ADAPTATION FUND

REGIONAL PROJECT/PROGRAMME CONCEPT NOTE

PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme:	**Enhancing Adaptive Capacity of Andean Communities through Climate Services (ENANDES)**
Countries:	Chile, Colombia, Peru
Thematic Focal Area[1]:	Disaster Risk Reduction and Early Warning Systems
Type of Implementing Entity:	MIE
Implementing Entity:	World Meteorological Organization (WMO)
Executing Entities:	National Meteorological and Hydrological Services of Colombia (IDEAM), Chile (DMC) and Peru (SENAMHI), and the WMO Regional Climate Centre for Western South America (CIIFEN)
Amount of Financing Requested:	7,398,000 (in U.S Dollars Equivalent)

Project / Programme Background and Context:

The Andean Region

The Andean mountain chain is located in western South America, where it runs continuously from Colombia to the extreme south of Chile. Its average altitude is around 4,000 meters above sea level (m.a.s.l.) with the highest peaks at almost 7,000 m.a.s.l., and its length reaches more than 7,000 km. Due to these characteristics the Andean mountain chain is the longest and one of the highest in the world. Along its coverage the area is subjected to diverse climate influences: the Amazon forest to the east, the displacement of the Inter-Tropical Convergence Zone (ITCZ), the Bolivian High and the Trade Winds to the north. At higher elevations, the subtropical jet stream and the permanent high-pressure system of the South Pacific and South Atlantic are also important (Garreaud, 2009[2]; Tedeschi et al., 2013[3]; Mo & Berbery, 2011[4]; Stäubli et al., 2018[5]).

The availability of water is fundamental for the Andes and for the adjacent areas, as it contributes to 9.5% of the world's fresh water reserves and plays the pivotal role in feeding the majority of South American watersheds. The hydrological cycle of the region depends on the

1 Thematic areas are: Food security; Disaster risk reduction and early warning systems; Transboundary water management; Innovation in adaptation finance.

2 Garreaud, R. D. (2009). The Andes climate and weather. Advances in Geosciences, 22, 3-11.

3 Tedeschi, R. G., Cavalcanti, I. F., & Grimm, A. M. (2013). Influences of two types of ENSO on South American precipitation. International Journal of Climatology, 33(6), 1382-1400.

4 Mo, K. C., & Berbery, E. H. (2011). Drought and persistent wet spells over South America based on observations and the US CLIVAR drought experiments. Journal of Climate, 24(6), 1801-1820.

5 Stäubli, A., Nussbaumer, S. U., Allen, S. K., Huggel, C., Arguello, M., Costa, F. Hergarten, C., Martínez, R., Soto, J., Vargas, R., Zambrano, E. & Zimmermann, M. (2018). Analysis of weather-and climate-related disasters in mountain regions using different disaster databases. In Climate Change, Extreme Events and Disaster Risk Reduction (pp. 17-41). Springer, Cham.

geo-ecosystems found at around and above 4,000 m.a.s.l. (paramos, wetlands and glaciers). In these zones, the water is absorbed and stored in solid and liquid form within the mountains, and then is released regularly throughout the year, feeding the majority of the rivers, which discharge in the Pacific and Atlantic oceans. Those rivers provide water for cities such as La Paz (4,000 m.a.s.l.), Bogota (2,600 m.a.s.l.) and Lima (at sea level), for irrigated agricultural areas and hydropower generation.

All these mentioned features, and some others like cultural characteristics, have led the United Nations Framework Convention on Climate Change (UNFCCC) to recognize the countries in this region especially vulnerable to climate change. Some specific vulnerable zones are those exposed to floods, drought, desertification, landslides, high atmospheric pollution, and economies that, to a large extent, depend on the agriculture and hydropower generation.

Climate variability is also playing a role in modifying the normal climate conditions. In terms of inter-annual variability, both the El Niño and La Niña phases of El Niño-Southern Oscillation (ENSO) influence the temporal and spatial distributions of precipitation, cloud cover and wind patterns, which generally have an impact on food production, agricultural waste (biomass) and power generation with significant socio-economic consequences over much of South America (Skansi et al., 2013[6]; FAO, 2016[7]; Martín, 2016[8]). For example, over the Colombian-Andes region, El Niño events bring below normal precipitation, whereas the opposite happens during La Niña. In the same way, in some regions of the Peruvian-Andes, El Niño events are often (but not always) associated with droughts while La Niña with above normal precipitation. However, this relationship is not always true, if the ENSO peak phase occurs early (or late) in relation to the austral summer wet season, its influence will be much reduced (Garreaud, 2009[9]; Vicente-Serrano et al., 2011[10]).

The above characteristics have been modulated due to climate change trends, and it is expected to continue in the future. The extreme hydro-meteorological events have been increasing in the last decades and the projections indicate that they might increase more in both frequency and magnitude, especially for droughts and floods.

Based on these facts and scientific analysis, it is imperative to strengthen the adaptive capacity of three countries of the Andean region: Colombia, Peru and Chile. Given the diversity of the climate variability and climate change manifestation and the different degree of vulnerability and resilience in the three target countries, the project will focus on the following pilot areas of the Andean region (figure 1):

- **Colombia:** upper Magdalena - Cauca river basin (Departments of Cauca, Tolima and Caldas);
- **Peru:** mid and upper Rímac, Huallaga and upper Apurimac basins;
- **Chile:** central region of the country (Valparaiso, Metropolitana, O'Higgins and Maule provinces) where important river basins like Aconcagua, Tinquiririca and Maule are located.

6 Skansi M., Brunet M., Sigró J., Aguilar E., Arévalo J., Bentancur O., Castellón Y., Correa R., Jácome H., Malheiros A., Rojas C., Pasten A., Mitro S., Villaroel C., Martínez R., Alexander L., Jones P.D., (2013). Warming and wetting signals emerging from analysis of changes in climate extreme indices over South America, Global and Planetary Change, 100, 295-307. ISSN 0921-8181, 10.1016/j.gloplacha.2012.11.004.

7 FAO (2016). 2015-2016 El Niño. Early action and response for agriculture, food security and nutrition. Food and Agriculture Organization of the United Nations. pp44.

8 Martín, L. (2016). ¡Es Niño!: Impacto económico en la Región Andina. Inter-American Development Bank.

9 Garreaud, R. D. (2009). The Andes climate and weather. Advances in Geosciences, 22, 3-11.

10 Vicente‐Serrano, S. M., López‐Moreno, J. I., Gimeno, L., Nieto, R., Morán‐Tejeda, E., Lorenzo‐Lacruz, J., Beguería, S. Azorin‐Molina, C. (2011). A multiscalar global evaluation of the impact of ENSO on droughts. Journal of Geophysical Research: Atmospheres, 116(D20).

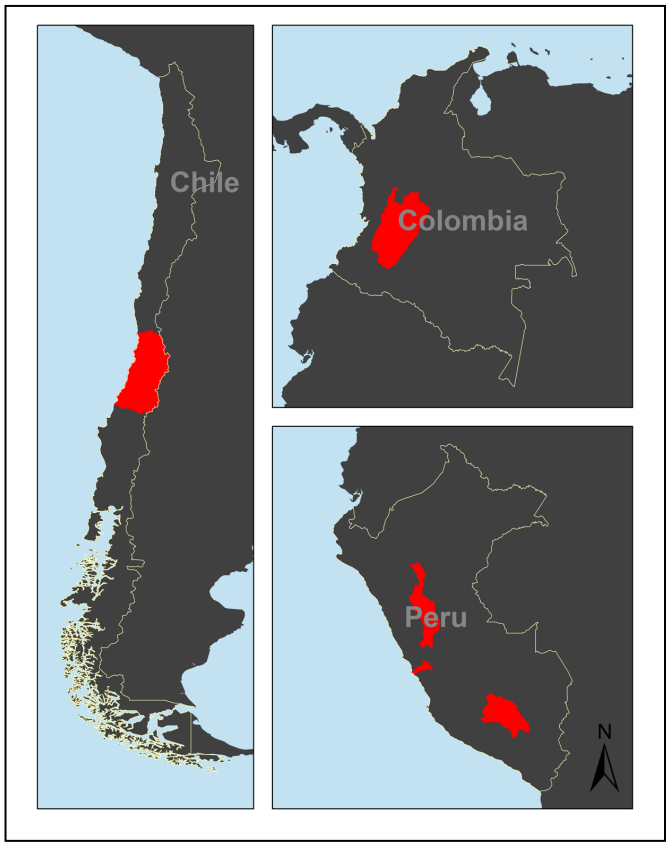

Figure 1. *Pilot areas of the project are highlighted in red for each country (Chile, Colombia and Peru).*

In these areas, the increase in temperature, the reduction of glacier and other environmental indices show that the impacts of climate change are already tangible and probably going to impact the population of the region if no adaptation measures are put in place.

Colombia, Peru and Chile, as well as many other countries, have committed to limit the impacts of climate change through specific adaptation measures as detailed in their National Adaptation Programs of Action (NAPAs) where the governments priority actions by sectors are outlined. The proposed adaptation measures provide the most vulnerable sectors with tools and support in order to reduce the impacts generated by extreme weather events and hydrometeorological variable trends, as well as to take advantage of positive outcomes in favour of sustainable development.

Moreover, the UNFCCC, through the agreement established at the Conference of the Parties (COP) in Paris in 2015, requested the signatory countries to present their Nationally Determined Contributions (NDCs) for both adaptation and mitigation. These documents describe the countries contributions and commitments to reduce greenhouse gases and to implement adaptation measures to climate change. Based on these documents, the priority sectors indicated by Colombia, Peru and Chile are listed in Table 1.

Table 1. *List of priority sectors for adaptation to climate change considered in the NAPAs and NDCs for Colombia, Peru and Chile*.

Sector	Colombia	Peru	Chile
Forest		+	+
Water management	+	+	+
Agriculture	+	+	+
Fishery		+	+
Health		+	+
Industry		+	
Energy	+		+
Transport			
Regional planning	+		
Education	+		
Environment	+		+
Institutional capacities	+		
Risk management	+		
Cities			+
Tourism			+

Source: MMA (2015[11]); Gobierno de Chile (2015[12]); Gobierno del Perú (2015[13]); MINAM (2010[14]); DNP (2012[15]); Gobierno de Colombia (2015[16]).

National Contexts

Colombia – General Characteristics

Geography

Colombia is located in the northern region of South America, has a land and sea area of 2,070,408 km^2 and borders with the Caribbean to the north, the Pacific Ocean to the west, Brazil and Venezuela to the east and Ecuador and Peru to the south. It is a country of great territorial diversity, from the coastal area in the Caribbean region and the Pacific, to the Andes (mountain) and the Amazon (forest) regions. The estimated population for 2005 was 48,474,708 inhabitants, and the main economy sectors are the extraction of crude oil, generation of electric power, manufacturing production and agriculture. In terms of economic growth, Colombiashowed an increase of Gross Domestic Product (GDP) in the last eight years, sometimes reaching values of almost 7% (2014), although in the last two years the growth was much lower, with averages of around 2% (IDEAM et al., 2017[17]).

11 MMA (2015). Plan Nacional de Adaptación al Cambio Climático. Departamento de Cambio Climático del Ministerio del Medio Ambiente, Santiago, Chile.

12 Gobierno de Chile (2015). Contribución Nacional Tentativa de Chile (INDC) para el Acuerdo Climático París 2015. Gobierno de Chile, Santiago, Chile.

13 Gobierno del Perú (2015). Contribución Prevista y Determinada a Nivel Nacional de la República del Perú.

14 MINAM (2010). Plan de Acción de Adaptación y Mitigación frente al Cambio Climático. Ministerio del Ambiente, Lima, Perú.

15 DNP (2012). Plan Nacional de Adaptación al Cambio Climático. Departamento Nacional de Planeación, Bogotá, Colombia.

16 Gobierno de Colombia (2015). Contribución Prevista y Determinada a Nivel Nacional de Colombia. Gobierno de Colombia, Bogotá, Colombia.

17 IDEAM, PNUD, MADS, DNP & CANCILLERÍA (2017). Resumen ejecutivo. Tercera Comunicación Nacional de Colombia a La Convención Marco de Las Naciones Unidas Sobre Cambio Climático (CMNUCC). Tercera Comunicación Nacional de Cambio Climático. IDEAM, PNUD, MADS, DNP, CANCILLERÍA, FMAM. Bogotá D.C., Colombia.

Climate

The rainfall and temperature climatology in Colombia varies on the region. In the Caribbean region, the seasonal rainfall cycle is well defined, with intermediate values between May and November and higher volumes between October and November, coinciding with the easterly waves and tropical cyclones season. The Andean region presents a bimodal variation that depends on the Inter-tropical Convergence Zone (ITCZ) and concentrates the rains between the months of April-May, and October-November. In the eastern region, rainfall occurs throughout the year; however, they are more intense between April and June and less intense between November and February. In the region of the Pacific coast, rainfall remains constant throughout the year. Air temperature, on the other hand, is directly related to the variation of altitude, since the country is located at low latitudes and therefore, does not present many seasonal variations. The thermal zones are used to describe temperature with high altitudes associated with lower temperature and vice versa. Due to the geographical variety, and especially the presence of the Andes mountain range, there is a wide variety of thermal zones in the country, ranging from warm (temperatures above 24 °C) to snow (below 1.5 °C) (IDEAM, et al., 2015[18]).

Climate variability and change

Climate variability acrossthe country occurs at different time scales. At the intra-seasonal level, extreme events are strongly related to the Madden-Julian Oscillations (MJO). On the inter-annual scale, the different manifestations of ENSO and the cycle of the Quasi-Biennial Component (QBO) are responsible for modulating the climate of Colombia. Among these phenomena of climate variability, the one that generates most impacts in Colombia is ENSO, where during the warm phase (El Niño) an increase in temperature and a decrease in rainfall is observed, especially in the center-north region of the country. Wheras, with the presence of La Niña, the Colombian territory, especially in the Andean region and the Caribbean, shows a decrease in temperature and increase in rainfall (IDEAM & UNAL, 2018[19]).

Regarding climate trends, from the second half of the 20th century, it has been observed that precipitation in the Andean and Caribbean areas has decreased by up to 30%. The adjacent areas however, the Pacific coast, presents an increase of up to 30%, which shows the great climate diversity of the territory (Marín et al., 2017[20]). Climate change scenarios project rainfall reductions of up to 40% in the southeastern regions and in the northern Caribbean region, while an increase by up to 40%, are projected to occur in the Andean region and near the Pacific coast. For the air temperature, as well as the global average, the projections indicate increases in values, which can vary from 0.5-1.0 °C in the average period to 2040, and up to 3.0 °C in the period to 2100 (figure 2 IDEAM et al., 2015[21]).

18 IDEAM, PNUD, MADS, DNP & CANCILLERÍA (2015). Escenarios de Cambio Climático para Precipitación y Temperatura para Colombia 2011-2100. Herramientas Científicas para la Toma de Decisiones – Estudio Técnico Completo: Tercera Comunicación Nacional de Cambio Climático. Bogotá D.C., Colombia.

19 IDEAM & UNAL (2018). Variabilidad y Cambio Climático en Colombia. Bogotá D. C., Colombia.

20 Marín, J. P. (2017). Dinámica de los eventos hidroclimáticos extremos en la cuenca del Río Chinchiná por efecto de la variabilidad climática. Master thesis. Universidad Nacional de Colombia, Manizales.

21 IDEAM, PNUD, MADS, DNP, CANCILLERÍA (2015). Nuevos Escenarios de Cambio Climático para Colombia 2011-2100. Herramientas Científicas para la Toma de Decisiones – Enfoque Nacional-Regional: Tercera Comunicación Nacional de Cambio Climático.

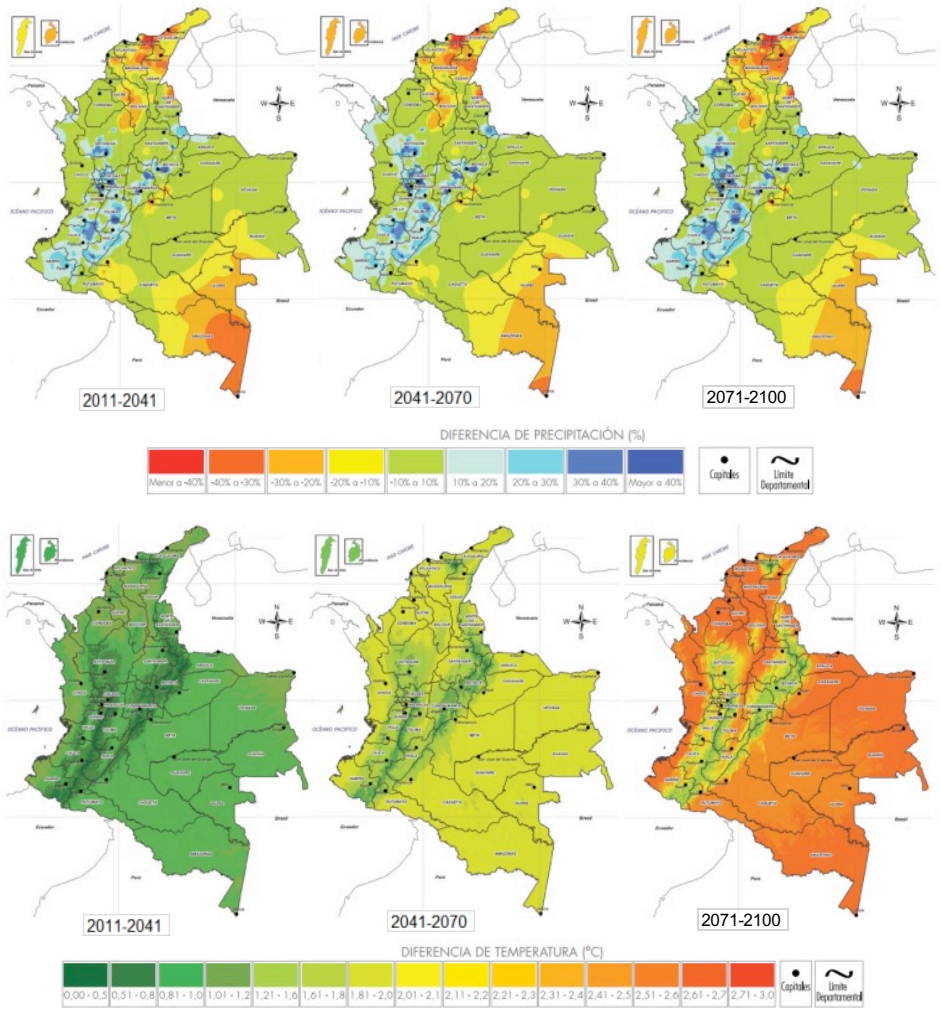

Figure 2. *Both maps are an estimate of the mean projections of climate change (average for all Representative Concentration Pathways (RCPs) scenarios) for the 2011-2041, 2041-2070 and 2071-2100 periods for Colombia, respectively. Up: percentage changes in precipitation. Down: temperature rising. Source: IDEAM et al., (2015[22]).*

Climate vulnerability

Colombia is a developing country that has its industrial activity concentrated in large cities or geographical areas with easy transportation access, such as port regions. As well as in other countries in the Andean region, activities such as agriculture and livestock provide food security and contribute to the economy of the small municipalities. Due to the biogeographic characteristics of the Andean region, these countries have specialized in the production and exportation of some products such as coffee, bananas, potatoes, cocoa and others.

Adverse climate has a direct impact on agricultural production and negative consequences for the economy (Pabón, 2004[23]). For example, in 2011, during La Niña phase, the National Planning Department reported 2.4 million people affected by significant losses in properties,

22 IDEAM, PNUD, MADS, DNP, CANCILLERÍA (2015). Nuevos Escenarios de Cambio Climático para Colombia 2011-2100. Herramientas Científicas para la Toma de Decisiones – Enfoque Nacional-Regional: Tercera Comunicación Nacional de Cambio Climático.

23 Pabón, J. D. (2004). Aplicación de la información sobre el clima en la agricultura en la región Andina. Acta de Reunión Técnica – Servicios de Información y Predicción del Clima y Aplicaciones agrometeorológicas para los países Andinos. World Meteorological Organization, WMO. Geneva, Switzerland.

schools and, above all, agriculture and livestock (Ángel, 2012[24]). This was declared the worst environmental tragedy of the latest 50 years.

The Colombian electric system depends heavily on the availability of water as well. The 2015-16 intense El Niño phase had a major impact on the electricity production, with an observed reduction in hydroelectric generation up to 43% of its historic values for the period of September 2015 to March 2016. The deficit led to higher operational costs and larger CO_2 emissions than in typical years. In the same period severe damages to important crops as coffee, potatoes and rice were also experienced (Martínez et al., 2017[25]).

Observations are suggesting that climate change is increasing the frequency and magnitude of extreme events and, therefore, droughts are expected during years in which the positive phase of ENSO is present. Wheras, in years when La Niña is present, floods and landslides are expected to occur (IDEAM et al., 2015[26]).

Over the long-term, an increase of temperatures would result in an accelerate melting of glaciers and decrease of snowfalls, as well as a retreat to the paramos in altitude. These two ecosystems are important sources of water storage for the region, as they contribute to agricultural productivity and hydroelectric production. These impacts added to the degradation of soils, could increase the processes of desertification and the occurrence of forest fires, with a consequent reduction in soil productivity. Additionally, the lack of water would affect the hydroelectric sector, compromising the production of electricity in the area. Moreover the extreme excesses of precipitation would affect even harder those areas that are exposed to high risk events such as landslides and floods.

Introduction to the pilot area: upper Magdalena – Cauca river basin

Geographical, socioeconomic and ecosystem contexts

The proposed pilot area for Colombia is the Magdalena - Cauca river basin, one of the most productive areas of the country, which represents 17% of the national territory. This basin crosses the country from south to north between the eastern and central mountain ranges and forms a corridor that goes from the Andean region to the Caribbean coast. The river has a length of 1,528 km and starts at 3,685 m.a.s.l. The entire surface of the basin area is almost 200,000 km^2 (Olmos & Hernández, 2015[27]).

24 Ángel J. D. Á. (2012). Sedimentos del Río Magdalena, reflejo de la crisis ambiental. Propiedad Pública, Universidad Eafit.

25 Martínez, R., Zambrano, E., Nieto, J. J., Hernández, J. & Costa, F. (2017). Evolución, vulnerabilidad e impactos económicos y sociales de El Niño 2015-2016 en América Latina. Investigaciones Geográficas, (68), 65-78. https://doi.org/10.14198/INGEO2017.68.04

26 IDEAM, PNUD, MADS, DNP, CANCILLERÍA (2015). Nuevos Escenarios de Cambio Climático para Colombia 2011-2100. Herramientas Científicas para la Toma de Decisiones – Enfoque Nacional-Regional: Tercera Comunicación Nacional de Cambio Climático.

27 Olmos, L. M. B., & Hernández, L. C. T. (2015). Estimación de caudales mensuales en la cuenca alta del Magdalena, usando métodos de transferencia. Universidad Distrital Francisco José de Caldas. Bogotá, Colombia.

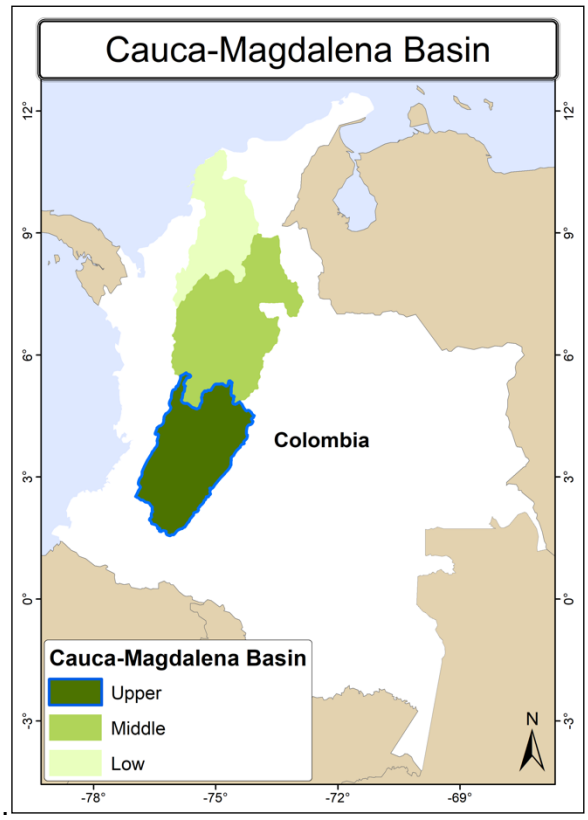

Figure 3. *Map of Colombia and all the levels of Cauca-Magdalena basin.*

The Cauca-Magdalena basin can be divided into upper, medium and low areas (figure 3), with the upper basin crossing the departments of Cauca, Tolima and Caldas, with a total population approaching 1.5 million people. This territory has an area of more than 20,000 km^2 with a population density of 70 inhabitants per km^2 (Gamarra & Nieto, 2013[28]).

The upper basin ecosystem of the Magdalena River extends from the humid paramo, where the river starts, to the tropical dry forest, characteristic of the Honda area, at the bottom of the valley. The forest that originally covered the deep part in the valley and consisted mainly of the tropical dry forest, has been removed due to agricultural activities and the demand for firewood (Olmos & Hernández, 2015[29]).

All these historical characteristics have made Magdalena River well known for trade, exchange of goods, fishing and fertility of its territory. Currently the entire basin has an impact on approximately 35 million Colombians, and represents about 75% of the country's agro-industrial production. In addition, the water of the river serves to produce electricity for industrial and domestic consumption.

28 Gamarra, A. H. & Nieto, L. H. B. (2013). Caracterización física, demográfica, social y económica de los municipios ribereños de la jurisdicción de la corporación autónoma regional del Río Grande de la Magdalena. CORMAGDALENA.

29 Olmos, L. M. B., & Hernández, L. C. T. (2015). Estimación de caudales mensuales en la cuenca alta del Magdalena, usando métodos de transferencia. Universidad Distrital Francisco José de Caldas. Bogotá, Colombia.

Climate characteristics and vulnerability

The basin is located in the tropical zone where the amount of radiation does not have much seasonal variation and the temperatures are dependent on the altitude. The complex orography of the valleys and mountains generates a regional and local circulation of air (Vargas, 2015[30]).

As most of the Andean region, this basin is influenced by the Trade Winds, which converge the ITCZ and regulate the cloudiness and precipitation. Other phenomena from the Atlantic side influencing the area are the permanent high-pressure centers, the subtropical high,, the Eastern Waves and the Tropical Cyclones. In the Upper Basin, the temperatures are more continental and the influence of the Amazon forest is a source of moisture in the air.

In the mountainous area, the spatial distribution of rainfall is conditioned by topography. The inter-Andean valleys show relatively low rainfall with values of 1,000 to 1,500 mm/year, but from the piedmont to an altitude of 1,000 to 1,500 m.a.s.l. the precipitation increases till around 2,000 to 2,500 m.a.s.l. In the valley, there is a predominance of dry warm climate, while in the middle elevations, a colder and more humid climate is observed.

Frost events at heights greater than 2,400 m.a.s.l. have resulted in significant economic losses in the agricultural sector in the past, from diminishing yields to total destruction of crops. The observed trends in air temperature, however, shows an increase of 0.10 to 0.25 °C per decade. One of the clearest signs of climate variability in the region is the ENSO cycle, which especially affects the area with a considerable deficit of precipitation and high temperatures during El Niño events, while the cold phase (La Niña) has generally manifested increases in precipitation. The three strong El Niño events recorded in 1972-73, 1976-77, and 1991-93 coincided with droughts conditions. The data record of rainfall in the Andean and Caribbean area presents a rainfall deficit trend over the years (IDEAM, 2001[31]).

The hydrological processes responding to the meteorological variability within the basin can be extreme factors of large soil detachments, landslides, torrential floods, mudflows and other events that, in many cases reached catastrophic proportions. Excessive rainfall has caused flooding and overflows in the Magdalena River (Olmos & Hernández, 2015[32]).

In addition to natural climate variability, the climate change signal negatively affects the Cauca-Magdalena river basin with an estimated increase of air temperatures by 1.0 °C and precipitation by 10-20% by the end of the century (IDEAM, 2015[33]) in the upper basin.

In addition to the direct impacts of climate, the basin is also affected by land use/modification pressure. It has been estimated that forest coverage has been reduced by more than 40% just between the 1970s and 1990s, and its current coverage represents a mere 10% of the original. An estimated 50% of soil erosion is caused by natural factors that can be explained by hydrological variables, relief, climate and geology. These impacts are more important in areas of human settlements and infrastructure locations. The upper basin also has some fragile ecosystems, such as deserts and arid areas. These are especially vulnerable, since, apart from the climate, they also suffer from anthropogenic pressure (Ángel, 2012[34]).

30 VARGAS, W. (2015). Una breve descripción de la vegetación, con especial énfasis en las pioneras intermedias de los bosques secos de la jagua, en la cuenca alta del río magdalena en el Huila. Colombia, 18(1), 47-70.

31 IDEAM (2001). Estudio Ambiental de la Cuenca Magdalena - Cauca y elementos para su ordenamiento territorial. Instituto de Hidrología, Meteorología y Estudios Ambientales. Bogotá, Colombia.

32 Olmos, L. M. B., & Hernández, L. C. T. (2015). Estimación de caudales mensuales en la cuenca alta del Magdalena, usando métodos de transferencia. Universidad Distrital Francisco José de Caldas. Bogotá, Colombia.

33 IDEAM (2015). Escenarios de Cambio Climático para Precipitación y Temperatura para Colombia 2011-2100 Herramientas Científicas para la Toma de Decisiones – Estudio Técnico Completo: Tercera Comunicación Nacional de Cambio Climático. Instituto de Hidrología, Meteorología y Estudios Ambientales. Bogotá, Colombia.

34 Ángel J. D. Á. (2012). Sedimentos del Río Magdalena, reflejo de la crisis ambiental. Propiedad Pública, Universidad Eafit.

The current context, as described, calls for policies oriented towards actions for vulnerability reduction and adaptation measures to climate change, particularly in mountain areas and in larger human settlements. In addition, the watershed management plan for this river basin aims to increase the generation of hydroelectric energy, strengthen sustainable human development, and increase touristic and recreational areas of the river, highlighting its environmental, landscape and recreational importance. It will also seek to recover the quality and quantity of water to manage flows and ensure purification, irrigation, natural and hydro-biological resources, giving priority to the attention to urbanized settlements in the basin. Finally, a flood mitigation plan is also prepared. Thus, it is critical to strength the supply of information and knowledge of the natural processes and interaction with socioeconomic and cultural processes. To solve all these problems, it is imperative to have in-depth knowledge about the climate conditions in the basin and about all the effects of climate variability (CORMAGDALENA, 2007[35]).

Peru – General Characteristics

Geography

Peru is located in the central-western region of South America, has a territorial area of 1,285,215.6 km^2 and shares borders with Colombia and Ecuador to the north, Brazil and Bolivia to the east, Chile to the south and the Pacific Ocean to west. The Andean mountain range crosses the country longitudinally, dividing it into three major natural regions: coast, Andes and rainforest. In 2015, the total population was estimated at 31.1 million. Of this population, 54.6% is located in the coastal region, whose territory accounts for 11.7% of the national territory; 32% of the population is located in the Andean region, which has 28% of the national territory; and finally the Amazon, which represents 58.9% of the national territory and has 13.7% of the population. In regards to the economy, Peru has shown economic growth in recent years, with GDP growing by 9.1% in 2008 and 2.4% in 2014. The sectors that have made the most contribution were services, manufacturing, mining, hydrocarbons, trade, construction and agriculture (MINAM, 2016[36]).

Climate

The climate in Peru is diverse due to its location and the geographic variety of the territory. For precipitation, the northern rainforest is the region where the highest values are observed, with a moderate annual variability. Precipitation is low along the coast, with seasonal increases between December and May. The values are moderate in the Andean region, with more seasonal variations and also has an increase between December and May. The Andean region climatology is strongly modulated by the altitudinal gradient along the cordillera. In the inter-Andean valleys at intermediate altitude (2,500-3,500 m.a.s.l), the annual average temperature varies between 11°C and 16°C and precipitation between 50 and 1000 mm[37]. The air temperatures also present characteristics according to the region and the season, where the highest values are observed in the northern region of the rainforest and coast between the months of December to May. The lowest values are found in the central and southern highlands, and are lower between June to August (MINAM, 2016).

Climate variability and change

The main inter-annual changes observed in the Peruvian climate are due to the influence of the El Niño and La Niña phenomenon, which changes air temperature and precipitation

35 CORMAGDALENA (2007). Plan de manejo de la cuenca del Río Magdalena – Cauca. Segunda Fase. Corporación Autónoma Regional del Río Grande de la Magdalena Empresa Industrial y comercio del Estado. Bogotá, Colombia.

36 MINAM (2016). Tercera Comunicación Nacional del Perú a la Convención Marco de las Naciones Unidas sobre el Cambio Climático. Ministerio del Ambiente. Lima, Perú.

37 SENAMHI,2009: Escenarios Climáticos en el Perú para el año 2030, Lima.

patterns significantly. The most significant changes in precipitation are observed mainly in the northern coastal region, where, during strong events of El Niño, excessive rainfall has been observed, meanwhile during La Niña conditions, rainfall is below normal. In the Andean regions, the changes in precipitation are opposite, with deficits in El Niño events and increases in La Niña.

In terms of climate trends, precipitation has shown a decrease in recent decades, while both maximum and minimum temperatures have increased for the same period. In the future, the climate scenarios made for the country indicate that climate change would affect precipitation with a high spatial variability, with both increasing and decreasing trends, even between nearby points. The exception would be in the northwest region of the country where the projections mark a definite increase in rainfall (figure 4). On the other hand, the air temperature, both for the maximum and the minimum, would increase throughout the territory, with minimum temperatures increasing more than the maximum. The highest increases would be in the highland region, with maximum heating values of up to 4 °C (figure 5) (MINAM, 2016).

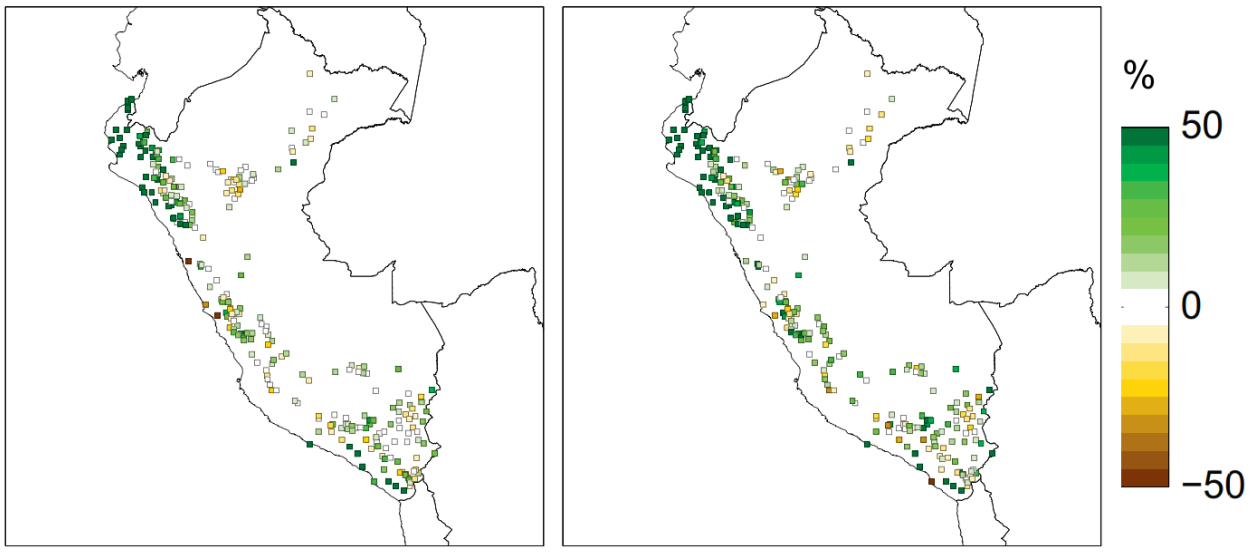

Figure 4. *Precipitation changes for the 2036-2065 period for RCP 4.5 (left) and 8.5 (right). Source: MINAM, (2016)[38].*

38 MINAM (2016). Tercera Comunicación Nacional del Perú a la Convención Marco de las Naciones Unidas sobre el Cambio Climático. Ministerio del Ambiente. Lima, Perú.

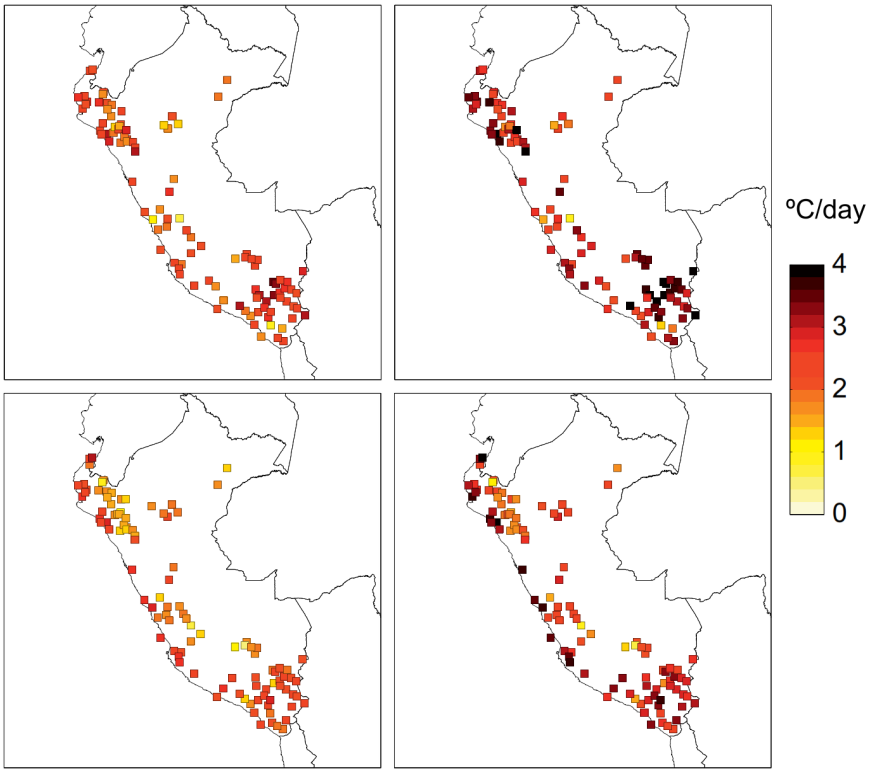

Figure 5. *Changes in maximum (up) and minimum (down) temperatures for the 2036-2065 period for RCP 4.5 (left) and 8.5 (right). Source: MINAM, (2016).*

Climate vulnerability

The geography and climate of Peru make it one of the most diverse countries on the planet. It has the fourth highest forest coverage in the world and has 71% of the world's tropical glaciers. All these diversities also cause a great cultural heterogeneity and make the country especially vulnerable. In addition, water in Peru is divided into two regions: the Atlantic slope, which has 97% of the resource and 33% of the population, and the Pacific slope that has 3% of water and 67% of the population. Therefore, although Peru is the country with the greatest availability of fresh water per inhabitant of Latin America, unequal distribution of water generates a shortage problem. In addition, the inefficient management of the resource ends up aggravating the problem.

The main climate impacts observed in the Peruvian territory are associated with ENSO, where last occurrences have affected the fisheries, agriculture, forestry , health and transportation sectors. For example, in mid-February 2017, the country began to suffer the consequences of an El Niño event that occurred over the Peruvian coast, which was called Coastal El Niño. This phenomenon brought excessive precipitation, which affected the entire coastal region of the country, generating significant losses in the north, where floods affected homes and crops. In the Lima region, impacts on water supply were also observed due to the overflow of several rivers, including the Rímac. According to the National Convention of Peruvian Agriculture (CONVEAGRO, Spanish acronym), the floods in April 2017 caused losses of nearly USD 645 million in the agriculture and livestock sectors throughout the country (MINAM, 2016[39]).

Drought events predominantly affect the southern Andean region of Peru, having an impact on agriculture, as this activity is mainly dependant on rainfall. Furthermore, another impact

39 MINAM (2016). Tercera Comunicación Nacional del Perú a la Convención Marco de las Naciones Unidas sobre el Cambio Climático. Ministerio del Ambiente. Lima, Perú.

observed in this country is associated to frost events, which occur between the months of June and August and are more frequent in regions with higher elevations. In addition, climate change scenarios indicate significant reduction of glaciers and intensification of droughts, which would affect further water availability. Furthermore, it is also expected that extreme climate events, generated by occurrences of El Niño, will increase their frequencies and intensities, which, as has already been observed in the historical records. Such trends already affected agricultural activities in the country and put food security and public health at risk(MINAM, 2016).

To deal with this situation, firstly, it is recommended to understand and disseminate knowledge on regular climate and its extremes in the regions of interest. The local governments are the first level for emergency response during disasters through civil defence groups; however, these should also be more involved in managing risk reduction of disasters. On many occasions, this development is limited due to a lack of incentives and recognition of their role in this effort. In addition to these problems, there is still a common problem in developing countries, which is the low technical capacity or weakness in the relations between science and politics (Venkateswaran et al., 2017[40]).

Figure 6. *Huallaga, Rímac and upper Apurimac basin.*

Introduction to the pilot areas: Huallaga, Rímac and Apurimac basins

The identified hydrographic basins for this project in Peru are especially vulnerable to climate variations and climate change, thus making them good pilot areas to test the impacts on the project investment and the potential for upscaling to the entire region (figure 6).

