Timeframe	48 months (4 years)- Approved for Implementation June 2021.
Total budget	6,337,319 USD GEF grant: 1,959,132 USD.
Geographical scope	Regions of Arequipa, Cusco and Puno (Peru national level)
Project objectives and components	**1. Resilient landscapes for sustainable development and global environmental protection** 1.1. Biodiversity and ecosystem services within Andean landscapes are enhanced through multifunctional land-use systems. 1.1.1 Community level small grants that improve connectivity, support innovation regarding biodiversity conservation and optimization of ecosystem services, including sustainable use of biodiversity; community-managed natural regeneration of native vegetation; participatory environmental planning and monitoring, etc. 1.2. The sustainability of production systems in the target landscapes for biodiversity conservation and optimization of ecosystem services in the face of climate change is strengthened through integrated agro-ecological practices. 1.2.1. Targeted community projects enhancing ecosystem services and the sustainability and resilience of production systems in the face of climate change, including soil and water conservation practices, pasture and agroforestry systems, conservation of agrobiodiversity; agro-ecological practices and cropping systems.

	1.3. Livelihoods of communities in the target landscapes are improved by developing eco-friendly products and small-scale community enterprises and improving market access. 1.3.1. Targeted community projects promoting sustainable livelihoods, biodiversity-enhancing businesses, and market access, including (agro)biodiversity products; agrobusinesses integrated into value chains. **2. Capacity building, knowledge management for upscaling and replication** 2.1. Multi-stakeholder governance platforms strengthened/in place for improved governance of Andean landscapes for effective participatory decision making to achieve landscape resiliency. 2.1.1. A multi-stakeholder governance platform in each target landscape develop / update and execute multistakeholder landscape agreements; adaptive landscape management plans; value-chain development strategies for agroecological products. 2.1.2. A landscape strategy developed/updated by multistakeholder platform for each target landscape to enhance socioecological resilience through community grant projects (including agreed typology of community level projects) 2.2. Mainstreaming and upscaling the contribution of local communities to landscape resilience, conservation, and connectivity 2.2.1. Knowledge from innovative project experience is shared for replication and upscaling across the landscapes, across similar contexts in the Andes, and to the global SGP network. 2.2.2. Strategic initiatives are supported to upscale successful SGP experiences and innovations
Linkage/relevance for GCF project	**Both programmes fund EbA interventions to enhance ecosystem services with agricultural and economic benefits in mind.** This GEF Small Grants Programme in the Peruvian Andes seeks to address very similar challenges through providing small grants (5000-50,000 USD) for community-led projects in biodiversity conservation, improvement of ecosystem services, as well as improving agricultural value chains through soil and water conservation practices. The Puna Facility will fund similar activities to those of the GEF Small Grants programme. It is important to note, however, that the Puna Facility will fund EbA activities and climate-resilient value chains specifically if they have a climate adaptation purpose, rather than a conservation/agricultural development one.
Achieved results / impacts	The programme is in its Seventh Operational phase. The mid-term review for the Sixth Operational phase noted that the programme was especially successful in creating multi-stakeholder platforms called Strategic Landscape Platforms. These support participatory planning and adaptive management of landscapes, and are composed of 6-9 members, including community platforms, local authorities, and private sector. (UNDP, 2019).

Project Title: Sustainable Management of Agro-Biodiversity and Vulnerable Ecosystems Recuperation in Peruvian Andean Regions Through Globally Important Agricultural Heritage Systems (GIAHS) Approach (FAO)	
Funding entity	GEF-6
Timeframe	4 years. Approved for Implementation January 2018, still under implementation due to delays because of Covid-19.

