REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
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ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	REGULAR PROJECT
Country/ies:	**PERU**
Title of Project/Programme:	**ADAPTATION TO THE IMPACTS OF CLIMATE CHANGE ON PERU' S COASTAL MARINE ECOSYSTEM AND FISHERIES**
Type of Implementing Entity:	**NIE**
Implementing Entity:	**PROFONANPE**
Executing Entity/ies:	**MINISTRY OF PRODUCTION**
Amount of Financing Requested:	**US$ 6,950,239** (in U.S Dollars Equivalent)

Project / Programme Background and Context:

Provide brief information on the problem the proposed project/programme is aiming to solve. Outline the economic social, development and environmental context in which the project would operate.

Peru sustains the most productive fisheries in the world, yielding nearly 10% of world's fish catch. The main driving factor for this enormous productivity is the physical and chemical characteristics of its coastal upwelling[1] (Chavez et al., 2008), which allow the efficient growth of primary producers, high survival rates of larvae and the efficient trophic transfer to foraging fish and top predators.

Two main coastal marine ecosystems are present off Peru. The Peruvian Coastal Upwelling Ecosystem (PCUE) extends from about 4°30'S to the south all along the coast and about 50-100 km offshore (though its influence can reach further) and is the one that sustains the large fisheries of the Peruvian anchovy (*Engraulis ringens*). In the north, limited by a narrow and dynamic transition zone, there is the southern tip of the Eastern Pacific Tropical Coastal Ecosystem that extends up to Central America. This ecosystem is characterized by high marine biodiversity, including large predatory fishes and vertebrates, and is important in terms of artisanal fishing (Hooker, 2009).

The scope of this proposal encompasses these two coastal marine ecosystems: the PCUE and the Tropical Eastern Pacific Coastal Ecosystem. It should be stressed that their marine boundaries are intrinsically dynamic, and they are loosely associated with the extension of the continental shelf and of the upwelling plumes (in the case of the PCUE), about 50 to 100km offshore. Circulation processes in this coastal domain are highly affected by local factors related to the bottom topography, coastal geomorphology and local winds; giving rise to both alongshore and cross-shore mesoscale flows. Due to its dynamics, water depth and proximity to nutrient sources (upwelling or riverine fluxes), the productivity and biodiversity is concentrated in this domain and the key parts of the living cycles of the resources take place here. The offshore

(western) boundaries of these ecosystems interact with the large-scale water masses and current systems, which are maintained by basin-scale ocean-atmosphere interactions and do not depend on local factors. The Humboldt Current system flows off Peru and Chile and is composed by equatorward and poleward surface and subsurface currents that link the tropics with the subtropics[1], extending hundreds of miles away the coast. The onshore (eastern) boundary is the desert but densely populated coastal fringe, which is a source of several anthropogenic stressors.

The two targeted ecosystems are subject of significant climatic variability that range from the interannual scale (El Niño Southern Oscillation, ENSO) to the scale of decades or centuries, as palaeoclimatic research has revealed. For example, during strong El Niño events, the warm and nutrient-poor water masses extend along the coast and the overall coastal productivity decrease. Due to thermal stress and scarcity of food sources, anchovy populations become highly vulnerable and experience high natural mortality. Meanwhile, warm-water, tropical fish species migrate along the coast. The opposite responses occur during the cool La Niña events. Therefore the climatic ecological impacts can have dramatic socio-economic consequences for the fishing industry and for the artisanal fishing communities.

The main uses of the coastal ecosystems services are fishing and aquaculture, and they account for around 3% of Peru's GDP (CSA, 2011; BCRP, 2010). Within the last decade, the contribution of fisheries to the national GDP has increased from 1.9 billion soles to 2.3 billion soles (at currency values of 2007), thus indicating a positive trend. The bulk of sector economic impact is related to anchovy fishing for fishmeal and fish oil industry, in which Peru provides around 35% of the global supply. According to official figures, in 2013, the fishing industry generated almost 30 million US dollars of tax revenues and sold more than 2 billion US dollars as exports[2]. In 2014, the anchovy stock was impacted by anomalous warm conditions brought by an intensified activity of Kelvin waves, reducing the biomass in more than 50%, but the current previsions estimate a recovery of the stocks during 2015. It is estimated that, between 150,000 and 170,000 people depend directly on the Current's productivity for their daily income. The large-scale industrial fishery dedicated to export production sustains approximately 30,000 employees according to IMARPE.