40 Venkateswaran, K., MacClune, K. and Enríquez, M.F. (2017). Coastal El Niño: The 2017 Floods in Peru. Zurich Flood Resilience Alliance.

Huallaga Basin

Geographical, socioeconomic and ecosystems contexts

The Huallaga River originates in the department of Pasco in the Huascacocha lagoon at 4,710 m.a.s.l. and has a length of 1,389 km. It crosses the departments of Pasco, Huánuco, La Libertad, San Martín and Loreto. The basin forms part of the Marañón basin, which in turn forms part of the Amazon basin, and therefore forms part of the Atlantic Ocean slope. The basin can be divided into three: upper, with altitudes from 4,700 to 3,600 m.a.s.l.; medium, with altitudes from 3,600 to 800 m.a.s.l.; and low, from 800 to 100 m.a.s.l. The upper zone begins in Pasco lagoon; the low area ends at the Marañón River. The entire basin covers an area of 95,000 Km^2 and the population is over 1.7 million inhabitants.

Climate characteristics and vulnerability

The climate variability is considerable due to the size of the basin and the contrasts between the Amazon plain in the lower parts and the Andean region in the highlands. The water resource in this region is important due to the potential agricultural production and the high capacity for land use (65%), which secures food for its population. Some of the most important products in the region are sugarcane, bananas, some citrus fruits and the raising of pigs and poultry. The basin also stands out for sustaining other sources of work for native communities through forest products, trout farming, tourism and human water use. In addition, it has important ecosystems that are vulnerable to extreme climate events such as paramos and humid and dry forests (Ferreyra, 1996[41]; MTC, 2005[42]).

The main extreme climate events in the basin have been droughts and floods, with the latter having been reported more frequently and intensely in the last two decades (ANA, 2015[43]).

Rímac Basin

Geographical, socioeconomic and ecosystem contexts

The Rímac River, the most important in the department of Lima, is also partially located in the department of Junín. It originates in the central mountain range of the Andean at an altitude of approximately 5,000 m.a.s.l., and its basin has a total area of 3,532 km^2. Its natural runoff is modulated by the seasonal rainfall that occurs in the upper basin and the presence of snow in the area.

The total population in the basin reaches almost 7 million inhabitants, because it includes the population of the capital, Lima. The main activities in the basin are the exploitation of minerals, industry and agricultural activity. The water resource of this basin is extremely important since it provides water for the entire population of Lima. The accelerated population growth in Lima has increased the water demand. The Peruvian government is working on major infrastructure for water storage and transfer in the Rimac river basin. The water flow of the river is insufficient to meet the water demand of the metropolitan area of Lima during the dry period (May-November). About 40% of water availability during this period comes from the Mantaro River basin transfer above 4,000 m.a.s.l. The regulated system details of Rímac river are shown in the table below:

41 Ferreyra, R. H. (1996). Comunidades vegetales de la cuenca superior de los ríos: Marañón, Huallaga y Ucayali. Iquitos, Perú.

42 MTC (2005). Estudio de la navegabilidad del Río Huallaga en el tramo comprendido entre Yurimaguas y la confluencia con el Río Marañón. Ministerio de Transporte y Comunicaciones. Lima, Perú.

43 ANA (2015). Evaluación de Recursos Hídricos en la cuenca de Huallaga. Resumen ejecutivo. Autoridad Nacional del Agua.

PROJECT	CONTRIBUTING SOURCES	Q(m3/s)	OPERATION START	DETAILS
Phase I (Marcapomacocha - Milloc)	Lagoons: Marcapomacocha, Antacoto, Marcacocha, Pucrococha, Tucto y Milloc.	6.0	Concluded in 1966	Main objective was to cover electric demand in Lima city.
Phase II (Derivación Pomacocha - Río Blanco)	Lagoons: Pomacocha y Huallacocha. Quebrada Pucullo.	4.0	Not built yet	Main objective was to cover the increasing water demand in Lima city.
Phase III (Afianzamiento del sistema Marcapomacocha)	Slopes:Cusurcocha y Casacanchan	3.0	Concluded in 1999	Main objective was to consolidate Phase I.
Phase IV (Huascarcocha -Rímac)	Lagoons: Huascarcocha, Sheque, Huaroncocha, Quimacocha, Naticocha, Yanamachay.	2.4	Concluded in 2012	Main objective was to increase caudal in Phase III.
Phase V (Embalse Casacancha)	RiverCarispaccha	1.8	Planned for 2030	Main objective is to contribute with more water during dry periods for water plants Atarjea and Huachipa

Climate characteristics and vulnerability

This region is prone to landslides events. In the past, several episodes of flash floods and overflows, as well as landslides and mudslides, many of which were caused by the occurrence of El Niño events, occurred. Added to these geological and climate threats, the basin suffers from human interventions that increased its vulnerability.

In order to reduce the impacts of these extreme events in the basin, it is recommended to strength the local risk management and disaster prevention capacities, as well as the capacities of coordination instances for the integral management of the territory (MINAGRI, 2010[44]; Rengifo, 2016[45]).

Apurimac Basin

Geographical, socioeconomic and ecosystem contexts

The Apurimac river basin has an area of 27,548.06 km^2, and is partially located in the Cusco, Apurimac and Ayacucho Departments. It starts in the Mismi glacier in the Andean mountain at more than 5,500 m.a.s.l., and is located about 160 km from Lake Titicaca. It has a diversity of environments where it is possible to identify, for example, the Andean dry forest, the Andean forest, and pre-montane tropical forest. The main sources of water are lagoons, where the population draws for household consumption; however, the glaciers also are important

44 MINAGRI (2010). Estudio hidrológico y ubicación de la red de estaciones hidrométricas en la cuenca del Río Rímac. Ministerio de Agricultura. Lima, Perú.

45 Rengifo, J. M. (2016). Diagnóstico de Vulnerabilidad y Riesgo en la Cuenca del Río Rímac. Foro Regional: Evaluación del Impacto del Fenómeno El Niño y Perspectivas de Recuperación. Chosica, Perú.

suppliers of water in dry periods. This hydrographic basin can be divided into upper and low, where the upper territory alone has an area of 3,818 km^2 and sums 25,290 inhabitants. Their principal economic activities are mining, agriculture and livestock (Pacheco et al., 2007[46]; Montesinos, 2012[47]).

Climate characteristics and vulnerability

Due to altitude variations, the Apurimac basin has different climate characteristics and risks. The upper region, which is located between 4,000 and 5,000 m.a.s.l., has an annual average precipitation that varies between 300 and 900 mm, and air temperatures between 1.5 and 6 °C. However, the climate variability affects these regular conditions, where the most common impacts observed have been associated with intense rainfall, landslides, frosts and snowfall. In addition, some human actions such as overgrazing and an improper water management have negatively affected the soil (Pacheco et al., 2007[48]; Montesinos, 2012[49]).

Chile – General Characteristics

Geography

Chile is located in the southwestern region of South America, has a land area of 2,006,096 km^2 and borders Peru to the north, Bolivia and Argentina to the west, and the Pacific Ocean to the east. The political-administrative organization is structured in three levels, the largest areas being defined as regions, then provinces, and finally communes. The population in 2010 was 17,066,142, where the great majority is concentrated in the central region, in the Metropolitan Region of Santiago, where the capital of Chile is located. The economy is stable and has grown in the last twenty years, with the country's GDP tripling between 1990 and 2015. The main economic activities that contribute to the country's GDP are the extraction of natural resources and primary goods, services, manufacturing industry and mining (MMA, 2016[50]).

Climate

The climate in Chile varies according to altitude and latitude, since the territory covers a wide range of latitude and large Andean elevations over short distances. These characteristics separate the country into natural geographical regions that present similar biogeographic, hydrological and vegetation conditions. The northern region is divided in two, the first being a desert region, where one of the lowest annual rainfalls in the world is observed. The second region presents sub-humid conditions on the coast and semi-arid inland. Then, the central region is characterized by warm temperate climates, with winter precipitation higher in its southernmost portion, where the seasons have a well-defined annual cycle. Finally, in the Southern region of the country, rainfall is more abundant. In regards to air temperature, since is close to Antarctica, it becomes colder (MMA, 2016[51]).

46 Pacheco, V., Salas, E., Cairampoma, L., Noblecilla, M., Quintana, H., Ortiz, F., Palermo, P., & Ledesma, R. (2007). Contribución al conocimiento de la diversidad y conservación de los mamíferos en la cuenca del río Apurímac, Perú. Revista peruana de Biología, 14(2), 169-180.

47 Montesinos, M. S. (2012). Análisis de la gobernanza del recurso hídrico en la cuenca alta del río Apurímac, Perú. Master thesis. Centro Agronómico Tropical de Investigación y Enseñanza, CATIE. Turrialba, Costa Rica.

48 Pacheco, V., Salas, E., Cairampoma, L., Noblecilla, M., Quintana, H., Ortiz, F., Palermo, P., & Ledesma, R. (2007). Contribución al conocimiento de la diversidad y conservación de los mamíferos en la cuenca del río Apurímac, Perú. Revista peruana de Biología, 14(2), 169-180.

49 Montesinos, M. S. (2012). Análisis de la gobernanza del recurso hídrico en la cuenca alta del río Apurímac, Perú. Master thesis. Centro Agronómico Tropical de Investigación y Enseñanza, CATIE. Turrialba, Costa Rica.

50 MMA (2016). Tercera Comunicación Nacional de Chile ante la Convención Marco de las Naciones Unidas sobre Cambio Climático. Ministerio del Medio Ambiente, Chile.

51 MMA (2016). Tercera Comunicación Nacional de Chile ante la Convención Marco de las Naciones Unidas sobre Cambio Climático. Ministerio del Medio Ambiente, Chile.

Some features determine these climate characteristics as the South Pacific High, the marine influence and the relief. The effect of the cold Humboldt Current and the sea cause Chilean temperatures to be lower than those that are observed in other countries with the same latitude. On the other hand, the influence of the Andean mountains produces an average temperature range between 7 and 20 °C, depending on the area of the country and the season of the year. In general, Chile has cool nights due to fresh sea winds and cold air masses that descend from the Andean region (Novoa et al., 1989[52]).

Climate variability and change

In the last century, changes in precipitation have shown important inter-decadal and inter-annual variabilities that are associated with the Pacific Decadal Oscillation (PDO) and El Niño-Southern Oscillation (ENSO) phases, respectively. The warm phase of ENSO is usually associated with above-normal precipitation, while during the cold phase, La Niña, there are is below-normal precipitation. However, in general, the center-south region of the country has shown a downward trend in rainfall in recent decades. In terms of air temperature, until 2010 the main trend observed was warmer temperatures in the central valleys and in the Andean region, and on the other hand cooler temperatures were observed in the coastal region, which coincides with the cooling of the Sea Surface Temperature (SST) due to the variability of the PDO (figure 7).

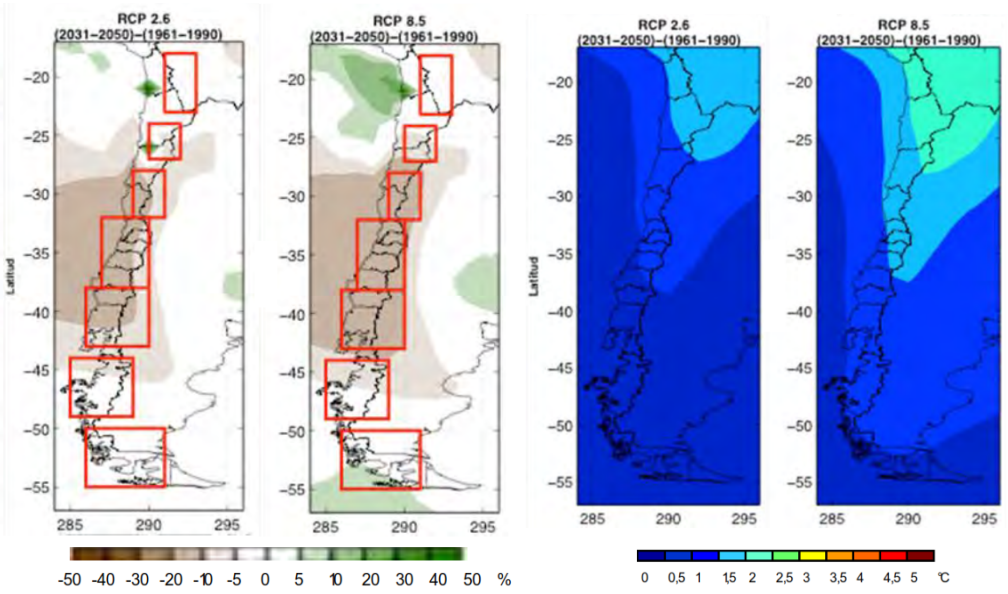

Figure 7. *Both maps are an estimate of the climate change projections for two scenarios (RCP 2.6 and 8.5) for the 2031-2050 period for Chile. Left: percentual changes in precipitation. Right: temperature rising. Source: MMA (2016[53]).*

A reduction in precipitation is expected for the future, in comparison with the historical average. The projections indicate a decrease between 5 and 15% in the central region of the country.

52 Novoa, R., Villaseca, S., Del Canto, P., Rouanet, J., Sierra, C., & Del Pozo, A. (1989). Mapa agroclimático de Chile. Instituto de Investigaciones Agropecuarias, Santiago, Chile. Vargas, W. (2015). Una breve descripción de la vegetación, con especial énfasis en las pioneras intermedias de los bosques secos de la Jagua, en la cuenca alta del Río Magdalena en el Huila. Colombia forestal. ISSN 012-0739.

53 MMA (2016). Tercera Comunicación Nacional de Chile ante la Convención Marco de las Naciones Unidas sobre Cambio Climático. Ministerio del Medio Ambiente, Chile.

For temperature, the projections present warming throughout the country, being more intense in the plateau, and lower in the southern regions (MMA, 2016[54]).

Climate vulnerability

According to the UNFCCC, Chile is considered a country especially vulnerable to changes in climate, as it has a low coastal edge, arid and semi-arid zones, forest cover and areas exposed to forest deterioration. In addition, it has areas prone to drought and desertification, urban areas with air pollution problems and fragile ecosystems, especially in mountainous systems.

Some regions in Chile are regularly affected by severe drought, where, on some occasions, water shortages have exceeded 50%. For example, since 2010 the central region has experienced an uninterrupted sequence of dry years (30 to 70% rainfall deficit) that have coincided with the warmest decade recorded. The precipitation deficit diminished the Andean snowpack and resulted in amplified declines (up to 90%) of river flow, reservoir volumes and groundwater levels. Climate change is also accelerating the progressive retreat of the tropical glaciers in the Andean region, which provides water for drinking, for small farms, hydroelectric power generation, and transnational mining operations. In the past 30 years, the glaciers have lost over 30% of their ice and snow, which will lead to severe water shortages in the future (Rudnick et al., 2011[55]).

From a climate point of view, it is imperative to strengthen the environmental monitoring network in order to monitor these conditions in the future, and thus, adjust the analysis and projections. The prospect is looming since the decrease of precipitation and increase in temperature results in the reduction of water availability and an earlier defrost process, which would make the dry season much longer and intense. These effects will continue to negatively impact various economic sectors in the region, especially the agricultural productivity. In the same way, under these conditions, forest fires will also increase, both in frequency and in extension (MMA, 2014[56]).

Concerned about this scenario, Chile has addressed the issue of climate change through its national strategy. The main objective is to minimize the impacts through integrated actions to determine the vulnerability of the country and adaptation measures to address them adequately. In the same way, the Ministry of Agriculture constituted the Council of Climate Change and Agriculture, with the mission of supporting the definition of the main guidelines and priorities to be considered in a program of adaptation and mitigation of climate change for forestry and agriculture (González et al., 2011[57]). From an international perspective, the strategy for disaster reduction has suggested some steps to be taken to reduce the impacts, where the identification of the nature, intensity and probability of the threat, together with the vulnerability, can be highlighted (Irarrázaval et al., 2016[58]).

The demand for water will continue to grow, and as in the rest of the world, the main factors that explain this constant increase are the greater social development and the economic growth itself that is forecasted for the future. Consequently, the main challenge is to ensure the

54 MMA (2016). Tercera Comunicación Nacional de Chile ante la Convención Marco de las Naciones Unidas sobre Cambio Climático. Ministerio del Medio Ambiente, Chile.

55 Rudnick, A., Ferreiro, C., Willumsen, H., Farías, F., Kleysteuber, A., & Canales, G. (2011). Segunda Comunicación Nacional de Chile ante la Convención Marco de Las Naciones Unidas sobre Cambio Climático.

56 MMA (2014). Plan de Adaptación al Cambio Climático. Oficina de Cambio Climático del Ministerio del Medio Ambiente. Santiago, Chile.

57 González, M. E., Lara, A., Urrutia, R., & Bosnich, J. (2011). Cambio climático y su impacto potencial en la ocurrencia de incendios forestales en la zona centro-sur de Chile (33º-42º S). Bosque (Valdivia), 32(3), 215-219.

58 Irarrázaval, S., Becerra, E., Ruiz, L., Gómez, G., Román, P., Monsalve, N., Flores, F., Lagos, A. & Moreno, C. (2016). Estudio Diagnóstico para desarrollar Plan de Riego en Tinguiririca. Informe final.

availability of water for all the inhabitants of the country and, at the same time, allow the sustainable development of the economy (Aravena et al., 2017[59]).

Introduction to the pilot area: central region

Geographical, socioeconomic and ecosystem contexts

The central zone of Chile is a natural division which includes some of the most important regions, such as Valparaíso, the Metropolitan Region (Santiago), O'Higgins, Maule and part of Biobío, where the three main urbanizations in the country are located: Santiago, Valparaíso and Concepción. It also concentrates 80% of the total population, due to its favourable Mediterranean and continental climate. It is surrounded by the Andean mountain range to the east and by the south Pacific coast to the west. Historically it has been the main economic zone of the country due to its high percentage of economic productivity. An important factor for this development is the location of the main ports, although, various productive sectors are also located in this region, such as mining. Another extremely important activity for the region is agriculture with the production of wheat, corn, rice, potatoes and various fruits. It is also worth noting the production of wine in this region, which is one of the most important in South America. The fauna and flora also presents endemic species due to the presence of very dry summers and rainy winters (Santibáñez, 2018[60]).

Three important hydrographic basins are located in the central region of Chile, Aconcagua, Tinguiririca and Maule (figure 8).

Aconcagua Basin: has an estimated area of 7,337 km^2 and has a mixed glacial-pluvial source, where its flow depends both on the snow-covered peaks of the region and of the rainfall.

Tinguiririca Basin: rises in the Andean mountains, in the Tinguiririca glacier volcano and has an area of 4,730 km^2.

Maule Basin: has an area of 20,295 km^2, being the fourth largest in the country. It originates in the Maule Lagoon at 2,200 m.a.s.l., where the glaciers of the region are also located.

Climate characteristics and vulnerability

The societal and economic sectors operating in the central zone, as in other parts of the country, have frequently faced extreme events, which caused serious damage to the population and the productive systems. It is worth mentioning that the climate characteristics existing in Chile, in addition to La Niña and El Niño phenomena, produce natural disasters of hydro-meteorological origin that already generated agricultural emergencies due to catastrophes that range from floods to water scarcity and long-term droughts in the valleys (Badilla et al., 2016[61]).

In terms of floods, Chile has a zonal pattern of fluvial flood types related to the distribution of climate domains. These floods are classified into four main types: landslides, glacial processes, volcanic processes and precipitation. The intensity or persistence of precipitation explains the occurrence of 71% of flooding during the latest years (Aravena et al., 2017[62]). For example, in the middle basin of the Tinguiririca, there is a high concentration of floods recorded, which have

59 Aravena, W. M., Gajardo, L. G. H., Ugarte, C. B., Hube, M. V., Jorquera, B. C., Henríquez, M. M., Baeza, J. P. & Pool, P. S. (2017). Estudio Básico "Diagnóstico para desarrollar Plan de Riego Cuenca del Maule". Informe final.

60 Santibáñez Q. F. (2018). Tomo III Regiones de Valparaíso, Metropolitana, del Libertador Bernardo O'Higgins y del Maule.

61 Badilla, M. H., Espinoza, L., Gomez, J. L., Bustamante, A. M., Navarro, A. M., Bustos, A., Riffo, A., Zamora, G., Reyes, G., Gajardo, G., Bruno, S., Villa, P., Quezada, F., Herrera, A., Parra, N. L., & Castro, M. V. (2016). Diagnóstico para desarrollar plan de riego en cuenca de Aconcagua. Informe Final.

62 Aravena, W. M., Gajardo, L. G. H., Ugarte, C. B., Hube, M. V., Jorquera, B. C., Henríquez, M. M., Baeza, J. P. & Pool, P. S. (2017). Estudio Básico "Diagnóstico para desarrollar Plan de Riego Cuenca del Maule". Informe final.

been caused by excessive rainfall, saturation of soil, shallow water table, poor drainage, or channel overflows (Irarrázaval et al., 2016[63]; Aravena et al., 2017[64]).

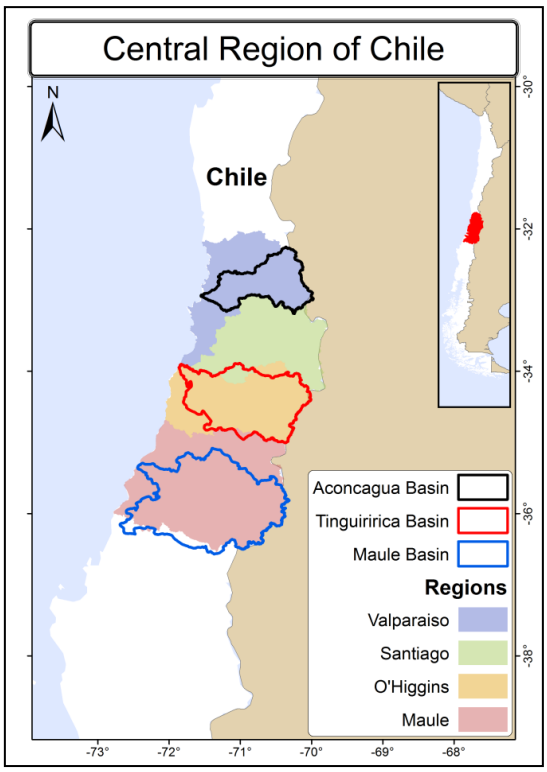

Figure 8. *Central region of Chile where the Aconcagua, Tinguiririca and Maule Basins are located, as well as the administrative region of Valparaiso, Santiago, O'Higgins and Maule.*

In most basins of the country, as the Aconcagua, recent observations indicate that reductions in precipitation along, with theexponential increases in demand for water, have led to a current scarcity of the resource. This disadvantage is reflected in tributaries with lower flow rates, reservoirs with little stored volume and drying of wells, which generates problems of drought and water scarcity despite being close to main rivers and estuaries. In this region, there is also an increasing demand for water, which is driven by the modernization and growth of agriculture, the installation of agro-industries, growing urbanization of rural areas, growing needs of the communities, and the generation of energy.

In addition, to the current situation of drought and increasing in water demand, are some internal problems of water use, which highlight the lack of organization, where some infrastructures of accumulation and distribution are weakened and without adequate maintenance. This drawback causes problems in the irrigation infrastructure, which also is affected by the excessive subdivision of land, especially in the urban sectors, where the construction of houses and private structures are carried out without considering the network of established channels.

63 Irarrázaval, S., Becerra, E., Ruiz, L., Gómez, G., Román, P., Monsalve, N., Flores, F., Lagos, A. & Moreno, C. (2016). Estudio Diagnóstico para desarrollar Plan de Riego en Tinguiririca. Informe final.

64 Aravena, W. M., Gajardo, L. G. H., Ugarte, C. B., Hube, M. V., Jorquera, B. C., Henríquez, M. M., Baeza, J. P. & Pool, P. S. (2017). Estudio Básico "Diagnóstico para desarrollar Plan de Riego Cuenca del Maule". Informe final.

Drought also makes forest fires more common in this region. The occurrence of prolonged dry summers and the presence of vegetation with high igniting power make this region most susceptible, especially in areas located in interfluves, coastal slopes, in sectors with forest patches or forest plantations, and in piedmont areas of the mountain, where native forests are present.

For the future, it is estimated that changes in climate due to greenhouse gases, increase the air surface temperature throughout the continental country. For the coast, the warming could be between 0.5 and 1.0 °C, while over the mountain range these changes could be up to 5 °C in some regions. The minor coastal heating would probably be due to the effect of the southern winds. There is also a slight differentiation between the seasons of the year, where warming of over 4 °C extend over the Andes is expected during the summer. In winter, the warming would be more intense, with values up to 5 °C, but concentrated in the central Andean region. For precipitation, changes are more difficult to quantify because it shows a more inter-annual variability. The projections indicate that the centre-south zone would present significant reductions, with values of up to 100 mm/decade. However, in other regions, the negative trends were not significant to the point of excelling on the great variability of precipitation of El Niño/La Niña events (Garreaud, 2011[65]).

It is also estimated that climate change will increase the intensity of extreme events, such as high and low temperatures, wind, intense storms, hail and drought. Lower rainfall, as expected in the future, would also increase the problem with the availability of water and, in this way, agriculture would face competition with other sectors of the economy (Badilla et al., 2016[66]).

Proposal

Global context

The Latin American region, due to its location and natural characteristics, has been affected by many disasters due to extreme weather events and climate change. Furthermore, this region comprises many developing countries that, in some cases, do not have the necessary capacities to manage these risks. To help improve the national capacity to understand and predict the climate, the World Meteorological Organization (WMO) together with international partners has launched the Global Framework for Climate Services (GFCS) as an authoritative, integrative and unique platform for guiding and supporting activities implemented within climate-sensitive investment areas. As a partnership with broad participation and reach, GFCS serves as a catalyser for activities, complementing the existing programs and initiatives that contribute to climate services, building on existing capacities and potentials, and providing momentum and tangible progress towards this fast-growing field. As such, it is directly contributing to the achievement of global and national goals identified in policy frameworks, such as the Paris Agreement adopted under the UNFCCC in 2015, the Sendai Framework for Disaster Risk Reduction 2015-2030, and the United Nations 2030 Agenda for Sustainable Development.

This framework focuses on developing and delivering services in five priority areas presenting immediate opportunities to bring benefits and wellbeing, especially in Latin America: agriculture and food security, disaster risk reduction, energy, health, and water. These priority areas were chosen due to their sensitivity to climate variability and change and also because they are the sectors where the strategies of adaptation and mitigation are prioritized. To achieve the

65 Garreaud, R. (2011). Cambio Climático: Bases físicas e impactos en Chile. Revista Tierra Adentro–INIA, 93, 13-19.

66 Badilla, M. H., Espinoza, L., Gomez, J. L., Bustamante, A. M., Navarro, A. M., Bustos, A., Riffo, A., Zamora, G., Reyes, G., Gajardo, G., Bruno, S., Villa, P., Quezada, F., Herrera, A., Parra, N. L., & Castro, M. V. (2016). Diagnóstico para desarrollar plan de riego en cuenca de Aconcagua. Informe Final.

development of specific climate services for these areas, it is necessary to have processes that include the collection of climate data, the generation and provision of climate information from the past, present and future, the development of products that help to understand the climate in its simplest form and its impacts on natural and human systems. Nonetheless, simply generating this information is not enough, but applying it correctly and turning it into a product for decision-making at all levels of society (WMO, 2016[67]).

Current situation of the region

An analysis of the technical and technological capacities of the National Meteorological and Hydrological Services (NMHSs) in the region, carried out through surveys with the countries, highlighted some of the critical problems that the institutions have and that restrict the production of sectorial climate services. For example, in terms of data management some NMHSs have mentioned that many data are not yet digitized, while some others are not homogenized, or have no quality control or metadata. However, the greatest weakness in the region is in the production of climate services, as there is still reported difficulty in generating specialized products for each sector, and when it is finally generated, it is not adequate enough for decision-making.

The main causes of this difficulty, and at the same time the priorities identified to improve them, have been the low number of personnel dedicated exclusively to this work, the inadequate computer infrastructure, inefficient databases and observation network. The ways to overcome these difficulties, according to the NMHSs, would be through partnerships with other NMHSs, the Regional Climate Centers (RCCs) and the WMO, as well as the engagement in partnerships and alliances with the private sector.

In this way, Colombia has taken an important step among the countries of Latin America, since it was the first to achieve the implementation of the National Framework of Climate Services (NFCS). The Colombian Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) came together with other institutions to improve the production of hydro-meteorological information and co-produce specific information for all productive sectors of the country, such as health, agriculture, energy, and transport (WMO[68]; IDEAM[69]). In addition, Peru and Chile have requested support to implement nationally the Global Framework for Climate Services (GFCS) and develop climate services for reducing the vulnerability of key societal and economic sectors of their territories (Table 2) . Therefore, this project proposal responds to these requests and facilitate WMO technical support to regional and countries partners.

Table 2. *GFCS status and priorities for each country.*

Country	GFCS priorities	NFCS implementation status

67 WMO (2016). Climate Services for Supporting Climate Change Adaptation. Supplement to the Technical Guidelines for the National Adaptation Plan Process. World Meteorological Organization, WMO. Geneva, Switzerland.

68 https://public.wmo.int/es/media/noticias/colombia-pionero-en-servicios-clim%C3%A1ticos-para-latinoam%C3%A9rica

69 http://www.ideam.gov.co/web/tiempo-y-clima/marco-nacional-de-servicios-climaticos

Chile	1) Disaster Risk Management: due to social and economic impacts. 2) Agriculture: key economic sector for the associated PIB/GDP. 3) Hydrological resources: availability and access to water is a problem clearly related to climate change. 4) Energy: the country is heading to clean energies through diversification of the energy matrix. 5) Health: a joint work has started however there is a necessity of major interaction with different sectors.	Internal consultations just started. Key information gathering in order to lead the activities for the establishment of the national baseline. The DMC is assessing its operational capabilities to respond to the NFCS implementation challenges, beginning with agriculture sector. It is expected by 2019 to begin the identification and key stakeholders mapping in order to determine intermediate and final users; and also the potential partners in the priority sectors.
Colombia	1) Agriculture and food security 2) Water resources 3) Health 4) Climate Risk Management 5) Energy	IDEAM initiated the implementation of the NFCS in 2017, as per the guidelines of the GFCS. In the first stage consisted of an assessment of national capabilities to provide climate services. This included the review of data, products and services developed and delivered by IDEAM. The second stage was a National consultation developed in September-October 2107 and a comprehensive identification of needs, sectorial priorities and the key elements of climate information value chains. The NFCS of Colombia was officially launched from 1st to 3rd of November 2017. During 2018, several activities has been developed: 1) The preparation of an institutional and legal framework for climate services for the agriculture sector. 2) The preparation of a document with a diagnostic of the state of the art in climate services for agriculture. 3) A deeper analysis of information requirement of farmers and associations. 4) An inventory of current climate services provided by IDEAM to the agriculture sector. 5) A prioritization of sectoral requirements. IDEAM is expected to develop an Operations Plan for NFCS implementation.

Peru	1) The NDC framework includes different priorities for health, water, agricultural, forest and fishing. Adaptation priorities that are being checked by multi-sectorial work group (GTM, RSN 005-2016-MINAM). 2) The PPR 068 (Presupuesto por Resultados) includes vulnerability reduction and emergency attention for disasters risk management. 3) The multi-sectorial program for frost (PMHF) guides different institutional actions to cope with low temperatures events from national institutions to vulnerable districts. 4) The SDG-6 monitoring project (GEMI) recommends multi-sectorial and progressive evaluations in order to obtain data to calculate the indicators related to the strengthening of public policies. 5) OCDE participation through the national program launched at 2014 has focused on economic growth, governance, fight against corruption, productivity and human capital and environment. 6) National policies related to GFCS priorities are: promotion of food safety, sustainable development and environment management, science and technology development and the agricultural and rural development policies.	1) Peru is member of the WMO Expert Team for the NFCS. 2) The MINAM is beginning coordination with WMO to support the NFCS process. 3) Based on CLIMANDES experience the preliminary stakeholders mapping has been systematized. 4) National Climate Outlook Fora (NCOF) will be institutionalized as an interaction space for users to know the climate information limits, needs and decision-making process. 5) Identification of strategic partners and legal frameworks to begin the process through an NFCS. The national system for disaster risk reduction (SINAGERED) represents the potential interface platform to connect all the users into the Disaster Risk Management (DRM) area.This platform is an inter-istitutional, dynamic, decentralized, trasversal and participatory system created in 2011 through the #29664 Law. The main objective is to identify and reduce risks related to multiple hazards, mitigate the negative effects and preparedness for disaster response 6) The National Emergency Operations Center- EOC, is the platform that allows an information exchange related to hazards, emergencies and disasters between all institutions in real time period which facilitates joint coordination for decision making at national level. This national and multi-sectorial network allows the interaction of climate services products. 7) Climate change involves hydroclimatic extreme events which has a bigger demand of climate information services. The SENAMHI is working on different actions to provide specific information for the National Climate Change Strategy – ENCC. The National Strategy on Climate Change (ENCC) incorporates approaches that contribute to achieve a satisfactory and sustainable development for society, based on a low carbon economy

Strengthening of capacities

The innovative pillars of the GFCS for strengthening the capacity to deliver actionable climate information are: The Climate Services Information System (CSIS) and the User Interface Platform (UIP).

The Climate Services Information System (CSIS) is the mechanism through which climate information is collected, stored and processed to generate products and services that inform decision-making across a wide range of climate-sensitive activities. Climate data includes past and present climate data (historical climate summaries, reanalysis and data rescue) as well as future climate (forecasts and projections) for use in mitigation, planning and adaptation. The CSIS comprises global, regional and national centres and other institutions that generate or process climate information and a network of computers and communication channels for the exchange of data and products through existing internationally-agreed systems. A key aim of the CSIS is to enhance the capacity of national and regional centres for effective use of global and regional inputs in national level operations. The Climate Services Toolkit (CST)[70], one of key instruments for CSIS implementation, promotes the development and provision of reliable, consistent and high-quality information and products to end-users. It will improve efficiency and raise capacities of service providers by facilitating the production, communication and application of climate information products. (WMO, 2014[71]).

Climate services often do not reach their target, the decisions-makers. The User Interface Platform (UIP) is a structured means for users, climate researchers and information providers to interact. Its purpose is to ensure that the information, products and communications relevant to user needs are applicable, actionable, timely, and easily understood. The User Interface Platform is the most novel GFCS component and reflects the fact that the involvement of users is crucial in helping to establish the needs, develop appropriate products, identify capacity development requirements and influence the direction of observational investments and research efforts. UIPs foster interaction among users, user representatives, service providers and researchers, through regional climate outlook forums, sector collaborations and expert study groups. The sustainability of this whole process is important to ensure that there is monitoring and evaluation of the processes (WMO, 2014a[72]).

The present proposal will seek to help Colombia achieve its objectives with the implementation of the NFCS and support Peru and Chile to establish the NFCS in their respective countries. It also thrives to strengthen the WMO Regional Climate Centre (RCC) as Centre of Excellence, to serve as the CSIS steward at the regional level by producing operational climate monitoring and prediction products, facilitating climate data services, and conducting regional and in-country training activities and to facilitate climate services network and play an instrumental role in the organization of Regional Climate Outlook

Regarding the priority sectors, this project will address climate variability and change in the water sector and its interaction with agriculture and hydropower. This approach addresses climate risk reduction through the enhancement of the design, production and provision of tools and products for early warnings of extreme events, water management (e.g. by cities, towns, and for irrigation), resilient food production, hydropower generation, and ecosystem and biodiversity conservation as part of the on-going climate adaptation, mitigation and sustainable development efforts. An analysis of the direct beneficiaries of this project is presented in Table 3.

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[70] http://www.wmo.int/cst/

71 WMO (2014). Anexo al Plan de ejecución del Marco Mundial para los Servicios Climáticos – Componente del Sistema de información de servicios climáticos. World Meteorological Organization, WMO. Geneva, Switzerland.

72 WMO (2014a). Anexo al Plan de ejecución del Marco Mundial para los Servicios Climáticos – Componente de la plataforma de interfaz de usuario. World Meteorological Organization, WMO. Geneva, Switzerland.

Table 3. Analysis of the direct beneficiaries and sectors in the pilot areas

Country/ location	Number of beneficiaries (men, women, etc.)	Crops and communities	Hydric infrastructure/power Dams
Chile	The 2017 national census at Quillota province registers: Total population: Male: 43.537 Female: 46.980 Farmers population: 5.148 Male:3.572 Female: 1.576	On the low basin of Aconcagua, the intensive agriculture systems are about 60% of fruit trees and 25% horticulture. The low basin of Aconcagua is the most important area of the country for avocado production. The horticulture are about: tomato, lettuce, carrot, kidney beans, all related to small farmers. The animal breeding is focus on: poultry (63% national production of turkeys). The small producer concentrates 40% of this production.	According to national census of watersheds updated on 2016 on Quillota province there are 38 watersheds, where 10 of them are tailings, 12 are for irrigation and 16 non-identified uses. The channel network of Quillota province there are 109 with 665.564 lineal meters (665,5 km) in which 6 of them represent 40% belongs to: MAUCO: 55.4 km WADDINGTON: 55.1 km OVALLE: 52.8 km EL MELON: 43.5 km PURUTUN: 34.4 km SERRANO: 24.6 km Power station installed on Quillota province: *Nehuenco I (1999). Power source: gas. Power: 368.4 MW *Nehuenco II (2003). Power source: gas. Power: 398.3 MW. *Nehuenco III (2002). Power source: gas. Power: 108 MW. *San Isidro (1998). Power source: gas, petroleum and diesel. Power: 379 MW. *San Isidro (2009). Power source: gas, petroleum and diesel. Power: 353 MW. *Tomaval 2 (2012). Power source: gas. Power: 1.6 MW. *Bio Cruz (2012). Power source: gas. Power: 1.8 MW. *Los Vientos (2007). Power source: gas. Power: 125 MW.

			*Las Vegas (2007). Power source: petroleum and diesel. Power: 2.1 MW.
Colombia	Cauca department Population: 35,758 inhabitants, Female: 17,213 Male: 18,545 Caldas department Population: 23,784 inhabitants, Female: 11,274 Male: 12,510 Tolima department Population: 36,977 inhabitants, Female: 17,910 Male: 19,087	Department of Cauca: Organic coffee, fruit trees, vegetables and potato. Indigenous Reserves of Popayán, Puracé and Totoró where there is an association of farmers. Department of Caldas: Coffee, fruit trees, vegetables, avocado and plantain. Department of Tolima: rice, corn, cotton and fruit trees	Department of Cauca: Aqueduct Company of Popayan Department of Tolima: Irrigation district of the Coello river, Usoguamo, Torres I district, and there is pumping activity of the Mangada River.
Peru	Lima: Rimac river basin Population: 7´605,742 inhabitants, Female: 51.2% Male: 48.8% The inter-basin high Apurímac has 110,000 inhabitants concentrated at Espinar and Canas provinces. The vulnerable population in front of flooding is concentrated at Huallaga basin with 77,416 inhabitants.	The river basin of Rímac, on the highlands area presents: Agricultural surface: 44,540.2 ha Producers: 4,041 Farmer communities: 28 The main crops are: fruit trees (9,081 ha), cultivated pastures (22,536 ha), cereals (3,877 ha), Andean tubers and roots (3,798 ha). The most cultivated fruit trees are: cherimoya, avocado, mango, apple and tuna; cultivated pastures: alfalfa and pastures are sown; cereals: wheat, maize corn and starchy corn; and tubers, white and yellow potatoes. High basin of Apurímac with: agricultural surface: 2´300,000 ha.; producers: 89,504 farmers communities: 700 Main crops: cultivated pastures: alfalfa, cereals: wheat, starchy corn and corn, tubers: white and yellow potatoes; and legumes: peas, beans. Of the 1,107,356.54 ha of agricultural area in the San Martin Region: 62% (686, 561.1 ha) corresponds to the study area (Huallaga Central, Bajo Mayo and Bajo Huallaga), 56.2% of the Agricultural Units (UA) has	In the Rímac zone there are Huinco - Sheque dam (270 MW) and Matucana – Tamboraque dam (140 MW). Huallaga has the Chaglla dam (456 MW). In all cases the dams are operated by private enterprises.

		agricultural area and 68.1% with natural pastures. The annual crops are: hard yellow corn, rice, plantains and yucca.	

Problem Overview

The project will address the current limitations of the participant countries to produce and deliver relevant climate information to a complex multi-institutional framework, sectorial stakeholders, national, subnational and local authorities in support of risk management and adaptation plans at the community level in the Andean region.

Project / Programme Objectives:

The overall objective of the project is to *reduce vulnerability and increase resilience of the Andean communities in Colombia, Peru and Chile to climate variability and change by implementing climate-smart decision-making networks for better disaster risk, hydropower generation and agriculture management.*

The sub-objectives of the project, which are in line with the project components below, and the Adaptation Fund outcomes, are:

- Increased technical capacity of the NMHSs of Colombia, Peru and Chile to generate and disseminate end-to-end and communities demand-driven weather, climate and hydrological services.
- Enhanced national and local inter-institutional/sectorial stakeholder networks to co-design and co-produce sector specific climate information in support of disaster risk management, long-term adaptation and water, food, and energy security.
- Empowered local communities to use the weather and climate information for local risk management and adaptation plans.
- Strengthened regional cooperation for mutual technical assistance among NMHSs, alignment with other complementary initiatives in the Andean region, and foster capacity building on data management, climate prediction, and tailored sectorial information that can be expanded to other countries such as Bolivia, Ecuador and Venezuela.