Total budget	88,984,386 USD (including co-financing) GEF grant amount: 9,369,864 USD
Geographical scope	Puno, Apurimac, Cusco, Huancavelica, and Arequipa
Project objectives and components	**1. Integrated Landscape Management and agrobiodiversity conservation in Andean Regions of Peru** 1.1. Agrobiodiversity is conserved in-situ and sustainably used through integrated natural resource management and the payment for the environmental services (PES) generated in functional services. 1.2. Andean forests in productive landscapes are sustainably managed and/or naturally restored and provide ecosystem services for agrobiodiversity conservation. **2. Development of markets for agrobiodiversity products to support conservation and sustainable use and local rural livelihoods.** 2.1. The marketing of agro-BD products has been enhanced to support the sustainable use of agro and rural livelihoods. **3. Institutional and policy strengthening to mainstream agro-biodiversity conservation and sustainable use into operational frameworks.** 3.1. Existing sectorial policies, regulatory frameworks, financing mechanisms and assistance programs have mainstreamed agroBD conservation and sustainable use in a harmonized manner. 3.2. Information on natural resource and agroBD management in Andean productive landscapes, including GIAHS (Globally Important Agricultural Heritage Systems), has been systematised to support decision-making and planning in Peru. **4. Monitoring, evaluation, and dissemination of project information** 4.1. Project implementation based on results-based management and lessons learned/good practices documented and disseminated.
Linkage/relevance for GCF project	**Both projects use PES schemes to enhance ecosystem services in the region.** Activity 2.1.2 of the proposed GCF project will strengthen capacities to develop and implement PES mechanisms for EbA in high Andean ecosystems, particularly for public water utilities. This will be done by providing technical assistance to develop/ improve payment for PES schemes in the sub-project areas and supporting the development of innovative PES schemes. Sub-activity 2.1.2.2. will also establish a methodology for calculating carbon in the Puna ecosystem and lay the groundwork for carbon accounting and credit systems for future trade, including legal and institutional arrangements. At a Puna Facility level, Local initiatives will be encouraged to leverage supplementary finance from government MERESE (PES) schemes. Similarly, this FAO project's strategy to manage landscapes includes PES schemes for the following services: carbon sequestration and storage from native relict forests, watershed protection, biodiversity conservation, and the protection of landscape beauty. At the community level, these PES schemes are operationalized through participatory Management Plans for Andean forests. Profonanpe is also implementing this project, meaning that knowledge and lessons learnt from implementing PES schemes can be leveraged during activity 2.1.2.2 to support the development of innovative PES mechanisms. Besides the existing synergies for the implementation of PES schemes, this project also generated a wealth of traditional knowledge on agrobiodiversity in

	the region. The proposed GCF Project will use the technical information on agrobiodiversity derived from the GIAHS FAO project in the regions of Puno, Apurímac and Arequipa to inform the implementation of EbA measures and making agricultural value chains more resilient. For example, the GIAHS FAO project identified several native potato species and their adaptability to different climates and altitudes in the Apurímac region and leveraged traditional knowledge to record cultivation techniques. The project compiled and organized traditional knowledge on the production potato and other crops' throughout the year (using communities' calendars) in two reports that were shared and used in schools and by local communities. Similarly, information on climate indicators and climate adaptation into locally-sensitive informational material (e.g. a video in Quechua, Aimara, Spanish and English). This material can be used under Output 1.1 and Output 1.2 of this project to scale-up ancestral knowledge in the project intervention area and provide technical assistance to sub-project beneficiaries to strengthen the production of High Andean crops.
Achieved results / impacts	The project is still underway. In its mid-term evaluation, it was noted that Covid-19 had a great impact on the progress being made (FAO, 2021). In 2021, no progress had been made in terms of the area under payment agreements that maintain the supply of ecosystem services from forests, wetlands, and grasslands. 893Has in 2021 were under a ReSCA (remuneration for Agrobiodiversity Conservation Services) compensation mechanism specifically for agrobiodiversity conservation and implementing traditional management services.