Fishing pressure represents a critical source of stress to the ecosystems and their fisheries resources. In the early 1970's inadequate management led to an extreme vulnerability of the anchovy stock, which collapsed upon the occurrence of a moderate El Niño event in 1972/1973. This crisis, with all subsequent social impacts, has been an important historical lesson. Since then, several regulations and policies have been put into place by the Government of Peru (GoP) to improve the management and prevent the overexploitation of the anchovy[3] (Box 1).

[1] Note that the 'Humboldt Current Large Marine Ecosystem' (HCLME) consists on the complex system of currents, water masses and biotic components extending as far as 200 to 300 miles, and from Northern Peru to Southern Chile. The criteria for defining this LME include fisheries management for transboundary resources and not only ecological/oceanographic reasons. Upon these criteria the PCUE is embedded within the HCLME. Therefore its scale is beyond the scope of this project.

[2] Besides being processed to fish meal and fish oil, the use of anchovy for direct human consumption has been promoted by the Peruvian government in recent years and thus become increasingly important.

[3] Anchovetas (or Peruvian anchovies – *Engraulis ringens*) represent 60-80% of the total marine fish catch, and about 90% of it is converted to fish meal for consumption by cultured fish and livestock.

Box 1. Current Regulations and Policies for the management of the anchovy stocks

The primary legal framework is the General Fishery Law. Since 1971 three general laws have been promulgated (DL N° 18810, L. N° 24790 and DL N° 25977), each one with new approaches according to different ecological, political, socioeconomic settings. Secondary regulations control specific issues of the anchovy fishery, such as reproductive processes, recruitment limits, fishing pressure, access to catch quotas, fate of catches, use of rights in different spatial areas, management, scientific and comercial bodies and protection of other ecosystem components. Regulations establish mínimum catch size, mínimum net size, proportion of juveniles in the catch, prohibition of discards of juveniles and fishing bans in nursery areas. Other regulations include controls to freeze the fishing fleet (which has an overcapacity related to the stock size), and random inspections of physical storage capacity to monitor compliance with capacity limitations. In June 2008, GoP adopted Legislative Decree No. 1084, which regulates anchovy fishing quotas by vessel, regulating all anchovy fishing for indirect human consumption. In December 2008, the government-enacted regulations to define the maximum catch limits for anchovy fishing vessels (industrial fisheries). The quotas system has alleviated the fishing pressure on the main stock and a precautionary policy for the overall quota has allowed a slow recovery of the populations of some top predators, as the guano birds and seals; however the fleet overcapacity still persists and most of other fisheries are not subject to the individual quotas system, remaining under high risk of overexploitation, so they will greatly benefit from more selective fishing gears. The interference between the industrial and artisanal fisheries of anchovy was regulated by allocating the area between 0 to 5 nm for artisanal fishery, and the area between 5 to 10 nm for minor scale fishery oriented to direct human consumption. Environmental events such as Kelvin waves or El Niño episodes are taken into account through adaptive regulations establishing precautionary catch quotas with temporal restrictions when stock vulnerability is increased. Recently, a new regulation about anchovy artisanal fishery for direct human consumption has been promulgated (DS 006-2015-PRODUCE)

It should be highlighted that the artisanal fishery accounts for a larger number of employees than industrial fishing, of which near 57,000 people are directly engaged in fisheries and 19,200 are employed by fishery-based food processing for direct human consumption, according to the Ministry of Production sources. Artisanal fisheries maintain approximately 16,000 vessels and contribute greatly to the country's food security ('Censo Nacional de la Pesca Artesanal, 2012, unpub. report), by producing between around 700,000 tons of catch per annum on average in the past five years (data from records of IMARPE for scientific use). Artisanal or 'medium-scale' fisheries sector is made up of small vessels with a hold capacity of up to 32.6 m^3. These mostly harvest resources along the coast, which include an estimated 220 species, of which some 80 percent are finfish, 17 percent invertebrates, 2 percent algae and the remaining 1 percent other resources. There are some 200 fishing settlements involved in this fishery along the Peruvian coast, whose catches are mainly for direct human consumption (DHC) (FAO 2010). The largest proportion of artisanal fishery catches comes from species such as scallop, hake, dolphinfish and jumbo squid (55%), and also anchovy for the PCUE. Yellowfin tuna is one of the most important species for artisanal fisheries at the TEPCE. While the industrial fishery has a quotas system preventing overexploitation of anchovy, the artisanal fishery requires a co-management community-authority system for conservation of important fisheries such as tuna and hake.