The theory of change of the ENANDES project is shown in the figure 9:

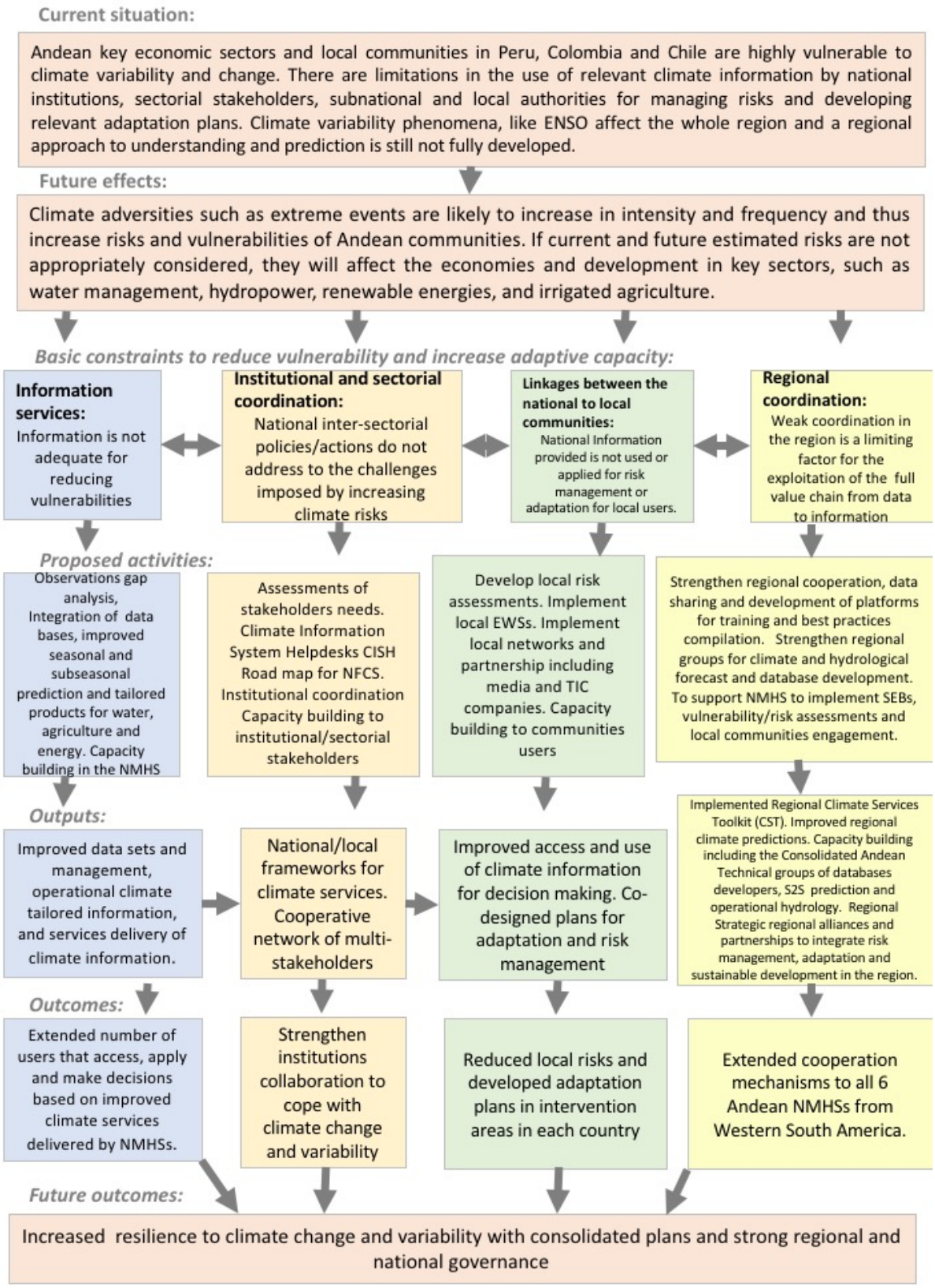


Figure 9. *Theory of change of ENANDES Project*

Project / Programme Components and Financing

Table 4. *Project components, expected outcomes and outputs*

Project Components	Expected Outcomes	Expected Outputs	Countries	Amount (US$)
1. Improvement of the national and local operational weather, climate and hydrological services system.	Extended number of users that access, apply and make decisions based on improved climate services delivered by NMHSs.	1.1 Updated national data management systems, archives, and integrated regional hydrological and meteorological databases.	Chile, Colombia, Peru	1,800,000
		1.2 Improved weather, climate and hydrological predictions and projections by establishing an optimized cascading system involving the regionalization of global forecast products.		
		1.3 Sustained delivery of weather and climate-related advisories to support decision-making for national and local water, agriculture and energy stakeholders.		
		1.4 End-to-end service through customization of climate information, communication and user feedback system.		
2. Implementation of national and local inter-institutional/ sectorial stakeholder networks.	Implemented contributions to start and consolidate the National frameworks of Climate Services.	2.1 Implemented contributions for the establishment and consolidation of National Frameworks for Climate Services in each country.	Chile, Colombia, Peru	900,000
		2.2 Implemented/improved sectorial local multi-stakeholder networks to support the co-design and co-production of tailored climate services.		

3. Engagement and empowerment of local communities to use the climate information for local risk management, and adaptation plans and projects.	Local stakeholders manage risks that arise from climate variability and change and develop adaptation plan, especially in pilot intervention areas.	3.1 Strengthened capacities of local stakeholders and communities to access, use and apply climate information for risk management and adaptation.	Chile, Colombia, Peru	1,800,000
		3.2 Co-designed local climate risk management and adaptation plans with local authorities and the support of public and private institutions/stakeholders.		
4. Strengthening of regional cooperation among NMHSs from the Andean region.	Extended cooperation mechanisms to all 6 Andean NMHSs from Western South America.	4.1 Implemented the Regional Climate Services Toolkit (CST).	Chile, Colombia, Peru	1,700,000
		4.2 Consolidated Andean Technical groups of data base developers, S2S[73] prediction and operational hydrology.		
		4.3 Implemented Strategic regional alliances and partnerships for sustained capacity building.		
5. Project/Programme Execution cost				6,850,000
6. Total Project/Programme Cost				548,000
7. Project/Programme Cycle Management Fee, charged by the Implementing Entity (if applicable)				650,000
Amount of Financing Requested				7,398,000

Project Duration: Three years and six months (2019 to mid-2022)

Projected Calendar: ***Table 5.***

Milestones	Expected Dates
Start of Project/Programme Implementation	March-2019
Mid-term Review (if planned)	January-2021
Project/Programme Closing	September-2022
Final Evaluation	November-2022

73 Seasonal to sub-seasonal

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project / programme components, particularly focusing on the concrete adaptation activities, how these activities would contribute to climate resilience, and how they would build added value through the regional approach, compared to implementing similar activities in each country individually. For the case of a programme, show how the combination of individual projects would contribute to the overall increase in resilience.

The connectivity and interactions between the different components and their corresponding outcomes are shown in the Figure 10.

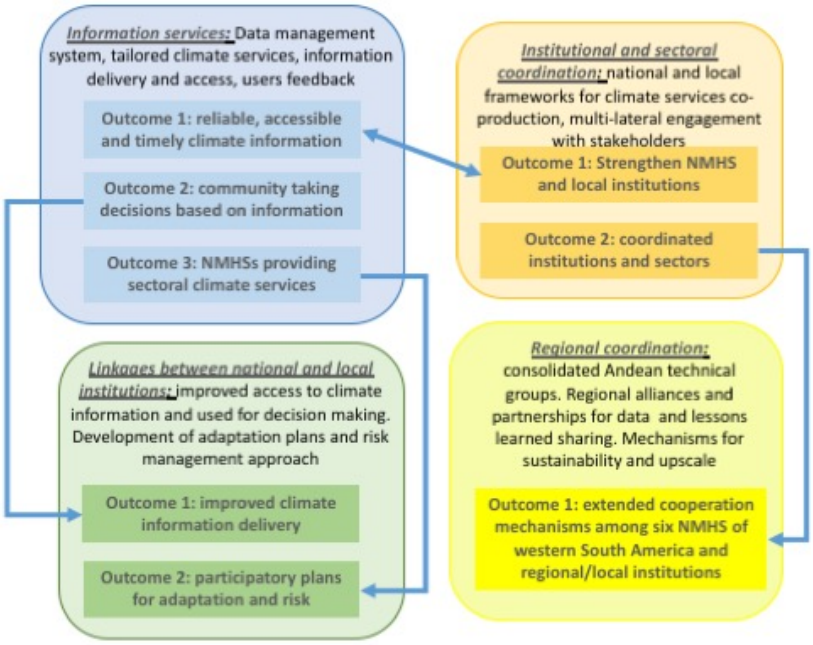


Figure 10. *Scheme of the component inter-linkages in ENANDES Project*

Component 1: Improvement of national and local operational weather, climate and hydrological services system

The Andean countries are known to have large meteorological and hydrological data gaps. The project will conduct a systematic data gap analysis to define the existing capabilities and propose adequate enhancements to achieve the goal of the project. This component will identify the gaps between the existing and the required sources of data, and assess the space and time coverage, availability, quality, and readiness for all parameters needed for the delivery of the improved information services. The analysis will also address data gaps across the existing observing networks, the integration of other sources of data (e.g. other national departments, academia, private sector), the use of available satellite data (this would need to cover the development of the capacity to ingest, interpret, and process satellite data, including required agreements for access), standardization of observation methods and data exchange. The findings will determine specific actions within the framework of the WMO Integrated Global Observing System (WIGOS) to achieve an integrated, coordinated and comprehensive observing system to satisfy, in a cost-effective and sustained manner, the evolving observing

requirements of countries in delivering their weather, climate, water and related environmental services.

The project will address the lack of homogenization of data streams such as meteorological and hydrological databases. This will be done through technical developments (e.g. Hydex[74] and others) and a sustained capacity building effort in each NMHSs with intensive efforts and resources to improve quality control and standardization of data sets within the weather, climate, and hydrology departments. This activity underpins the provision of weather and climate services for Early warning Systems (EWS), floods and drought prevention, and deliver more consistent information to risk managers and planners.

Key activity of this component is the availability of improved weather, climate, and hydrological predictions and projections through an optimized cascading system involving the regionalization of global forecast products. This will be developed through the implementation of an integrated hydrometeorological prediction system, with the capability of hydrological modelling and flood mapping in the selected basins. It is expected to optimize and extend the use of software tools previously implemented in the Andean NMHSs, such as SmartMet[75], accompanied by capacity building efforts at a regional and national scale.

The climate model representation of the ENSO signal in the Andean region is currently very poor due to a lack of understanding of topographic effects of the Andes, land-ocean boundary temperatures, etc. Considering the increased demand of seasonal and subseasonal predictions for risk management and sectorial planning, the project will support the implementation of experimental/operational hybrid[76] models for seasonal to subseasonal (S2S) predictions, including skill assessment and operational verification. This will also include models for climate impact forecasts, which are inexistent in Andean countries at present, and will represent a significant step towards increase resilience.

The project will support the implementation of sustained delivery mechanisms of weather and climate-related advisories in each NMHS to national and local water, agriculture and energy stakeholders. This will be achieved through a participatory process, complemented with capacity building with sectorial end-users to co-design and co-develop weather and climate products.

In order to expand the current information service and increase its application in the sectorial planning and climate change adaptation, the project will support the development of Impact-Based Forecast (IBF) products to contribute with decision support services. This will be complemented with the development of new communication channels based on mobile technology for the effective communication of alerts, advisories, and other information to users.

To consolidate the products developments, the project will promote specific actions to establish a system for “end-to-end” service through the customization of climate information, communication and user feedback system. The system will include the implementation of full climate information chain trough formal arrangements between national, local and sectorial institutions and the co-design and co-development of protocols and communication mechanisms.

74 Open source software developed for the Andean countries under PRASDES Programme. http://www.prasdes-ciifen.org/index.php/publicaciones/cat_view/12-documentos/26-hydex

75 https://github.com/fmidev/smartmet-server

76 “Hybrid” seasonal predictions based on the predicted state of ENSO, which can be forecasted relatively skillfully, together with observed local relationships with ENSO to be explored.

Outcome 1: Extended number of users that access, apply and make decisions based on improved climate services delivered by NMHSs.

Output 1.1: Updated national data management systems, archives, and integrated regional hydrological and meteorological databases.

Activities under output 1.1:

Activity 1.1.1: Conduct an observation gap analysis and address its findings within the WMO Integrated Global Observing System (WIGOS) National plans and framework for the region. Evaluation of the hydrometeorology networks for proposes this project in the pilot areas.
Activity 1.1.2: Local meteorological and hydrological data rescue (digitalization).
Activity 1.1.3: Implementation of integrated databases, including quality control and homogenization of data sets.
Activity 1.1.4: Improvement of regional/national/local data exchange, gridded data sets and services and interoperability protocols.
Activity 1.1.5: Regional and national workshops.

Output 1.2: Improved weather, climate, and hydrological predictions and projections by establishing an optimized cascading system involving the regionalization of global forecast products.

Activities under output 1.2:

Activity 1.2.1: Implementation of a comprehensive hydrometeorological prediction system integrating hydraulic modelling and flood mapping in selected basins.
Activity 1.2.2: Implementation of experimental/operational hybrid models for Seasonal to subseasonal (S2S) prediction, including skill assessment and operational verification.
Activity 1.2.3: Implementation of an operational model for the prediction of climate events.

Output 1.3: Sustained delivery of weather and climate- related advisories to support decision making for national and local water, agriculture, and energy stakeholders.

Activities under output 1.3:

Activity 1.3.1: Tailoring of weather and climate advisory products for disaster risk reduction, water, energy, and agriculture.
Activity 1.3.2: Implementation of a climate-smart platform for decision making to agricultural and water resources local planning.
Activity 1.3.3: Development of a training module for climate related advisory co-producers and end-users.
Activity 1.3.4: Development of impact-based forecast (IBF) products to help in decision support services in the areas of weather, disaster risk reduction, water, energy, and agriculture.
Activity 1.3.5: Develop communication channels based on the mobile technology for the effective communication of alerts, advisories and other information to users.

1.4 End-to-end service through customization of climate information, communication and user´s feedback system.

Activities under Output 1.4:

Activity 1.4.1: Exploitation of the full climate information value chain trough formal agreements with national, local and sectorial institutions.

Activity 1.4.2: Development mechanisms to incorporate users' feedback and customer satisfaction into the product development.

Activity 1.4.3: Identification of institutional, financial and cooperation mechanisms to ensure the sustainability of the climate information chains.

This overall component of the project will strengthen the current operational capabilities of the NMHS from Chile, Colombia and Peru to produce and deliver suitable climate services for informed adaptation activities. The services delivery will set up the technical and operational basis to contribute at different levels to prevention, preparedness and a better response to climate extreme events, and have more and better-informed adaptation plans at different geographic scales.

The existent interaction and coordination between the NMHS of Chile, Colombia, Peru and CIIFEN, as well as the WMO Regional Climate Center for Western South America (RCC-WSA) ensure optimization of resources and the transfer of know-how for the improvement and/or development of data management, prediction services and information management.

Component 2: Implementation of national and local inter-institutional/ sectorial stakeholder networks.

The implementation/consolidation of the NFCS is a key element to foster the inter-sectorial dissemination of climate information as well as enable its cascading through different territorial governance levels (national-subnational–local). These interlinkages will underpin the governance structures and the information needed to support adaptation plans while contributing with the institutional development and their empowerment to enable the necessary changes for climate resilience. The involvement of users in helping to establish the needs, co-develop appropriate products, identify capacity development requirements and influence the direction of observational investments and research efforts is crucial in achieving the project goal (figure 11).

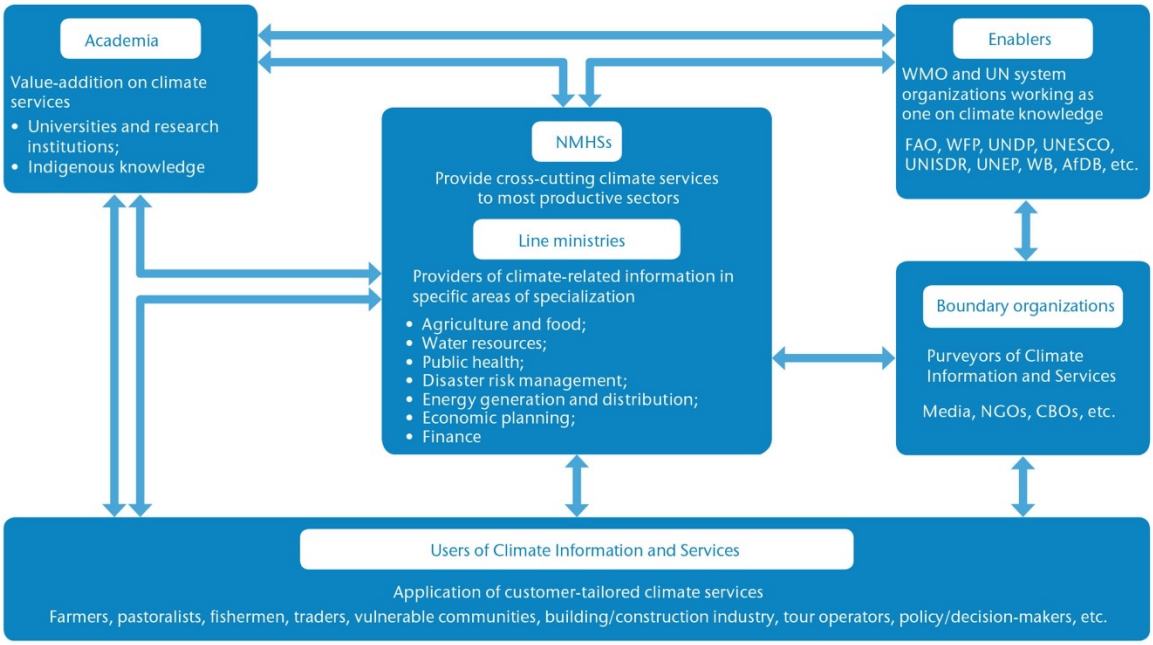


Figure 11. *Schematic representation of an NFCS showing interlinkages among partner institutions acting together as one on climate knowledge.*

Outcome 2: Contributions implemented to start/consolidate the National Climate Services frameworks

The project will support the establishment/consolidation of a NFCS in Chile, Colombia and Peru in accordance with GFCS Guidelines[77]. Several prerequisites for the successful development of the NFCS will be addressed during the project such as the engagement of national sectorial stakeholders (water, energy, agriculture, and risk management) involved in the production, tailoring, communication and utilization of climate services, the establishment of a national dialogue around climate services provision, identification of weather, hydrology and climate information needs and a blueprint strategic Plan for the implementation of the National Climate Services Framework for each country. Along with these processes, National Climate Information System Helpdesks (CISH) will be implemented.

A similar process will be performed at a local level with for local sectorial stakeholders (water, energy, agriculture and risk management). The project will support participatory processes in the intervention areas to reach institutional arrangements between local/sectorial stakeholders to join the local networks and contribute in the co-design, delivery and use of climate services. This will be accompanied by a well-structured capacity building process aimed towards all the participants.

The Global Climate Services Framework assigns an important role to the WMO-RCCs by supporting the implementation of NFCS by following the *Step-by-step Guidelines for Establishing a National Climate Services Framework, published by WMO in 2018*. The countries involved in this project have different levels of progress in the NFCS. The interaction among the technical staff and the institutions from the region provided a valuable space for mutual learning, to share lessons, good practices and foster south-south cooperation, which is long term sustainable and more cost effective.

77 Guidelines for Establishing a National Climate Services Framework, published by WMO in 2018

Output 2.1: Contributions implemented for the establishment/consolidation of National Climate Services Frameworks in each country.

Activities under output 2.1:

Activity 2.1.1: Assessment of baseline on climate services, mapping of national and subnational sectorial users and providers (water, energy, agriculture and disaster risk management), and identification of weather, hydrology and climate information needs.

Activity 2.1.2: Assessment of existing gaps and key elements in the full value chain of operational climate services. Identify climate related impacts and Socio-Economic Benefits of climate services in water, energy and agriculture sectors (figure 12).

Activity 2.1.3: Development of a comprehensive mapping of water, energy, agriculture and risk management requirements of climate services.

Activity 2.1.4: Development/Improvement of the national strategic plan and costed action plan for the implementation of the National Climate Services Framework for each country.

Activity 2.1.5: Implementation of National Climate Information System Helpdesks (CISH).

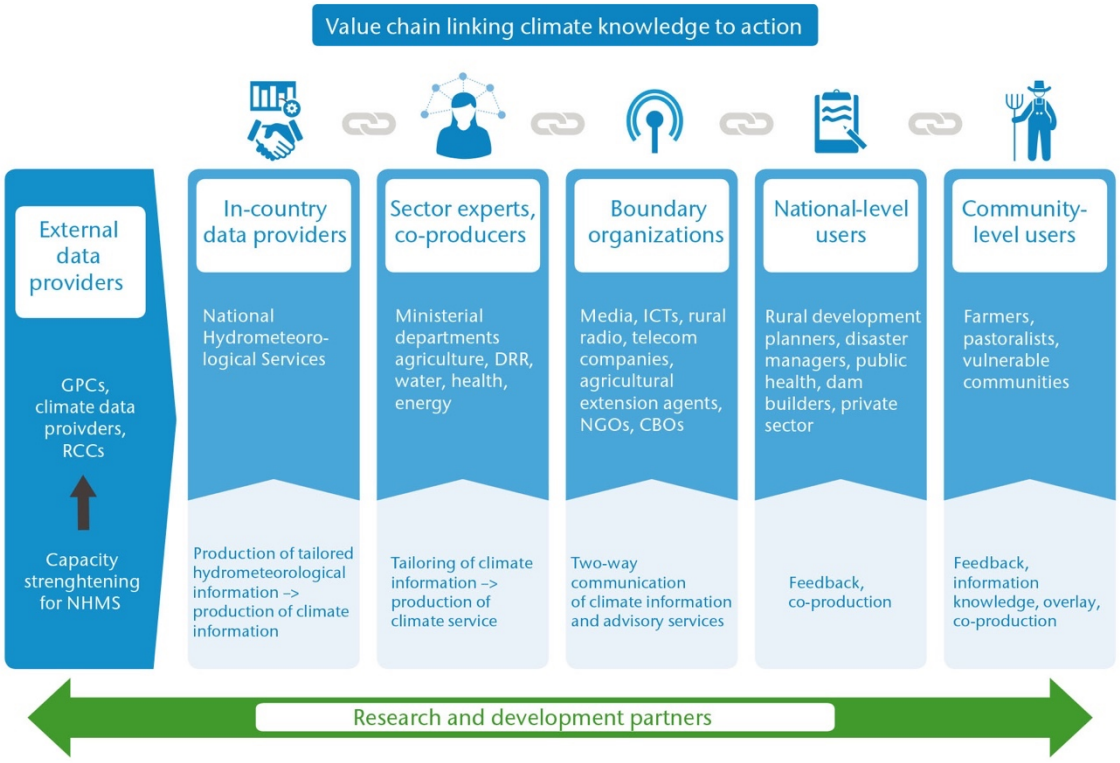


Figure 12. *National value chain for climate services*

Output 2.2: Implemented /improved local sectorial stakeholder networks to deliver and use of climate services.

Activities under output 2.2:

Activity 2.2.1: Identification and mapping of community level sectorial stakeholders (water, energy, agriculture and disaster risk management), and weather, hydrology and climate information needs.

Activity 2.2.2: Local assessment of climate related impacts and Socio-Economic Benefits of climate services in water, energy and agriculture sectors with gender disaggregation.

Activity 2.2.3: Sustained mechanism of regular consultations and communication channels .

Activity 2.2.4: Capacity building on climate information use and application at community level.

Component 3: Empowerment of local communities to apply risk management and adaptation measures.

This component of the project is specifically and strongly focused on supporting adaptation activities in the local intervention areas, and every aspect of the implementation is a direct contribution to building climate resilience. It involves actions to reduce vulnerability, to apply climate information for reducing exposure, and strengthen local institutions capacity while empowering local communities.

Outcome 3:

The project will strengthen the capacity of local stakeholders and communities to access, use, and apply climate information for risk management and adaptation. An identification and mapping of local partners and institutions to support the sustained and timely provision of climate information to local communities will be performed. Along with this assessment a capacity building strategy will be developed to support the implementation of a community based EWS with the active involvement of local partners (schools, rural communities, women and youth), and mainstream climate information for risk management and adaptation at a local scale. To consolidate the EWS, the project will support the implementation of the Common Alerting Protocol (CAP) standard for the automated communication of alerts in each NMHS. This process will be accompanied by a capacity building process targeted to local stakeholders, such as agricultural and energy associations, smallholder farmers and micro-hydropower operators. Depending on the local conditions and the previous observation gap analysis (component 1), voluntary local observation networks will be implemented in local intervention areas.

One of the main principles in the climate services value chain is the belief that different stakeholders and communities of practice operating at the local level have a tremendous amount of knowledge to contribute. This will advance their shared interests of reducing adverse impacts of climate-related risks while maximizing the socioeconomic benefits gained by receiving advance information of weather, water and climate parameters. Traditional knowledge and gender aspects will be assessed, along with capacity building activities on the access, interpretation and application of climate information and risk analysis. In addition the project will support participatory consultations and dialogues in order to establish strategic alliances and partnerships with local media (radios, TV), NGOs, private companies (ITC), telecommunication companies for SMS-based two-way communication, mobile device applications (apps), local offices of National institutions willing to the project implementation.

As final step, the project will support the preparation of local risk management and adaptation plans (considering voluntary adaptation responses) in line with the NDCs in water and

agriculture, and with emphasis on climate extreme events through participatory processes in local intervention areas in the three countries.

Output 3.1: Local stakeholders manage risks arisen from climate variability and change in pilot intervention areas

Activities under output 3.1:

Activity 3.1.1: Identification and mapping of local partners and institutions to timely dissiminate climate information to local communities.
Activity 3.1.2: Implementation of a capacity building strategy for local partners (schools, rural communities, women and youths) to implement local EWS and mainstream climate information for risk management and adaptation at a community level.
Activity 3.1.3: Training workshops on the use of climate products to the main agricultural and energy associations, including training of trainers for smallholder farmers and micro-hydropower operators.
Activity 3.1.4: Implementation of self-sustainable community-based climate early warning systems in designated areas.
Activity 3.1.5: Implementation of the Common Alerting Protocol (CAP) standard for the automated communication of alerts.
Activity 3.1.6: Implementation/enhancement of local hydro-meteorological observation networks.

Output 3.2: Local climate risk management and adaptation plans with local authorities and the support of public and private institutions/stakeholders

Activities under output 3.2:

Activity 3.2.1: Risk and vulnerability assessments at community level including traditional knowledge and gender aspects.
Activity 3.2.2: Strengthen capacities of local communities. stakeholders to access, interpret and apply climate information and risk analysis combining them with the traditional knowledge for local planning. Participatory activities for local community stakeholders to provide feedback on the delivered climate information and develop risk analysis, combined with the traditional knowledge of local planning.
Activity 3.2.3: Establishment of partnerships with local media (radios, TV), NGOs, private companies (ITC), telecommunication companies for SMS-based, mobile device applications (apps) local offices of National institutions
Activity 3.2.4: Preparation of local risk management and adaptation plans (considering voluntary adaptation responses) in line with the NDCs in water and agriculture, and with emphasis on extreme climate events, through a participatory process in locally designated local communities.

Component 4: Strengthening of regional cooperation among NMHSs from the Andean region.

The Andean region shares many common features among the covered countries this is why regional cooperation is essential to sharing of knowledge, expertise, and also good practices which can be extended to similar geographic, social, or cultural environments. To accomplish this regional approach and foster cooperation, it is critical to support the process of knowledge exchange, identify relevant regional experts who can train others and join the thematic expertise in groups that can be consolidated and evolve according to the emerging needs of

each country. This regional cooperation should be promoted through a regional entity. Established as an international center for the study of the ENSO phenomenon, CIIFEN, based in Ecuador, has been closely working with the NMHS and other national institutions related with climate risk management and adaption during the last 15 years. Since 2015, the institutional relationship between CIIFEN and the NMHS from Western South American countries was formalized with the implementation of the WMO Regional Climate Centre for the WSA region. Despite this significant formal process, and the ongoing activities this institutional regional framework must be strengthened. The activities of Component 4 are designed to enhance the regional role of CIIFEN in supporting the NMHS of the region by regionalizing global climate products and tools, coordinating and implementing a sustained capacity building strategy, supporting the functioning of regional groups of experts and trainers and also seeking inter-regional partnerships and other alliances and articulation within or outside the region.

Outcome 4: Strengthen regional cooperation mechanisms and upscale to Western South America Region

One of the CSIS enablers ensuring basic consistency of information across the regional and national scales, and from historical data to future climate change projections is the GFCS Climate Services Toolkit (CST). CST provides operational CSIS function to share new tools, procedures and instruction, information and methods, and thereby enable all CSIS providers to take advantage of research and development advances. CST facilitates the production, communication, and application of climate information products. CST enables more countries to develop their national products, and so encourage improved data sharing, and foster the interaction and shared learning between information providers through the development of a common set of skills. CST ensures the climate information and products developed for and provided to end-users is relevant, reliable, useable, consistent (through time and across regions) and of high quality. And finally, CST will reduce the need for expensive capacity building through availability of training resources and make training workshops more focused, tangible, and efficient in imparting the operational skills.

CIIFEN, will work with the NMHSs to improve the linkages across the Global-Regional-National information chain and optimize the use and application of what is available in the CST for the NMHS by developing a Regional CST. The CST will complement existent capabilities available at CIIFEN as WMO-RCC to further support the NMHSs participating in this project, and the implementation of climate services in other countries of the Andean region.

The project will consolidate the Andean technical groups of database developers, Sub-Seasonal to Seasonal (S2S) prediction and operational hydrology; and contribute to implement strategic regional alliances and partnerships for sustained capacity building. This will include close coordination with RA III WMO RTCs[78] to implement sustained climate services for water, energy and agriculture sectors, and the preparation of an online collection of best practices and lessons-learned on climate service implementation at a regional, national and local scale; and improvement of computational capabilities, interoperability and communication systems for regional climate services.

To consolidate the regional cooperation, the project will contribute with the implementation of joint coordinated activities with UN agencies such as FAO, UNESCO, UNISDR, regional intergovernmental organizations, such as the Secrateria General de la Comunidad Andina (SGCAN), and other networks working in the region on common matters. It is expected that based on improved partnerships the agreement for the further establishment of an ad-hoc panel

78 Regional Training Centers

of financial agencies for the sustainability and extension of adaptation efforts in other Andean nations will be reached.

The strengthened regional cooperation among NMHS and other partners will contribute to foster synergy in risk management and adaptation initiatives, and make them more complementary, cost-efficient and coordinated. This will reduce mutual interferences between projects, institutions and financial agencies, and consequently increase its impact on climate resilience.

Output 4.1 Implemented Climate Services Toolkit (CST) for the Andean region.

Activities under output 4.1:

Activity 4.1.1: Diagnostics of operational capabilities and needs of the NMHSs in the Andean region to provide sustainable climate services.

Activity 4.1.2: Strengthening of the regional platform to support the Climate services Toolkit, including new regional operational products:

- Generation of a regional Long-Range Forecast (LRF) from Global LRF products and verification (regional).
- Implementation of a regional platform to access global model outputs, including climatology.

Activity 4.1.3: Development of a regional training and capacity building plan in close coordination with RA III WMO RTCs to implement sustained climate services for water, energy, and agriculture sectors.

Activity 4.1.4: Development of an online collection of best practices and lessons-learned on the implementation of climate services at regional, national and local level.

Activity 4.1.5: Improvement of modern computer science, interoperability and communication systems for RCC-WSA members.

Activity 4.1.6: Local assessment and demonstration of Social-Economic Benefits (SEB) of the services provided by NMHSs to the disaster risk reduction, water, agriculture and energy sectors.

Output 4.2: Consolidated Andean Technical groups of database developers, S2S prediction and operational hydrology.

Activities under output 4.2:

Activity 4.2.1: Regional workshops for coordination and training.

Activity 4.2.2: Improvement of the regional Andean database, S2S and interoperability system.

Activity 4.2.3: Implementation of innovative hydrometeorological prediction models based on satellite information.

Activity 4.2.4: Strengthening of operational hydrology, advanced techniques for hydrological monitoring and hydrometry.

Output 4.3: Strategic regional alliances and partnerships implemented for sustained capacity building.

Activities under output 4.3:

Activity 4.3.1: Implementation of joint coordinated activities with UN agencies such as FAO, UNESCO, UNISDR and regional intergovernmental organizations, such as the SGCAN.

Activity 4.3.2: Establishment of an ad-hoc panel of financial agencies for the sustainability and extension of adaptation efforts to other Andean nations.

B. Describe how the project /programme would promote new and innovative solutions to climate change adaptation, such as new approaches, technologies and mechanisms.

Under component 1: Improvement of national and local operational weather, climate and hydrological services system.

Using and extending the Climate Services Information System (CSIS)

The project will apply and extend the ongoing principles, components and information of the CSIS.[79] For delivering climate information effectively it is imperative that appropriate operational institutional mechanisms are in place to generate, exchange and disseminate information nationally, regionally and globally. The Climate Services Information System (CSIS) is the principal GFCS mechanism that will routinely collate, store and process information about past, present and future climate. The CSIS will comprise a physical infrastructure of institutes, centres and computer capabilities that, together with professional human resources, will develop, generate and distribute a wide range of climate information products and services to inform complex decision-making processes across a wide range of climate-sensitive activities and enterprises. The WMO World Climate Services Programme will be the principal mechanism for implementing the CSIS, a substantial part of which already exists. The implementation strategy of the CSIS is based on a three-tiered structure of collaborating institutions (CSIS 'entities 1 ') that will ensure climate information and products are generated, exchanged and disseminated: a) Globally through a range of advanced centres; b) Regionally through a network of entities with regional responsibilities (RCCs); c) Nationally and locally by National Meteorological and Hydrological Services (NMHSs) and, through national institutional arrangements, with partners. A set of initial, high priority minimum functions of CSIS include: (i) climate data rescue, management and mining; (ii) climate analysis and monitoring; (iii) climate prediction; and (iv) climate projection. These functions comprise processes of data retrieval, analysis and assessment, re-analysis, diagnostics, interpretation, assessment, attribution, generation and verification of predictions and projections and communication (including exchange/ dissemination of data and products) that will be carried out over a global-regional-national system of inter-linked producers and providers. Formalized structures and procedures governing CSIS entities and functions are essential for standardization, sustainability, reliability, and adherence to established policies and procedures. Knowing user requirements and understanding how users apply climate information will be essential for designing, disseminating and encouraging uptake of CSIS products and services. The CSIS will engage with the GFCS User Interface Platform (UIP) to achieve these objectives and will also work with the Observations and Monitoring (O&M) and Research, Modelling and Prediction (RM&P) pillars to obtain the inputs required for its operations. There are already a number of advanced centres providing global-scale CSIS products, although their operations will need to be further coordinated and standardized, especially regarding exchange of routine data and products so as to ensure compatibility across geographical and jurisdictional boundaries. Making regional implementation a first priority gives countries that need the most help something to work with quickly, while awaiting further specification and funding of longer-term national climate capacity development efforts. At regional level, Regional Climate Outlook Forums (RCOFs) are one effective mechanism for stimulating the development of such collaboration and consensus. Users of climate information can benefit from access to products

79 Annex to the Implementation Plan of the Global Framework for Climate Services – Climate Services Information System Component. WMO, 2014.

reflecting collaborative expert assessment and consensus along with information derived from a variety of individual sources.

Enabling the cascading of climate information at different geographic scales

The project will innovate the ways of connectivity between the national, local and community level to ensure the cascading of climate information, building on existent partnerships, enabling new ones and empowering institutions, authorities, media, private and public stakeholders. This will contribute to increase the access, understanding, use and application of climate information, through the following outcomes:

- Improved use and access to weather and water data, remote sensing and model outputs, for use by both, intensive and extensive agriculture sectors, from those highly organized to small-scale agricultural associations.
- A wide portfolio of services to the energy sector, databases, forecasts and scenarios for medium and long term climatic variables, assessment, compliance with international standards of the hydro-meteorological networks, instrumentation calibration, training, research;
- Optimization of decision-making on water use based on resource monitoring, expected climate scenarios and impact-oriented forecasts. This will be particularly important to solve potential conflicts in water use between agriculture, energy and environment using multipurpose infrastructures, taking into account flood protection.

Capacity building activities for the NMHS

Capacity building activities for the NMHSs will be delivered based on materials already tested and made available by WMO in the framework of specific activities such as the Flood Forecasting Initiative, or the Integrated Drought Management Programme (IDMP). These training could also be embedded in wider WMO initiatives (e.g. corresponding to the work plan of the WMO Commissions for Climatology and Hydrology), and therefore provide an in-kind commitment from WMO in the development of training materials and the logistical organization of the training workshops. Countries would benefit from this training and at the same time contribute in-kind by having their NMHSs staff attending the workshops or assisting on the local logistical arrangements for holding the workshops. These trainings will strengthen NMHS capacities in generating and delivering climate information and prediction products for climate services by developing skills required to access forecasts and reforecast data from Global Producing Centres for Long-Range Forecasts (GPCLRF).

Figure 13. WMO Global Producing Centres for Long-Range Forecasts

GPCLRF is an integral part of the WMO Global Data-Processing and Forecasting System (GDPFS) underpinning the generation of climate information products by the NMHSs. The GPCLRFs follow a strict designation process according to which the Centres adhere to well defined standards to ensure consistency and usability of output. These standards include a fixed forecast production cycle, a standard set of forecast products and the WMO defined verification standards. Currently there are 13 WMO designated GPCLRFs, from which NMHSs can take advantage, especially from CPETC in Brazil (Figure 13).

Trainings will also focus on products from WMO Regional Climate Centres (RCC-WSA for the Andean region) and two Lead Centres: The Lead Centre for Long-Range Forecast Multi-Model Ensemble prediction (LC-LRFMME) and the Lead Centre for Standard Verification System for Long Range Forecasts (LC- SVSLRF). RCCs have been established to deliver regionally, high-resolution data and products including long-range forecasts that support regional and national climate activities and climate services. Regional Climate Centres are operated as Centres of Excellence that strengthen capacity of WMO Members in a given region to deliver the best climate services to national users.

LC-LRFMME is jointly managed by the Korean Meteorological Agency and NOAA's National Centre for Environmental Prediction in the USA. Its functions include: collection of long-range forecast data from all GPCs each month; maintaining a central portal from which forecast users can access the GPC output in standard digital and graphical formats; developing and providing multi-model forecast products with improved skill and promoting research into techniques for combining predictions from different models.

LC-SVSLRF is jointly managed by the Australian Bureau of Meteorology and the Meteorological Service of Canada. The key role of the LC-SVSLRF is to collate and display GPC hind-cast verification diagnostics in standard formats that allow easy comparison between models. The Lead Centre provides access to: verification datasets; verifying software;

documentation of the system; broad technical support; and, access to the final verification data as well as graphing and display of results.

Under component 2: Implementation of national and local inter-institutional/ sectorial stakeholders networks.

Fostering the inter-institutional and sectorial coordination

NMHSs are increasingly coordinating with other national and local authorities, private institutions and NGOs to deliver weather/climate advisories and warnings for extreme events. Those alliances will provide a basis for climate information co-production among them. The project will develop capacity building activities and foster joint and coordinated work among national institutions which could improve the holistic approach to the climate resilience, by connecting the related economic sectors linked with water resources: agriculture, and energy production. This coordination should lead to a better governance and coordination to optimize financial resources and enhance the sectorial risk management and adaptation plans.

Under component 3: Engagement and empowerment of local communities to co-design local risk management and adaptation plans and projects.

Innovation on capacities building

The project will combine virtual platforms with sustained capacity building processes by engaging local institutions, NGOs, or other stakeholders. They will include typical training workshop but combining traditional /ancestral knowledge with the formal one. This will be done through participatory, gender inclusive, activities with strong involvement of local actors from different economic sectors, and private and public institutions.

Under component 4: Strengthening of regional cooperation among NMHSs from the Andean region.

The regional approach

The regional approach is one of the key elements within the GFCS. The innovative side and added value of the regional cooperation is based in the following principles (1) improve capabilities within national institutions through regional collective action, (2) share knowledge and experiences on national specific benefits, (3) contribute to the reduction of disparities among countries, (4) demonstrate that a regional climate service can be enhanced as a result of improving national components and vice-versa, and (5) agree upon regional coordination mechanisms[80].

Colombia, Chile and Peru, and other Andean countries, share regional climate characteristics. However, their social, cultural and economic characteristics could be different with a wide variety of good practices, learning and innovative solutions, which could strengthen to all involved national and local institutions if they are shared within a regional cooperation mechanism.

80 Martinez, R. (2011). Building sustainable regional climate information systems. Climate Research, 47(1/2), 41-45. Retrieved from http://www.jstor.org/stable/24872339

The regional approach proposed in this project in mostly based in a long cooperation history among Western South American NMHSs[81] and CIIFEN which since 2015 is a WMO RCC. Previous experiences, good practices and lessons learnt provides a suitable regional platform to complement national and local actions to foster risk management and long-term adaptation.

From an operational perspective, a regional approach allows identifying common needs supported by an operational system for climate services involving CIIFEN as WMO RCC, and global climate centers as well as NMHSs. The forecast system worldwide is based on operational global and regional numerical weather prediction models, fed by data and observations exchanged internationally by NMHSs, and regional and global centers. The regional approach seeks for the deployment of a CST, which facilitates access by NMHSs to relevant climate data, products and tools from CIIFEN and WMO global centers with which NMHSs can create value-added products. CST deployment will be accompanied by hands-on support from CIIFEN and third-party NMHSs with advanced climate services capabilities, through "twinning" arrangements. The resulting operational system will support climate services delivery in selected local communities affected by climate variability and change. The value chain will set an example supported by CIIFEN for the larger region (Bolivia, Ecuador, and Venezuela).