Project Title: Conservation and Sustainable Use of High-Andrean Ecosystems through Compensation of Environmental Services for Rural Poverty Alleviation and Social Inclusion (IFAD)	
Funding entity	GEF-5
Timeframe	5 years (approved 2013)
Total budget	34,354,545 USD (including co-financing) Grant amount: 5,099,625 USD
Geographical scope	High Peruvian Andes – three watersheds: Cañete (Lima), Santa (Ancash) and Shullcas (Huancayo).
Project objectives and components	**Objective:** to protect and sustainably use High Andes ecosystems in Peru that provide environmental services, especially biodiversity and water, by transferring economic resources from downstream beneficiaries to upstream rural communities. **Component 1: Conservation and Sustainable management of high Andes ecosystems** Activities under this component include a) the conservation of relict forest land (*queues),* including the rehabilitation of degraded forest through participatory methods and forest inventories, b) rehabilitation and conservation of Andean wetlands, c) conservation and rehabilitation of shrublands and grasslands, d) improved management of forests and rehabilitation activities, e) promotion of sustainable agriculture, including riverbank protection. **Component 2: Improvement of the Institutional Framework for ecosystem services in Peru for Implementation of Payment for ecosystem services schemes.** Activities include the creation of three watershed committees that established 2 trust funds (Cañete and Santa) to provide incentives to environmental services provides. Activities included the capitalization of the trust funds,

	the definition of protocols and policies, the establishment of a national dialogue with relevant stakeholders and the development of a Law on Environmental Services.
Linkage/relevance for GCF project	This project can provide important information about the processes and lessons learned for implementing a PES scheme for watershed ecosystems. Under Activity 2.1.1, the Puna Facility will leverage innovative financial mechanisms such as a PES scheme.
Achieved results / impacts	• Legal and institutional framework for PES created at a national level. • Improved management of watershed ecosystems characteristic in the High Andes through 37 subprojects. 6 Territorial Management plans were created to support further activities. • Improved hydrological monitoring in the Cañete watershed. (IFAD, 2021)

Project Title: Peruvian Amazon Bio Business Facility (Profonanpe)	
Funding entity	GCF
Timeframe	Approved November 2022, implementation period of 10 years.
Total budget	10,000,000 USD GCF grant: 8,972,400
Geographical scope	Amazon biome, in the Amazonas, San Martin, Cusco, Puno, Loreto and Madre de Dios regions.
Project objectives and components	**Objective:** The Amazon Eco Bio Business Facility (EBBF) will provide effective climate change mitigation outcomes by investing in eco bio businesses (EBBs) supporting the sustainable management and conservation of Peruvian forests **Component 1: Strengthen technical and institutional capacities to design, implement and monitor EBBs towards nesting the EBBF under Peru's national REDD+ framework.** 1.1. Strengthened technical and institutional capacities to monitor and prevent deforestation and forest degradation. 1.2. Strengthened technical and institutional capacities to ensure the environmental and social integrity and sustainability of EBBs. **Component 2: Establishment and management on the Amazon Eco Bio Business Facility.** 2.1. Strengthened business case and productivity of EBBs. 2.2. Increased investor appetite for EBBs
Linkage/relevance for GCF project	This facility, managed by Profonanpe, provides repayable grants to EBBs that manage and conserve Peruvian forests in the Amazon, and provide mitigation benefits through enhancing carbon stocks. The Puna Facility, established under Activity 2.1.1 of this proposed project, will invest in Climate Resilient Value Chains through the development of businesses that increase SHAP communities' resilience to climate change, and/or reduce the negative impacts of existing livelihood strategies on the Puna ecosystem. The Puna Facility will also invest in EbA measures to adapt to climate change impacts in the intervention area. Both facilities are managed by Profonanpe, which will have gained capacity and knowledge on best practices and management through implementing the EBBF. However, the Puna Facility will fund climate adaptation activities in the Puna biome.

Achieved results / impacts	This project is still under implementation, but the EBBF aims to contribute to enhancing carbon stocks and avoiding the emission of 3.8 million tonnes of CO2, with an estimated cost of 2.63 USD / t CO2eq during its lifetime, and support REDD+ infrastructure in Peru.