Land-based and marine-based activities are another important source of stress on the coastal marine ecosystems. Pollution, coastal development and resource exploitation are major stressors. Solid and liquid residues derived from domestic sources and from fishing and landing, aquaculture (e.g. biofouling and organic wastes) and other industrial activities in the coastal

border are major stressors for the quality of the marine coastal environment. In addition, many oil platforms are installed onshore the Northern coast, and there are seismic explorations and plans to extend this economic activity by the private sector. Therefore oil/gas exploration and exploitation are emerging threats for the coastal ecosystems. Peru has taken some steps to address these anthropogenic pressures. These include coastal zone management initiatives and establishment of sectorial regulatory and normative frameworks and mechanisms to reduce the impact of land-based activities on coastal and marine assets. However these efforts are largely focused within single sectors, have limited scope, and are inadequate to address this highly complex, variable and linked ecosystems.

Climate change is affecting the heat content, thermal stratification, productivity, acidity and oxygen content in the oceans so that it becomes an additional stressor for the global marine ecosystems. As shown in Figure 1 the communities of the Peruvian coast, including 15% of the nation's urban population, are highly vulnerable to eventual changes in the fish production due to variables such as climate exposure, sensitivity or fisheries dependence and limited adaptive capacity (Allison et al., 2009), thus a reduction of the fisheries' productivity would mean a significant drawback in Peru's economy.

Current oceanographic trends for the last 30-40 years indicate a strengthening of coastal upwelling and related primary productivity near shore Central to Southern Peru, whereas warming and increasing thermal stratification off Northern Peru and the rest of the coast (Gutiérrez et al., 2011). On the other hand, current regional climate change scenarios (Brochier et al., 2013) suggest a weakening of upwelling and increased stratification along the Peruvian coast by the mid twenty first century (Gutiérrez et al., 2014). These conditions should lead to changes in the distribution, life-cycle and catch potential of marine resources. For example, the species may adjust their distribution towards the best range of temperature, food availability, wind-driven turbulence and oxygenation, leading in some cases to the expansion or to the contraction of their range of distribution (Cheung et al., 2009, 2010). Therefore warm-water species as tuna might expand its distribution southward and become more available for fishing. Nevertheless the overall fish potential in the Peruvian coastal ecosystems will ultimately depend on the fate of the primary productivity (e.g. carrying capacity). Since global models predict an increase of thermal stratification and weakening of the trade winds that control the potential productivity in the Eastern Pacific (Vecchi & Soden, 2007; Echevin et al., 2011), a decrease in the Peruvian fishing yields is expected in the long-term.

Summarizing, even though there is still uncertainty about the near-future evolution of upwelling and water mass distributions, there is no doubt that these would impact significantly on habitat distribution and carrying capacities of the resources for fisheries and aquaculture at sea. These impacts would add additional stress to the coastal ecosystems that are already threatened by the non-climatic factors such as those described above.

The main challenge thus consists in increasing the resilience of the coastal marine ecosystems and the coastal communities (particularly the artisanal fishing communities) to climate change impacts (e.g. the Ecosystem Based Adaptation, EBA; CBD, 2009). Therefore the **main beneficiaries** of this proposal are the artisanal fishing communities, whose livelihoods largely depends on the status of the coastal marine ecosystems, which are already subject to a number of non-climatic threats.