Since 1997 WMO has supported the routine generation of regional seasonal climate outlooks in most regions of the world. The principal mechanism for this is the Regional Climate Outlook Forum (RCOF). An RCOF is a platform that brings together national, regional and international climate experts and user representatives from countries in a region to provide consensus-based climate predictions with input from NMHSs, regional institutions, WMO Regional Climate Centres (RCCs), Global Producing Centres for Long Range Forecasts (GPCLRFs) and other climate prediction centres. Through interaction with sectoral users, extension agencies and policymakers, RCOFs also assess the likely implications of the outlooks on the most pertinent socio-economic sectors in a given region, and explore the ways in which use can be made of them. In the Western South America, the RCOF involves six NMHSs on a monthly and uninterrupted cooperation since 2003 to provide regionally integrated climate outlooks. This integration mechanism will be used to strengthen south-south cooperation where countries contribute with experts to enhance the capacities of their peers in other NMHSs. RCC-WSA members are the directors of the NMHSs who signed the following regional strategic actions:

1. Strengthening capacities for climate data management.
2. Capacity building for seasonal prediction.
3. Strengthening tailored climate services to priority sectors.
4. Positioning and visibility of NMHSs as permanent and official entities in the respective countries
5. Resource mobilization and technical cooperation for the RCC-WSA operation.

This project aligns with this regional strategy. It will strengthen the operational exchange of data and products between global, regional and national meteorological institutions, and between NMHSs and climate affected stakeholders, to increase the capacity for developing, delivering and using tailored products for risk management and adaptation (figure 14).

81 Martinez, R. & Mascarenhas, A. (2009). Climate risk management in western South America: implementing a successful information system - WMO Bulletin, 2009 - researchgate.net

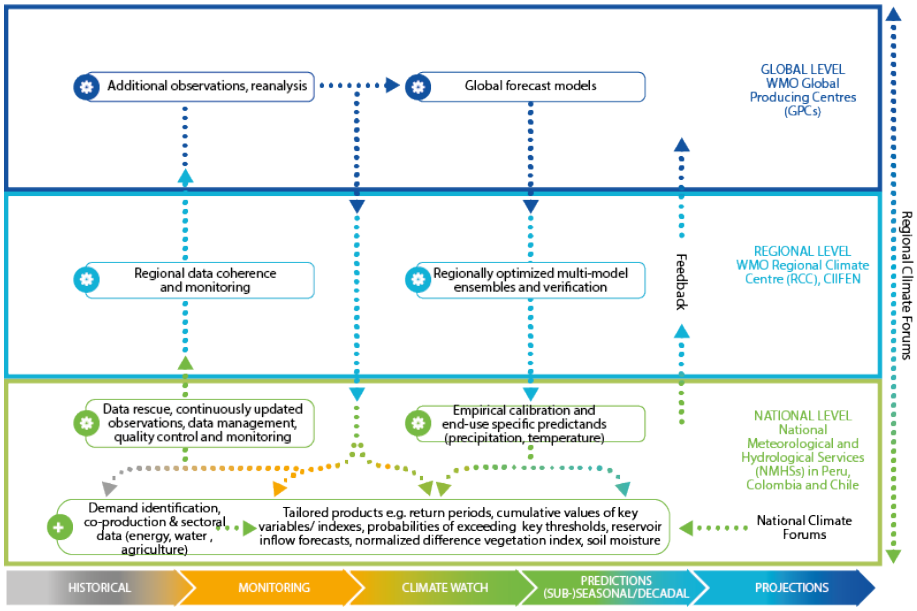


Figure 14. WMO Climate Operational framework at Global, Regional and National level

C. Describe how the project / programme would provide economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme would avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

Investments in climate risk reduction and preventive adaptation measures based on authoritative climate information spanning the historical recurrence and the future new trends should result in economic benefits for local communities and the whole nation given the potential avoided costs associated with lack of preparedness. CIIFEN as part of the activities of the regional project, PRASDES[82], conducted in 2014, a Social and Economic Benefits Study in Puno-Peru which was presented in the COP-20. The study demonstrated that the benefit of the Peruvian Government investment in the regional office of SENAMHI in Puno, was easily doubled only for the avoided losses associated with weather and climate adverse events. The potential of the financial return only by increasing the number of climate information users, is 4 times the current investment without considering the economic impact of social benefits. The experience of CLIMANDES Project in Peru on the estimation of the socioeconomic benefits (SEB) of climate services will be shared with the Project. The SEB constitutes a necessary building block for public policy-making. This helps mobilizing the required financial and personal resources to operate and maintain climate services, and to invest them strategically to enhance such services and make adaptation decisions based on prevention strategies.

The effective end-user climate services through capacity building, communication and awareness will guide resource allocation at community, municipality and national level. By engaging local government authorities and community members in identifying climate information needs linked to monitoring, forecasts and alerts, the project will lay the foundation for environment-related behavioural patterns and attitudes of future generations. The exhaustive description of benefits is summarized in table 6.

82 Regional Programme to Strengthen Weather, Water, Climate Services and Development in the Andean Region. http://www.prasdes-ciifen.org/

Table 6. *Social, economic and environmental benefits per country*

Country	Economic benefits	Social benefits	Environmental benefits
Chile	Reduced losses and damages associated with hydro-meteorological and climate extreme events. Increased competitiveness based on climate-smart production (agriculture, energy). Increased economical growing associated with increased climate resilience.	Improved capacities at national and local level to cope with adverse weather and climate events which mean less impact in the livelihoods of most vulnerable families. Improved quality of life associated with reduced vulnerability and increased safety in communities and their properties. Reduced possibilities of abrupt cuts jobs or negative effects in communities' livelihoods. Improved employment stability in rural climate-sensitive areas.	Improvement and better practice on use of agriculture fertilizers reducing the amount of applications. Improved practices for water resources. Efficient use of hydroelectric power and clean energy.
Colombia	Reduction of production cost through agricultural planning, crop, soil and water management, sowing programming, phytosanitary management, among others. Efficiency in the generation of climate information products, focus on expressed needs of final users. Clean energy projects based on information of water availability at the intervention area. Improvement of the local economy through energy saving consumption by reducing the operation and production cost.	Reduction of climate extreme events that impacts food production and water availability. Livelihood improvement for non-connected communities and population to the national electrical net through the use of renewable energies. The Project will provide key information for system design and technological solutions applied to lighting, communications, refrigeration, water pumping, air heating, drying of agricultural products, air	Land use planning improved with environmental aspects, such as: water resources management, renewable energy, disaster risk management, conservation and exploitation of biotic and edaphic resources. Reduction of issues that increases climate change impacts and disaster risk factors. Improvement of the natural resources management.

		conditioning, among other applications.	
Peru	Through timely access to hydro-meteorological warning and/or weather forecasting information for planning purposes, preventive risk management actions and adaptation measures will be developed that will contribute to reducing impacts and damage to crops, livestock, energy infrastructure (production, transmission, distribution, etc.), as well as optimal water resource management. Avoided damages are avoided costs in emergency response, rehabilitation costs, costs of restoring operational capacity of risk and/or energy infrastructures,	The populations are more aware of the changes in climate and climate variability and have more information on response mechanisms, which will strengthen the participation of the population (the most vulnerable communities that include women in decision-making related to agricultural production and risk management) and organized society in the development of a culture of prevention and commitment to disaster risk management.	Reduced damage and losses to populations, livelihoods, and also ecosystems that are part of the production systems of rural populations. The negative effects of extreme events are managed through adaptation measures that aim to maintain and conserve ecosystems and their ecosystem services (agro-biodiversity, water-regulating water services for the provision of water for irrigation and/or sustainable energy generation), as well as to mitigate their negative impacts.

D. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme and explain how the regional approach would support cost-effectiveness.

The project has been designed to be implemented over the basis of what is available and is working with or without limitations. The cost-effectiveness of the improvement of national and local operational weather, climate and hydrological services system (component 1) will be reflected in the south-south cooperation which is being facilitated by CIIFEN as WMO RCC. This means to reduce asymmetries between countries with the local expertise of the most advanced institutions, sharing knowledge through regional or national workshops. The cost-effectiveness of the regional approach also is reflected in the knowledge, experience and good practices from past regional projects implemented by CIIFEN with the NMHS of the Andean region where national and local interventions were conducted, such as the project funded by the IDB: *"Implementing a regional information system to support climate risk management in the Andean region"*[83].

83 http://www.ciifen.org/index.php?option=com_content&view=article&id=1885&Itemid=513&lang=es

Regarding the implementation of national and local inter-institutional/sectorial stakeholders as well as the engagement and empowerment of local communities (components 2 and 3), the regional approach improves the cost-effectiveness, avoiding significant investments in new structures at local level because the existent networks are going to be strengthened. Past experiences of CIIFEN in regional projects, will be used to implement community-based EWS (PRASDES, 2016)[84] http://www.prasdes-ciifen.org/ or multi-institutional local networks to increase climate resilience (Cuencas Climáticamente Resilientes, 2015-2019) http://www.cuencasresilientes-ciifen.org/

The impact and cost-effectiveness will be reflected in enhanced on-going collection, updating and processing of data at regional level, delivering reanalysis and forecast model outputs to countries, providing technical assistance in model downscaling outputs and developing tailored products for country-level decision support systems.

E. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist. If applicable, please refer to relevant regional plans and strategies where they exist.

The Project will be consistent with the national sustainable development strategies, National Plans and others. The relation between the National and subnational plans with the local intervention areas is indicated in Table 7.

Table 7. *Relationship between these documents and their relations with the local intervention areas*

Country	National/Subnational Plans	Relationship between these documents and their relations with the local intervention areas
Chile	▪ Climate Change National Action Plan (PANCC-2017-2022), ▪ Climate Change Adaptation Plan ▪ Agriculture Sectorial Plan, ▪ Energy Agenda, ▪ National Plan to fight desertification, ▪ National Strategy of Water Resources, ▪ National Strategic Plan for Disaster Risk Reduction and NDC.	PANCC-2017-2022: climate change impacts have projected significant reduction of monthly average flows in the regions of Coquimbo and Los Lagos (intervention zone in Quillota), and an elevation of the isotherm 0 °C, which brings as a consequence, the reduction of water reserves in the headwaters of the snow melting and rainwater basins, increasing the risk of disasters during extreme rainfall events and high temperatures, consequently floods and alluviums may be generated. In the agroforestry sector, with less water availability for irrigation in the central zone, a migration of crops towards the south is anticipated, generating changes in production and also in the net income, with negative effects, especially for rain-fed farmers and cattle ranchers, at the coastal, internal and transversal valleys. The energy sector will be affected on temporality and availability of basin flows affecting current hydroelectric generation and reducing the capacity of response in front of increasing demand of energy.

84 http://www.ciifen.org/index.php?option=com_content&view=article&id=1885&Itemid=513&lang=es

		The agroforestry sectorial plan includes climate change effects on soil, production, annual and permanent crops (fruit tress), forest and pastures. The plan concludes that there will be low availability of water for irrigation, where droughts, frosts and precipitation are the main risks for the sector. The project proposal for agriculture is aimed to increase farmer's resilience capacity to cope climate change by improving climate products and services for decision making on risk management process. The energy agenda contains an action plan to build and execute a long-term energy policy with social, technical and political validation. Considering that the energy sector is strategic and fundamental for the functioning of society. This document has 7 axes focus on an accomplishment of energetic efficiency as national policy, hydroelectric sustainability and massive educational campaigns which are related to the components 1, 2 and 3 of the project. The National Action Plan heads against dry and desertification in Chile (PANCD-Chile) looking for strengthening population life quality and communities directed to reduce negative impacts allowing to achieve economic and social development through the strengthening of knowledge of the causes and impacts of these phenomena and the development of sustainable production systems. The main objective of the project is to support the rain-fed agricultural activities of the most vulnerable communities. The National Strategic Plan for Disaster Risk Management is the instrument to reach what is established on the current national DRM policy. The project aims to strengthen early warning systems and the development of scientific capabilities on identification process for risk scenarios.
Colombia	▪ National Development Plan 2010-2014 ▪ National Climate Change Adaptation Plan, ▪ Green Growth envelope strategy and Law 1715 of 2014, which encourages the diversification of energy supply with	**Agriculture and rural development:** Promotion of comprehensive preventive risk management schemes, to cope climate variability, prices and the exchange rate. It covers the three work zones. Land use planning to take advantage of the productive potential of soil, environmental aspects and access to markets. **Environmental management for sustainable development:**

	other non-conventional renewable sources (wind, biomass, among others), and Nationally Determined Contribution (NDC) to the Paris Agreement. ▪ The National Plan of Disaster Risk reduction.	Strengthening of water resources management: development of hydrological, meteorological and oceanographic networks, water quality monitoring and evaluation systems, guidelines for watershed management, among others. Implementation of the National Climate Change Policy, creating the National Climate Change System, and incorporate the climate change variables into the policy instruments. Institutional strengthening: define priorities of the national environmental policy, deepen the quality of environmental information, and implement monitoring and evaluation schemes. **Disaster risk management for safe communities:** Strengthening knowledge of local risk conditions; articulate this knowledge with planning instruments; prioritize public policies in front of adverse events and management of frequently disasters.
Peru	▪ National Strategy to Fight Desertification (2016-2030), ▪ National Plan on Disaster Management (PLANAGERD), 2014-2021, ▪ National Strategy on Water Resources, ▪ National Adaptation Plan for Agricultural Sector (PLANGRACC) 2012-2021, ▪ The Predicted and Determined Contribution at national level-NDC	The PLANAGERD is an instrument for resilient and safe communities for SINAGERD. The diagnostic reveals that 4 of 5 main hazards have hydro-meteorological origin (80%) related to low temperatures, heavy precipitations, drought and El Niño phenomena. ENANDES Project supports the strategic objectives: 1. Strengthening the local level knowledge of disaster risk including the climate change scenarios, extreme events and adaptation actions plan 2. Reduction of the risk level of population livelihood with a territorial approach, promoting that local governments include risk management and emphasis on adaptation actions in the agriculture and water sectors 3.- Strengthening the participation of organized society and population on the intervention areas, for a culture of prevention and commitment to DRM. The national Strategy for Drought and Desertification seeks for an information system for drought monitoring indicators, impacts and related actions and projects on current and potential affected zones. The project will contribute to the implementation of the policy and strategy of Fight against Desertification and Mitigation of drought in the country, through the National Action and Awareness Program aimed at state authorities and public opinion, as well as carrying out activities framed in the specific objectives 2 and 6.

		The PLANGRACC is a management instrument that provides strategies and political proposals for risk and vulnerabilities reduction by reducing climate change negative effects on agricultural sector. As is considers the climate risk management as a priority for agricultural development, the sector is already including climate change adaptation measures to increase resilience The project will contribute on the following strategic lines: 1.-Research, technology and information for the DRM and CCA through hydro-agrometeorological information affecting the agricultural sector, in the intervention areas of the project. 3.-Prevention and reduction of climatic risks, 5.-Improvement of local capacities in DRM and CCA. The National Determined Contribution NDC presents the per capita emission total level with 0.3% of global GHG, which is related to change of soil uses and forestry (USCUSS). According to CMNUCC, Peru has been qualified as particularly vulnerable. The ENANDES project supports the enabler's conditions of major part of NDC for thematic areas of agriculture and water. Consequently, the identified climate change adaptation measures on NDC – GTM as part of international commitments are binding for the agricultural and energy sectors.

F. Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

The project will work with NMHSs which complies with all WMO technical standards for the data management and services delivery. The actions to be developed in the context of the project are closely related with the improvement of the access, understanding, use and application of climate information for risk management and adaptation in different geographic scales and focused on three priority sectors: agriculture, energy and water resources. The project will not implement actions that require interventions in land use or building. It is mostly focused on technical institutional strengthening, capacity building, stakeholders and users consultations. The national consultation processes and the local intervention will be performed according to the Environmental and Social Policy of the Adaptation Fund.

G. Describe if there is duplication of project / programme with other funding sources, if any.

The project will not duplicate efforts of other initiatives or funding sources. Instead the project will promote synergies with on-going and planned initiatives and will seek engagement with the NIEs in Chile (AGCI) and Peru (PROFONAPE), regional/national institutions, and organizations like FAO. There are no regional projects that address common climate related phenomenon and apply similar approaches. Specifically, lessons will be drawn from the sample initiatives in each country.

The ongoing projects in the region are listed in Table 8.

Table 8. *Projects ongoing in the Andean region and their potential synergies*

Project title/web	Description	Potential synergies
Northwest South America Flash Flood Guidance System (NWSAFFGS)[85] To be implemented in three years (2018-2020) by IDEAM, INAMHI, SENAMHI and US NOAA National Weather Service, the Hydrologic Research Center (HRC), San Diego, USA as scientific partners. Funded by USAID/OFDA.	It will be implemented in two phases: phase one will include standard flash flood guidance system with landslide module and weather Radar data ingestion; phase two will include FFG advanced modules - Riverine Routing and Urban Flash Flood Early Warning System for selected River Basins and cities in the participating countries. Extensive training would be provided to the forecasters from the participating NMHSs to allow forecasters to be able to use its products effectively in daily operations.	Complementary with Component 1: 1.2.1. Implementation of integrated hydro-meteorological prediction system integrating hydraulic modeling and flood mapping in selected basins. 1.2.2. Implementation of experimental/operational hybrid models for Seasonal to subseasonal (S2S) prediction including skill assessment and operational verification.
Climate Resilient Basins: Chinchina, Colombia and Mantaro, Peru Implementation period: 2015-2019 (four years)	The objective of the project is to increase resilience and reduce vulnerability to climate change in the basins of Chinchiná	Project´s activities are complementary with components 3.1 Strengthened capacities of local stakeholders and

85 NWSAFFG is the regional component for the north-western part of South America of the Flash Flood Guidance System (FFGS) developed by the WMO Commission for Hydrology (CHy) jointly with the WMO Commission for Basic Systems (CBS) and in collaboration with the US National Weather Service, the US Hydrologic Research Center (HRC) and USAID/OFDA, to provide operational forecasters and disaster management agencies with real-time informational guidance products pertaining to the threat of small-scale flash flooding.

Project title/web	Description	Potential synergies
Implemented by CIIFEN; key partners: IDEAM, Corpocaldas and Vivo Cuenca in Colombia; and SENAMHI, Peruvian Ministry of Environment (MINAM), Regional Governments of Junin and Ayacucho, and Junin Regional Directorate of Agriculture in Peru. Project funded by USAID. www.cuencasresilientes-ciifen.org/	(Colombia) and Mantaro (Peru), through the strengthening of knowledge used as basis for decision-making for local policies and strategies for adaptation to climate change.	communities to access, use and apply climate information for risk management and adaptation. 3.2 Co-designed local climate risk management and adaptation plans with local authorities and the support of public and private institutions/stakeholders.
Strengthening of national systems and regional monitoring and risk management of drought and floods in a context of climate change and desertification in the Andean countries. Project funded by EUROCLIMA +. Project will start the last quarter of 2018.	The main objective of the project is the strengthening of national information systems for the integral management of droughts in the countries of western South America.	The project is complementary with component 1 and 4. There are complementary actions with strengthening of NMHS and improvement of regional cooperation mechanisms to enhance information services for sectoral management

H. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

A learning and knowledge management component to capture and disseminate lessons learned will be provided by CIIFEN. The following mechanisms will be available for the project:

- In each Project Component, there will be a capacity building strategy which will be implemented by CIIFEN and composed of several actions: training of trainers, development of training resources for future national training efforts, and reference materials and guides so that people can be sure to apply what they have learned, and so that new people after the project can learn to perform their jobs in the same way.
- An adequate and complementary coordination will be established with the WMO Regional training Center hosted by Peru.
- An E-learning platform for specific contents related with Components 1, 2 and 3. The target audience will be the technicians from NMHSs, sectorial users and local authorities. Good paractices and existing training platforms developed under CLIMANDES project willl be considered and enhanced.
- Training to local trainers approach which is complemented with a complete training toolkit to extend capacity building activities by selected community leaders, tecnhicians at local Governments.
- Discussion forum on good practices, learning and innovation as part of the National/Local Sectoral climate meetings in each country to be implemented during the project.

- Quarterly bulletins and annual technical publications.
- Regional forums for knowledge and experiences exchange which could be organized back to back from Regional climate Outlook Forum.
- Regular webinars in different topics coordinated by CIIFEN for technicians of technical institutions from participant countries.
- National/local webinars coordinated by NMHS or partner institutions in each country.

As a complement, the WMO climate services information system (CSIS) will comprise a set of tools, including an online web interface and sharing platform to facilitate access and networking. Lessons learnt from knowledge management in other projects in the region like CLIMANDES (https://public.wmo.int/en/projects/climandes) phase I and II, PRASDES (http://www.prasdes-ciifen.org/), or Cuencas Climáticamente Resilientes (http://www.cuencasresilientes-ciifen.org/) will facilitate the dissimination of best practices.

I. Describe the consultative process, including the list of stakeholders consulted, undertaken during project / programme preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy of the Adaptation Fund.

This proposal was developed by national institutions, CIIFEN and WMO following a series of national consultations in Colombia, Chile and Peru. CIIFEN has wide experience to engage different audiences which include authorities, local stakeholders, and small communities. The following regional activities emerged after consultations: Regional Climate Information to strengthen risk management in the agriculture sector (2007-2009)[86]. Regional information to support public policies on climate change and biodiversity in the Andean countries (2011-2013)[87].; Regional Andean Programme to enhance weather, climate water services and development-PRASDES (2013-2016).[88]

Colombia, Peru and Chile have conducted national consultations on Climate Services requirements with target stakeholders as documented here below:

Colombia: The Climate Services for Resilient Development (CSRD) Partnership already conducted a stakeholders meeting in Bogota in 2015, the output white paper on “Options for Climate Services Investments in Colombia “ was published in early 2016. The official launch of the National Framework of Climate Services held in 1-3 November 2017 provided the basis for the development of a National Plan for implementing Climate Services. Prior to that event, meetings with sectors representatives of agriculture, energy, disaster risk reduction and water took place in September-October 2017.[89]

Peru: During the National Forums on Climate Perspectives in Peru, the users and different stakeholders have ben consulted about the information gaps, priority needs with valuable information from small farmers, sectors representatives and authorities. (2014-2016).[90] SENAMHI has conducted workshops to identify needs and demands for climate services

[86] https://www.researchgate.net/publication/255754566_Technical_Guide_IADB_Final
[87] http://geoportal.ciifen.org/es/
[88] http://prasdes-ciifen.org/
[89] http://www.wmo.int/pages/prog/wcp/meetings/presentations/Bogota3010-0311-2017/Report_SeasonalForecast_Bogota_2017_final.pdf)
[90] http://www.senamhi.gob.pe/?p=prensa&n=492 ; http://www.senamhi.gob.pe/?p=prensa&n=16 http://www.senamhi.gob.pe/?p=prensa&n=59; http://www.senamhi.gob.pe/?p=prensa&n=194

(2016)[91]; a Workshop: Mapping of actors of the agricultural sector for climate services (2017)[92] and Dialogue roundtables on potential socio-economic benefits of climate services (2017)[93]

Chile: Several workshops were organized by DMC during July 2017with the aim to meet users and learn about their climate information demand[94]. The participant entities were: Dirección Meteorológica de Chile (DMC), Subdepartamento de Información, Monitoreo y Prevención (IMP), Ministerio de Agricultura (MINAGRI), Dirección General de Aguas (DGA), Ministerio de Energía (MEN), de la Unidad de Gestión de Riesgos y Emergencias Energéticas and Ministerio de Medio Ambiente (MMA).

During the process of construction of this Concept Note, consultations were designed in order to explore in the communities among men and women the following aspects:

- Requirements of climate information (specific products, frequency and resolution) from local stakeholders and representatives of agriculture, water and energy sectors, to improve their plans for risk management and adaptation.
- Identification of the current barriers (access, awareness, understanding, local capacities, ownership, lack of articulation and coordination) to implement local climate risk management and make better informed decisions in the agriculture, water and energy sectors.
- The perception of local stakeholders about the potential impact in their lives of improved climate services

During July, 2018, local consultations were conducted in: Quillota (Chile), Espinal, Riosucio and Popayan (Colombia), Matucana and Lima (Peru). The findings of these consultation meetings and complementary information are included as Annex 1.

J. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

The justification for funding requested is described by comparing the current situation and the impacts due to the implementation of the project. It is detailed in the Table 9.

Table 9. *Justification of funding requested based on impact due to the proposed project*

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
	Chile	**Chile**

[91] http://www.senamhi.gob.pe/climandes/index.php/noticias/detalle/senamhi-desarrolla-taller-de-necesidades-y-demandas-de-servicios-climaticos-para-autoridades
http://www.senamhi.gob.pe/climandes/index.php/noticias/detalle/conociendo-las-necesidades-de-los-agricultores-en-cusco

[92] http://www.senamhi.gob.pe/climandes/index.php/noticias/detalle/cusco-senamhi-present-mapeo-de-actores-del-sector-agropecuario-para-los-servicios-climticos

[93] http://www.senamhi.gob.pe/climandes/index.php/noticias/detalle/senamhi-instala-mesa-de-dilogo-sobre-beneficios-socioeconmicos-potenciales-de-los-servicios-climt

[94] http://164.77.222.61/climatologia/

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
1.1 Updated national data management systems, archives, and integrated regional, hydrological and meteorologic al databases.	-The DMC provides warnings and early alerts for high impact events at national and local level. For the agricultural sector, there are bulletins for frosts, heat waves and heavy precipitation. -Daily bulletins of agro-climatic risks and seasonal forecast. -Monthly bulletin of drought index, heat waves, climate indicators. **Colombia** -A diversity of process such as data integration, storage, verification, control and quality assurance, generation of outputs, tables, graphs, maps and texts are performed through the data management project. - Analysis and manual capture of rain gauge belts, thermograph and anemocinemograph has been developed for more than 1'000,000 graphs. - In close coordination with universities, there is a process of construction and application of software for digitization and analysis of output graphs and also the development of a methodology for the homogenization and complementation of daily meteorological data. -The DHIME is implementing several instruments for verification, control and quality assurance of meteorological data and climate information. - IDEAM through the World Telecommunications System of WMO shares meteorological data in METAR, SYNOP, BUFR, TEMP and PILOT. **Peru** -Related to the variables of extreme temperatures, precipitations and levels: 85% of database have been transcribed; 40% digitized; 50% has quality control in conventional and automatic stations; and 15% of data has been homogenized. -There is a 70% of the platform for interoperability (infrastructure), where: 100% of data with the first level of quality	-Design and implementation of an IT platform (Climate Services Portal), planned to disseminate the products and services generated by the DMC and other related institutions. -Hydrological and meteorological models adjusted to the needs of final users. **-**Implementation of new climate services for other productive sectors. **Colombia** -It is expected to have data quality with timely availability and free access for final users. -Improvement of climate products and services through availability and the development of applied studies of climate and meteorology. **Peru** -Maintain the level of data interoperability and services. -100% of transcribed database, digitized data, quality control and 50% of homogenized data of conventional stations. -To implement an Integrated Data bases and metadata management system which includes a systematic module of data quality control.

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
	control are interoperable and 0% of climate information/products was produced.	
1.2 Improved weather, climate and hydrological predictions and projections by establishing an optimized cascading system involving the regionalizatio n of the global forecast products.	**Chile** -The DMC applies numerical modeling with WRF in various configurations, supporting the research work, such as long-term climate simulations and specific meteorological simulations, in collaboration with national entities (INIA, Ministry of the Environment, Universities, among others). **Colombia** -Model for hydrological forecasting (3 days) integrates data from real time stations, satellite hydro-estimator inputs and forecast of precipitation in the articulated FEWS (Flood Early Warning System) platform. -FEWS is also applied to generate hydrological alerts in watersheds with no hydrological models or level stations. -IDEAM is using the Climate Predictability Tool (CPT) of IRI. Currently there are obtained outputs based on 598 precipitation stations and about 180 temperature stations. **Peru** SENAMHI has medium infrastructure capacities and personnel for integrated meteorological, climate and hydrological forecasts in the intervention area of the project. There are some limitations in the following areas: -The meteorological and hydrological forecast systems are not explicitly integrated. SENAMHI has models for daily forecast through the RS-Minerva Platform. -The regionalization of climate forecasts is made, however it is important to integrate with the hydrological forecasts. -Operational sub-seasonal forecast products are not available. -There are conceptual models for forecasting extreme events, but the associated operational forecasting procedures are not documented.	**Chile** ¨-Improvement of computing capacity (HCP) and numerical modeling, with high speed process for spatial and temporal resolution. **Colombia** -Operational products based on seasonal predictions -There will be time-series data equal or longer than thirty years. **Peru** -Integrated meteorological, climate and hydrological forecast system, according to the needs of end users and articulated to the decision-making processes for the intervention areas. -Validated operational model for flood forecast to support the decision-making of key stakeholders at local level. -Improved seasonal and sub-seasonal forecast. -Updated climate change senarios for adaptation plan

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
	-Climate Change senarios at national level not gridded	
1.3. Sustained delivery of weather and climate-related advisories to support decision-making for national and local water, agriculture and energy stakeholders	**Chile** -The DMC provides warnings and early alerts for high impact events at national and local level. For the agricultural sector, there are bulletins for frosts, heat waves and heavy precipitation. -Daily bulletins of agro-climatic risks and seasonal forecast. -Monthly bulletin of drought index, heat waves, climate indicators. **Colombia** - As part of the strategy of raising requirements, the sectors have been included as active participants in the identification of information, products and services that respond to their needs and activities specific to agricultural activity, for the first phase of the process. - The National Technical Agroclimatic roundtable and the 7 regional agroclimatic subgroups are initiatives in which information, advice and recommendations on crop management are periodically delivered to support the decision making of stakeholders in the sector. **Peru** -SENAMHI provides information at different time scales, organizes workshops on climate perspectives, integrates information for short, medium and long-term planning, develops products and services for different sectorial users. -SSCC has been consolidated in the DRM at the inter-institutional level (CENEPRED, INDECI); however, in the project area the SSCC has not already been operationally consolidated in some priority areas such as energy, agriculture and waterincluding the climate risk management *	**Chile** -operational tailored weather and climate related services widely used in the decision-making processes in water, agriculture and energy sectors. **Colombia** - As it has been a consensus and a participative information gathering, the subsequent phase consists of jointly designing future products or adjusting existing ones to cover the needs of the sector identified in this phase of requirements. - As for the implementation of a platform, once the action plan has been drawn up, it is considered a priority. **Peru** -Implementation of climate services for agriculture and water sector, which was identified in the NDC document as the information priorities for local capacities.
	Chile	**Chile**

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
	-The information is disseminated through mass media: newspapers, radio and TV. -At regional level, there are Agro-climatic Information Centers (CRIA), whose function is to disseminate information and train final user, in close coordination with agricultural organizations. -The DMC develops extension and training workshops for users, to establish feedback mechanisms.	-Improve the dissemination of bulletins using social networks, infographics, radio stations and local newspapers. -Implement workshops and technical tables with final users to train on the understanding and use of climate information.
1.4 End-to-end services through customization of climate information, communication and user´s feedback system.	**Colombia** -The main information chain links the national and regional Agroclimatic Technical Tables, through the dissemination of climate information. -The monthly climate-health bulletin is prepared with the institutions of the national health system. **-**A guide document called "PICSA" has been developed (Implementation of Participatory Integrated Climate Services for Agriculture) and was already proved and implemented in the department of Cauca. **Peru** -There are chains of information for the DRM at the Rimac river basin. -There are general protocols for delivery and dissemination process of hydrological and climate information.	**Colombia** -Climate prediction bulletins for all sectors, users and decision makers. -Agroclimatic bulletin for the regions at national level, by crop in the agricultural sector and by species in fishing sector. -Climate-Health bulletin for 5 natural regions of Colombia, on the probable development of respiratory diseases, zoonoses, vector-borne diseases and critical diarrheal diseases. -Institutionalize a protocol for the dissemination of information from the regional agricultural tables. -The MAPA of AGROSAVIA and TeSac of CIAT projects have components for the strengthening of local capacities for an information transfer process related to adaptation and risk reduction at the community level. **Peru** -There will be chains of information for DRM for all areas of intervention including for climate change projections. -There will be communication and feedback protocols considering a better articulation of actors and processes in order to improve the access and use of hydroclimatic information by different users (officials, private sector, urban population, rural population, etc.).
	Chile	**Chile**

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
2.1 Implemented contributions for the establishment/consolidation of National Frameworks for Climate Services in each country.	-There is a gathering data process to initiate the evaluation of the baseline according to the implementation of the National Framework for Climate Services (NFCS-Chile). -It is planned to advance on the key actors mapping by 2019 for the implementation of the national framework, with emphasis on the needs of intermediate and final users. **Colombia** The IDEAM launched the National Framework for Climate Services, but the elaboration of the Action Plan is currently on preparation. **Peru** **-**The National Meteorological Service has been strengthened from the CLIMANDES project in order to provide climate information services, as well as improving interaction with final users. This is an advance in the process of institutionalizing a regulatory framework for climate services at the national level.	-Implementation of the National Framework of Climate Services. **Colombia** The NFCS in Colombia is fully consolidated covering the local areas of intervention in this project. **Peru** -Initialize a process for the preparation of the National Framework of Climate Services with priority to the agricultural, water and energy sectors.
2.2 Implemented /improved local sectorial stakeholder´s networks to support co-design, deliver and use of climate services	**Chile** At local level, DMC works with the local Secretariat of the Ministry of Agriculture, which facilitates contact and dissemination mechanisms with agricultural technical key actors, such as the Agricultural and Livestock Service (SAG), Agricultural Research Institute (INIA) and Agricultural Development (INDAP). **Colombia** Currently there are incipient and limited local networks to co-design, disseminate and use climate information. They are mostly focused on agriculture. **Peru** -The risk management group works operationally at national and regional level.	**Chile** Implement a network of direct and permanent contacts with small and medium farmers and associations, as well as water monitoring boards. **Colombia** Local sectorial stakeholder´s networks will be consolidated in the intervention areas and they will be able to effectively co-design, deliver and maximize the use of climate information. **Peru** **-**There is a network of interest groups in water agriculture and energy

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
	-Local networks are still limited to support a major interaction at national and regional level.	articulated and implemented at the intervention areas, including actions to cope climate change-related hazards. -Strengthening of the deconcentrated processes of SENAMHI with management tools in order to implement the Interface Platform with local users.
3.1 Strengthened capacities of local stakeholders and communities to access, use and apply climate information for risk management and adaptation.	**Chile** -Climate and meteorological information is used in local agricultural development plans lead by the Ministry of Agriculture, Institute of Agricultural Research (INIA) of La Cruz and the Pontifical Catholic University of Valparaíso with headquarters in Quillota province. -Agriculture adaptation plans are related to seasonal forecast (1 to 3 months) applied to prevent the negative impacts of climate extreme events associated to climate change. **Colombia** -The 2010-2011 La Niña event allowed switching from conventional to automatic stations, with real-time data from 639 hydrometeorological stations and 680 conventional stations reporting daily. -Google Public Alerts is the platform used by IDEAM to disseminate emergency messages, such as evacuation alerts in case of hurricanes. **Peru** -There are disaster risk management plans at regional and national level. -The national water resources plan, national strategy and policy for water resources include adaptation and climate risk reduction actions. -Adaptation measures in agriculture and water have been identified, which also include the goals and indicators of intervention at 2021, 2025 and 2030 within the framework of Peru's commitments to the UNFCCC.	**Chile**-Dissemination and efficient use of meteorological and climate information (current and new) applied on forestry and agricultural sector of the pilot area. -Development of new 5-day forecasts from numerical models and sub-seasonal forecasts (10-30 days), for disaster risk management.-New climate model runs (outputs) in order to update regional scenarios of climate change as key information for the definition of more resilient crops at the intervention area. **Colombia** Dissemination of official alerts by performing a Google and Google Maps search. **Peru** -Small and medium farmers use meteorological and hydrological information and early alert system, such as adaptation process at local level. -Local and regional governments use hydrological information for investment projects; develop strategies and agricultural production development plans within the framework of the NDC implementation process. -Hydropower operators use hydrological information in vulnerable

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
		watersheds to develop mechanisms and risk reduction strategies within the framework of the NDC on water sector.
3.2 Co-designed local climate risk management and adaptation plans with local authorities and the support of public and private institutions/stakeholders.	**Chile** -There is a close coordination between the secretariat of Agriculture and other agricultural services of the Valparaíso region based in Quillota province, in order to provide meteorological and climate information for local farmers. In addition, in joint coordination with the CMD/DMC, early warning information is disseminated for frosts, heat waves, intense precipitation and strong winds. -Agro-meteorological and climate tendencies seminars for decision makers and farmers have been developed in the zone. **Colombia** -According to the conceptual bases of the IPCC Evaluation Report 5, a multi-sectorial analysis was conducted at national, departmental and municipal levels for six dimensions of human development (food security, water resources, biodiversity and ecosystem services, health, human habitat and infrastructure). **-**The vulnerability analysis presents the information about the glacier reduction in Colombia, as well as flood maps due to sea level rise at the Atlantic and Pacific coastal regions for 2011-2040, 2041-2070 and 2071-2100. **Peru** The Huallaga region has climate information for climate risk reduction.	**Chile** -Implementation of new networks for information dissemination and communication between the government authorities and farmers. -Agricultural risk management plan should work efficiently through the different channels of information between the authority and the end users. -Implementation of a safe communication network by using current communication systems between authorities and final user. -The creation of a participatory agrometeorological group that contributes to decision-making process of farmers. **Colombia** -The updating process for vulnerability information and risk assessment due to climate change in the 1122 municipalities of Colombia. -Development of seasonal forecast in a better space-temporary resolution. **Peru** -The three pilot areas have climate risk management and adaptation plans or protocols. -The evaluation of climate risks and climate change using the integration of traditional, technical and scientific knowledge is led by local populations at the community level. -Local, regional and national key actors work articulated for the

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
		dissemination of climate information related to data, alerts, forecast, among others for the implementation of adaptation measures to cope negative impacts of climate change. -Regional and local authorities promote and develop projects with adaptation measures for climate change in agriculture and water sectors through management instruments. -The energy sector updates the risk management tools including climate change issues according to climate scenarios of water resources and energy sector.
4.1 Regional Climate Services Toolkit (CST).	**Chile:** There are initiatives to consolidate climate services. DMC is in charge of providing climate information for sectoral users. Since the last years important improvements have been made in this matter. Other initiatives from the academia side contributed enhancing climate services. Private sector is also an active actor supporting maintenance of information services specific for sectors as agro exports and water resources. **Colombia:** IDEAM is officially in charge of providing climate services, although there are private initiatives also. There is a strong linkage with academia as a source of qualified scientists. The country established a NFCS. IDEAM coordinates regular meetings to inform seasonal forecast to users from agriculture, hydropower and health sectors. **Peru:** SENAMHI is in charge of provide climate services. Regional offices lead provision of specialized products to users. CLIMADES project conducted by SENAMHI has developed several climate services in the intervention areas. Academia and private sector has a limited role in the climate services chain.	It's expected to have enhanced and operative linkages among NHMSs and users from food security, energy and water resources, to generate and disseminate end-to-end and local demand-driven weather, climate and hydrological services. The project aims to Improve data management, prediction systems, tailored information, and services delivery of climate information through the implementation of regional implementation of the Climate Services Toolkit. The expected impact is to have an extended number of users that access, apply and make decisions based on improved climate services delivered by NMHSs.
4.2 Consolidated Andean technical groups of databases developers,	-There is a group of database developers from Colombia and Peru who created a system for real-time data exchange from selected stations, the group is no longer operational active. -The group of seasonal forecast is active in Chile, Colombia and Peru, since they are	Through the regional climate outlook forum which involves six NMHSs of western South America on a monthly and uninterrupted cooperation since 2003 to provide regionally integrated climate forecasts, the work of regional groups will be strengthened for south-south cooperation where countries

Expected Outputs	Base line (current status)	Impact due to the proposed programme (with the support of Adaptation Fund)
(S2S[95]) prediction and operational hydrology.	part of climate outlook bulletin coordinated by CIIFEN. Activities of the groups need to be strengthened.	contribute with experts to enhance the capacities of their peers in other NMHSs. Bolivia, Ecuador and Venezuela will be included as well
4.3 Implemented strategic regional alliances and partnerships for sustained capacity building.	There are regional activities coordinated by CIIFEN, recently enhanced by the establishment of the WMO's Regional Climate Center for west of South America, who facilitate regional coordination among NMHS of Chile, Colombia and Peru. Activities may further have extended to other countries of western South America.	The project will combine virtual platforms with sustained capacity building processes by engaging local institutions, NGOs, or other stakeholders. They will include typical training workshop but combining traditional /ancestral knowledge with the formal one. This will be done through participatory activities with strong involvement of local actors from different economic sectors; private and public institutions, but focused in the co-design of risk management and adaptation plans The regional approach of the project, seeks to facilitate access by NMHSs to relevant climate data, products and tools from CIIFEN and WMO global centers with which NMHSs can create value-added products. The value chain will set an example supported by CIIFEN for the larger region (Bolivia, Ecuador, and Venezuela).

K. Describe how the sustainability of the project / programme outcomes has been taken into account when designing the project / programme.