Project Title: Strengthening Livelihood Diversification, Markets in Southern Peru	
Funding entity	IFAD
Timeframe	2005-2011
Total budget	34,400,000 USD IFAD financing: 24.59M USD
Geographical scope	Southern Andean rural areas.
Project objectives and components	**Objective:** Improve income in rural families through livelihood diversification Component 1: Natural Resource management Component 2: Strengthening local markets Component 3: Management of cultural knowledge and assets Component 4: Improved administrative and organisational capacity.
Linkage/relevance for GCF project	This GCF project will invest, through the Puna facility, in climate-resilient value chains. The facility will help establish new businesses or scale-up existing ones that increase resilience of SHAP communities or reduce the negative impacts from existing livelihood strategies. This GCF project will build on this project's achievements, as it demonstrated that the improvement of natural resources has economic benefits for rural communities. The project also developed participatory planning methods and favoured horizontal knowledge transfer amongst smallholder farmers and families, which will be furthered through the dissemination of EbA knowledge under 1.2.1 of this project.
Achieved results / impacts	• 12.6% reduction in poverty through diversified income and improvement of natural resources families have access to. This figure was obtained through a quantitative analysis using the National Agriculture Census and Household surveys, which showed a further decline in poverty in the clusters covered by the project. (IFAD, 2018) • Increased agricultural and livestock activity. • Enhanced local leadership. ▪ (IFAD, 2018)

Project Title: AYNINACUY- Strengthening the livelihoods for vulnerable highland communities in the provinces of Arequipa, Caylloma, Condesuyos, Castilla and La Union in the Region of Arequipa, Peru (Latin America Development Bank)	
Funding entity	Adaptation Fund
Timeframe	2018-2020
Total budget	2,941,446 USD (full grant amount).
Geographical scope	Districts in Arequipa Region, highland communities.
Project objectives and components	**Objective:** Strengthening the activity of obtaining and selling alpaca fibre through improved climate resilience

	Component 1: Implementation of measures designed to strengthen means of livelihood and income sources of vulnerable communities in the selected areas and implementation of complementary measures. 1.1. Specific livelihood strategies are strengthened in relation with climate change impacts (improved livestock and fibre production, protective fencing installed, increased fodder production, pasture rotation etc) 1.2. Water production and management is improved (installation of pressurised irrigation modules, construction of micro-dams, improved highland wetlands etc.) 1.3. Housing and water use improvements to protect human health. **Component 2: Strengthening and development of community and institutional capacities for the reduction of risks associated with losses due to climate change.** 2.1. Activities to raise awareness and to develop capacities and ownership regarding local processes for management and self-management of adaptation and climate risk reduction (e.g. participatory M&E plans, design of training modules in leadership and teamwork 2.2. Activities to raise awareness and develop capacities and ownership regarding local, community and institutional processes of adaptation and climate risk reduction. 2.3. Activities to raise awareness improve and transmit capacities for climate risk management and adaptive techniques.
Linkage/relevance for GCF project	Some of the sub-activities and techniques to improve livelihood strategies (e.g. pasture rotation) and water management are complementary to the EbA measures listed in the EbA catalogue of the proposed GCF project. This project is also an example of enhancing climate-resilient value chains in some of the target districts of the project, which will serve as a basis for the activities funded by the Puna Facility once it is established.
Achieved results / impacts	• Strengthened livelihoods through improved, wetlands and pastures, as well as increased forage. • Improved water management through improved rustic canals, pressurized irrigation modules, micro-damns, and irrigation water reservoirs. • Improved community and institutional coordination and capacity (Libélula, 2022)

Project Title: Resilient Andes (COSUDE- Swiss Cooperation Agency in Peru)	
Funding entity	Swiss Cooperation Agency
Timeframe	2020-2027
Total budget	9,899,388 USD
Geographical scope	Peru (Cusco and Puno regions), Bolivia and Peru
Project objectives and components	**Objective:** Enhance capacities of public and private actors to support climate resilience among impoverished and vulnerable rural Andean populations, with a focus on improving food and water security. **Component 1: Improved and implemented policies.** This component includes the implementation of Peru's NDC. Relevant to this project, it also includes the development of a private microfinance product for subsistence and small-scale Andean agriculture resilience. **Component 2: Scaling up best practices.** Activities include strengthening of capacities in national and local actors. This ranges from strengthening resource mobilization capacities of the Ministry of Agricultural Development and Irrigation mobilization, to capacity-building for rural producers.