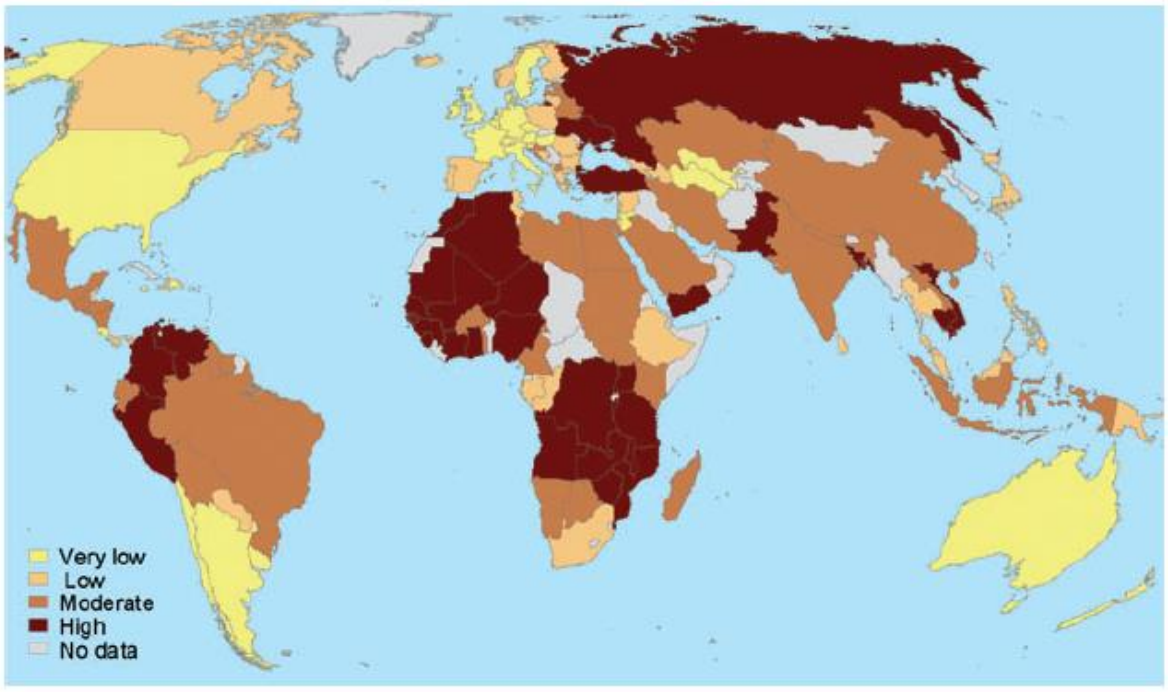


Figure 1: Vulnerability of national economies to potential climate change impacts on fisheries under IPCC scenario B2 (Allison et al., 2009)

The approach of the proposal is to focus the adaptation measures in two pilot areas, one associated to the southern tip of the Tropical Eastern Pacific Coastal Ecosystem, and the other, a typical representative of the PCUE. The project will carry out adaptive 'win-win' measures to improve the resiliency to climate change of both the ecosystems and of the artisanal fishing communities. The measures will help, on one side, to reduce fishing pressure through adoption of environmentally friendly gears while developing incentives from the human direct consumption market. On other side, economic diversification through aquaculture and ecotourism, will strengthen resilience of fisher communities. Bio-conversion of fish landing and aquaculture residues will aid to economic diversification as well, while mitigating pollution for the coastal marine ecosystem. All the adaptation measures will be sustainable in the long-term through active participation of local communities empowered through by co-management framework. The ultimate purpose of the proposal is that these adaptive measures at local level can be upscaled or replicated to other zones of the coastal domain, combining governance, capacity building and interventions sponsored by the government and the private sector.

Activities that include an improved ecosystem management by those with vested interests in its long-term sustainability, allowance of sustainable fishing quotas, adoption of environmentally friendly fishing and harvesting practices, and the promotion of the sustainable use of other ecosystem services with minimal impact in the ecosystem health, should improve the livelihoods of the fishers communities, thus reducing their vulnerability to climate change and variability-induced stress. This requires an improved climatic and environmental surveillance and enhanced

capabilities on modelling to enable the diagnosis and constant monitoring as well as the prediction of likely changes of the ocean currents and the resulting development of the fish stocks due to climate change.

As mentioned above, pollution from several sources is one important non-climatic stressor for the coastal marine ecosystems and resources. For the last decade, the GoP has implemented measures and regulations to reduce pollution from the industrial fishing processing plants; nevertheless pollution derived from fish landings, fish harbours and aquaculture still needs to be addressed. The project will transfer know-how to the artisanal fishing in order to convert residues from fishing and aquaculture sources to bioproducts, thus reducing pollution to the marine coastal ecosystem, while improving their incomes and generating economic diversification.

As well, the proposal recognizes the presence of other land-based ecosystem stressors, such as changes in land-use and building of infrastructure, and coastal marine exploration and exploitation of gas and oil fields. For these hazards, the project will support and strengthen the efforts of the GoP in developing and implementing land use plans in coastal areas. Working with the municipalities and their agencies responsible for developing territorial plans, under the general guidance and coordination of the Ministry of Environment, the project will support developing the processes required to formulate and adopt local territorial plans. This effort also includes developing management plans for Marine Protected Areas (MPA) as needed to secure “no-take” zones.