The participating NMHSs are standing entities within their national governments. The project sustainability will be garanteed by DMC, IDEAM and SENAMHI in their roles of government agencies supported by public funding with officially mandated duties. In Peru, policies for adaptation to climate change in agriculture are spearheaded by the Ministry of Agriculture and Irrigation (MINAGRI) in coordination with the Ministry of Environment (MINAM) and with the support of the Regional Governments (GOREs). The National Service of Meteorology and Hydrology of Peru (SENAMHI) provides climate and environmental data. Similar arrangements are in place in Colombia and Chile.

For the outcomes of component 1:
The component has been designed to support the improvement of several operational capacities within IDEAM, SENAMHI and DMC which involves technical staff and technological tools. This will be accompanied by a comprehensive capacity building strategy which will ensure the continuous knowledge transference within the national institutions, produce and update relevant training material, e-learning tools with the adequate support and follow up from the RCC-WSA and the WMO RTC for the Andean region which is based in Peru. All the

[95] Seasonal to sub-seasonal

technological tools for data bases management, prediction and services delivery will be developed in open source code in order to reduce the risks of discontinuity for lack of funding to purchase licenses. The whole component will also improve the visibility and awareness of NMHS in local areas contributing to increase their relevance for local and national authorities.

For the outcomes of component 2:
The component has been designed to build institutional and multi-stakeholders network to support climate services information chain. The construction of the framework itself, is conceived to sustain the climate information provision in a continuous way. This implies to identify gaps, user needs by sector, stakeholders, institutions to be further engaged, reach formal agreements, and join them to a whole coordinated structure to be connected with the NMHS for the dissemination, use and application of climate information. The sustainability of the framework will be based on the perceived social and economical benefits of the new information services to trigger further support from public institutions, local governments, private companies and the community in general.

For the outcomes of component 3:
The component has been designed to build capacities at very local level involving also the private sector. Through a participatory process of dialogue and discussion, the project will promote the ownership of local communities and private stakeholders to improve their current risk management and adapatation actions. The sustainability is build through the further materialization of both capacity building and participatory co-design in formal plans for risk management and adaptation endorsed by the community and supported by public and private actors. Since all this planification instruments are long term based, they become the basis for the sustainability which is key for long term adaption.

For the outcomes of component 4:
The regional component has been designed to ensure the sustainability of the other components 1, 2 and 3 by articulating the national efforts with the international initiatives and other projects running in the region. CIIFEN will facilitate the synergy with other projects, UN efforts and global and regional opportunities to ensure further contributions build on what has been done in each country. This will contribute to increase the possibility to ensure new funding from national governments or international sources with interest in the Andean region. In the operational aspect, as RCC-WSA, the project will consolidate several regional group of experts from the NMHS which can provide technical assistance and training to other technicians in the region and conduct training to trainers to ensure the knowledge source will keep available in a long term basis and sustain the implemented tools, methodologies, systems and networks in each country and expand them to other countries of the Andean region.

L. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

Table 10. *Environmental and social impacts and risks*

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	The project will work to strengthen capacities of NMHS; inter-institutional coordination and sectorial networking at national and local level involving authorities in all the levels. All these actions will be developed in according to National Plans in force in the three countries. Therefore, all the actions implemented under this project are within the institutional frameworks and comply with national law in all the participant countries.	
Access and Equity	The project will provide impartial and equitable access to project benefits. As one of the planned activities a local vulnerability and risk assessment will be conducted in local intervention areas. This will include the social, economic, environmental and governance dimensions. The findings of these studies will guide the prioritization of actions specially related with capacity building and more effort at community level to assure access and equity in all the activities.	
Marginalized and Vulnerable Groups	The programme will contribute to the reduction of existing inequalities for EWS for floods and drought, particularly those affecting marginalized or vulnerable groups (previously identified and locate) who are dependent on agriculture or living in rural areas. The EWS system for floods and drought will be available through technological sources, but also through the local media where agreements and partnership will be established during the project. The implementation of SMS will be an additional source for broadcasting. With all this communication channels, the project will maximize the attention and impact of the project in marginalized and vulnerable groups. All the previous actions will be accompanied by capacity building efforts including the exchange and integration with local/ancestral knowledge from the communities.	Despite all the complementary actions, there is still risk that vulnerable and marginalized groups will have insufficient knowledge and/or access to technological devices such as mobile phones or lack of good cellular connectivity. To avoid the exclusion of marginalized and vulnerable communities, traditional practices will be implemented to reach these groups especially women, girls, elderly, physically challenged individuals. For that the support of local governments, NGOs, and private sector will be managed with specific activities of the project.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Human Rights	The proposed activities are or will not be against any of the established international human rights. Moreover, the proposed programme will promote the basic human rights of access to weather, climate water information to better risk management of associated in agriculture, food security, water resources and energy.	
Gender Equity and Women's Empowerment	The proposed project will improve the gender equity and women empowerment through the WMO developed tool: Training Manual for mainstreaming gender in End to End Early Warning system for Floods and integrated Flood Management through a participatory design approach. This will help in increasing the participation of women, girls and other vulnerable groups in Flood and Drought management activities as well as decision making processes.	The proposed project is targeting some localities where men occupy the majority of the leadership positions. Women participation in local plans, disaster preparedness and decision making is often limited due to cultural and social norms. There is therefore a risk that women will not benefit equitably from the proposed adaptation measures and capacity-development interventions.
Core Labour Rights	The project will be implemented and managed in compliance with the participating countries labour laws. No individual will be hired without pay and the payment will be according to the countries labour legislation/laws. Children's labour will be forbidden and it will not be accepted from other programme partner agencies. Local communities will be involved in capacity building and participatory activities but will not be exposed to any risk of accidents. Core labour rights will be respected and considered in programme design and implementation.	
Indigenous Peoples	The indigenous population in the region will be consulted and involved during the design and implementation of the project activities as part of the communities in the local intervention areas. The traditional knowledge of indigenous people to cope with extreme events or mitigate adverse impacts will be considered and integrated to local plans. The project will consider the inclusion of indigenous peoples in the different local networks and participatory activities as part of local risk management and adaptation plans.	

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Involuntary Resettlement	There are no activities proposed in the project which will create direct involuntary resettlement of communities. .	
Protection of Natural Habitats	There is no potential direct risks to the protection of ecosystems and its natural habitats and biological diversity through the project activities. For adaptation plans Ecosystems based solutions will be promoted using the Flood Green Guide by WWF, but they will not be implemented in the course of this project.	
Conservation of Biological Diversity	There will be no direct risks associated with the conservation of biological diversity	
Climate Change	The project will address the current limitations in the participant countries to ensure the adequate production and delivery of relevant climate information by NMHSs to a complex multi-institutional framework, sectorial stakeholders, subnational and local authorities to action risk management at national, subnational, local and community level and support ongoing local climate change adaptation plans and actions and increase resilience.	
Pollution Prevention and Resource Efficiency	The project activities are not expected to result in water, air and soil pollution.	
Public Health	The project activities should not have negative effect on public health. On the contrary, it will contribute to prevent the population from natural disasters, to improve income for getting access to health facilities, etc.	
Physical and Cultural Heritage	The project should not have any activity related to affecting physical and cultural heritages.	

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Lands and Soil Conservation	The project will promote the conservation of soil and land resources, especially through the selection of ecosystem-based solutions with environmental-friendly approaches.	

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme management at the regional and national level, including coordination arrangements within countries and among them. Describe how the potential to partner with national institutions, and when possible, national implementing entities (NIEs), has been considered, and included in the management arrangements.

The project will be implemented by WMO in partnership with CIIFEN, the WMO Regional Climate Center hosted in Guayaquil (Ecuador) and the National Meteorological and Hydrological Services (NHMSs) of Chile, Peru and Colombia as Executing Entities. NMHSs are the main national authorities responsible for providing weather and climate warnings, advisories and services, and are playing a major role in developing partnerships for the project implementation by taking the lead on national consultations and climate information co-production.

CIIFEN is expected to lead the project implementation of the regional “common” activities as well as to provide support to IDEAM, SENAMHI and DMC given the institution long experience in project implementation with regional institutions like the Inter-American Development Bank, World Bank, Latin America Development Bank, European Commission, Ministry of Foreign Affairs of Finland, the Adaptation Fund through the World Food Programme for Ecuador, specific projects/consultancies with GIZ, UNDP, FAO, UNISDR, IUCN, OAS and ACTO.

At regional level, the project will be executed by CIIFEN supervised by WMO Regional Office for America (ROA). The project will be executed by a Project Management Team (PMT) to be hosted in CIIFEN and in the NMHSs. The PMT will be composed by an overall Project Manager, three part-time national officers, WMO specialists to provide technical support to activities and a Project Coordinator at ROA. Regular meetings of the PMT will be chaired by the Director of ROA with the support of WMO staff in Geneva as required.

In one hand, PMT will ensure the good execution of the various components of the project and coordination between the different national and local entities. On the other hand, the PMT will centralize data, compile reports and analyse the financial and technical contributions while ensuring that the project's logical framework, objectives and expected results are achieved.

Institutional coordination at regional and international level will be led by WMO, including communication, promotion and cooperation. Based on a consolidated partnership with WMO, FAO has been invited to participate for developing synergies with its “Integrating Agriculture on NAP” project proposal in preparation. The project will also contribute to the implementation of Global Framework for Water Scarcity in Colombia, Chile, Peru and the Andean Region.

At the national level: The project will be implemented by national executing entities, the NMHSs, who will develop agreements with their respective National Implementing Entities to ensure coordination and long-term sustainability of project achievements.
The identified country level project partners are:

- Colombia: National Hydrometeorological Institute IDEAM, Ministry of Agriculture and Rural Development (MADR), Agriculture and Livestock Institute (ICA), Agriculture and Livestock Research Institute (CORPOICA), , Rural Agricultural Planning Unit (UPRA), Tropical Agriculture Research Centre (CIAT), Energy National Operation Centre (CNO), Energy Market Experts (XM), Mine and Energy Planning Unit (UPME), Irrigation Management National Unit (UNGRD) and several private agricultural associations as FEDEARROZ, FENALCE.
- Chile: National Meteorological Service (DMC), Water General Directorate (DGA), Ministry of Agriculture (MINAGRI), Ministry of Environment (MMA) and Information, Monitoring and Prevention Unit at Ministry of Energy (MEN),
- Peru: National Hydrometeorological Service (SENAMHI), Ministry of Environment (MINAM), National Centre for Estimation, Prevention and Risk Disaster Reduction (CENEPRED), , Ministry of Agriculture and Irrigation (MINAGRI), Ministry of Energy and Mining (MEM) , National Institute of Civil Defense (INDECI), National Water Authority (ANA).

At national level, the National Framework of Climate Services will represent the platform for enhanced institutional cooperation. A National Coordination Project Team, chair by a representative from the NMHS, with participation of the relevant participant institutions and one observer from NIE will be established. Main role of this Team would be to implement the national and community activities components.

A Steering Committee (SC) composed by the Western South America Regional Climate Centre Board (6 Andean countries NMHS plus CIIFEN), NIEs from Colombia, Peru and Chile, WMO, FAO, MeteoSwiss, CIAT, IRI and others will provide to the project guidance and recommendations on the implemented activities in the past year and will endorse proposed next year action plan.

B. Describe the measures for financial and project / programme risk management.

Financial and programme risks measures will be assessed as an on-going process throughout the design and implementation of the programme. The potential risks identified are described in Table 11:

Table 11. Potential risks identified and mitigation measures

Type of risk and how it affects the project	Risk impact on the project goal (low, medium, high)	Probability of occurrence (low, medium, high)	Mitigation measure(s)
Acceptance of the programme Even though detailed needs assessments have been conducted since 2017, the support of the stakeholders can differ in the three countries. This results in differential levels of acceptance and slowdown of the inception phase of the programme.	Medium	Medium	- During the preparation phase of the project, all relevant stakeholders (government, agencies, departments and communities) will be/are clearly identified, so that they fully share the vision and goal of the project and are aware of their contribution to the programme, hence fostering ownership over the process. - MoU and Agreements will be signed with the participating stakeholders. - Roles and responsibilities of the implementing agencies and executing agencies will be defined in the initial stages of the project so that all the activities are completed in a coordinated way.
Physical risks Administrative barriers hinder sharing of social and topographic data. This result in difficulties to implement components 1 and 3.	Medium	Medium	The executing and implementing entities will ensure from the National Coordination Team that the required data and information are shared.
Technical/quality risks Component 1 and 4 of the programme are can be too technical and could be difficult to be adapted to specific area or countries. Low commitment and interest from stakeholders.	Medium	Low	The project activities will be monitored by experts of WMO Development of strategic partnerships with NMHS leaders in science and technique with experience in South America will be seek. Meetings with local decision-makers and participants from community to understand the expectations and suggestions from the participants under Component 3 would provide feedback and guidance for technical improvements. The feedbacks and suggestions from the

Type of risk and how it affects the project	Risk impact on the project goal (low, medium, high)	Probability of occurrence (low, medium, high)	Mitigation measure(s)
			participants will be integrated.
Restructuring of government officials Restructuring in the government work structure may cause possible shifts of responsible persons at local and national levels to a different location. Delays and lack of support.	Low	Medium	Alternative persons from the departments will be involved in most of the activities so that implementation of project activities will not be hampered at any time.
Financial/resources risks Inadequacy of the financial management system: procurement system, financial availability, monitoring, reporting and auditing system, etc. Availability of programme resources	Low	Low	During implementation, project and financial monitoring/reviews will be conducted to ensure efficient management of project resources.
Human resources/capacity risks Lack of skills or human resources availability Inadequacy of existing versus required experience and skills could result in slowing down the programme activities	Medium	Low	- The project benefits from the deployment of professionals/staffs by the implementing and executing agencies who are selected by a panel of experts. Their Terms of Reference are developed based on the programme needs and in collaboration with the hosting institutions. - Projects in the region and the WMO Regional Training Centre in Peru will provide additional support for training and capacity building. - National support is obtained at the level of the governmental agencies to ensure sufficient human resources
Documentation/Reporting risks Lack of available tools and templates for developing reports and progress report. Delays of reporting by the partners Delays in the reporting process and financial access to funding	Low	Medium	Appropriate tools/templates and reporting structures and procedures will be put in place by WMO to ensure proper documentation and reporting so that donor agencies and steering committee receive timely reports.
Gender neutral approach Techniques and technology developed are not accepted by all groups of the communities.	Low	Medium	The project includes gender sensitive approach in all activities. Wherever required non-technological or traditional methods will

Type of risk and how it affects the project	Risk impact on the project goal (low, medium, high)	Probability of occurrence (low, medium, high)	Mitigation measure(s)
Decreases the gender equality compliances			be adopted to reach and get participation from every group of the communities.

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.

During the preparation of the Full Project Proposal, all relevant issues related to environmental and social risks will be identified. The UNDP Social and Environmental Safeguards Procedure (SESP) will be completed along with all related requirements under the Adaptation Fund and recommendations made for appropriate action for the project implementation stage.

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

Monitoring and Evaluation (M&E) measure the overall progress and impact of the project activities through Key Performance Indicators (KPI). They will be monitored regularly to identify the achievements or insufficiencies, therefore supporting the development of additional strategies to achieve the targets. M&E tool will be made available for project activities, as well as project management.

Monitoring and evaluation arrangements for the programme activities
A monitoring and evaluation system will be developed to support the PMT team in designing, implementing and adjusting the project activities. The overall (short, medium and long term) impact of the planned activities will also be assessed using the resources, methodologies or tools etc.

The M&E arrangements will be structured and organized at various level of project institutional set-up such as:

- **Local level:** for the local executing partners and other stakeholders
- **National level:** for the NMHS of Colombia, Peru and Chile.
- **Regional level:** for the regional technical support or consultation that will be regularly carrying out the monitoring and mid-term and terminal evaluations.

Monitoring and evaluation arrangement for Programme Management
The Programme Management Team (PMT) will be made available with monitoring and evaluation tools of project activities and resources. The PMT under the implementing agencies will ensure that the executing agencies have adequate resources and capacity to measure and monitor results at the local, national and transboundary level. The quarterly monitoring and annual evaluation reports of the executing agencies along with the financial statements and resource management will be submitted to the implementing agencies and further to the Adaptation Fund Secretariat for the review.

E. Include a results framework for the project / programme proposal, including milestones, targets and indicators.

Table 12. Results framework for the project

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
1. Improvement of national and local operational weather, climate and hydrological services system.	1.1 Updated national data management systems, archives, and integrated regional hydrological and meteorological databases.	1.1.1 Conduct an observation gap analysis and address its findings within the WMO Integrated Global Observing System (WIGOS) National plans and framework for the region. Evaluation of the hydrometeorology networks for proposes this project in the pilot areas. 1.1.2 Local meteorological and hydrological data rescue (digitalization). 1.1.3 Implementation of integrated data bases including quality control and homogenization of data sets. 1.1.4 Improvement of regional/national/local data exchange, gridded data sets and services and interoperability protocols. 1.1.5 Regional and national training workshops.	AF 1: Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis.
	1.2 Improved weather, climate and hydrological predictions and projections by establishing an optimized cascading	1.2.1 Implementation of integrated hydrometeorological prediction system integrating hydraulic modeling and flood mapping in selected basins. 1.2.2 Implementation of experimental/operational models for Seasonal to subseasonal (S2S) prediction including operational verification.	

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
	system involving the regionalization of the global forecast products.	1.2.3 Implementation of an operational model for climate extreme events [96]prediction.	
	1.3 Sustained delivery of weather and climate-related advisories to support decision making for national and local water, agriculture and energy stakeholders.	1.3.1 Co-design and co-development with end-users of climate advisory products for water, energy and agriculture. 1.3.2. Implementation of a climate- smart platform for decision making support to agricultural and water resources local planning. 1.3.3 Implementation of a training module for climate related advisories co-producers and end-users. 1.3.4: Development of impact-based forecast (IBF) products to help in decision support services in the areas of weather, disaster risk reduction, water, energy, and agriculture. 1.3.5: Develop communication channels based on the mobile technology for the effective communication of alerts, advisories and other information to users.	
	1.4 End-to-end service through customization of climate information,	1.4.1 Implementation of climate information chains trough formal arrangements between national, local and sectorial institutions. 1.4.2 Co-design and co-development of protocols and communication	

[96] Climate extremes events definitions will be agreed for the three countries.

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
	communication and user´s feedback system.	mechanisms to ensure the adequate users´ s feedback system. 1.4.3 Identification of institutional, financial and cooperation mechanisms to ensure the sustainability of the climate information chains.	
2. Implementation of national and local inter-institutional/ sectorial stakeholders networks.	2.1 Implemented contributions for the establishment/consolidation of National Frameworks for Climate Services in each country.	2.1.1 Identification and mapping of national and sub-national, local and sectorial stakeholder´s, weather, hydrology and climate information needs[97], service delivery and feedback mechanisms. 2.1.2 Subnational/local assessment of climate related impacts and Socio-Economic Benefits of climate services in water, energy and agriculture sectors. 2.1.3 Development of a comprehensive mapping of water, energy, agriculture and risk management requirements of climate services. 2.1.4 Development/Improvement of the Guidelines, Road map and Strategic plan of the implementation of the National Framework of Climate Services for each country. 2.1.5 Implementation of National Climate Information System Helpdesks (CISH).	AF 2.1: Percentage of targeted population aware of predicted adverse impacts of climate variability and change, and of appropriate adaptation responses. AF 2.2: Responsiveness of development sector services to evolving needs from changing and variable climate. AF 2.3: Climate change priorities are integrated into national development strategy.

[97] Based on the priorities identified in NDCs.

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
	2.2 Implemented/improved sectorial local multi-stakeholder networks s to support co-design and co-production of tailored climate services.	2.2.1 Identification and mapping of local/sectorial stakeholder, weather, hydrology and climate information needs, service delivery and feedback mechanisms. 2.2.2 Local assessment of climate related impacts and Socio-Economic Benefits of climate services in water, energy and agriculture sectors with comprehensive gender focus. 2.2.3 Implementation of formal arrangements between local/sectorial stakeholders including sustainability mechanisms. 2.2.4 Capacity building on climate information to support tailored products co-development.	
3. Engagement and empowerment of local communities to co-design local risk management and adaptation plans and projects.	3.1 Local stakeholders manage risks that have arisen from climate variability and change through adaptation plans, especially in pilot intervention areas	3.1.1 Identification and mapping of local partners and institutions to support sustained and timely provision of climate information to local communities. 3.1.2 Implementation of capacity building strategy for local partners (schools, rural communities, women and youth to implement local EWS and mainstream climate information for risk management and adaptation at community level. 3.1.3 Training workshops on the use of climate products to the main agricultural and energy associations including	AF 3.1: Number of projects/programmes that conduct risk and vulnerability assessments (by sector and scale) AF 3.2: Number of EWS and number of beneficiaries covered. AF 3.3: Percentage of targeted population aware of predicted adverse impacts of climate change, and of

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
	3.2 Co-designed local climate risk management and adaptation plans with local authorities and the support of public and private institutions/stakeholders.	training of trainers for smallholder farmers and micro-hydropower operators. 3.1.4 Implementation of self-sustainable community-based climate early warning systems in designated areas. 3.1.5 Implementation of the Common Alerting Protocol (CAP) standard for the automated communication of alerts. 3.1.6 Implementation/enhancement of local observation networks. 3.2.1 Risk and vulnerability assessments at community level including traditional knowledge and gender aspects. 3.2.2 Strengthen capacities of local communities. stakeholders to access, interpret and apply climate information and risk analysis combining them with the traditional knowledge for local planning. Participatory activities for local community stakeholders to design and produce climate information and risk analysis, combined with the traditional knowledge of local planning. 3.2.3 Implementation of local partnerships with local media (radios, TV), NGOs, private companies (ITC), telecommunication companies for SMS-based two-way communication, local	appropriate responses. AF 3.4: Number and type of adaptation assets (tangible and intangible) created or strengthened in support of individual or community livelihoods strategies.

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
		offices of National institutions 3.2.4 Preparation of local risk management and adaptation plans (considering voluntary adaptation responses) in line with the NDCs[98] in water and agriculture and with emphasis in climate extreme events, through participatory process in local designated local communities.	
4. Strengthening of regional cooperation among NMHSs from the Andean region.	4.1 Implemented Regional Climate Services Toolkit (CST).	4.1.1 Diagnostics of operational capabilities and needs of the NMHSs in the Andean region to provide sustainable climate services. 4.1.2 Strengthening of regional platform to support the Climate services Toolkit., including new regional operational products: - Generation of regional Long-Range Forecast (LRF) from Global LRF products and verification (regional) - Implementation of a regional platform to access to global models outputs including climatology. 4.1.3 Development of a regional training and capacity building plan in close coordination with RA III WMO RTCs[100] to implement sustained climate services for water, energy and agriculture sectors.	AF 4.1: Number of projects/programmes that conduct and update risk and vulnerability assessments (by sector and scale). AF 4.2 Number of staff trained to respond to and mitigate impacts of climate related events from targeted institutions increased.

[98] National Determined Contributions
[100] World Meteorological Organization Regional Training Centers in Regional Association III (South America).

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
		4.1.4 Development of an online collection of best practices and lesson-learned on climate services implementation at regional, national and local level. 4.1.5 Improvement of modern computation, interoperability and communication systems for the RCC-WSA[101] members. 4.1.6: Local assessment and demonstration of Social-Economic Benefits (SEB) of the services provided by NMHSs to the disaster risk reduction, water, agriculture and energy sectors.	
	4.2 Consolidated Andean Technical groups of data bases developers, S2S[99] prediction and operational hydrology.	4.2.1 Regional workshops for coordination and training. 4.2.2 Improvement of the regional Andean data base, S2S and interoperability system. 4.2.3 Implementation of innovative hydrometeorological prediction models based on satellite information. 4.2.4 Strengthening of operational hydrology advanced techniques for hydrological monitoring and hydrometry.	
	4.3 Implemented Strategic regional alliances and partnerships for sustained capacity building.	4.3.1 Implementation of joint coordinated activities with UN agencies such as FAO, UNESCO, UNISDR and regional intergovernmental organizations such as the SGCAN[102].	

[99] Seasonal to Subseasonal
[101] Regional climate Center for Western South America http://crc-osa.ciifen.org/
[102] Secretaría General de la Comunidad Andina de Naciones

Project/Programme Components	Expected Outputs	Expected Activities	Indicator
		4.3.2 Establishment of an ad-hoc panel of financial agencies for the sustainability and extension of adaptation efforts to other Andean nations.	

F. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund

During the preparation of the Full Project Proposal, all relevant issues related to environmental and social risks will be identified. The UNDP Social and Environmental Safeguards Procedure (SESP) will be completed along with all related requirements under the Adaptation Fund and recommendations made for appropriate action for the project implementation stage.

G. Include a detailed budget with budget notes, broken down by country as applicable, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Projects costs are split over the main four components according the following criteria:

- Improvement of national and local operational weather, climate and hydrological services system: 26,3% (1,800,000 USD)
- Implementation of national and local inter-institutional/ sectorial stakeholders networks: 13.1% (900,000 USD)
- Engagement and empowerment of local communities to co-design local risk management and adaptation plans and projects: 26.3% (1,800,000 USD)
- Strengthening of regional cooperation among NMHSs from the Andean region: 24.8% (1,700,000 USD)
- Execution cost including monitoring and evaluation will take 8.5% (650.000 USD).

Table 13. Detailed budget per component

Project Components	Expected Outputs	Countries / Regional Institutions
Component 1 - Improvement of national and local operational weather, climate and hydrological services system.	a) Updated national data management systems, archives, and integrated regional hydrological and meteorological databases.	270.000 USD (90.000 per country) 30,000 WMO
	b) Improved weather, climate and hydrological predictions and projections by establishing an optimized cascading system involving the regionalization of the global forecast products.	270.000 USD (90.000 per country) 80.000 USD WMO regional approach
	c) Sustained delivery of weather and climate- related advisories to support decision making for national and local water, agriculture and energy stakeholders.	600.000 USD (200.000 per country)

	d) End-to-end service through customization of climate information, communication and user´s feedback system.	100.000 USD WMO regional approach 420.000 USD (140.000 per country) 30.000 USD WMO technical support
Component 2. Implementation of national and local inter-institutional/ sectorial stakeholders networks.	a) Implemented contributions for the establishment and consolidation of National Frameworks for Climate Services in each country. b) Implemented/improved sectorial local multi-stakeholder networks s to support co-design and co-production of tailored climate services.	285.000 USD (95.000 per country) 15.000 USD WMO 540.000 USD (180.000 per country) 60.000 USD WMO
Component 3 . Engagement and empowerment of local communities to co-design local risk management and adaptation plans and projects.	a) Strengthened capacities of local stakeholders and communities to access, use and apply climate information for risk management and adaptation. Co-designed local climate risk management and adaptation plans with local authorities and the support of public and private institutions/stakeholders.	810.000 USD (270.000 per country) 90.0000 USD WMO regional 900.000 USD (300.000 per country)
Component 4. Strengthening of regional cooperation among NMHSs from the Andean region.	a) Implemented Regional Climate Services Toolkit (CST). b) Consolidated Andean Technical groups of data bases developers, S2S[103] prediction and operational hydrology. c) Implemented Strategic regional alliances and partnerships for sustained capacity building.	500.000 USD (CIIFEN and WMO) 600.000 USD (CIIFEN and WMO) 150.000 USD (CIIFEN) 450.000 USD (150.000 per country)

H. Include a disbursement schedule with time-bound milestones.

[103] Seasonal to Subseasonal

The disbursement schedule for each outputs of the components proposed in the ENANDES project proposal will be developed and presented in the final programme proposal.

PART IV: ENDORSEMENT BY GOVERNMENTS AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[104]

Provide the name and position of the government official and indicate date of endorsement for each country participating in the proposed project / programme. Add more lines as necessary. The endorsement letters should be attached as an annex to the project/programme proposal. Please attach the endorsement letters with this template; add as many participating governments if a regional project/programme:

Gladys Santis, Adaptation Officer, Ministry of Environment, Chile	Date*: 31st July 2018*
David Felipe Olarte Amaya, Acting Chief International Affairs Office, Ministry of Environmental and Social Development, Colombia	Date*: 01st August 2018*
Rosa Morales Saravia, Head of the General Directorate of Climate Change and Desertification, Ministry of Environment, Peru	Date*: 02nd August 2018*

6. Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

B. Implementing Entity certification *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (.....list here.....) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.
Jean-Paul GAUDECHOUX *Name & Signature* Implementing Entity Coordinator
Date: *(Month, Day, Year)* 6/8/18 | Tel. and email:
Project Contact Person:
Tel. And Email:

Annex 1 referred to Part II, Section I

Community Consultation Reports

COLOMBIA (Meetings 10, 12 and 13 July 2018)

Matriz de Reporte de Consultas Nacionales
País/Ciudad/Sede del Taller/Fecha Colombia, Riosucio. Auditorio de la Cámara de Comercio. Julio 10 de 2018.
Equipo Facilitador Luis Reinaldo Barreto, IDEAM Olga Janeth Galindo Ruiz, CIIFEN
Institución Anfitriona Asohofrucol
Descripción Participantes Productores Rurales de Aguacate, Café, Plátano, Frutales de clima medio y cálido, representantes de la Asociación de Caficultores de Riosucio, funcionarios de la Alcaldía y una concejala. Todos son miembros de Asohofrucol. Nivel educativo diverso. (30 asistentes).
Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan para mejorar: la planeación del cultivo, **planes de gestión de riesgos climáticos (prevención, preparación y respuesta)** en su respectivo sector. • Pronósticos sobre fenómenos como lluvias frecuentes o intensas, heladas, sequías, vientos, granizadas y fenómenos de El Niño y La Niña a escalas detalladas más allá de los municipios. • Indicaciones sobre cómo enfrentar eventos como inundaciones y sequías.
Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan para mejorar sus **planes de adaptación al cambio climático** a largo plazo en su respectivo sector. • Información acerca de medidas de adaptación de acuerdo a los cultivos que tiene cada usuario miembro de la asociación. • Información y conceptos de predicción climática e información sobre pronósticos para el manejo de los cultivos y la probabilidad de eventos extremos. • Información a escalas más detallada. • Información sobre impactos económicos y productivos sobre los cultivos. • Las mesas agroclimáticas regionales y el boletín que se emite mensualmente, establecen recomendaciones que deben ser difundidas hacia los agricultores de la región. Sin embargo, los participantes manifiestan la necesidad de información sobre prácticas culturales. • Conocimiento sobre acciones de prevención, como siembras de acuerdo a aspectos climáticos y aspectos físicos del territorio; restauración, conservación de bosques, cuidado de los nacimientos. • Manejo de medidas para el manejo de los vientos fuertes.

Hallazgos sobre cuáles son las **barreras** (acceso, comprensión, escasa articulación, capacitación, empoderamiento local, etc.) que **impiden la aplicación** de la información entregada por los SMHN para: 1) La gestión de riesgos **(prevención, preparación y respuesta)** y toma de decisiones en los sectores agricultura, agua y energía, y 2) Los planes y acciones locales de **gestión de riesgos y adaptación.**

- Sólo algunos usuarios indicaron conocer el boletín de predicción climática regional.
- La información no es de fácil acceso para todos los usuarios, deben tenerse en cuenta medios masivos de difusión diferentes al internet.
- Los boletines agroclimáticos regionales ya existentes en el departamento no están llegando a todos los usuarios.
- La información existente está aún a una escala muy regional, situación que no permite tomar decisiones a escala de su cultivo.
- La información existente está muy fragmentada, y no se tiene claridad acerca de cuál es la información oficial.
- La información que se encuentra en la página web del IDEAM no es fácil de entender, ni fácil de encontrar.

Análisis de percepciones de los actores locales:

En general, existe mucha confusión respecto a la información climática, en cuanto a la oficialidad de la misma, y sobre los sitios y formas de consulta.

La escala de información existente es muy amplia, lo cual dificulta la toma de decisiones frente a sus actividades productivas.

Los asistentes en general muestran confusión respecto a los conceptos básicos.

Para los usuarios, no es muy clara la información generada por el IDEAM, y en algunos casos, le atribuyen a otras entidades la elaboración de la misma.

Todos los participantes son conscientes de los impactos generados por los fenómenos climáticos y demandan información para la generación de las acciones.

Existe un amplio desconocimiento acerca de los instrumentos de planificación asociados al clima, tales como planes de adaptación o mitigación, incluso no conocen muy bien los instrumentos de ordenamiento como POMCAS y POTs.

Los participantes, casi en su totalidad destacaron la poca articulación que hay entre las instituciones, situación que crea gran confusión.

Existe la necesidad de educación sobre los términos, conceptos e información para los usuarios, basado en los conceptos de tiempo y clima, las escalas de la información, entre otra cosas.

Anexos

- Lista Asistencia
- Fotografías

Socialización Servicios Climáticos y Proyecto a participantes de taller. Municipio Riosucio, por parte de funcionario del IDEAM.

Mesas de trabajo por actividad productiva

Socialización resultados mesas de trabajo

Matriz de Reporte de Consultas Nacionales
País/Ciudad/Sede del Taller/Fecha Colombia, Tolima, Espinal. Auditorio Fedearroz. Julio 13 de 2018.
Equipo Facilitador Luis Reinaldo Barreto, IDEAM Olga Janeth Galindo Ruiz, CIIFEN
Institución Anfitriona Fedearroz
Descripción Participantes Pequeños productores rurales de arroz
Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan los productores de arroz para mejorar sus planes de **gestión de riesgos climáticos (prevención, preparación y respuesta).** • La principal problemática manifestada por el grupo de productores participantes son los impactos sobre el cultivo que causan las temperaturas extremas y cambios de la misma dados en cortos periodos de tiempo, por tanto demandan información diaria como mínimo (mencionan que en los posible sea 3 veces al día) que les permita prepararse e implementar medidas como el manejo del riego para asegurar que no le falte la humedad al cultivo. • Conocer localmente los datos de precipitación, brillo solar, humedad relativa, temperaturas máximas o mínimas, velocidad del viento. • Análisis de impactos de variabilidad climática. • Tener acceso a información del comportamiento de las variables climáticas en las partes altas de la cuenca.
Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan los productores de arroz para mejorar o diseñar sus **planes de adaptación al cambio climático** a largo plazo en su respectivo sector. • En la zona existe un distrito de riego del que se surten los cultivos. Es necesario conocer la información predictiva de precipitaciones o épocas de sequía, con el objeto de tener un cronograma apropiado de riegos y establecer un programa de siembra adecuado. • Conocer en detalle medidas de adaptación como los reservorios de agua, su diseño y manejo. • Se propone el diseño e implementación de aplicaciones de celular que permitan el acceso fácil a datos locales y regionales. • Información de lluvias mes a mes, basado en un centro o red de información con datos de estaciones de la zona. • Conocimiento sobre tecnologías para mitigar los efectos de la variabilidad climática sobre los cultivos.
Hallazgos sobre cuáles son las **barreras** (acceso, comprensión, escasa articulación, capacitación, empoderamiento local, etc.) que **impiden la aplicación** de la información entregada por los SMHN para: 1) La gestión de riesgos **(prevención, preparación y respuesta)** y toma de decisiones en los sectores agricultura, agua y energía; y 2) Los planes y

acciones locales de **gestión de riesgos y adaptación.**

- Hay poca credibilidad sobre la información que genera el IDEAM
- La escala de la información es muy amplia
- No hay conocimiento claro de cómo acceder a la información
- No hay claridad acerca de la expresión de los datos, es decir, no saben lo que puede significar el dato respecto a su actividad productiva.

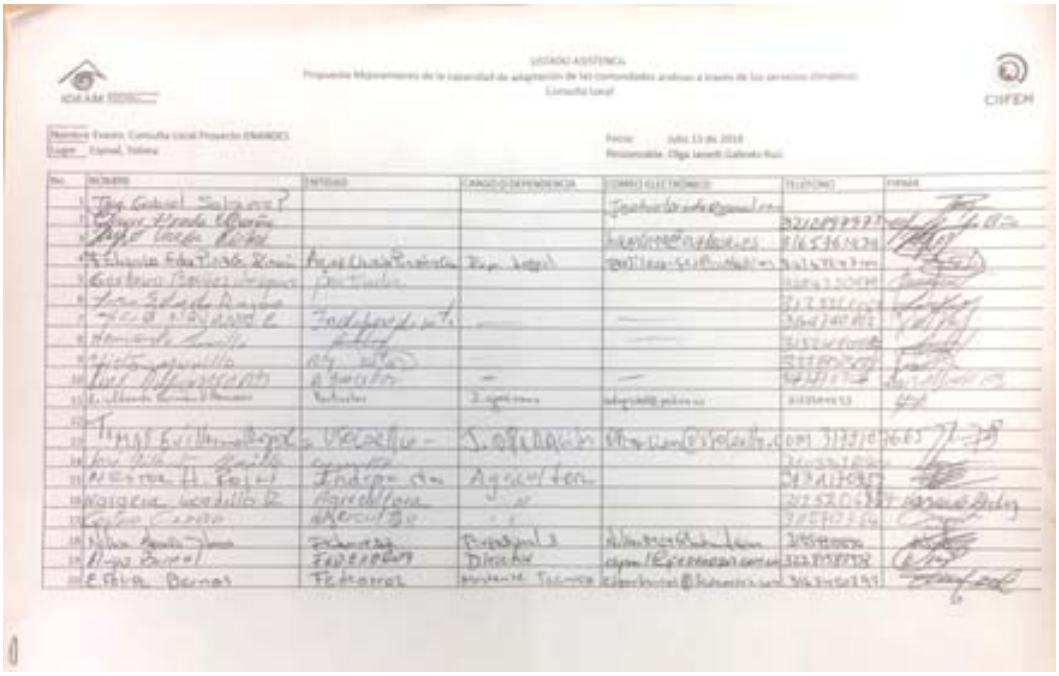
Análisis de percepciones de los actores locales:

El gremio arrocero no posee como tal un plan de adaptación al cambio climático, sin embargo, implementan desde hace aproximadamente 7 años un programa denominado Adopción Masiva de Tecnología (AMTEC), esta estrategia pretende disminuir el impacto del cambio climático a través de transferir las tecnologías de manejo del cultivo disponibles que incrementen la productividad y disminuya los costos de producción con el menor impacto sobre el medio ambiente. Para la generación y diseño de estas tecnologías se utiliza la información generada por el IDEAM. De acuerdo a la entrevista telefónica realizada a la coordinación de este proceso en FedeArroz, existe una clara necesidad de aumentar la cobertura del programa a otros territorios (el sector en el que realizamos el taller aún no está dentro del programa) y de mejorar la red de estaciones, puesto que la información emitida por el IDEAM es de una escala regional o municipal en el mejor de los casos.

Los participantes del taller manifiestan la necesidad de articulación entre las instituciones, y establecer claramente para ellos las competencias de cada una. Igualmente, es necesario armonizar las actividades del cultivo y programas de adaptación a los planes de ordenación de las cuencas hidrográficas, ya que el cultivo es tan dependiente de la oferta del recurso hídrico.

Anexos

- Fotografías
- Lista Asistencia



LISTADO ASISTENCIA

Propuesta Mejoramiento de la capacidad de adaptación de las comunidades andinas a través de los servicios climáticos

Consulta Local

IDEAM

CIFEN

Nombre Evento: Consulta Local Proyecto ENANDES

Lugar: Espinal, Tolima

Fecha: Año 13 de 2018

Responsable: Olga Lucero Galindo Ruiz

No.	NOMBRE	ENTIDAD	CARGO/DEPENDENCIA	CORREO ELECTRONICO	TELEFONO	FIRMA
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Presentación Servicios Climáticos y Propuesta Proyecto

Matriz de Reporte de Consultas Nacionales
País/Ciudad/Sede del Taller/Fecha • Colombia, Popayán, Cauca. Auditorio Empresa de Acueducto de Popayán. Julio 12 de 2018.
Equipo Facilitador • Luis Reinaldo Barreto, IDEAM • Olga Janeth Galindo Ruiz, CIIFEN
Institución Anfitriona • Empresa de Acueducto de Popayán.
• **Descripción Participantes** 1. Representantes de acueductos rurales. 2. Participantes del proyecto “Custodios de Semillas”, de la Empresa de Acueducto. 3. Representantes de Cabildos Indígenas Puracé 4. Miembros de asociaciones de productores campesinos (Asocampo) 5. Funcionarios de la Empresa de Acueducto • En total se contó con la participación de 40 personas.
• **Hallazgos sobre qué** información (productos, frecuencia, resolución) del SMHN necesitan los **representantes de los sectores**: agricultura y agua para mejorar sus planes de **gestión de riesgos climáticos (prevención, preparación y respuesta)** en su respectivo sector. • Necesidad de una red local de monitoreo climático a microcuencas, que emita reportes periódicos (diarios, semanales, mensuales, trimestrales y semestrales) • Boletines de fácil interpretación con conceptos claros para agricultores y comunidad en general. • Información de escala local. • Pronósticos diarios y mensuales. • Medios de comunicación de fácil acceso como mensajes de texto a través de celulares y emisoras comunitarias.
• **Hallazgos sobre qué** información (productos, frecuencia, resolución) del SMHN necesitan los **representantes de los sectores** agricultura y agua para mejorar sus **planes de adaptación al cambio climático** a largo plazo en su respectivo sector • Ampliar el número de variables que se reportan normalmente, a otras como humedad, brillo y luminosidad solara, velocidad de los vientos. • Medidas de adaptación ilustradas, es decir, a través de mecanismos que pueden ser gráficos que permitan un mejor entendimiento por parte de los usuarios.

- Información analítica sobre los impactos sobre sus actividades productivas y sobre prevención de las mismas.