	Component 3: Measuring and Reporting Adaptation practices. M&E strengthening for adaptation measures aligned with Peru's NDC for agriculture and water. **Component 4: Global dissemination of regional knowledge** This consists in the establishment of a website to share best practices for Andean small-scale agricultural activities. The establishment of knowledge exchange and learning platforms (such as the Andean Regional Forum for Water and Climate Change)
Linkage/relevance for GCF project	The proposed GCF project is complementary to some of the activities under this regional project implemented by the Swiss Cooperation Agency, such as the provision of microfinance products for small-scale agriculture, which is in line with the establishment of the Puna Facility.
Achieved results / impacts	As of 2021, the project had contributed to the development of Regional Action Plans for sectoral NDC adaptation measures for Puno and Cusco and strengthened SENAMHI's local agricultural management platform. (Swiss Cooperation and Development Agency (COSUDE), 2021)

Project Title: Scaling Up Mountain Ecosystem-based adaptation: building evidence, replicating sucess and informing policy.	
Funding entity	BMU (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany) through the International Climate Initiative (IKI).
Implementing partner	International Union for Conservation of Nature and Natural Resources (IUCN) - Switzerland
Timeframe	2017- 2022 (two phases)
Total budget	2.999.495,03 €
Geographical scope	Uganda, Nepal, Perú (flagship countries); Kenia, Buthan, Colombia (expansion countries)
Project objectives and Outputs	**Objective:** Effective and sustainable EbA measures for mountains are applied and up scaled in Flagship countries; planned for application in other mountainous regions in South America, East Africa and South Asia ("Expansion" countries); and shared globally by key actors. 1. **Mountain EbA measures are being continued, tested, monitored, and adapted at local levels by communities, government, and other stakeholders in Flagship Country sites.** The project produced evidence on EbA effectiveness in mountains necessary to influence target groups and thereby support other outputs. Target groups range from local communities who take up beneficial on-the-ground EbA measures, to national policy makers who bolster policy, capacity building and funding mechanisms for EbA in mountains, to achieve national and international targets. 2. **The mountain EbA approach is being up scaled in Flagship countries, locally and nationally, and considered in planning processes and strategies for application in expansion countries by local governments and other stakeholders.** Up and upscaling was supported by disseminating the lessons and knowledge generated from the first output and from the completed Mountain EbA flagship program to target audiences in the flagship and expansion countries. This knowledge was applied to new EbA community-based demonstration projects, and promote and support uptake of mountain EbA by other existing projects in expansion countries. This process improved capacity of individuals, communities, organizations, and government agencies to undertake and sustain EbA at all levels.

	3. **EbA as an adaptation strategy for mountain regions is considered by key actors in national and international policies and planning processes.** The project advanced the integration of mountain EbA in national and international adaptation planning and policy. To increase the uptake of knowledge generated from previous outputs, it aimed to ensure that EbA becomes more widely recognized among international policy-oriented target audiences as a compelling solution for climate change adaptation in mountain regions globally.
Linkage/relevance for GCF project	This project can provide important information about EbA measures implementation and consolidation in local communities using participatory approaches to increase ownership and sustainability. It can also contribute with their lessons learned in monitoring the EbA measure effectiveness, impact and performance monitoring tools, that will be replicated in component 1, in this GCF project´s under Activity 1.2.2 where it will stablish a community monitoring system.
Achieved results / impacts	• Targeted countries are becoming champions of EbA. In Peru, EbA has been integrated not only at the community level, but knowledge has been shared into by-laws, plans and other projects at regional and national levels. • EbA actions in flagship countries have become self-sustaining. In Peru, improved management of grasslands in Miraflores in the Nor Yauyos Cochas Landscape Reserve brings larger dividends to communities, based on a stronger local community organization, resulting in community ownership. • Knowledge shared by countries has supported the development of and networking with other EbA projects to boost the spread of EbA. • EbA measures were consolidated in community sites strengthening participatory methods, increasing local ownership levels. Impact and effectiveness EbA measures assessment has been conducted in flaghip sites, based on the project monitoring system information and participatory evaluation. • New EbA measures were implemented in flagship sites, new projects proposals were developed for the local and national level, and the EbA approach was disseminated in expansion countries. Online EbA courses were developed and conducted for interested stakeholders, and communication materials disseminated the project approach and achievements.