The proposed project attempts to put in place the required technical systems as well as enhance the necessary regulatory adjustments at national and local levels in order to support the coastal communities and Peru’s economy to adapt to the likely impacts of climate change on the productivity of their marine and coastal ecosystems. It will give particular emphasis on artisanal fishery. This emphasis of course, does not ignore nor seek to diminish the role that industrial fishing plays in the Peruvian economy and its impacts to fish stocks. On the contrary, the proposed project seeks to complement on-going efforts of national authorities to regulate industrial fishing. It will complement climatic monitoring and will build regulations and capacities to implement the Ecosystem Approach to Fisheries for coastal marine ecosystems adding to ongoing efforts comprising mostly the Humboldt Current Ecosystem. As it will be explained along the proposal, the project will contribute to implement sustainable fishing practices, targeting fish products for direct human consumption with better income for fishers, support co-management of benthic fishing ground areas and natural banks, and incentive extensive aquaculture and ecotourism as alternative economic activities. All together, these measures will contribute to lower the fishing pressure over the stocks and improve the fisheries sustainability and their resiliency to climate change.

It should be noted that an adaptation project has been launched recently, entitled “Adaptation to climate change in the fishery sector and marine-coastal ecosystem of Peru”, which is funded by the Interamerican Development Bank (IADB) for 2014-2016, with a budget of US$ 2.5 million. The IADB-funded project main expected outcomes are: i) the development of climate change scenarios for anchovy biomass and catch potential; ii) the test and implementation of environmentally friendly gears for anchovy fishery by the artisanal and medium-scale fleets (<30 tons of store capacity), first at Huacho and later to Pisco, both at the PCUE; iii) the support of governance to help creating incentive market mechanisms for ensuring the sustainability of good fishing practices, among others. Thus the IADB project will not overlap but complement the present proposal which will build upon the activities initiated with the IABD project, extending adaptation measures to other marine species (tuna, hake, scallop, razor clam) and to the other

main coastal marine ecosystem, the ETCPE. Close coordination between both projects is ensured as the same coordination team in PRODUCE will be in charge of the AF project.

Project / Programme Objectives:

List the main objectives of the project/programme.

The overall objective of the project is to support the GoP in reducing the vulnerability of coastal communities to impacts of climate change on the coastal marine ecosystems and fishery resources. This will require the implementation of a group of adaptation measures that include:

(i) Implementation of a group of activities that contribute to the enhancement of current adaptive capacity of artisanal fishing communities living along the Peruvian coast, and reduce the vulnerability of coastal ecosystems, while increasing the income of the communities and their participation in managing and protecting their natural resources.

(ii) Deployment of a modern and efficient surveillance, prediction and information system of climate and environmental key factors at regional and local scales, supporting fishing, aquaculture and ecotourism activities, as well as fisheries adaptive management based on long-term prevision under climate change scenarios.

(iii) Development of a knowledge framework to facilitate capacity building at different levels and the dissemination of project's lessons learned;

(iv) Adjustment of the institutional framework (legal, regulatory and organizational) to facilitate EBA for the coastal marine domain at country-level and to implement an Ecosystem Approach to Fisheries (EAF) including artisanal fishing.

As compared to classical (non-climatic) good fisheries management, the proposed project considers three aspects directly related to adaptation capacities: a) the implementation of a monitoring system that allows the continuous adjustment of the management actions; b) a multi-sectorial approach for the governance of the coastal marine domain (fisheries, environment and local authorities); and c) a socio-economic approach towards the improvement of the livelihoods of artisanal fishing communities through 'win-win' measures that also benefits ecosystem resilience.

Specifically, the presented group of adaptation measures is built upon the following key foundational concepts:

- **A key to successful adaptation of vulnerable communities is promoting the diversification of livelihoods**. Livelihood diversification helps ensure that, if one economic option temporarily closes, people can resort to other options for making a living. Poverty reduction strategies that help diversify livelihoods and improve poor people's access to natural resources also help build adaptive capacity for climate change (*FAO, Fisheries report No. 870*). In this context **component 1** encompasses a group of activities, selected by the communities themselves, aimed at diversifying current livelihoods of coastal communities contributing to reduce their vulnerability to climate change impacts.