- **Hallazgos sobre cuáles** son las **barreras** (acceso, comprensión, escasa articulación, capacitación, empoderamiento local, etc.) que **impiden la aplicación** de la información entregada por los SMHN para: 1) La gestión de riesgos **(prevención, preparación y respuesta)** y toma de decisiones en los sectores agricultura, agua y energía; y 2) Los planes y acciones locales de **gestión de riesgos y adaptación.**

- La escala de la información es muy gruesa, no permite tomar decisiones sobre territorios pequeños.
- No se conoce con exactitud dónde se puede consultar la información.
- La información brindada no es clara para los usuarios.

- **Análisis de percepciones de los actores locales:**
-
- En general la percepción de los participantes es negativa frente a la información generada por IDEAM, la forma de consultarla no es clara y mucho menos su comprensión.
-
- El común denominador de los asistentes mencionó la necesidad de capacitación en el manejo de instrumentos y en la interpretación de la información generada.
-
- Como punto adicional a lo expuesto por los participantes en el taller relacionado con las necesidades de información, éstos destacaron la necesidad de contar con redes de información conformada por voluntarios locales y con elementos sencillos de comunicación como altavoces, en apoyo a las alertas ante fenómenos o eventos.
-
- Las administraciones municipales según se documentó en el taller, son un punto focal fundamental donde se puede depositar la información y donde los usuarios pueden acceder a ella fácilmente.
-
- No es claro para la mayoría de participantes, las competencias y funciones de las instituciones; por tanto, no hay claridad acerca de quien genera la información necesaria para la toma de decisiones relacionadas con el clima.
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- **Anexos**

- Listado Asistencia
- Fotografías

LISTADO ASISTENCIA

Propuesta Mejoramiento de la capacidad de adaptación de las comunidades andinas a través de los servicios climáticos

Consulta Local

IDEAM · CIIFEN

Nombre Evento: Consulta Local Proyecto ENANDES

Lugar Popayan, Cauca

Fecha: Julio 12 de 2018

Responsable. Olga Janeth Galindo Ruiz

No.	NOMBRE	ENTIDAD	CARGO O DEPENDENCIA	CORREO ELECTRÓNICO	TELÉFONO	FIRMA
1	Beatriz Helena Lulige		Vda claridad		3145972081	[illegible]
2	Mariastellachantre	Asocampo			3203625823	M Stellachantre
3	Mari Escobar		PURACE		3235119311	[illegible]
4	Marcelina Laure P	J.A.C	Vda El Hogar	marcelinalaure@gmail.com	3122815583	Marcelina Laure P
5	Javier Alexander Cosmmal		Vda Santa Elena	jalex2677@hotmail.com	3105390027	[illegible]
6	Maria Lucia Ocoro	Cabildo Quintana	Custodio		3133536990	[illegible]
7	Maria Zoraida Galindo	Asocampo	Facilitadora Comite	[illegible]	3137524404	Maria Zoraida Galindo
8	Diego Lara Rivera	AAPSA	SIG - Amb.	diegolr7@gmail.com	3116747030	[illegible]
9	Liliana Bravo Fdez	AAPSA	Asist. Ambiental	lilianabf68@hotmail.com	3146813468	[illegible]
10	Julio B [illegible]	4723494	Custodio Semillas	— — — —	3136454726	[illegible]
11	[illegible]	[illegible]	Custodio	— — —	4.612.069	— —
12	Victor Hugo Zuñiga S	AAPSA	AAPSA	victorh7zu@gmail.com	1031015	[illegible]
13	Luisa Fernanda Bonilla		Vrd Sta Elena	luisachbonilla@gmail.com	3145303810	Luisa Bonilla
14	[illegible] K [illegible]	IDEAM	Profesional	[illegible]@ideam.gov.co		[illegible]
15	[illegible]	ASOAGROV	Asociado		3122915334	[illegible]
16	Diana Del Mar López Rosero	Acueducto	AAPSA contr.	[illegible]	3185749540	Diana López Rosero
17	Clara Ortaiza [illegible]	Acueducto	Ambiental	clara86@gmail.com	3113741976	[illegible]
18	Olga Eugenia [illegible]	Acueducto	Ambiental	[illegible]@gmail.com	3128211566	[illegible]
19	Lorena Lopez	Acueducto	Ambiental	lopezlorena@gmail.com	3124887220	LORENA LÓPEZ
20	Mauricio Cruz	Asocampo		mauricioalejocruz2014	3218454874	[illegible] A.C.A

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LISTADO ASISTENCIA

Propuesta Mejoramiento de la capacidad de adaptación de las comunidades andinas a través de los servicios climáticos

Consulta Local

IDEAM · CIIFEN

Nombre Evento: Consulta Local Proyecto ENANDES

Lugar Popayan, Cauca

Fecha: Julio 12 de 2018

Responsable. Olga Janeth Galindo Ruiz

No.	NOMBRE	ENTIDAD	CARGO O DEPENDENCIA	CORREO ELECTRÓNICO	TELÉFONO	FIRMA
1	Absalon Escobar	10'527706 pop			3146853612	[illegible]
2	[illegible]	4.607677	ASOAGROV		3122915334	[illegible]
3	Luis Hernan [illegible]	4617.021	[illegible]		3154589280	[illegible]
4	Lucinea Caldon	25265077	Custodio		3203745840	[illegible]
5	Fernando E Gurrute	76.304.682	Quintana		3106394423	Fernando [illegible]
6	Evert Gurrute Campo	1061781359.	Quintana		3202976016	Evert Gurrute
7	Ricardo Manzano		Puracé Ferragpe	rialme3@hotmail.com	3146248679	[illegible]
8	Jair Camayo	4788298	ACUG. G.L.	jaircamayo230@gmail.com	3146852581	[illegible]
9	[illegible]	4687018	[illegible]			[illegible]
10	Cielo Rocio Vidal Sánchez	1061728181	Vigía Amb. Vda El Hogar	rocio.vidal-90@hotmail.com	3103406579	Cielo Rocio Vidal Sanchez
11	Rosalba Galindez Rosero	34324679	J.A.C V/el sendero		3212032822	Rosalba Galindez R.
12	Angelica Mª Bonilla S	1061775288	V/Santa Elena		3225071085	[illegible]
13	Jvelio Calupo	10536182	Los Cuacos P.	senderoeloasis@gmail.com	3117901501	[illegible]
14	Francy Elena Hidalgo	34'571.627	Huacas Cuenca Piedras	francyelenah10@gmail.com	3146575491	Francy Elena.
15	Julio B [illegible]	4723984	Custodio de Semillas		3136454726	[illegible]
16	Libardo Antonio Gurrute Q	1061696860	Acueducto	lgurrute87@hotmail.com	3206659335	[illegible]
17	Andrea Collazos	Acueducto	SAATP	andreacollazos@gmail.com	312222496	[illegible]
18	Sandra Sanchez C.	34317799	Custodia	Sandra Sanchez	3188053359	Sandra Sanchez
19	Carlos Alfredo Maca. M	76309132 P	Poblazón		3147801247	[illegible]
20	[illegible] Quilindo	10.528218	Quintana	. . . . . .	3117080681	[illegible]

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CHILE (Meeting 5 July 2018)

Matriz de Reporte de Consultas Nacionales
País/Ciudad/Sede del taller/Fecha Chile/Quillota/Secretaría Regional Ministerial de Agricultura/05.jul.2018
Equipo facilitador: 1. Humberto Lepe, Secretario Regional Ministerial de Agricultura 2. Antonio Yaksic, Sección Emergencias y gestión de riesgos agrícolas 3. Enrique Garrido, Dirección Meteorológica de Chile 4. Oscar Bustamante, Sección Emergencias y gestión de riesgos agrícolas. 5. Julio Galleguillos, SEREMI Agricultura región de Valparaíso 6. Gastón Torres, Sección Climatología, Dirección Meteorológica de Chile. 7. Liliana Villanueva, Sección Emergencias y gestión de riesgos agrícolas. 8. Juan Quinta, Sección Meteorología Agrícola, Dirección Meteorológica de Chile.
Instituciones anfitrionas: • Asociación de Agricultores de Quillota y Marga-Marga • Junta de Vigilancia de la tercera sección del río Aconcagua • Programas de apoyo a los agricultores (PRODESAL, PDTI, SAT) • Ministerio de Agricultura: Secretaría Regional Ministerial de Agricultura, región de Valparaíso y sus servicios del agro: Servicio Agrícola y Ganadero (SAG); Corporación Nacional Forestal (CONAF); Instituto de Investigaciones Agropecuarias (INIA); Instituto de Desarrollo Agropecuario (INDAP); Sección de Emergencias y Riesgos Agrícolas (SEGRA). • Dirección Meteorológica de Chile (DMC), a través del Sub Departamento de Climatología y Meteorología Aplicada y su Sección de Meteorología Agrícola. • Instituciones vinculadas a los recursos hídricos: Dirección General de Aguas (DGA); Dirección de Obras Hidráulicas (DOH).
Descripción de participantes/ actividad, instituciones, sectores, actores privados, ONGs, etc. Dentro de los participantes, se encontraron principalmente agricultores de la zona, dedicados a los rubros de frutales y hortalizas. En particular, destacó la participación de la presidenta de la Asociación de Agricultores de Quillota y Marga-Marga, Sra. Irene Salazar. También participaron representantes de la Junta de Vigilancia de la Tercera Sección del Río Aconcagua los cuales representan a los usuarios del agua en la región. También estuvieron presentes los representantes de los organismos del Agro de la zona, como el Instituto de Investigaciones Agropecuarias (INIA), la Corporación Nacional Forestal (CONAF), el Instituto de Desarrollo Agropecuario (INDAP), la Dirección General de Aguas (DGA), la Dirección de

Obras Hidráulicas (DOH), Docente de la Universidad Católica de Valparaíso, de la carrera de Agronomía, entre otros.

Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan las **instituciones nacionales**, las **autoridades locales** y los **representantes de los sectores**: agricultura, agua y energía para mejorar sus planes de **gestión de riesgos climáticos (prevención, preparación y respuesta)** en su respectivo sector.

- Información confiable y con mayor certeza;
- Información meteorológica e hidrológica como las mencionadas;
- % probabilidad de ocurrencia (histórico);
- Estimado de nieve acumulada; alertas de heladas; olas de calor y vientos; estado de embalses; ruta de nieve traducida a tiempo de uso; calidad del agua; radiación solar; probabilidad de incendios; probabilidad de ocurrencia de precipitaciones, heladas u otros fenómenos;
- Información georreferenciada; información por internet; información nueva: realidad climática
- Disponer de información en línea en relación a los niveles de aguas subterráneas; previsión de heladas - isotermas; estado de embalses; nevadas; acumulación histórica y prevista de nieve.
- Plantear cuál es el beneficio económico de usar los servicios meteorológicos; para producción bajo invernadero se requiere conocer la luminosidad, días de calor sobre 30°C, altura de napas y evapotranspiración; estado y fluctuación de las napas; para proyecciones de mediano plazo de temperatura y radiación que influyan decisiones de inversión; entregar información de temperatura y precipitaciones comparada con la misma fecha del año anterior.
- Generar un boletín acotado de rubros según sus características, temperatura, horas frío (acumulación), por mes, para hortalizas. Información sobre grados de radiación según cada comuna, región y mes del año.
- Generar un pronóstico comparativo con años anteriores, es decir, preventivo para manejos.

Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan: las **instituciones nacionales**, las **autoridades locales** y los **representantes de los sectores**: agricultura, agua y energía para mejorar sus **planes de adaptación al cambio climático** a largo plazo en su respectivo sector.

- Pronóstico de heladas; pronóstico de lluvias; pronóstico de horas de frío (mayor a 30°C); todo comparado con periodo anterior o 10 años.
- Información procesada histórica v/s avance de la temporada en cuanto a horas bajo

7°C y horas sobre 25°C.

- Datos correctos o adecuados a una norma para poder comparar bien.
- Se requiere información histórica y conocer también las tendencias para futuras inversiones.
- Se requiere más información sobre los canales de comunicación (dar a conocer).

Hallazgos sobre cuáles son las **barreras** (acceso, comprensión, escasa articulación, capacitación, empoderamiento local, etc.) que **impiden la aplicación** de la información entregada por los SMHN para: 1) La gestión de riesgos **(prevención, preparación y respuesta)** y toma de decisiones en los sectores agricultura, agua y energía; y 2) Los planes y acciones locales de **gestión de riesgos y adaptación**.

- No todos usamos Twitter "prefiero e-mail";
- Para mejorar se propone mayor periodicidad y mayor difusión de la información.
- Falta información satelital instantánea, herramienta más directa.
- Se requiere recomendaciones por rubro.
- Se requiere información histórica y conocer también las tendencias para futuras inversiones.
- Se requiere más información sobre los canales de comunicación (dar a conocer).
- La información es de utilidad.
- La información es adecuada, pero, no suficiente.
- Se propone que se permita contar con filtros personales, para cruzar datos de relevancia particular.
- Evitar modelos preestablecidos.
- En general, los canales de comunicación son adecuados y útiles.
- Mejorar la entrega de información, que sea más certera y técnica en tema agrícola.
- Mejorar páginas Web con datos más amigables.

Análisis de percepciones de los actores locales:

De acuerdo a las respuestas de los usuarios durante las mesas técnicas, obtenidas de la aplicación del cuestionario, se deduce que las principales necesidades de los participantes son:

1. Alertas agroclimáticas, como heladas, olas de calor, olas de frío, eventos severos de

precipitación.

2. Boletines, diarios, decadales y mensuales, que contengan estadística básica de las principales variables meteorológicas de interés para la agricultura, como temperatura, precipitación, humedad y viento, horas de frio, entre otros.
3. Pronóstico meteorológico especial para la actividad agrícola, sectorizados.
4. Necesidad de pronósticos meteorológicos de largo plazo, que permitan disponer de orientaciones para la planificación y gestión de sus actividades.
5. Pronósticos meteorológicos especiales, para planificar aplicaciones de pesticidas, de acuerdo a la estación del año.
6. Información meteorológica estadística de un período determinado (semanal, decadal), comparado con igual período del año anterior.
7. Información relacionada con balance hídrico y evapotranspiración para optimizar el manejo del riego.
8. Disponer de información meteorológica (temperatura y acumulación de horas de frío), dirigida a diferentes rubros agrícolas (frutales y hortalizas).
9. Información, sobre monitoreo de indicadores de sequía para la región.

En relación a los medios de difusión, las necesidades detectadas son:

1. Redes sociales (whatsapp, twitter)
2. Correo electrónico.
3. Televisión, radioemisoras y diarios locales.
4. Página Web, aplicaciones móviles

Sugerencias de los usuarios:

1. La información agrometeorológica que manejan actualmente no es suficiente para satisfacer sus necesidades operativas.
2. Mejorar los sistemas de acceso a la información, haciéndolos más amigables.
3. Se requiere capacitación para el manejo de los sistemas de comunicación.

Otra información relevante extraída del taller

- Se requiere información Vía e-mail, Web, diariamente; para productores medianos a grandes e-mail y redes sociales; para pequeños agricultores información radial.
- Se requiere mejorar precisión de la información; sistemas meteorológicos con información horaria, diaria y pronóstico semanal; sistemas climáticos con periodicidad

semestral, anual y trimestral; información digital georreferenciada al teléfono, vía Web, e-mail; información segmentada.

- Boletín de alertas climáticas; radios locales; diarios semanales.
- Pronósticos con información local al menos dos veces al día.
- Dispositivos móviles (celular, app sin cobro); vía correo electrónico y radios locales.
- Vía celular e informes por correo electrónico; vía sitio Web; con periodicidad semanal, semestral y estacional; en el caso de dispositivo móvil con periodicidad semanal; así también semanal y mensual.

Anexos:

- Lista de registro con firmas e instituciones.
- Fotos.
- Encuestas.
- Resultados de trabajo en grupo.
- Presentaciones de relatores de grupo.
- Recortes de prensa.
- Otros

Programa

Horario	Actividad
08:30 – 09:00	**Recepción e inscripción de los participantes.**
09:00 – 09:30	**Palabras de bienvenida y presentación de la actividad.** *Sr. Humberto Lepe, SEREMI de Agricultura - Región de Valparaíso* *Sr. Antonio Yaksic, Jefe SEGRA – MINAGRI*
09:30 – 10:00	**Presentación del Proyecto ENANDES** *Sr. Enrique Garrido, Jefe Subdepartamento Climatología y Meteorología Aplicada, Dirección Meteorológica de Chile (DMC)*

10:00 – 10:30	**Meteorología, Cambio Climático y Adaptación en la Agricultura** *Sr. Juan Quintana, Jefe de la Sección de Meteorología Agrícola, Dirección Meteorológica de Chile, DMC*
10:00 – 10:20	**Servicios meteorológicos e hidrológicos para la agricultura** *Sr. Gastón Torres, Profesional de la Dirección Meteorológica de Chile (DMC)*
10:20 – 10:50	Pausa para café
10:50 – 11:10	**Servicios meteorológicos e hidrológicos para la agricultura** *Sr. Antonio Yaksic Soulé, Jefe Sección de Emergencias y Gestión de Riesgos Agrícolas (SEGRA) del MINAGRI* *Por definir, División de Hidrología, Dirección General de Aguas (DGA)*
11:10 – 13:00	**Mesas de trabajo – Discusión sobre las necesidades de información climática a nivel local** Presentación de la metodología *Liliana Villanueva Nilo, Profesional SEGRA - MINAGRI* Organización de las mesas de trabajo *Todos los participantes*
13:00 – 13:30	**Plenaria sobre principales conclusiones y cierre de la actividad**

User Survey

ENCUESTAS UTILIZADAS EN LA CONSULTA:

CHILE LO HACEMOS TODOS

ADAPTATION FUND

ENCUESTA			
Estimada(o) participante, le solicitamos un momento de su tiempo para completar este formulario. Esta información es confidencial y nos ayudará a seguir mejorando los servicios climáticos para el sector agropecuario. Muchas gracias por su opinión y colaboración.			
DATOS DEL PARTICIPANTE			
Nombre (opcional)			
e-mail de contacto (opcional)			
Edad		Género (F/M/Otro)	
Comuna		Región	
		teléfono de contacto (opcional)	
¿Cuál de las siguientes categorías le identifica más? (marque con una X)			
Agricultor		Asesor/consultor	
Funcionario público del agro		Docente/profesor	
Otro Profesional del agro		Estudiante	
Otro (especificar)			
Si Usted es Agricultor, por favor, indique su o sus rubros principales (marque con una X)			
Cultivos		Hortalizas	
Frutales mayores		Ganadería bovina	
Frutales menores		Ganadería porcina	
Apícola		Ganadería ovina	
Otro rubro (especifique)			
Si Usted es Agricultor, por favor, indique ¿Cuál es la principal amenaza que le ha afectado en su zona?			
Sequía		Heladas	
Lluvias intensas		olas de calor	
otra (especifique)			

SERVICIOS CLIMÁTICOS			
En relación a los siguientes portales de Internet, responda SÍ o NO a las siguientes preguntas			
Sitio Web	**¿Cónoce este sitio Web? (SÍ o NO)**	**¿Conoce la información de este sitio Web? (SÍ o NO)**	**¿Usa la información de este sitio Web? (SÍ o NO)**
Ministerio de Agricultura (www.minagri.gob.cl)			
Dirección Meteorológica de Chile (www.meteochile.cl)			
Dirección General de Aguas (www.dga.cl)			
Poral AGROMET - RAN (www.agromet.cl)			
¿Conoce otro sitio Web con información meteorológica e hidrológica? (por favor indíquelo o déje espacio en blanco):			
En relación a la información climática, responda SÍ o NO a las siguientes preguntas:			
Reporte o comunicado climático	**Institución**	**¿Conoce este reporte o comunicado climático? (SÍ o NO)**	**¿Ha usado la información de este reporte o comunicado? (SÍ o NO)**
Coyuntura Agroclimática	SEGRA - Ministerio de agricultura		
Matriz de sequía	SEGRA - Ministerio de agricultura		
Boletín Agroclimático	Dirección Meteorológica de Chile		
Boletín Perspectiva Agroclimática	Dirección Meteorológica de Chile		
Informe Agrometeorológico Semanal	Dirección Meteorológica de Chile		
Situación climática, Monitoreo ciclo El Niño/La Niña y Pronóstico	Dirección Meteorológica de Chile		
Avisos y alertas meteorológicas	Dirección Meteorológica de Chile		
Boletín hidrológico (Información pluviométrica, fluviométrica,	Dirección General de Aguas		
Pronóstico de disponibilidad de agua para la Temperada de riego	Dirección General de Aguas		
¿Conoce otro reporte o comunicado climático (por favor indíquelo o deje espacio en blanco):			
¿Qué tipo de medio prefiere para recibir información climática? (marque con una X)			
Teléfono celular		Diario regional	
Diario nacional		Radio local	
Radio nacional		Televisión	
Sitio Web		Charlas	
Otro medio (especifique)			

Difusión en redes sociales

PERÚ (Meetings 11 and 13 July 2018)

Matriz de Reporte de Consultas Nacionales
Área temática: AGROPECUARIA, AGUA Y GESTIÓN DE RIESGOS

País/Ciudad/Sede del taller/Fecha
Perú

Taller con usuarios de **agropecuaria, agua y gestión de riesgos**, realizado en el Centro Cívico de la Municipalidad de Matucana, provincia de Huarochirí, departamento de Lima, a 2400 msnm, el 11 de julio del 2018.

Equipo facilitador:
La facilitación estuvo a cargo del SENAMHI y CIIFEN:
Del SENAMHI: Gabriela Rosas, Grinia Avalos, Irene Trebejo, Waldo Lavado, Karim Quevedo, Luis Cruzado, Esequiel Villegas, Gladys Chamorro y Diego Miranda.
Del CIIFEN: Pedro Cabrera y Luisa Cortez.

Instituciones anfitrionas:

- Direcciones de Meteorología, Hidrología, Agrometeorología y Dirección Zonal Lima del SENAMHI
- Dirección Zonal Lima/AGRORURAL/Ministerio de Agricultura y Riego.
- Gerencia Ambiental-Municipalidad Provincial de Huarochirí- Matucana
- Instituciones socias: Giovanna Egas, Ministerio del Ambiente (MINAM); Edith Rojas, Ministerio de Agricultura y Riego (MINAGRI); Karina Obregón, Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres (CENEPRED); Franklin Hidalgo, Instituto Nacional de Defensa Civil (INDECI) y Jairo Chunga, Autoridad Nacional del Agua (ANA).

Descripción de participantes/ actividad, instituciones, sectores, actores privados, ONGs, etc.

Los objetivos específicos de los talleres fueron los siguientes:

1. Identificar peligros y prácticas de adaptación en el sector agrario y gestión de riesgos.
2. Identificar la necesidad de información climática.
3. Identificar barreras por las que no se tiene acceso o no se utiliza la información climática.
4. Compilar recomendaciones prácticas de los participantes.

Para el taller realizado en la localidad de Matucana, se contó con el apoyo de

AGRORURAL/MINAGRI para la convocatoria. Se establecieron tres mesas temáticas: Agropecuaria, Agua y Gestión de riesgos. Participaron representantes de instituciones técnicas, y líderes de comunidades campesinas para la mesa temática de agropecuaria; representantes de comités de regantes para la mesa temática de agua; y representantes de autoridades y gobernadores para la mesa temática de gestión de riesgo.

Asistieron un total de 98 participantes, de los cuales 71,5% varones y 28,5% de mujeres.

En la mesa temática de **Agropecuaria,** bajo la coordinación de especialistas en agrometeorología del SENAMHI y del MINAGRI, se trabajó con participantes técnicos de la Agencia Agraria Santa Eulalia, Agrorural-Santa Eulalia y Zonal Lima, y con representantes de las comunidades campesinas de: Soca, Paroc, San Juan, Chauta, Purhuay, San Mateo, San Pedro de Huancay, Laraos, Huanza, Caracancha, Collana, Mariatana, Llambilla, Cochacra, San Mateo, Copara, Viso, Tupicocha, Surco, entre otros.

En la mesa temática de **Agua**, con la coordinación de especialistas en Hidrología del SENAMHI, del ANA y del MINAM, se trabajó con los representantes del Comité de riego de San Mateo, Santa Eulalia, Viso, Comité de Regantes de Santa Eulalia, Junta de usuarios de agua del Rímac, Comité de agua de Purhuay, Chaupimarca, Pacaychico; Canal de Pacomanta, Comité de usuarios de agua de Huancate, Songollo, Laraos, entre otros.

En la mesa de **Gestión de riesgos**, con la coordinación de especialistas en meteorología del SENAMHI y de gestión de riesgos de CENEPRED e INDECI, se trabajó con representantes del Gobierno Regional de Lima (GORE-Lima), el Centro de Operaciones de Emergencia Nacional (COEN), y representantes de las municipalidades distritales de Matucana, San Mateo, San Juan de Iris, Mariatana, Antioquia, Chicla, Surco, Callahuanca, Santa Eulalia, Ahuillay Matu, Viso, San Pedro de Casta, Laraos, entre otros.

Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan las **instituciones nacionales**, las **autoridades locales** y los **representantes de los sectores**: agricultura, agua y GRD para mejorar **sus planes de gestión de riesgos climáticos** (prevención, preparación y respuesta) en su respectivo sector.

- Boletines con pronósticos climáticos e hidrológicos antes y durante la campaña agrícola.
- Pronóstico de heladas y lluvias intensas.
- Sistemas de alerta temprana.
- Talleres de capacitación sobre eventos climáticos, prevención de impactos, riego, gestión de riesgos, etc.

Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN **necesitan** las **instituciones nacionales**, las **autoridades locales** y los

representantes de los sectores: agricultura, agua y GRD **para mejorar sus planes de adaptación al cambio climático a largo plazo** en su respectivo sector.

- Cambio climático
- Zonificación para diversificación productiva en cultivos
- Capacitación sobre implementación de medidas de adaptación, agricultura orgánica, siembra y cosecha de agua, etc.

Hallazgos sobre cuáles son **las barreras** (acceso, comprensión, escasa articulación, capacitación, empoderamiento local, etc.) que **impiden la aplicación** de la información entregada por los SMHN para:

- La gestión de riesgos **(prevención, preparación y respuesta)** y toma de decisiones en los sectores agricultura, agua y GRD.
- Los planes y acciones locales de **gestión de riesgos y adaptación**.

Excepto los representantes de la mesa temática de gestión de riesgos, que mostró mayor conocimiento sobre las actividades del SENAMHI, los usuarios de las mesas de agropecuaria y agua (comités de regantes) manifestaron desconocer en su mayoría las actividades del SENAMHI y sus productos, manifestando la poca notoriedad de la institución. Indicaron como principales barreras el no tener acceso al internet, la falta de comunicación con sus autoridades locales y entes técnicos como agentes zonales de agricultura y riego.
Los usuarios de la mesa de gestión de riesgos mencionaron que sí conocen la actividad del SENAMHI; sin embargo, un bajo porcentaje manifestó utilizar sus productos, mencionando como barreras la falta de acceso a los medios de comunicación y difusión, oportunidad y disponibilidad; falta de prioridad en la agenda política para trabajar el tema de clima para la gestión del riesgo, deficiente comprensión de los productos, mapas poco detallados, lenguaje muy técnico, no contar con estaciones meteorológicas, falta de capacitación, etc.

Análisis de percepciones de los actores locales:

Peligros e impactos:

Con respecto a los peligros que les afectan, se consideran con mayor prioridad las lluvias intensas, sus efectos como los deslizamientos y las inundaciones, seguido de las heladas en las partes altas y en siguiente prioridad las sequías, altas temperaturas y los vientos fuertes.

Como impactos de los peligros se mencionan: pérdidas de terrenos agrícolas y de cultivos, pérdidas de vidas humanas, desnutrición y mortandad de animales, bajo rendimiento de leche de ganado, aparición de plagas y enfermedades, pérdidas de pastos, daños en canales y tomas de regadío, migración de jóvenes, interrupción de carreteras y caminos de acceso, entre otros.

Género y juventud:

Con respecto a la participación de la mujer, la mayoría menciona que sí participa en la administración y/o toma de decisiones vinculadas con la producción agropecuaria y la disponibilidad hídrica, y asimismo que sí accede a la información, capacitación y educación formal; sin embargo, con respecto a que si la agricultura pueda crear oportunidades para los jóvenes, una gran mayoría considera que no existen oportunidades, que requieren mayor tecnología, mayor capacitación y se debe crear incentivos para evitar la migración.

Otra información relevante extraída del taller

Propuesta:

- Representantes de la mesa de gestión de riesgo manifestaron recibir la información del SENAMHI mediante los COER (sectores de salud y educación); sin embargo, existe una deficiente articulación entre estos sectores, por lo que solicitan se vincule a los Comités de Regantes para la recepción y difusión de la información climática.
- Solicitan masificar la información por radio local y mensajes de texto, TV local.
- Sugieren elaborar e implementar instrumentos de gestión (planes de contingencia ante sequías y lluvias intensas).

Anexo:

Fotos durante el taller, imágenes de la lista de participantes y encuestas por mesas temáticas.

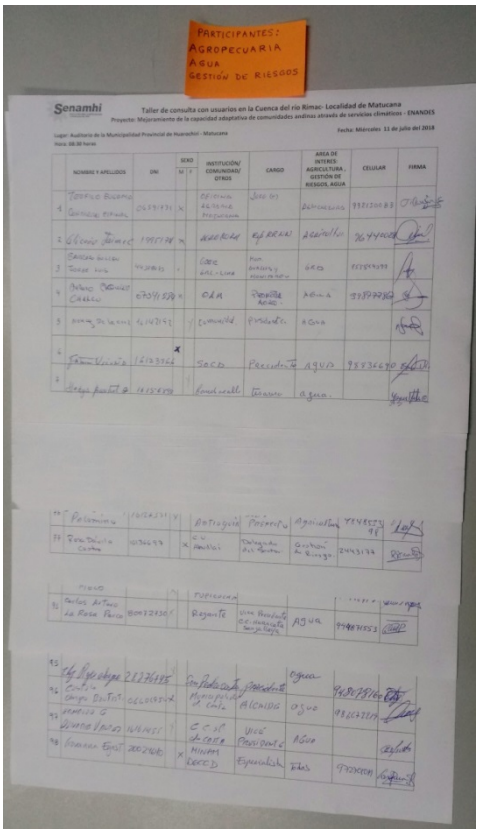
TALLER CON USUARIOS DE AGROPECUARIA, AGUA Y GESTIÓN DE RIESGOS

EQUIPO TÉCNICO: SENAMHI, SOCIOS INSTITUCIONALES Y CIIFEN

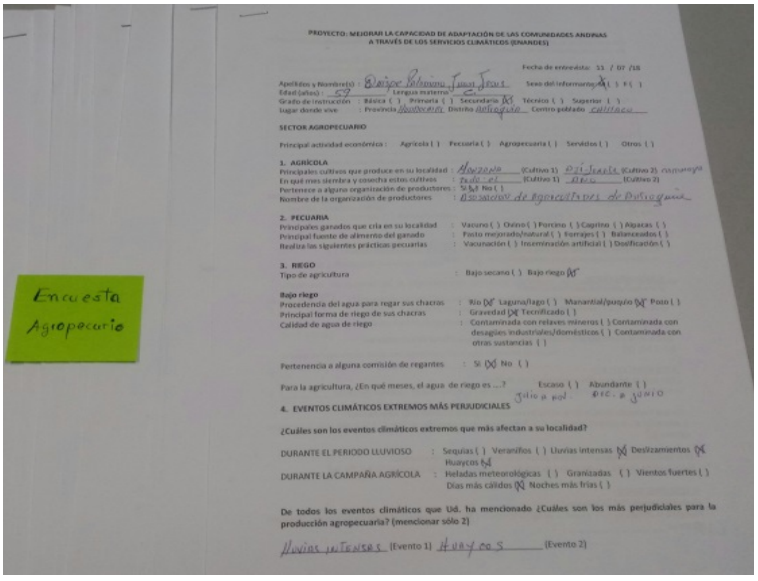
MESAS TEMÁTICAS DE AGROPECUARIA

MESAS TEMÁTICAS DE AGUA

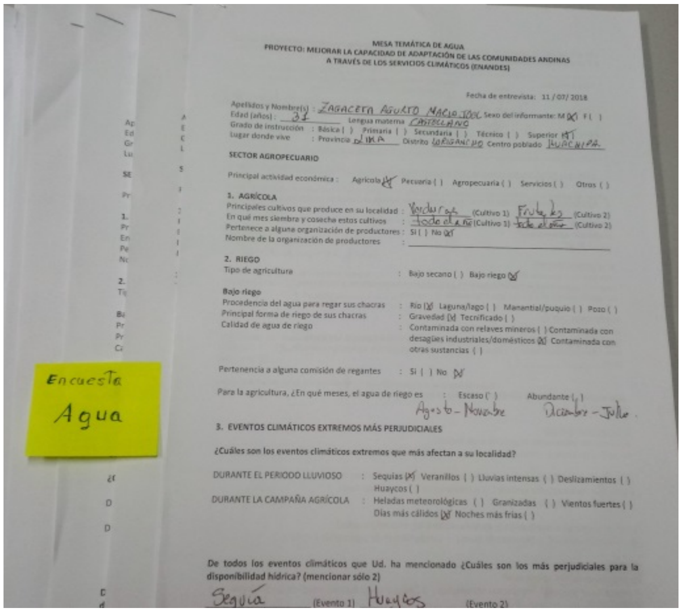
MESA TEMÁTICA DE GESTIÓN DE RIESGOS



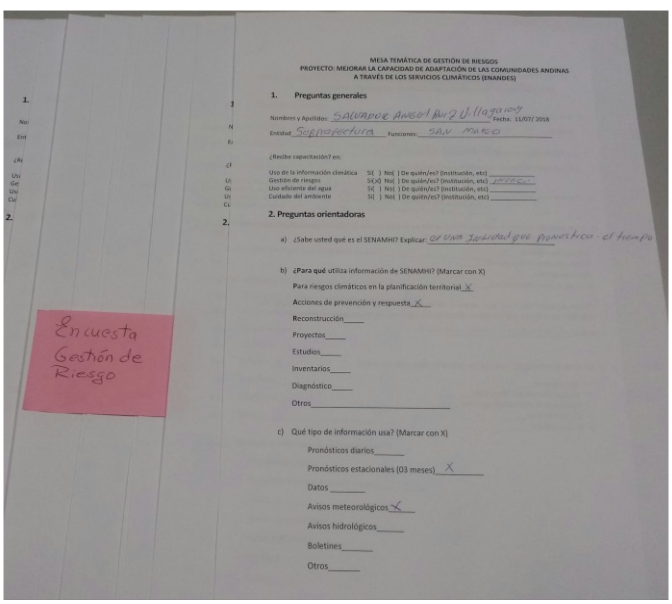
LISTA DE PARTICIPANTES



ENCUESTAS: AGROPECUARIA



ENCUESTAS : AGUA



ENCUESTAS: GESTIÓN DE RIESGO

Matriz de Reporte de Consultas nacionales **Área temática: ENERGÍA**
País/Ciudad/Sede del taller/Fecha Perú Taller con usuarios del Sector **Energía**, realizado en la Sala de Capacitación del SENAMHI, distrito de Jesús María, Provincia de Lima, Departamento de Lima, el 13 de julio del 2018.
Equipo facilitador: La facilitación estuvo a cargo del SENAMHI y CIIFEN. Por el SENAMHI: Gabriela Rosas, Oscar Felipe, Waldo Lavado, Grinia Avalos, Amelia Díaz, Irene Trebejo, Esequiel Villegas, Kris Correa y Ricardo Rosas Por el CIIFEN: Pedro Cabrera y Luisa Cortez
Instituciones anfitrionas: • Direcciones de Meteorología e Hidrología del SENAMHI-PERU. • Instituciones socias: Roberto Mendoza, Dirección de Eficiencia Energética del Ministerio de Energía y Minas y Giovanna Egas, Ministerio del Ambiente.
Descripción de participantes/ actividad, instituciones, sectores, actores privados, ONGs, etc. Los objetivos específicos del taller fueron los siguientes: 1. Identificar peligros y prácticas de adaptación en el sector energía. 2. Identificar la necesidad de información climática para el sector. 3. Identificar barreras por las que no se tiene acceso o no se utiliza la información climática. 4. Compilar recomendaciones prácticas de los participantes. El taller de Energía fue orientado a la cuenca del Río Rímac, por cuanto los representantes del sector energía que operan en esta cuenca, tienen su sede en la ciudad capital Lima. Participaron como representantes del Sector: ELECTROPERÚ, el Organismo Supervisor de la Inversión en Energía y Minería (OSINERGMIN) y el Ministerio de Energía y Minas (MEM), y como representante del sector privado: AUSTER ENERGÍA.
Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN **necesitan**: las **instituciones nacionales**, las **autoridades locales** y los **representantes del sector** energía para mejorar sus planes de **gestión de riesgos**

climáticos (prevención, preparación y respuesta) en su sector.

- Datos de lluvia, temperatura, caudales y evaporación.
- Pronósticos de 48 a 72 horas de caudales y vientos (Ráfagas).
- Sistema de Alerta Hidrológico.

Hallazgos sobre qué información (productos, frecuencia, resolución) del SMHN necesitan las **instituciones nacionales**, las **autoridades locales** y los **representantes del sector** energía para mejorar sus **planes de adaptación al cambio climático** a largo plazo.

- Escenarios de disponibilidad hídrica (presente y futuro).
- Información climática más detallada en medio digital.
- Disponibilidad de datos en cuencas de mayor potencial hídrico.
- Mapas de energía solar y eólica actualizados.

Hallazgos sobre cuáles son las **barreras** (acceso, comprensión, escasa articulación, capacitación, empoderamiento local, etc.) que **impiden la aplicación** de la información entregada por el SENAMHI para: 1) La gestión de riesgos **(prevención, preparación y respuesta)** y toma de decisiones en el sector energía; y 2) Los planes y acciones locales de **gestión de riesgos y adaptación.**

Los usuarios manifiestan que sí reciben o tienen acceso a la información climática, sin embargo existen dificultades para su uso:

- Oportunidad y disponibilidad.
- Mejorar formatos.
- Falta de articulación con el Sector.
- Mensaje muy técnico.

Análisis de percepciones de los actores locales:

Peligros:

Con respecto a los peligros que les afectan, se consideran con mayor prioridad las lluvias intensas y sus efectos como los deslizamientos y las inundaciones, en segunda prioridad las sequías y en menor prioridad los vientos, nevadas, granizadas, tormentas eléctricas.

Como impactos de los peligros se mencionan:

- Arrastre de sedimentos por huaycos y deslizamientos, colmatación de cauces, inundación. Restricción y disminución en la producción energética. Disminución de la producción por causa de la sequía.
- Altas pérdidas económicas por las tuberías de gas, infraestructura hidráulica, turbinas.
- Si el viento es intenso, quema de aerogeneradores (sobrecarga).

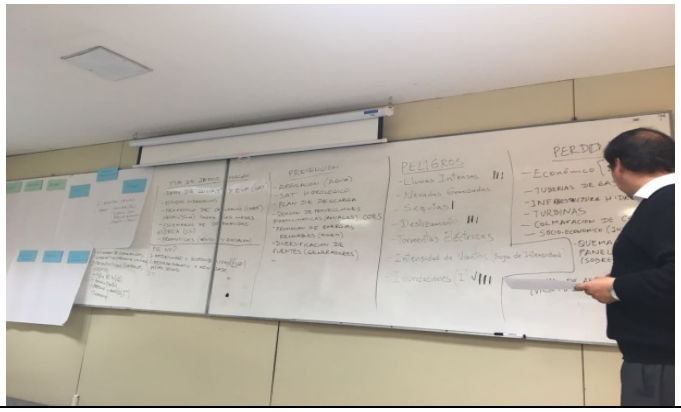
Otra información relevante extraída del taller

Se propone contar con:

- Plataforma con información integrada y más útil para el sector.
- Mejorar la gestión con el MEM, convenios con las áreas de Concesiones y Electricidad.

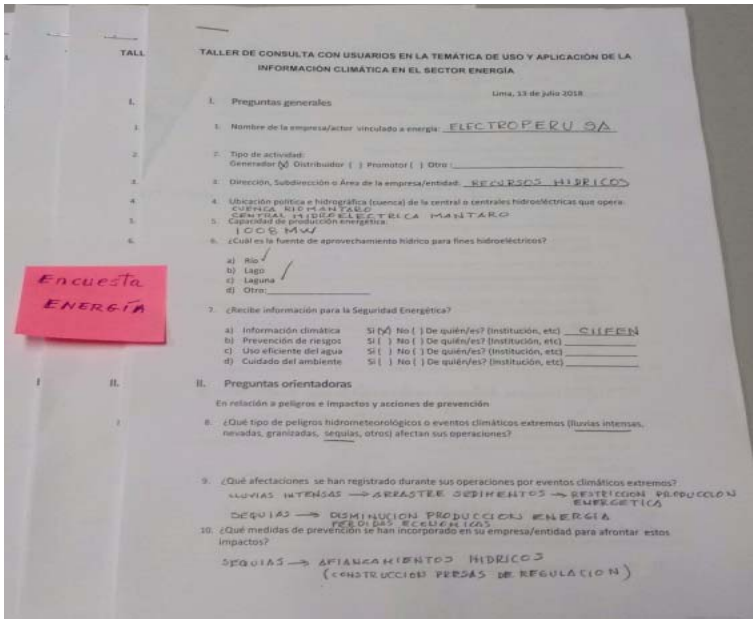
Anexos:
ANEXO: Fotos durante el taller, imágenes de la lista de participantes y encuestas por mesas temáticas.