- **A sustainable dynamic surveillance, prediction and information system to fill the existing gap of reliable climatic and non-climatic data is key to an effective adaptation process of marine and coastal ecosystems**. Based on the premise that

adaptation is a non-static continuous process, requiring a multi-sectorial approach, the use, visualization and proper interpretation of data for decision making and the elaboration of natural resources management plans becomes a structural pillar of any EBA strategy, in which coastal communities are directly involved. In this context, **component 2** is aimed at designing a modern system of climatic and oceanographic surveillance, forecasting and long-term prediction, including biological, physical and chemical variables, which will be used for early warning and for supporting ecotourism, aquaculture and fishing activities as well as adaptive fishery management.

- **An effective and efficient adaptation process should be implemented in parallel at different levels, involving clear customized strategies to disseminate lessons learned and build capacities for replication and up-scaling successful measures**. Although resource-dependent communities have adapted to change throughout history, projected climate change poses multiple additional risks to fishery dependent communities that might limit the effectiveness of past adaptive strategies. Adaptation strategies will require to be context and location-specific and to consider impacts both short-term (e.g. increased frequency of severe events) and long-term (e.g. reduced productivity of aquatic ecosystems). All three levels of adaptation (community, national and regional) will clearly require and benefit from stronger capacity building, by raising awareness on climate change impacts on fisheries and aquaculture, promoting general education, and targeting initiatives in and outside the sector. (*FAO, Fisheries report No. 870*). In this context **component 3** is designed so that lessons learned from the project could be disseminated to the general public and project stakeholders in an efficient manner. Similarly, capacity building activities on the use of new science-based tools for decision making and ecological risk assessments will be developed for government officials, academia and stakeholders.

- **An ecosystem stressed by overfishing is more likely to collapse when subjected to climate change**. Policies to prevent overfishing and ensure the sustainable use of fish stocks help build ecosystem resilience to climate change (*WorldFish Center 2007*). In this sense **component 4** builds on current national efforts to prevent overfishing caused by industrial fleets and seeks the development of sustainable management of coastal ecosystems, following the EAF and the transfer of management rights to local artisanal fishing communities but limiting open access to resources. The concrete adaptation activities for small-scale aquaculture, co-management of benthic fishing ground areas and the implementation of “no–take” zones are all aligned with this philosophy.

Moreover, in terms of climate change adaptation and building resilient systems (i.e. including reducing exposure and increasing adaptive capacities), the application of the EAF would be an important contribution to maintaining biodiversity, preserving the resilience of human and aquatic systems to change, and improving our capacity to anticipate and adapt to inevitable climate induced changes in aquatic ecosystems and the related fisheries production systems.

The adaptation interventions will focus both on the national level and on two specific pilot areas, one in the southern tip of the Tropical Eastern Pacific Coastal Ecosystem-in the northerly Piura Region and the other one representative of the PCUE located in the central coast. In accordance to the main fishing towns in both areas (north and center), pilot sites will be named Máncora and Huacho, respectively.

Project / Programme Components and Financing:

Fill in the table presenting the relationships among project components, activities, expected concrete outputs, and the corresponding budgets. If necessary, please refer to the attached instructions for a detailed description of each term.

For the case of a programme, individual components are likely to refer to specific sub-sets of stakeholders, regions and/or sectors that can be addressed through a set of well defined interventions / projects.

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
Component 1. Implementation of interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress.	OUTPUT 1.1.1. Adoption of sustainable fishing methods to tackle non-selective fishing gear based on EAF principles directed to target species vulnerable to climate change OUTPUT 1.1.2. Restoration and co-management of natural banks OUTPUT 1.2.1 Planning and development of sustainable aquaculture through small-scale concessions OUTPUT 1.2.2. Creation of ecotourism enterprises OUTPUT 1.2.3 Improvement of market power capacities for sustainable artisanal fisheries OUTPUT 1.2.4. Start-up of certification process for local artisanal fisheries OUTPUT 1.2.5. Production of bio-fertilizers from fishery and aquaculture residues	OUTCOME 1.1. Increased resilience and reduced vulnerability of targeted coastal marine ecosystems to observed effects of climate change and variability-induced stress OUTCOME 1.2. Improved adaptive capacity of local participating communities through the diversification and strengthening of their livelihoods and sources of income as they face climate change induced modifications of biomass and fish distribution	3,124,800
Component 2. Deployment of a modern and efficient environment surveillance and prediction system in the coastal marine ecosystems at regional and local scales supporting fisheries adaptive management under the EAF principles	OUTPUT 2.1.1. Development of a climatic and an oceanographic surveillance system. OUTPUT 2.1.2. Establishment of marine environment surveillance programs in pilot	OUTCOME 2.1.Increased response capacity of the government at a national and local level at PAs to address climate change induced physical and ecological stresses on the coastal marine environment, ecosystem services and resources availability	2,055,200