TALLER CON USUARIOS DE ENERGÍA



EQUIPO TÉCNICO: SENAMHI, SOCIOS INSTITUCIONALES Y CIIFEN

ENCUESTA



TALLER DE CONSULTA CON USUARIOS EN LA TEMÁTICA DE USO Y APLICACIÓN DE LA INFORMACIÓN CLIMÁTICA EN EL SECTOR ENERGÍA

Lima, 13 de julio 2018

I. Preguntas generales

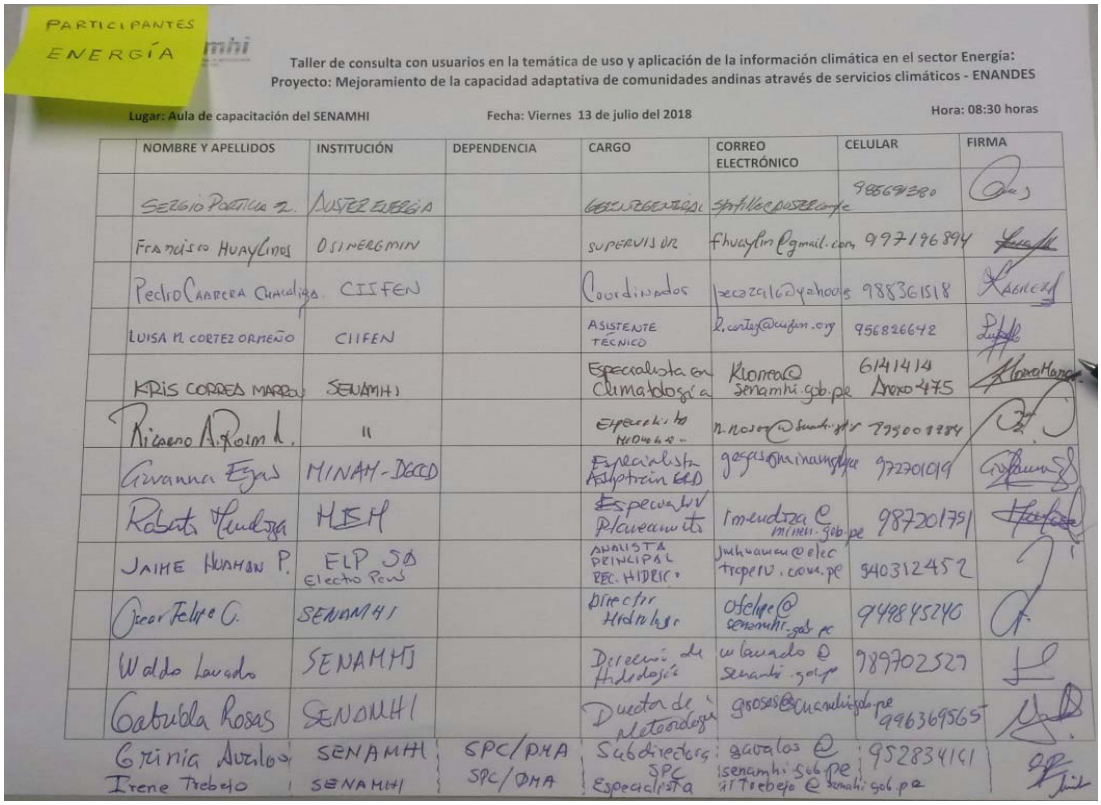
1. Nombre de la empresa/actor vinculado a energía: ELECTROPERU SA
2. Tipo de actividad: Generador (X) Distribuidor ( ) Promotor ( ) Otro: _____
3. Dirección, Subdirección o Área de la empresa/entidad: RECURSOS HIDRICOS
4. Ubicación política e hidrográfica (cuenca) de la central o centrales hidroeléctricas que opera: CUENCA RIO MANTARO
5. Capacidad de producción energética: CENTRAL HIDROELECTRICA MANTARO 1008 MW
6. ¿Cuál es la fuente de aprovechamiento hídrico para fines hidroeléctricos?
   a) Río ✓
   b) Lago
   c) Laguna /
   d) Otro: _____
7. ¿Recibe información para la Seguridad Energética?
   a) Información climática — Si (X) No ( ) De quién/es? (Institución, etc) CIIFEN
   b) Prevención de riesgos — Si ( ) No ( ) De quién/es? (Institución, etc) _____
   c) Uso eficiente del agua — Si ( ) No ( ) De quién/es? (Institución, etc) _____
   d) Cuidado del ambiente — Si ( ) No ( ) De quién/es? (Institución, etc) _____

Encuesta ENERGÍA

II. Preguntas orientadoras

En relación a peligros e impactos y acciones de prevención

8. ¿Qué tipo de peligros hidrometeorológicos o eventos climáticos extremos (lluvias intensas, nevadas, granizadas, sequías, otros) afectan sus operaciones?
9. ¿Qué afectaciones se han registrado durante sus operaciones por eventos climáticos extremos?
   LLUVIAS INTENSAS → ARRASTRE SEDIMENTOS → REDUCCION PRODUCCION ENERGETICA
   SEQUIAS → DISMINUCION PRODUCCION ENERGIA
   PERDIDAS ECONOMICAS
10. ¿Qué medidas de prevención se han incorporado en su empresa/entidad para afrontar estos impactos?
    SEQUIAS → AFIANCAMIENTOS HIDRICOS (CONSTRUCCION PRESAS DE REGULACION)



PARTICIPANTES ENERGÍA

Taller de consulta con usuarios en la temática de uso y aplicación de la información climática en el sector Energía:
Proyecto: Mejoramiento de la capacidad adaptativa de comunidades andinas através de servicios climáticos - ENANDES

Lugar: Aula de capacitación del SENAMHI — Fecha: Viernes 13 de julio del 2018 — Hora: 08:30 horas

	NOMBRE Y APELLIDOS	INSTITUCIÓN	DEPENDENCIA	CARGO	CORREO ELECTRÓNICO	CELULAR	FIRMA
	Sergio Portilla Z.	Duster Energía		Gerente Regional	sportilla@dusterenergia.pe	986694280	
	Francisco Huayllinos	OSINERGMIN		Supervisor	fhuayllin@gmail.com	997196894	
	Pedro Cabrera Carhuaz.	CIIFEN		Coordinador	pecazal62@yahoo.es	988361518	
	Luisa M. Cortez Ormeño	CIIFEN		Asistente Técnico	l.cortez@ciifen.org	956826642	
	Kris Correa Marroquín	SENAMHI		Especialista en Climatología	Kcorrea@senamhi.gob.pe	614141 Anexo 475	
	Ricardo A. Rojas L.	"		Especialista Modelamiento	r.rojas@senamhi.gob.pe	995009884	
	Giovanna Egas	MINAM - DGCCD		Especialista Adaptación GRD	gegas@minam.gob.pe	972701019	
	Roberto Mendoza	MEM		Especialista Proyectos	rmendoza@minem.gob.pe	987201751	
	Jaime Huaman P.	ELP SA Electro Peru		Analista Principal Rec. Hídricos	jhuaman@electroperu.com.pe	940312452	
	Oscar Felipe C.	SENAMHI		Director Hidrología	ofelipe@senamhi.gob.pe	949845240	
	Waldo Lavado	SENAMHI		Dirección de Hidrología	wlavado@senamhi.gob.pe	989702527	
	Gabriela Rosas	SENAMHI		Director de Meteorología	grosas@senamhi.gob.pe	996369565	
	Gricia Aurelio	SENAMHI	SPC/DMA	Subdirectora SPC	gaurelio@senamhi.gob.pe	952834141	
	Irene Trebejo	SENAMHI	SPC/DMA	Especialista	itrebejo@senamhi.gob.pe		

LISTA DE PARTICIPANTES

Full Reports

National Consultations

(in Spanish)

1. INFORME DEL SEMINARIO TALLER SOBRE SERVICIOS CLIMÁTICOS PARA LA ADAPTACIÓN A LOS IMPACTOS DEL CLIMA EN LA AGRICULTURA

Antecedentes generales del encuentro

El Seminario-Taller sobre Servicios Climáticos para la adaptación a los impactos del clima, se realizó en la ciudad de Quillota, en dependencias de la Secretaría Regional de Agricultura de la región de Valparaíso, con el propósito de establecer un diálogo directo entre los organismos encargados de elaborar servicios climáticos y los usuarios de la información meteorológica y climática, en sectores relevantes de la región, como son la agricultura, la gestión de recursos hídricos y la energía, en el marco de la actividad de Consultas Nacionales asociadas a la elaboración de la Nota de Concepto del proyecto "Enhancing Adaptative Capacity of Andean Communities through Climate Services" (ENANDES), el que será presentado al Fondo de Adaptación (FA).

Esta actividad fue desarrollada por la Sección de Emergencias y Gestión de Riesgos Agrícolas y la Dirección Meteorológica de Chile, con el Equipo regional de la Secretaría Regional Ministerial de Agricultura de la Región de Valparaíso.

La zona piloto del proyecto es la Cuenca de Aconcagua, ubicada en la provincia de Quillota, en la Región de Valparaíso.

El Seminario Taller, sobre servicios climáticos para la adaptación a los impactos del clima en la agricultura, se realizó el 05 de julio en el Salón Auditorio de la Secretaría Regional Ministerial de Agricultura de la Región de Valparaíso (Freire 765 – Quillota), Chile.

Participantes del taller

Se convocó a 32 personas, cuyos participantes representaron a:

- La Asociación de Agricultores de Quillota y Marga Marga.
- La Junta de Vigilancia de la Tercera Sección del Río Aconcagua.
- Los programas de apoyo a los agricultores (PRODESAL, PDTI, SAT, etc.).
- Ministerio de Agricultura: Secretaría Regional Ministerial de Agricultura Región de Valparaíso y sus Servicios del agro: Servicio Agrícola y Ganadero (SAG); Corporación Nacional Forestal (CONAF); Instituto de Investigaciones Agropecuarias (INIA); Instituto de Desarrollo Agropecuario (INDAP) y la Sección de Emergencias y Gestión de Riesgos Agrícolas.
- Dirección Meteorológica de Chile, a través de su Subdepartamento Climatología y Meteorología Aplicada, Dirección Meteorológica de Chile y de su Sección de Meteorología Agrícola.
- Instituciones vinculadas a los recursos hídricos: Dirección General de Aguas (DGA); Dirección de Obras Hidráulicas (DOH).
- Instituciones de investigación como universidades.

Objetivo del encuentro

Identificar las brechas de los servicios meteorológicos e hidrológicos nacionales para que éstos respondan a los requerimientos y necesidades de sus usuarios/beneficiarios.

Metodología

Etapas de la actividad

La actividad consistió en un Seminario taller con etapas, desarrolladas en una jornada de trabajo (ver Programa): presentación del proyecto y del marco conceptual de los servicios climáticos meteorológicos e hidrológicos; presentación de los servicios climáticos disponibles para el agro; mesas de trabajo para el análisis de brechas en cuanto a servicios climáticos (disponibilidad, acceso, y pertinencia de los servicios climáticos, equidad de género, necesidades de difusión y de fortalecimiento de capacidades en el uso de estos servicios, etc.).

Caracterización de los participantes

Se realizó a través de una encuesta elaborada por la Sección de Emergencias y Gestión de Riesgos Agrícolas y la Sección de Meteorología Agrícola de la Dirección Meteorológica de Chile, con el apoyo propuestas desarrolladas por CIIFEN (Ver Formato en ANEXO).

Mesas de trabajo

La discusión se desarrolló en 3 mesas de trabajo con un máximo de 6-8 participantes, con un moderador. Los participantes se distribuyeron en grupos heterogéneos. Para la discusión se elaboró un cuestionario de 3 preguntas y se trabajó con tarjetas. Además, se elaboró un glosario de apoyo para la discusión.

Previamente al inicio del trabajo se presentó la metodología de trabajo y se entregó el cuestionario a cada uno de los participantes.

Programa

Horario	Actividad
08:30 – 09:00	**Recepción e inscripción de los participantes.**
09:00 – 09:30	**Palabras de bienvenida y presentación de la actividad.** *Sr. Humberto Lepe, SEREMI de Agricultura - Región de Valparaíso* *Sr. Antonio Yaksic, Jefe SEGRA - MINAGRI*
09:30 – 10:00	**Presentación del Proyecto ENANDES** *Sr. Enrique Garrido, Jefe Subdepartamento Climatología y Meteorología Aplicada, Dirección Meteorológica de Chile (DMC)*
10:00 – 10:30	**Meteorología, Cambio Climático y Adaptación en la Agricultura** *Sr. Juan Quintana, Jefe de la Sección de Meteorología Agrícola, Dirección Meteorológica de Chile, DMC*
10:00 – 10:20	**Servicios meteorológicos e hidrológicos para la agricultura** *Sr. Gastón Torres, Profesional de la Dirección Meteorológica de Chile (DMC)*
10:20 – 10:50	Pausa para café
10:50 – 11:10	**Servicios meteorológicos e hidrológicos para la agricultura** *Sr. Antonio Yaksic Soulé, Jefe Sección de Emergencias y Gestión de Riesgos Agrícolas (SEGRA) del MINAGRI* *Por definir, División de Hidrología, Dirección General de Aguas (DGA)*

Horario	Actividad
11:10 – 13:00	**Mesas de trabajo – Discusión sobre las necesidades de información climática a nivel local** Presentación de la metodología *Liliana Villanueva Nilo, Profesional SEGRA - MINAGRI* Organización de las mesas de trabajo *Todos los participantes*
13:00 – 13:30	**Plenaria sobre principales conclusiones y cierre de la actividad**

Resultados

Mesas de trabajo

La discusión de las mesas de trabajo se muestra en la tabla siguiente (Tabla 1). Además, hubo aportes de forma individual de 7 participantes del taller, incluidas también en el análisis (Tabla 2).

Las preguntas para la discusión fueron las siguientes:

Pregunta 1. ¿Qué tipo de información meteorológica y/o climática se necesita para las decisiones productivas en su zona? (información meteorológica como lluvias o temperaturas; información hidrológica como estado de los caudales o embalses; análisis e indicadores necesarios; alertas de heladas; otro tipo de información)

Pregunta 2. ¿Cómo le gustaría recibir la información meteorológica y/o climática que necesita y con qué periodicidad? (medios como dispositivos móviles, radio, televisión, folleto impreso, sitio web, reporte de su asesor; periodicidad: diaria, semanal, mensual, quincenal; otras).

Pregunta 3. En relación con la información agroclimática ¿Considera Usted que los canales de comunicación son los adecuados? ¿Cree Usted que esta información es de su utilidad? ¿Qué propone Usted para mejorar la información meteorológica y/o climática que recibe o pudiera recibir para apoyar sus decisiones productivas?

2. Tabla 1. Respuestas al cuestionario de las mesas de trabajo.

N° Mesa	Pregunta 1	Pregunta 2	Pregunta 3
Mesa 1	Información confiable y con mayor certeza; información meteorológica e hidrológica como las mencionadas; %probabilidad de ocurrencia (histórico); Eto; nieve acumulada; alertas de heladas; olas de calor y vientos; estado de embalses; ruta de nieve traducida a tiempo de uso; calidad del agua; radiación solar; probabilidad de incendios; probabilidad de ocurrencia de precipitaciones, heladas u otros fenómenos; información georreferenciada; información por internet; información nueva: realidad climática	Vía e-mail, Web, diariamente; para productores medianos a grandes e-mail y redes sociales; para pequeños agricultores información radial. Se requiere mejorar precisión de la información; sistemas meteorológicos con información horaria, diaria y pronóstico semanal; sistemas climáticos con periodicidad semestral, anual y trimestral; información digital georreferenciada al teléfono, vía Web, e-mail; información segmentada.	No todos usamos Twitter "prefiero e-mail"; la información es de utilidad; para mejorar se propone mayor periodicidad y mayor difusión de la información. Falta información satelital instantánea, herramienta más directa. Se requiere recomendaciones por rubro.
Mesa 2	Disponer de información en línea en relación a los niveles de aguas subterráneas; previsión de heladas - isotermas; estado de embalses; nevadas; acumulación histórica y prevista de nieve. Plantear cuál es el beneficio económico de usar los servicios meteorológicos; para producción bajo invernadero se requiere conocer la luminosidad, días de calor sobre 30°C, altura de napas y evapotranspiración; estado y fluctuación de las napas; para proyecciones de mediano plazo de temperatura y radiación que influyan decisiones de inversión; entregar información de temperatura y precipitaciones comparada con la misma fecha del año anterior.	Vía celular e informes por correo electrónico; vía sitio Web; con periodicidad semanal, semestral y estacional; en el caso de dispositivo móvil con periodicidad semanal; así también semanal y mensual.	Se requiere información histórica y conocer también las tendencias para futuras inversiones. Se requiere más información sobre los canales de comunicación (dar a conocer). La información es de utilidad. La información es adecuada, pero, no suficiente. Se propone que se permita contar con filtros personales, para cruzar datos de relevancia particular. Evitar modelos preestablecidos. En general, los canales de comunicación son adecuados y útiles.

N° Mesa	Pregunta 1	Pregunta 2	Pregunta 3
Mesa 3	Generar un boletín acotado de rubros según sus características, temperatura, horas frío (acumulación), por mes, para hortalizas. Información sobre grados de radiación según cada comuna, región y mes del año. Generar un pronóstico comparativo con años anteriores, es decir, preventivo para manejos.	Boletín de alertas climáticas; radios locales; diarios semanales. Pronósticos con información local al menos dos veces al día. Dispositivos móviles (celular, app sin cobro); vía correo electrónico y radios locales.	Mejorar la entrega de información, que sea más certera y técnica en tema agrícola. Mejorar páginas Web con datos más amigables.

Los moderadores de estas mesas fueron: Oscar Bustamante, Sección Emergencias y Gestión de Riesgos Agrícolas (mesa 1); Julio Galleguillos, Seremi Agricultura Región Valparaíso (mesa 2); y Gastón Torres, DMC (mesa 3).

3. Tabla 2. Respuestas individuales al cuestionario.

N°	Pregunta 1	Pregunta 2	Pregunta 3
1	Agua caída a la fecha, comparación de agua caída con el año pasado, temperaturas, horas de frío acumuladas, datos para cálculo de evapotranspiración, emergencias climáticas (heladas)	Información vía correo electrónico	No consideramos que sean adecuados los medios de comunicación debido a que la información no es personalizada, ni a tiempo. Lo ideal sería que se hiciera un catastro de las organizaciones interesadas en la información y poder informarles vía correo electrónico semanalmente las condicione o emergencias que puedan ir sucediendo.
2	Información suficiente; información segmentada a grupos agricultores.	--	--

3	Pronóstico de heladas; pronóstico de lluvias; pronóstico de horas de frío (mayor a 30°C); todo comparado con periodo anterior o 10 años	Radio; teléfono vía Whatsapp; televisión	Son adecuados pero su modalidad no es la adecuada, ya sea por dificultad a acceder a información, especulación. Debe ser confiable, acotada y de fácil acceso.
4	Información procesada histórica v/s avance de la temporada en cuanto a horas bajo 7°C y horas sobre 25°C. Datos correctos o adecuados a una norma para poder comparar bien.	Dispositivo móvil; sitio Web. Mensual. Importante la comparación permanente con la historia.	Canales de comunicación deben ser de fácil acceso. Información sirve en la medida que se procese. Informes mensuales históricos/avance actual en temperatura bajo 7°C, bajo 12°C y sobre 25°C; pluviometría.
5	Mantener información sobre lluvias, temperaturas, heladas y todas las anteriores ya que es necesario para realizar toma de decisiones en predio.	A través de dispositivos móviles, app, y radios locales para tener mayor cobertura. Periodicidad diaria, quincenal y mensual.	Actualmente no sirven para el tema agrícola, se deben adecuar. Mejorar la página Web, temáticas más amigables y con acceso para todos, sin costo involucrado.
6	Heladas, acumulación de horas de frío, tiempo que duró la helada. Comparación con años anteriores y alertas a la fecha.	Móviles, a través de app, prioridad 1 vez por semana, dependiendo si hay emergencia. Debería llegar una alerta a celulares sobre algún evento, se ha hecho por ONEMI cuando hay riesgo de tsunami. Radios locales, dos veces al día, pronóstico del tiempo.	No, porque no sirve para la parte agrícola, pero, sí para un particular que quiere hacer otra actividad. Se requiere página Web más atractiva para ingresar, que entregue datos más fáciles de interpretar.
7	Principalmente se requiere información sobre la temperatura con datos duros cada dos días por ejemplo.	Vía teléfono celular, con frecuencia diaria.	Se debe mejorar las páginas Web con datos que sean más amigables y simples a la vista de profesionales y agricultores.

Análisis/interpretación de resultados

De acuerdo a las respuestas de los usuarios durante las mesas técnicas, obtenidas de la aplicaciòn del cuestionario , se deduce que las principales necesidades de los participantes son:

1.- Alertas agroclimaticas, como heladas, olas de calor, olas de frío, eventos severos de precipitación.

2.- Boletines, diarios, decadales y mensuales, que contengan estadistica básica de las principales variables meteorologicas de interes para la agricultura, como son temperatura, precipitación, humedad y viento, horas de frio, entre otros.

3.- Pronostico meteorológico especial para la actividad agrícola, sectorizados.

4.- Necesidad de pronósticos meteorológicos de largo plazo, que permitan disponer de orientaciones para la planificación y gestión de sus actividades.

5.- Pronosticos meteorológicos especiales, para planificar aplicaciones de pesticidas, de acuerdo a la estación del año.

6.- Información meteorológica estadística de un período determinado (semanal, decadal), comparado con igual período del año anterior.

7.- Información relacionada con balance hídrico y evapotranspiración para optimizar el manejo del riego.

8.- Disponer de información meteorológica (temperatura y acumulación de horas de frío), dirigida a diferentes rubros agrícolas (frutales y hortalizas).

9.- Información, sobre monitoreo de indicadores de sequía para la región.

En relación a los medios de difusión, las necesidades detectadas son:

1.- Redes sociales (whatsapp, twitter)

2.- Correo electrónico.

3.- Televisión, radioemisoras y diarios locales.

4.- Página Web, aplicaciones móbiles

Sugerencias de los usuarios:

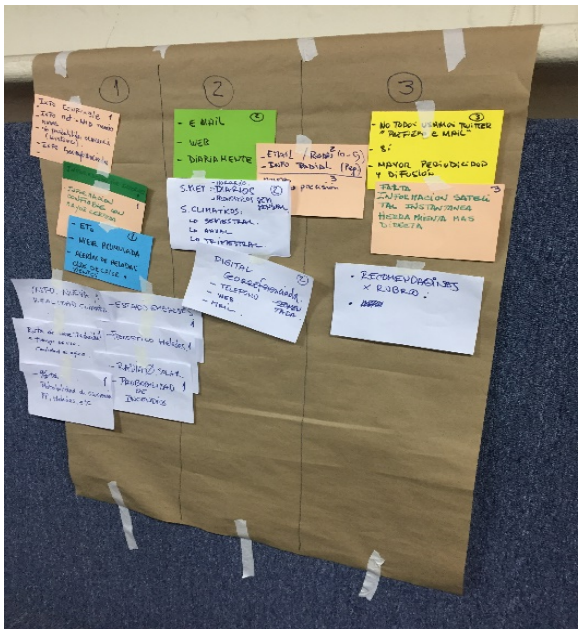
1.- La información agrometeorlógica que manejan actualmente no es sufciente para satisfacer sus necesidades operativas.

2.- Mejorar los sistemas de acceso a la información, haciéndolos más amigables.

3.- Se requiere capacitación para el manejo de los sistemas de comunicación.


Proyecto ENANDES
ENhancing Adaptive capacity of
ANDEan communities
through climate Services
Chile, Colombia
WMO OMM
World Meteorological Organization


Mesa Técnica de Trabajo
Consulta a Usuarios


1
2
3
E MAIL
WEB
DIARIAMENTE
DIGITAL
RECOMENDACIONES

4. ANEXO

Encuesta de caracterización de los participantes (parte 1):

CHILE LO HACEMOS TODOS

ADAPTATION FUND

ENCUESTA			
Estimada(o) participante, le solicitamos un momento de su tiempo para completar este formulario. Esta información es confidencial y nos ayudará a seguir mejorando los servicios climáticos para el sector agropecuario. Muchas gracias por su opinión y colaboración.			
DATOS DEL PARTICIPANTE			
Nombre (opcional)			
e-mail de contacto (opcional)			
Edad		Género (F/M/Otro)	
Comuna		Región	
		teléfono de contacto (opcional)	
¿Cuál de las siguientes categorías le identifica más? (marque con una X)			
Agricultor		Asesor/consultor	
Funcionario público del agro		Docente/profesor	
Otro Profesional del agro		Estudiante	
Otro (especificar)			
Si Usted es Agricultor, por favor, indique su o sus rubros principales (marque con una X)			
Cultivos		Hortalizas	
Frutales mayores		Ganadería bovina	
Frutales menores		Ganadería porcina	
Apícola		Ganadería ovina	
Otro rubro (especifique)			
Si Usted es Agricultor, por favor, indique ¿Cuál es la principal amenaza que le ha afectado en su zona?			
Sequía		Heladas	
Lluvias intensas		olas de calor	
otra (especifique)			

Encuesta de caracterización de los participantes (parte 2):

SERVICIOS CLIMÁTICOS			
En relación a los siguientes portales de Internet, responda SÍ o NO a las siguientes preguntas			
Sitio Web	**¿Cónoce este sitio Web? (SÍ o NO)**	**¿Conoce la información de este sitio Web? (SÍ o NO)**	**¿Usa la información de este sitio Web? (SÍ o NO)**
Ministerio de Agricultura (www.minagri.gob.cl)			
Dirección Meteorológica de Chile (www.meteochile.cl)			
Dirección General de Aguas (www.dga.cl)			
Poral AGROMET - RAN (www.agromet.cl)			
¿Conoce otro sitio Web con información meteorológica e hidrológica? (por favor indíquelo o déje espacio en blanco):			
En relación a la información climática, responda SÍ o NO a las siguientes preguntas:			
Reporte o comunicado climático	**Institución**	**¿Conoce este reporte o comunicado climático? (SÍ o NO)**	**¿Ha usado la información de este reporte o comunicado? (SÍ o NO)**
Coyuntura Agroclimática	SEGRA - Ministerio de agricultura		
Matriz de sequía	SEGRA - Ministerio de agricultura		
Boletín Agroclimático	Dirección Meteorológica de Chile		
Boletín Perspectiva Agroclimática	Dirección Meteorológica de Chile		
Informe Agrometeorológico Semanal	Dirección Meteorológica de Chile		
Situación climática, Monitoreo ciclo El Niño/La Niña y Pronóstico	Dirección Meteorológica de Chile		
Avisos y alertas meteorológicas	Dirección Meteorológica de Chile		
Boletín hidrológico (Información pluviométrica, fluviométrica,	Dirección General de Aguas		
Pronóstico de disponibilidad de agua para la Temperada de riego	Dirección General de Aguas		
¿Conoce otro reporte o comunicado climático (por favor indíquelo o deje espacio en blanco):			
¿Qué tipo de medio prefiere para recibir información climática? (marque con una X)			
Teléfono celular		Diario regional	
Diario nacional		Radio local	
Radio nacional		Televisión	
Sitio Web		Charlas	
Otro medio (especifique)			

Cuestionario para mesas de trabajo:

MESAS DE TRABAJO
Estimadas(os) participantes, a continuación les presentamos 3 preguntas para conversar. Les agradecemos desde ya que comparta sus opiniones y propuestas con nosotros. La información aportada por ustedes se usará para mejorar los Servicios Climáticos para la agricultura chilena.
Pregunta 1. ¿Qué tipo de información meteorológica y/o climática se necesita para las decisiones productivas en su zona? (información meteorológica como lluvias o temperaturas; información hidrológica como estado de los caudales o embalses; análisis e indicadores necesarios; alertas de heladas u olas de calor; otro tipo de información)
Pregunta 2. ¿Cómo le gustraría recibir la información meteorológica y/o climática que necesita y con qué periodicidad? (medios como dispositivos móviles, radio, televisión, folleto impreso, sitio web, reporte de su asesor; periodicidad: diaria, semanal, mensual, quincenal; otras).
Pregunta 3. En relación a la información meteorológica y/o climática ¿Considera Usted que los canales de comunicación son los adecuados? ¿Cree Usted que esta información es de su utilidad? ¿Qué propone Usted para mejorar la información meteorológica y/o climática que recibe o pudiera recibir para apoyar sus decisiones productivas?

Perú

INFORME TÉCNICO:
TALLERES DE CONSULTA CON USUARIOS EN ÁMBITO DE INTERVENCIÓN DEL PROYECTO:

MEJORAMIENTO DE LA CAPACIDAD ADAPTATIVA DE COMUNIDADES ANDINAS A TRAVÉS DE SERVICIOS CLIMÁTICOS (ENHANCING ADAPTIVE CAPACITY OF ANDEAN COMMUNITIES THROUGHT IMPROVED CLIMATE SERVICES (ENANDES)

INFORME TÉCNICO

TALLER DE CONSULTA CON USUARIOS EN AMBITO DE INTERVENCIÓN DEL PROYECTO

1. Antecedentes

La Organización Meteorológica Mundial (OMM), conjuntamente con los Servicios Meteorológicos de Colombia, Chile y Perú, así como el Centro Internacional de Investigación del Fenómeno El Niño (CIIFEN) han presentado el proyecto: Mejoramiento de la capacidad adaptativa de comunidades andinas a través de Servicios Climáticos (ENANDES) a la convocatoria del Fondo de Adaptación (FA). Propuesta que tiene como objetivo general contribuir a la reducción de la vulnerabilidad e incrementar la resiliencia de comunidades andinas en Perú, Colombia y Chile, a la variabilidad climática y el cambio climático, para una mejor gestión del agua, para generación de energía hidroeléctrica y para la agricultura. De esta forma contribuirá en la generación de información relevante para la implementación de las Contribuciones Determinadas a Nivel Nacional (NDC) en las temáticas de agua, energía y agricultura, compromisos internacionales del país.

Con el objetivo de preparar las actividades para el Proyecto, se organizó una primera reunión técnica en Lima, el 25 de junio del 2018, con participación de especialistas de todos los socios nacionales participantes del Proyecto (Ministerio del Ambiente (MINAM), Ministerio de Energía y Minas (MEM), Ministerio de Agricultura y Riego (MINAGRI), Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres (CENEPRED), Instituto Nacional de Defensa Civil (INDECI) y Autoridad Nacional del Agua (ANA) con fines de validar los ámbitos de intervención del Proyecto así como definir actividades para los talleres de consulta a ser realizados.

En este contexto, se llevaron a cabo dos talleres en uno de los ámbitos de intervención del proyecto (Cuenca del río Rímac), a fin de levantar información de usuarios de la información climática y asimismo evidenciar las dificultades, limitaciones o barreras para su acceso, comprensión, uso y aplicación en acciones individuales, colectivas o institucionales para la reducción de los riesgos asociados al clima e implementar acciones de adaptación. Los talleres fueron organizados conjuntamente con todos los socios nacionales.

El primer taller se realizó el 11 de julio 2018, en la localidad de Matucana, provincia de Huarochirí, departamento de Lima, a 2400 msnm, donde se abordaron las mesas temáticas de agropecuaria, agua y gestión de riesgos y el segundo el 13 de julio 2018, en la ciudad de Lima, donde se abordó la mesa temática de energía. Los resultados se muestran en cuadros resúmenes, asimismo se evidencian la participación de los usuarios a través de fotografías de los participantes e imágenes de las lista de participantes y encuestas.

2. Objetivos

Los objetivos específicos de los talleres fueron los siguientes

1) Identificar peligros y prácticas de adaptación en el sector agrario, gestión de riesgos y energía
2) Identificar la necesidad de información climática para cada sector.
3) Identificar barreras por las que no se tiene acceso o no se utiliza la información climática.
4) Compilar recomendaciones prácticas de los participantes.

3. Metodología

Las mesas de trabajo fueron facilitadas por el SENAMHI y el CIIFEN y asimismo contaron con la participación de los socios nacionales de las instituciones técnicas.

Para ambos talleres se establecieron las siguientes actividades:

1. Exposición sobre los objetivos del proyecto, ámbitos de intervención, componentes. La contribución de la propuesta a los objetivos de las Contribuciones Nacionalmente Determinadas (NDC) en agricultura y agua a cargo de SENAMHI y MINAM.
2. Mesas de trabajo donde los participantes identificaron la información relevante, en base a preguntas claves establecidas.
3. Completación de encuesta.
4. Sesión plenaria, donde cada mesa temática presentó las conclusiones. Esto se aplicó en Matucana.

3.1 Taller sobre Agua, Agricultura y Gestión de Riesgos-Matucana

1) Luego de las exposiciones se crearon 5 grupos de trabajo, los que se distribuyeron en 3 sectores priorizados:
    a. Sector Agropecuaria (2 mesas)
    b. Sector Agua (2 mesas)
    c. Sector Gestión de riesgo (1 mesa)
2) Se entregó a los asistentes las tarjetas por cada pregunta.
3) Se motivó a los participantes, surgiendo varios comentarios, dudas y respuestas a las preguntas claves, los mismos que fueron anotados en las tarjetas.
4) Para los peligros identificados se estableció una priorización, en base a votación in situ de los participantes.

3.2 Taller sobre Energía – Lima

1) Luego de las exposiciones, un especialista en hidrología se encargó de iniciar las conversaciones con los usuarios sobre preguntas clave, relatándose al final las conclusiones del mismo.

4. Consulta local a usuarios de Agua, Agricultura y Gestión de Riesgos – Localidad de Matucana

El Taller con usuarios de agricultura, agua y gestión de riesgos se realizó en el Centro Cívico de la Municipalidad de Matucana, provincia de Huarochirí, departamento de Lima, a 2400 msnm, el 11 de julio del 2018.

Participaron como anfitriones especialistas de las Direcciones de Meteorología, Hidrología, Agrometeorología y Dirección Zonal Lima del SENAMHI, la Dirección Zonal Lima/AGRORURAL/Ministerio de Agricultura y Riego, Gerencia Ambiental-Municipalidad Provincial de Huarochirí- Matucana y las Instituciones socias: Ministerio del Ambiente (MINAM), Ministerio de Agricultura y Riego (MINAGRI), Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres (CENEPRED), Instituto Nacional de Defensa Civil (INDECI) y Autoridad Nacional del Agua (ANA).

Se contó con el apoyo de AGRORURAL/MINAGRI para la convocatoria. Se establecieron tres mesas temáticas: agropecuaria, agua y gestión de riesgos, participaron representantes de instituciones técnicas y líderes de comunidades campesinas para la mesa temática de agricultura, representantes de comités de regantes para la mesa temática de agua y representantes de autoridades y gobernadores para la mesa

temática de gestión de riesgo. Asistieron un total de 98 participantes, de los cuales 71,5% varones y 28,5% de mujeres.

En la mesa temática de **agropecuaria,** bajo la coordinación de especialistas en agrometeorología del SENAMHI y del MINAGRI, se trabajaron con participantes técnicos de la Agencia Agraria Santa Eulalia, Agrorural-Santa Eulalia y Zonal Lima, así como representantes de las comunidades campesinas de: Soca, Paroc, San Juan, Chauta, Purhuay, San Mateo, San Pedro de Huancay, Laraos, Huanza, Caracancha, Collana, Mariatana,, Llambilla, Cochacra, San Mateo, Copara, Viso, Tupicocha, Surco, entre otros.
En la mesa temática de **agua**, con la coordinación de especialistas en Hidrología del SENAMHI, del ANA y del MINAM, se trabajó con los representantes del Comité de riego de San Mateo, Santa Eulalia, Viso, Comité de Regantes de Santa Eulalia, Junta de usuarios de agua del Rímac, Comité de agua de Purhuay, Chaupimarca, Pacaychico; Canal de Pacomanta, Comité de usuarios de agua de Huancate, Songollo, Laraos, entre otros.
En la mesa **de gestión de riesgos**, con la coordinación de especialistas en meteorología del SENAMHI y de gestión de riesgos de CENEPRED e INDECI, se trabajaron con representantes del Gobierno Regional de Lima (GORE-Lima), el Centro de Operaciones de Emergencia Nacional (COEN), así como representantes de las municipalidades distritales de Matucana, San Mateo, San Juan de Iris, Mariatana, Antioquia, Chicla, Surco, Callahuanca, Santa Eulalia, Ahuillay Matu, Viso, San Pedro de Casta, Laraos; entre otros.

Percepción sobre los peligros e impactos

Con respecto a los peligros que les afectan, se consideran con mayor prioridad las lluvias intensas y sus efectos como los deslizamientos y las inundaciones así como las heladas en las partes altas, en siguiente prioridad las sequías, altas temperaturas y los vientos fuertes.

Como impactos de los peligros se mencionan: pérdidas de terrenos agrícolas y de cultivos, pérdidas de vidas humanas, desnutrición y mortandad de animales, bajo rendimiento de leche de ganado, aparición de plagas y enfermedades, pérdidas de pastos, daños en canales y tomas de regadío, migración de jóvenes, interrupción de carreteras y caminos de acceso, entre otros.

Productos para mejorar sus planes de gestión de riesgos climáticos:

- Boletines con pronósticos climáticos e hidrológicos con anticipación a la campaña agrícola
- Pronóstico de heladas, lluvias intensas.
- Sistemas de alerta temprana
- Talleres de capacitación sobre eventos climáticos, prevención de impactos, riego, gestión de riesgos, etc.

Productos para mejorar sus planes de adaptación al cambio climático:

- Escenarios de clima futuro
- Zonificación para diversificación productiva en cultivos
- Capacitación sobre implementación de medidas de adaptación, agricultura orgánica, siembra y cosecha de agua, etc.

Barreras que impiden el uso de la información:

Excepto para los representantes de la mesa temática de gestión de riesgo de desastres, que mostró mayor conocimiento sobre las actividades del SENAMHI, los usuarios de las mesas de agropecuaria y agua (comités de regantes) manifestaron desconocer en su mayoría las actividades del SENAMHI, tampoco sobre sus productos, manifestando la poca notoriedad, y como barreras el no tener acceso al internet, la falta de comunicación con sus autoridades locales y entes técnicos como agentes zonales de agricultura y riego.

Los usuarios de la mesa de gestión de riesgos mencionaron que sí conocen la actividad del SENAMHI, sin embargo un bajo porcentaje manifestó utilizar sus productos, mencionando como barreras la falta de acceso a los medios de comunicación y difusión, oportunidad y disponibilidad, falta de prioridad en la agenda política para trabajar el tema de clima para la gestión del riesgo, deficiente comprensión de los productos, mapas poco detallados, lenguaje muy técnico, no contar con estaciones meteorológicas, falta de capacitación, etc.

Género y juventud

Con respecto a la participación de la mujer, la mayoría de los participantes menciona que sí participa en la administración y/o toma de decisiones vinculadas con la producción agropecuaria y la disponibilidad hídrica, y asimismo que sí accede a la información, capacitación y educación formal ; sin embargo, con respecto a que si la agricultura pueda crear oportunidades para los jóvenes, una gran mayoría considera que no existen oportunidades, que requieren mayor tecnología, mayor capacitación y se debe crear incentivos para evitar la migración.

Propuesta

- Representantes de la mesa de gestión de riesgo manifestaron recibir la información del SENAMHI mediante los COER (sectores de salud y educación), sin embargo, existe una deficiente articulación entre estos sectores, por lo que solicitan se utilice como centro de recepción y difusión de la información climática a los Comités de Regantes.
- Solicitan masificar la información por radio local y mensajes de texto, TV local
- Sugieren elaborar e implementar instrumentos de gestión (planes de contingencia ante sequías y lluvias intensas)

5. Consulta local a usuarios de ENERGÍA-Lima

El Taller con usuarios del Sector energía fue realizado en la Sala de Capacitación del SENAMHI, distrito de Jesús María, Provincia de Lima, Departamento de Lima, el 13 de julio del 2018. Participaron como anfitriones especialistas de las Direcciones de Meteorología e Hidrología del SENAMHI y del Ministerio del Ambiente.

El taller de Energía fue orientado a la cuenca del Río Rímac, por cuanto los representantes del sector energía que operan en esta cuenca, tienen su sede en la ciudad capital Lima. Participaron como representantes del Sector: ELECTROPERÚ, el Organismo Supervisor de la Inversión en Energía y Minería (OSINERGMIN) y el Ministerio de Energía y Minas (MEM), y como representante del sector privado: AUSTER ENERGÍA.

Percepción sobre los peligros e impactos

Con respecto a los peligros que les afectan, se consideran con mayor prioridad las lluvias intensas y sus efectos como los deslizamientos y las inundaciones, en segunda prioridad las sequías y en menor prioridad los vientos, nevadas, granizadas, tormentas eléctricas. Como impactos de los peligros se mencionan:

- Arrastre de sedimentos por huaycos y deslizamientos, colmatación de cauces, inundación. Restricción y disminución en la producción energética. Disminución de la producción por causa de la sequía.
- Altas pérdidas económicas por las tuberías de gas, infraestructura hidráulica, turbinas.

- Si el viento es intenso, quema de aerogeneradores (sobrecarga)

Productos para mejorar sus planes de gestión de riesgos climáticos:
- Datos de lluvia, temperatura, caudales y evaporación.
- Pronósticos de 48 a 72 horas de caudales y vientos (Ráfagas)
- Sistema de Alerta Hidrológico

Productos para mejorar sus planes de adaptación al cambio climático:
- Escenarios de disponibilidad hídrica (presente y futuro)
- Información climática más detallada en medio digital
- Disponibilidad de datos en cuencas de mayor potencial hídrico
- Mapas de energía solar y eólica.

Barreras que impiden el uso de la información:
Los usuarios manifiestan que sí reciben o tienen acceso a la información climática, sin embargo existen dificultades para su uso:
- Oportunidad y disponibilidad.
- Mejorar formatos.
- Mensaje muy técnico.
- Falta de articulación con el Sector.

Propuesta:
- Plataforma con información integrada y más útil para el sector.
- Mejorar la gestión con el MEM, convenios con las áreas de Concesiones y Electricidad.

A continuación se presentan los cuadros resúmenes para las mesas temáticas de agricultura, agua, gestión de riesgos y energía.

AREA TEMÁTICA: AGROPECUARIA

Peligros(*)	Impactos y/o afectaciones	Prácticas de adaptación/ atenuación de impactos	Acceso, uso , barreras y propuesta	
1.Heladas 2.Lluvias repentinas (cambio de patrones) 3.Sequías 4. Altas temperaturas Los Huaycos y deslizamientos como producto de las lluvias.	1.Pérdidas de terrenos agrícolas (daños en los cultivos de maíz, trigo, alfalfa, papa, habas, alverja). 2.Desnutrición y mortandad de animales (generalmente terneros) 3.Bajo rendimiento de leche en el ganado vacuno 4.Afectación de la floración en algunos frutales 5.Daños en vacunos (mal de altura) 6.Aparición de algunas enfermedades/plagas en las plantas ▪ Caracol negro (asociado a cambios en la intensidad de las lluvias) ▪ Pulgón blanco (palto), (asociado a altas T°) ▪ Mancha negra en la hoja (asociado a la humedad relativa alta) ▪ Araña roja (asociado a las altas T°) 7.Pérdidas de pastos (por heladas) 8.Daños en los canales y tomas de regadío 9.Incremento de roedores 10. Migración de jóvenes a otras ciudades.	Se mencionaron algunas prácticas de adaptación o de atenuación de impactos: 1. Siembra de quinuales (acción realizada por el proyecto PRONAMACHS 2. Riego tecnificado 3. Uso del mulch o alcochado 4.Cobertizos 5.Amunas (siembras de agua en las partes altas) 6.Aplicación de vacunas en animales 7. Aplicación de abono foliar en frutales 8. Barreras con árboles 9. Quema de pastos y rastrojos. Sin embargo, un alto % de participantes mencionó que no efectúa ninguna práctica ante los eventos climáticos extremos por falta de capacitación. **Solicitan acciones preventivas a través de capacitación:** Capacitaciones: para prevención de daños climáticos, para implementación de siembra de agua y riego tecnificado, agricultura orgánica para prevenir plagas, cambio climático.	**SI:** Bajo% recibe **Porqué medio lo recibe:** Radio local, TV	**NO:** Un mayor % manifestó no recibir ni usar la información del SENAMHI. **Barreras:** ➢ Falta de comunicación directa con las instituciones, gobiernos locales y regionales ➢ No llega la información ➢ Deficiente comprensión de la información **Tipo de información que les gustaría recibir** ➢ Capacitaciones en temas de clima ➢ Boletines con pronósticos climáticos antes y durante la campaña agrícola. ➢ Pronóstico de heladas ➢ Zonificación de cultivos

(*): Los peligros se encuentran enumeradas por orden de priorización

AREA TEMÁTICA: AGUA

Peligros (*)	Impactos y/o afectaciones	Prácticas de adaptación/atenuación de impactos	Acceso, uso , barreras y propuesta	
1.Lluvias fuertes 2.Sequias 3.Huaycos 4.Heladas 5.Días más cálidos 6.Noches más frías	1.Pérdida de producción y calidad de productos agrícolas 2.Daños a la infraestructura hidráulica (mayormente canales) 3.Interrupción y destrucción de vías de comunicación 4.Pérdidas humanas 5.Mortandad de animales 6.Daños y pérdidas de casas 7.Afectación a la salud de los pobladores. Los impactos afectan mayormente al sector económico, agrícola y ganadero	Se mencionaron algunas prácticas de adaptación o de atenuación de impactos: 1.Mejorar la infraestructura de riego 2. Construcción de reservorios 3.Siembra de agua y zanjas de infiltración 3.Limpieza y descolmatación de canales 4. Reforestación 5. Andenerías 6.. Regulación del uso de agua para consumo humano y la agricultura 7.Elaboración e implementación de instrumentos de gestión (planes de contingencia ante sequias y lluvias intensas)	**SI:** Un bajo % recibe. **¿Qué tipo de información?** ➢ Información de COER (pronósticos) ➢ Datos meteorológicos históricos/SENAMHI **¿A través de qué medio se informa?** 1.Radio Local/municipal Existe una radial “Ecoradio”, que a veces transmite información de clima) 3. Internet 4.Tv 5.Boletines/trípticos	**NO:** Un mayor % manifestó no recibir ni usar la información del SENAMHI. **Barreras:** ➢ Falta de especialistas en clima y recursos hídricos ➢ Falta de acceso a medios de comunicación (celular, en ciertos casos radial) ➢ Falta de prioridad en la agenda política para trabajar temas de clima (poblacional e institucional) ➢ No existen suficientes estaciones hidrometeorológicas ➢ No existe articulación de acciones de difusión ➢ No tienen acceso a internet ➢ Deficiente comprensión de la información, lenguaje muy técnico. **Tipo de información que les gustaría recibir y medios:** ➢ Pronóstico climático, hidrológico y de lluvias intensas ➢ Talleres de capacitación en temas de clima ➢ Pautas para la implementación de Sistemas de Alertas Tempranas (SAT). Por medios radial y cursos/talleres de capacitación.

(*): Los peligros se encuentran enumeradas por orden de priorización

AREA TEMÁTICA: GESTIÓN DE RIESGOS

Peligros	**Impactos y/o afectaciones**	**Prácticas de adaptación/atenuación de impactos**	**Acceso, uso , barreras y propuesta**	
San Mateo: ➢ Heladas ➢ Sequía ➢ Lluvias Intensas Santo Domingo de los Olleros: ➢ Huaycos (Valle de Chilca y de Chamauri) San Lorenzo de Quinti: ➢ Friaje ➢ Heladas Matucana: ➢ Lluvias torrenciales ➢ Huaycos por desborde de rio Chucumayo ➢ Deslizamientos ➢ Sequias Santa Eulalia: ➢ Fuertes lluvias ➢ Huaycos ➢ Incremento de radiación ➢ Sequias Cocachacra: ➢ Baja temperatura ➢ Vientos fuertes Coranche Huarochiri (cuenca alta): ➢ Heladas	➢ Interrupción de carreteras y caminos de acceso al predio rural ➢ Colmatación del rio Chucumayo ➢ Pérdida de infraestructura de riego y cosechas ➢ Escasa agua para riego y para la alimentación producto del descenso del nivel de agua en los manantiales. ➢ Afectación a la salud ➢ Destrucción de viviendas y puentes ➢ Reprogramación de actividades educativas ➢ Muerte de animales, por las heladas.	Se mencionaron algunas prácticas de adaptación o de atenuación de impactos: ➢ Realizar zanjas de infiltración ➢ Construcción de diques ➢ Construcción de cochas ➢ Reforestación ➢ Cierre de bocatomas ➢ Construcción de reservorios ➢ Construcción y mejoramiento de canales de riego ➢ Limpieza de canales o acequias ➢ Campañas de capacitación de prevención frente a heladas ➢ Implementar Sistemas de Alerta Temprana-SAT	Un alto % manifestó conocer las actividades de SENAMHI relacionada a la provisión de datos y pronósticos. Sin embargo, un bajo % manifestó que utiliza la información generada para planificación de riesgos. INDECI, transmite información al COER (sectores salud y educación), pero manifiestan que existe una deficiente articulación y difusión.	**NO:** Un mayor % de los participantes de la mesa, indicaron que no acceden y no usan la información climática. **Barreras:** ➢ No es notorio ➢ No saben de la información, ni de la web del SENAMHI ➢ No tienen cobertura/acceso a internet ➢ No conocen, no lo entienden, muy técnico, no está disponible con datos locales. ➢ Poca anticipación ➢ Mapas poco detallados. **Tipo de información que les gustaría recibir** ➢ Boletines semanales y/o quincenales de pronóstico del clima y caudales. ➢ Que exista difusión de información climática a través de la radio y mensajes. ➢ Que se utilice como centro de recepción y difusión de la información a los Comités de Regantes. ➢ Cambio climático

(*): Los peligros se encuentran enumeradas por orden de priorización

AREA TEMÁTICA: ENERGÍA

Peligros	**Impactos y/o afectaciones**	**Prácticas de adaptación/atenuación de impactos**	**Acceso, uso, barreras, propuesta**	
➢ Lluvias ➢ Sequías	➢ Arrastre de sedimentos por Huaycos y deslizamientos,	➢ Afianzamiento hídrico por causa	**Reciben:** Información de pronósticos de la	**Barreras:**

➢ Vientos	colmatación de cauces, inundación. Restricción y disminución en la producción energética. ➢ Disminución de la producción por causa de la sequía. ➢ Altas pérdidas económicas por las tuberías de gas, infraestructura hidráulica, Turbinas. ➢ Si el viento es intenso, quema de aerogeneradores (sobrecarga).	de la sequía, construcción de presas de regulación. Plan de descarga ➢ Diversificación de fuentes ➢ Estar alertas a informes o pronósticos climáticos ➢ Sistema de alerta hidrológico. ➢ Promoción de energías renovables.	web de SENAMHI, información de caudales del COES. **Requieren:** - Datos de lluvia, temperatura, caudales y evaporación. - Escenarios de disponibilidad energética (presente y futuro) - Pronósticos de 48 a 72 horas de caudales, y vientos (Ráfagas) - Información climática más detallada en medio digital - Disponibilidad de datos en cuencas de mayor potencial hídrico - Mapas de energía solar y eólica. **Para:** -Operaciones y planificación de oferta/demanda energética, estudios hidrológicos	- Oportunidad y disponibilidad. - Mejorar formatos. - Mensaje muy técnico. - Falta de articulación con el Sector. **Propuesta:** - Plataforma con información integrada y más útil para el sector. - Mejorar la gestión con el MEM, convenios con las áreas de Concesiones y Electricidad.

6. FOTOS

PRIMERA REUNIÓN DE COORDINACIÓN CON SOCIOS NACIONALES, LIMA, 25 JUNIO 2018

TALLER CON USUARIOS DE AGROPECUARIA, AGUA Y GESTIÓN DE RIESGOS, MATUCANA, 11 DE JULIO DEL 2018

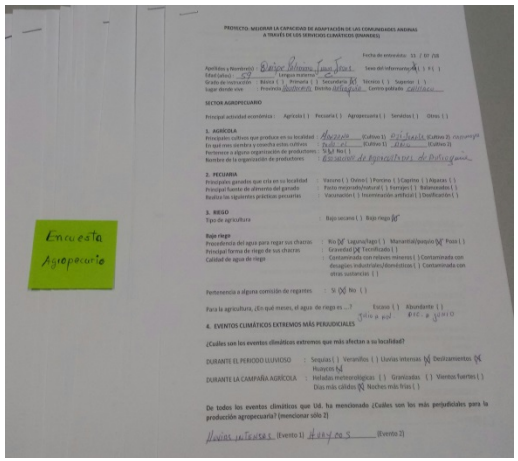
MESAS TEMÁTICAS DE AGROPECUARIA

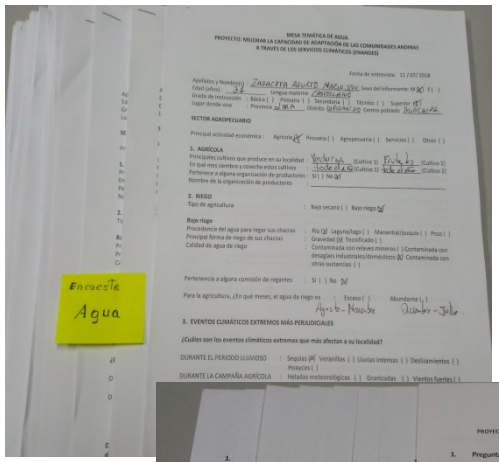
MESAS TEMÁTICAS DE AGUA

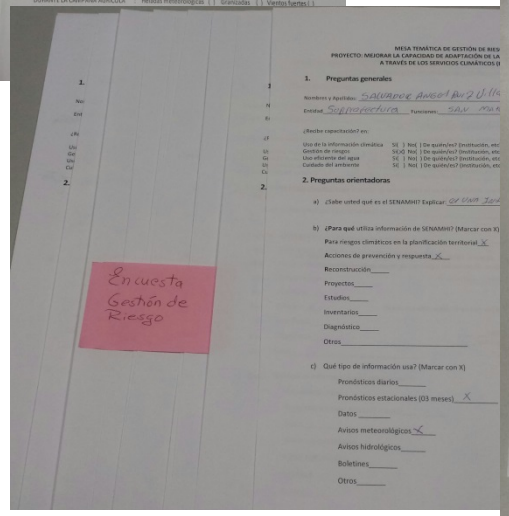
MESA TEMÁTICA DE GESTIÓN DE RIESGOS

EQUIPO TÉCNICO DEL TALLER DE CONSULTA EN MATUCANA

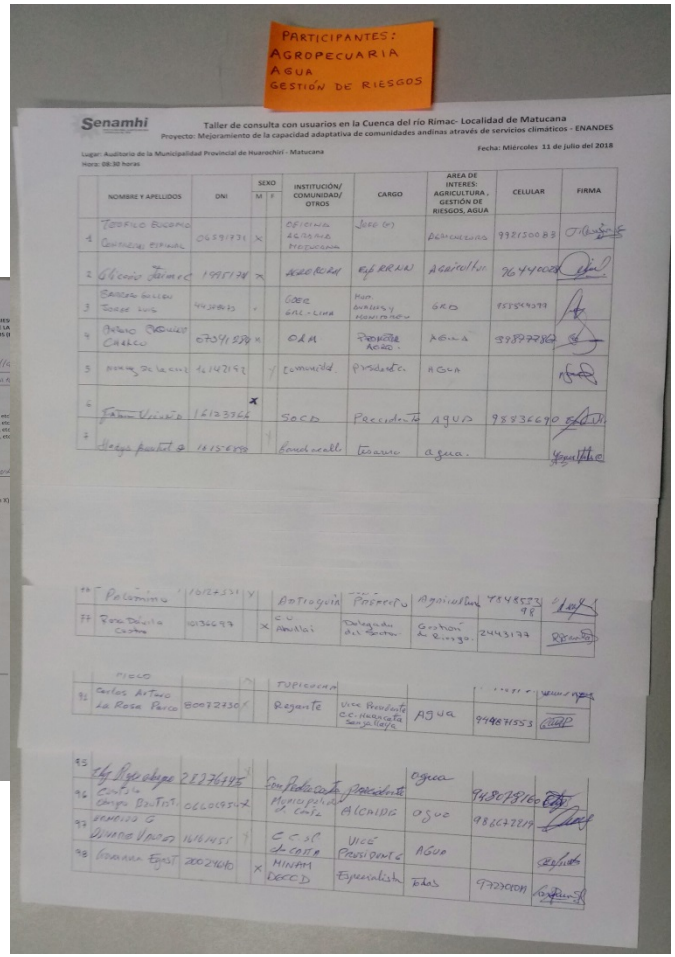
ENCUESTAS





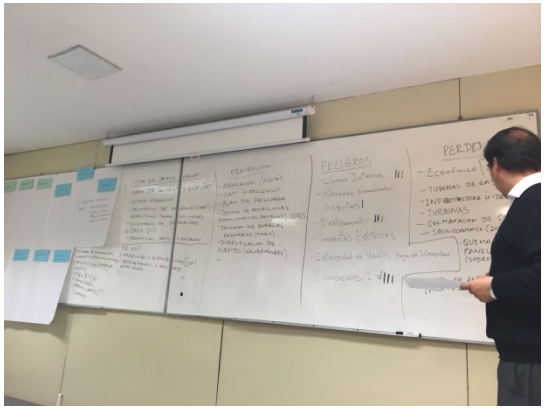


LISTA DE PARTICIPANTES



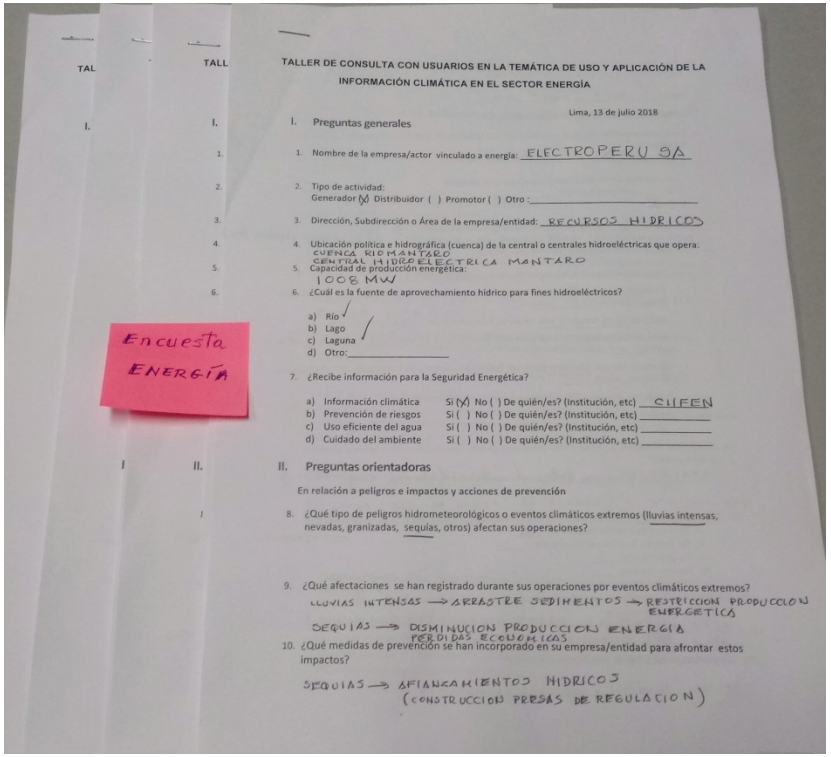
TALLER DE CONSULTA CON USUARIOS DE ENERGÍA

LIMA, 13 DE JULIO DEL 2018



EQUIPO TÉCNICO DEL TALLER EN LIMA

ENCUESTA



TALLER DE CONSULTA CON USUARIOS EN LA TEMÁTICA DE USO Y APLICACIÓN DE LA INFORMACIÓN CLIMÁTICA EN EL SECTOR ENERGÍA

Lima, 13 de julio 2018

I. Preguntas generales

1. Nombre de la empresa/actor vinculado a energía: ELECTROPERU SA
2. Tipo de actividad: Generador (X) Distribuidor ( ) Promotor ( ) Otro :_____
3. Dirección, Subdirección o Área de la empresa/entidad: RECURSOS HIDRICOS
4. Ubicación política e hidrográfica (cuenca) de la central o centrales hidroeléctricas que opera: CUENCA RIO MANTARO CENTRAL HIDROELECTRICA MANTARO
5. Capacidad de producción energética: 1008 MW
6. ¿Cuál es la fuente de aprovechamiento hídrico para fines hidroeléctricos?
   a) Río /
   b) Lago
   c) Laguna /
   d) Otro:_____
7. ¿Recibe información para la Seguridad Energética?
   a) Información climática Si (X) No ( ) De quién/es? (Institución, etc) CIIFEN
   b) Prevención de riesgos Si ( ) No ( ) De quién/es? (Institución, etc)_____
   c) Uso eficiente del agua Si ( ) No ( ) De quién/es? (Institución, etc)_____
   d) Cuidado del ambiente Si ( ) No ( ) De quién/es? (Institución, etc)_____

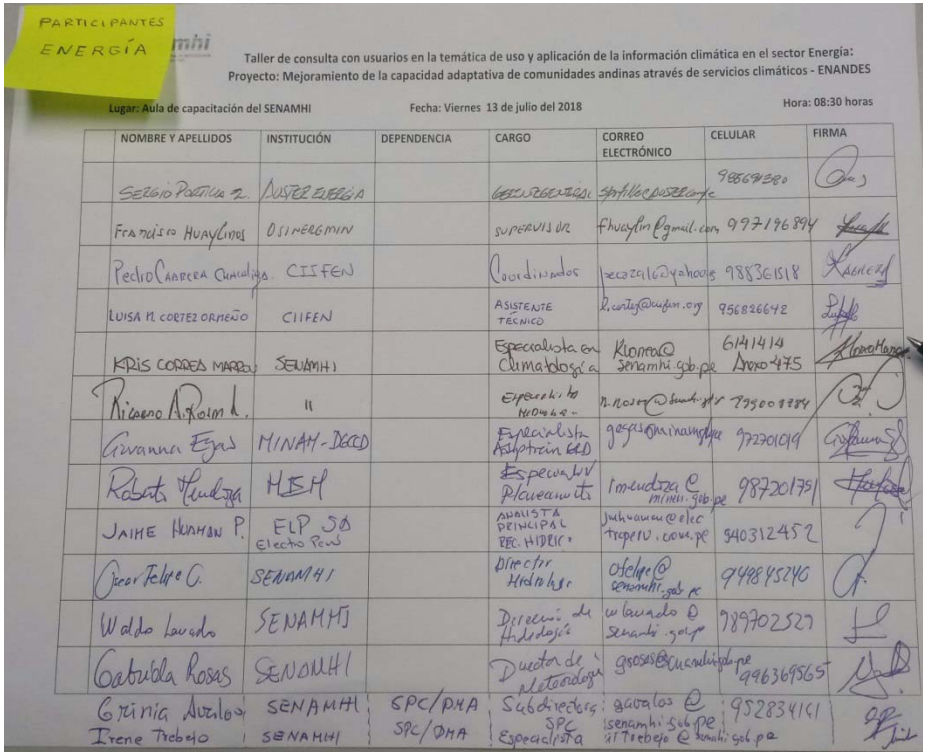
Encuesta ENERGÍA

II. Preguntas orientadoras

En relación a peligros e impactos y acciones de prevención

8. ¿Qué tipo de peligros hidrometeorológicos o eventos climáticos extremos (lluvias intensas, nevadas, granizadas, sequías, otros) afectan sus operaciones?
9. ¿Qué afectaciones se han registrado durante sus operaciones por eventos climáticos extremos?
   LLUVIAS INTENSAS → ARRASTRE SEDIMENTOS → RESTRICCION PRODUCCION ENERGETICA
   SEQUIAS → DISMINUCION PRODUCCION ENERGIA → PERDIDAS ECONOMICAS
10. ¿Qué medidas de prevención se han incorporado en su empresa/entidad para afrontar estos impactos?
    SEQUIAS → AFIANCAMIENTOS HIDRICOS (CONSTRUCCION PRESAS DE REGULACION)

LISTA DE PARTICIPANTES



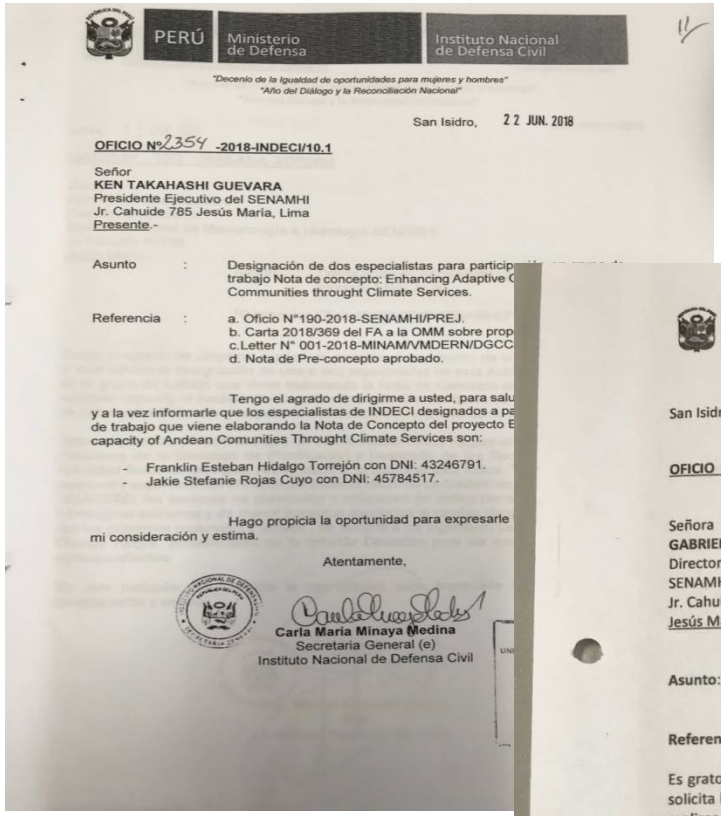
PARTICIPANTES ENERGÍA

Taller de consulta con usuarios en la temática de uso y aplicación de la información climática en el sector Energía:
Proyecto: Mejoramiento de la capacidad adaptativa de comunidades andinas através de servicios climáticos - ENANDES

Lugar: Aula de capacitación del SENAMHI Fecha: Viernes 13 de julio del 2018 Hora: 08:30 horas

NOMBRE Y APELLIDOS	INSTITUCIÓN	DEPENDENCIA	CARGO	CORREO ELECTRÓNICO	CELULAR	FIRMA
Sergio Portilla G.	Cluster Energía		Gerente Regional		985694380	
Francisco Huaylinos	OSINERGMIN		Supervisor	fhuaylinos@gmail.com	997196894	
Pedro Cabrera Chanduvi	CIIFEN		Coordinador	secazal62@yahoo.es	988361518	
Luisa M. Cortez Ormeño	CIIFEN		Asistente Técnico	l.cortez@ciifen.org	956826642	
Kris Correa Marcos	SENAMHI		Especialista en Climatología	Kcorrea@senamhi.gob.pe	614141 Anexo 475	
Ricardo A. Rojas L.	"		Especialista Hidrología	r.rojas@senamhi.gob.pe	995009884	
Giovanna Egas	MINAM - DGCCD		Especialista Adaptación CCD	gegas@minam.gob.pe	977201019	
Roberto Mendoza	MEM		Especialista Petróleo	lmendoza@minem.gob.pe	987201751	
Jaime Huaman P.	ELP SA Electro Peru		Analista Principal Rec. Hídricos	jhuaman@electroperu.com.pe	940312452	
Oscar Felipe C.	SENAMHI		Director Hidrología	ofelipe@senamhi.gob.pe	948845245	
Waldo Lavado	SENAMHI		Dirección de Hidrología	wlavado@senamhi.gob.pe	989702527	
Gabriela Rosas	SENAMHI		Director de Meteorología	grosas@senamhi.gob.pe	996369565	
Grinia Avalos	SENAMHI	SPC/DMA	Subdirectora SPC	gavalos@senamhi.gob.pe	952834161	
Irene Trebejo	SENAMHI	SPC/DMA	Especialista	itrebejo@senamhi.gob.pe		

PERÚ- CARTAS INSTITUCIONALES DE LOS SOCIOS NACIONALES -PERÚ



PERÚ | Ministerio de Defensa | Instituto Nacional de Defensa Civil

"Decenio de la Igualdad de oportunidades para mujeres y hombres"
"Año del Diálogo y la Reconciliación Nacional"

San Isidro, 22 JUN. 2018

OFICIO N°2354 -2018-INDECI/10.1

Señor
KEN TAKAHASHI GUEVARA
Presidente Ejecutivo del SENAMHI
Jr. Cahuide 785 Jesús María, Lima
Presente.-

Asunto : Designación de dos especialistas para participar [illegible] trabajo Nota de concepto: Enhancing Adaptive C[illegible] Communities throught Climate Services.

Referencia : a. Oficio N°190-2018-SENAMHI/PREJ.
b. Carta 2018/369 del FA a la OMM sobre prop[illegible]
c. Letter N° 001-2018-MINAM/VMDERN/DGCC[illegible]
d. Nota de Pre-concepto aprobado.

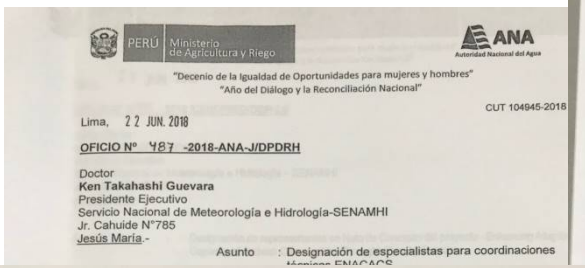
Tengo el agrado de dirigirme a usted, para salu[illegible] y a la vez informarle que los especialistas de INDECI designados a pa[illegible] de trabajo que viene elaborando la Nota de Concepto del proyecto E[illegible] capacity of Andean Comunities Throught Climate Services son:

- Franklin Esteban Hidalgo Torrejón con DNI: 43246791.
- Jakie Stefanie Rojas Cuyo con DNI: 45784517.

Hago propicia la oportunidad para expresarle [illegible] mi consideración y estima.

Atentamente,

Carla Maria Minaya Medina
Secretaria General (e)
Instituto Nacional de Defensa Civil



PERÚ | Ministerio de Agricultura y Riego | ANA Autoridad Nacional del Agua

"Decenio de la Igualdad de Oportunidades para mujeres y hombres"
"Año del Diálogo y la Reconciliación Nacional"

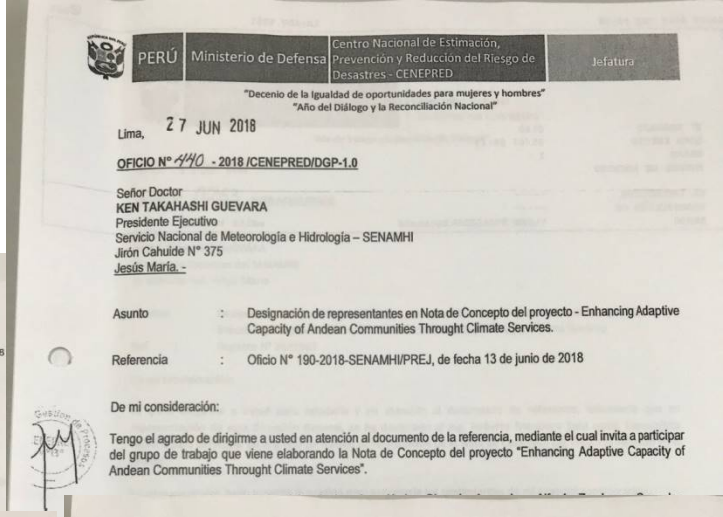
CUT 104945-2018

Lima, 22 JUN. 2018

OFICIO N° 487 -2018-ANA-J/DPDRH

Doctor
Ken Takahashi Guevara
Presidente Ejecutivo
Servicio Nacional de Meteorología e Hidrología-SENAMHI
Jr. Cahuide N°785
Jesús María.-

Asunto : Designación de especialistas para coordinaciones [illegible]



PERÚ | Ministerio de Defensa | Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres - CENEPRED | Jefatura

"Decenio de la Igualdad de oportunidades para mujeres y hombres"
"Año del Diálogo y la Reconciliación Nacional"

Lima, 27 JUN 2018

OFICIO N° 440 - 2018 /CENEPRED/DGP-1.0

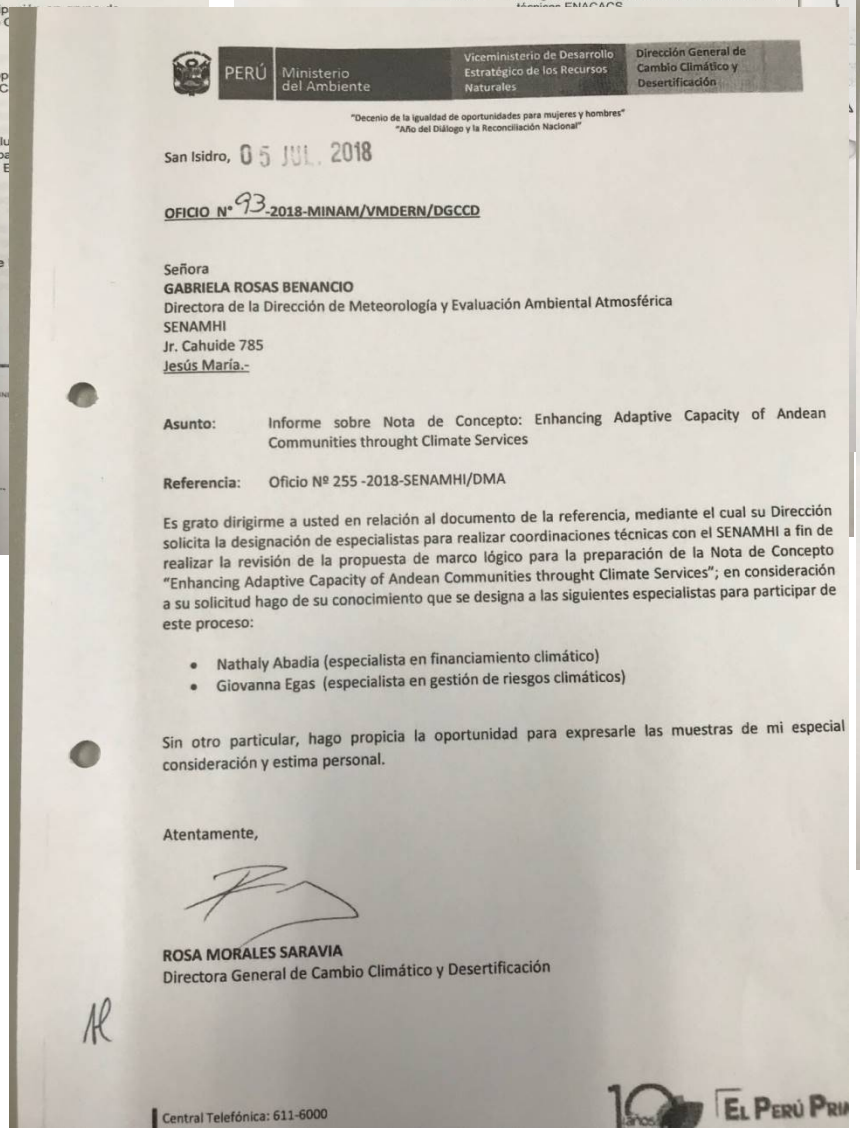
Señor Doctor
KEN TAKAHASHI GUEVARA
Presidente Ejecutivo
Servicio Nacional de Meteorología e Hidrología – SENAMHI
Jirón Cahuide N° 375
Jesús María. -

Asunto : Designación de representantes en Nota de Concepto del proyecto - Enhancing Adaptive Capacity of Andean Communities Throught Climate Services.

Referencia : Oficio N° 190-2018-SENAMHI/PREJ, de fecha 13 de junio de 2018

De mi consideración:

Tengo el agrado de dirigirme a usted en atención al documento de la referencia, mediante el cual invita a participar del grupo de trabajo que viene elaborando la Nota de Concepto del proyecto "Enhancing Adaptive Capacity of Andean Communities Throught Climate Services".



PERÚ | Ministerio del Ambiente | Viceministerio de Desarrollo Estratégico de los Recursos Naturales | Dirección General de Cambio Climático y Desertificación

"Decenio de la Igualdad de oportunidades para mujeres y hombres"
"Año del Diálogo y la Reconciliación Nacional"

San Isidro, 05 JUL. 2018

OFICIO N° 93-2018-MINAM/VMDERN/DGCCD

Señora
GABRIELA ROSAS BENANCIO
Directora de la Dirección de Meteorología y Evaluación Ambiental Atmosférica
SENAMHI
Jr. Cahuide 785
Jesús María.-

Asunto: Informe sobre Nota de Concepto: Enhancing Adaptive Capacity of Andean Communities throught Climate Services

Referencia: Oficio Nº 255 -2018-SENAMHI/DMA

Es grato dirigirme a usted en relación al documento de la referencia, mediante el cual su Dirección solicita la designación de especialistas para realizar coordinaciones técnicas con el SENAMHI a fin de realizar la revisión de la propuesta de marco lógico para la preparación de la Nota de Concepto "Enhancing Adaptive Capacity of Andean Communities throught Climate Services"; en consideración a su solicitud hago de su conocimiento que se designa a las siguientes especialistas para participar de este proceso:

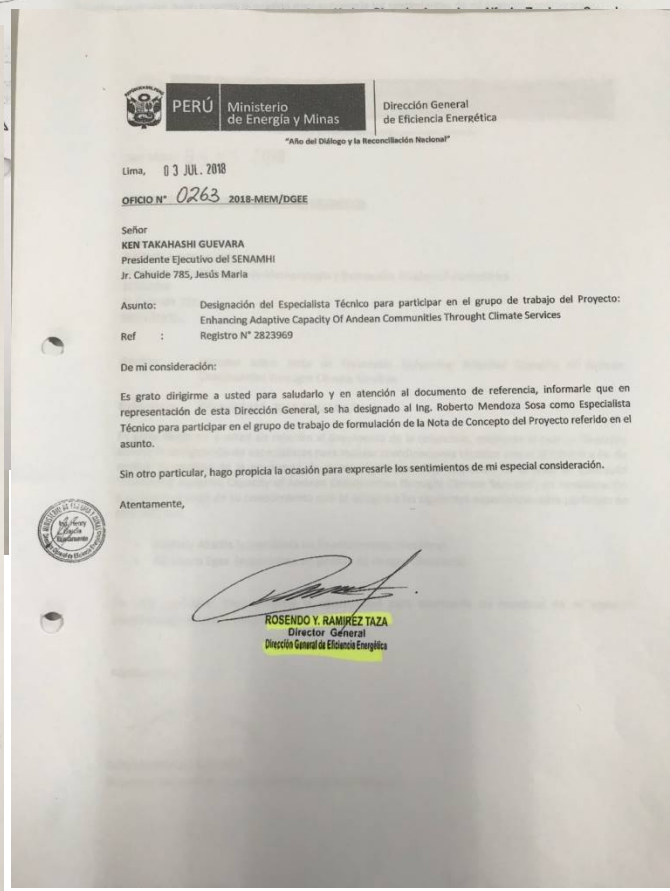
- Nathaly Abadia (especialista en financiamiento climático)
- Giovanna Egas (especialista en gestión de riesgos climáticos)

Sin otro particular, hago propicia la oportunidad para expresarle las muestras de mi especial consideración y estima personal.

Atentamente,

ROSA MORALES SARAVIA
Directora General de Cambio Climático y Desertificación

Central Telefónica: 611-6000



PERÚ | Ministerio de Energía y Minas | Dirección General de Eficiencia Energética

"Año del Diálogo y la Reconciliación Nacional"

Lima, 03 JUL. 2018

OFICIO N° 0263 2018-MEM/DGEE

Señor
KEN TAKAHASHI GUEVARA
Presidente Ejecutivo del SENAMHI
Jr. Cahuide 785, Jesús María

Asunto: Designación del Especialista Técnico para participar en el grupo de trabajo del Proyecto: Enhancing Adaptive Capacity Of Andean Communities Throught Climate Services
Ref : Registro N° 2823969

De mi consideración:

Es grato dirigirme a usted para saludarlo y en atención al documento de referencia, informarle que en representación de esta Dirección General, se ha designado al Ing. Roberto Mendoza Sosa como Especialista Técnico para participar en el grupo de trabajo de formulación de la Nota de Concepto del Proyecto referido en el asunto.

Sin otro particular, hago propicia la ocasión para expresarle los sentimientos de mi especial consideración.

Atentamente,

ROSENDO Y. RAMIREZ TAZA
Director General
Dirección General de Eficiencia Energética

ADAPTATION FUND

Ministerio del Medio Ambiente
Gobierno de Chile

CHILE LO HACEMOS TODOS

Letter of Endorsement by Government

July 31st, 2018

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for Enhancing Adaptive Capacity of Andean Communities through Climate Services (ENANDES)

In my capacity as designated authority for the Adaptation Fund in Chile, I confirm that the above regional project/programme proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the country.

Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by the World Meteorological Organization (WMO) and executed by the National Meteorological and Hydrological Services of: Colombia (IDEAM), Chile (DMC) and Peru (SENAMHI), and the WMO regional Climate Centre for Western South America (CIIFEN).

Sincerely,

Gladys Santis
Adaptation Officer
Ministry of Environment
Government of Chile

ADAPTATION FUND

TODOS POR UN NUEVO PAÍS
PAZ EQUIDAD EDUCACIÓN

MINAMBIENTE

Letter of Endorsement by Government

August 1st, 2018

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for "Enhancing adaptive Capacity of Andean Communities through Climate Services (ENACACS)

In my capacity as designated authority for the Adaptation Fund in Colombia, I confirm that the above regional project/programme proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the country.

Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by the World Meteorological Organization (WMO) and executed by the National Meteorological and Hydrological Service of: Colombia (IDEAM), Chile (DMC) and Peru (SENAMHI) and the WMO regional Climate Center for Western South America (CIIFEN).

Sincerely,

David Felipe Olarte Amaya
Acting Chief of the International Affairs Office
Ministry of Environment and Social Development
Government of Colombia

Lima, 02 AGO. 2018

Letter N° 70 -2018-MINAM/VMDERN/DGCCD

Merssrs.
The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@adaptation-fund.org
Fax: 202 522 3240/5

Subject : Endorsement the Concept Note for a Regional Project: "Enhancing Adaptive Capacity of Andean Communities through Climate Services"

Dear Sirs:

In my capacity of Designated Authority for the Adaptation Fund in Peru, I confirm that the above regional project proposal is in accordance whit the government´s national and subnational priorities; specifically, with the National Designated Contributions (NDC) in thematic areas of water and agriculture in adaptation; reducing adverse impacts risks by climate change in our country.

Accordingly, I am pleased to endorse this project proposal with support from the Adaptation Fund, as it has been being. If approved, the project will be implemented by the World Meteorological Organization (WMO) and executed by The National Service of Meteorology and Hydrology of Peru.

Sincerely yours,

Rosa Morales Saravia
Head of the General Directorate of Climate Change and Desertification
Ministry of the Environment
Designated Authority