	areas in coordination with local stakeholders OUTPUT 2.1.3. Development of a modeling and prediction system at local scales. OUTPUT 2.1.4. Building capacity on monitoring and development of new science-based tools such as Ecological Risk Assessments (ERA) for climate change directed to IMARPE, decision makers and academia.		
Component 3. Capacity building and knowledge management system for implementing the EBA and the EAF, and for the dissemination of project's lessons learned, targeting government officials, academia, local communities and other stakeholders	OUTPUT 3.1.1. Development and implementation of a Knowledge Management Strategy (KMS) OUTPUT 3.2.1. Training and sensitizing of beneficiaries on key topics such as formalization, entrepreneurship, normative and fishing gear OUTPUT 3.2.2. Design and implementation of early warning systems through a participatory process at local and regional scales	OUTCOME 3.1. Strengthened institutional capacity to assess the extension and magnitude of climate change impacts on fisheries and effective actions to cope with these changes, providing limits on climate induced loss of income in local communities. OUTCOME 3.2. Strengthened awareness and ownership of adaptation and climate risk reduction processes on impacted communities in the project target areas	420,000
Component 4. Management policies, regulations and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress.	OUTPUT 4.1.1. Support of the cross-sector working group for the promotion of common actions addressing coastal ecosystems' resilience to climate change impacts. OUTPUT 4.1.2. Development of regulations and proposals for co-management in coastal marine areas OUTPUT 4.1.3. Development of regulation to implement incentives for the participation of artisanal fishermen, adopting sustainable practices, in the National Direct Human Consumption Program.	OUTCOME 4.1. Improved governance, policies and regulations at a national and local level to enhance the sustainable use and resilience of coastal marine resources	250,000
6. Project/Programme Execution cost			9.5% of TPC (555,750)
7. Total Project/Programme Cost			5,850,000
8. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)			8.5% of TPC+PEC (544,489)
Amount of Financing Requested			**6,950,239**

Projected Calendar:

Indicate the dates of the following milestones for the proposed project/programme

Milestones	Expected Dates
Start of Project/Programme Implementation	August 2016
Mid-term Review (if planned)	August 2018
Project/Programme Closing	July 2020
Terminal Evaluation	April 2020

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

A.1 INTRODUCTION TO PROJECT COMPONENTS

The proposed adaptation project consists of four components, namely: 1) Implementation of interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress; 2) Deployment of a modern and efficient environment surveillance and prediction system in the marine-coastal marine ecosystems at regional and local scales supporting fisheries adaptive management under the EAF principles; 3) Capacity building and knowledge management system for implementing the EBA and the EAF, and for the dissemination of project's lessons learned, targeting government officials, academia, stakeholders and local communities and 4) Management policies, regulations and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress.

These adaptation actions will be carried out both at the national and sub-national levels involving a variety of stakeholders including local fishers's associations, local development agencies and other governmental agencies. Interventions in the first component are centred in two pilot areas, namely Máncora and Huacho, while the other three will have in addition a national area of action, necessary for the success of this project.

The adaptation approach which will be adopted for the proposed project, responds to the recommendations presented by international experts from developed and developing countries during the workshop "*The Economics of Adapting Fisheries to Climate Change*" organized by the OECD in Busan, Korea in 2010 to address challenges of climate change for fisheries and to provide practical insights to policy makers.

It is expected that climate change will impact on the biodiversity, habitat quality, carrying capacities and life cycles of marine ecosystems and organisms, as well as on socio-economic

services, such as fish catch potential, fishing efforts and fishers incomes, increasing the vulnerability of the ecosystem and the human local communities. Other anthropic stressors, as by-catch, discard practices and pollution can further amplify climate change impacts through effects on ecological processes, as spawning rates and distribution of nursery grounds[4]. Consequences on catch and fishing effort also imply changes in the mean trophic levels of the fishery community (Pauly et al., 1998)

A combination of replicable actions at local scale (targeting affected communities) and national policies (need to be developed for a long-term and effective enabling environment) are both required to ensure a successful adaptation process. Benefits from these adaptation measures could be distributed along the short and the long-term. Of special interest are those contributing to the welfare of local communities, preserve or restore key ecosystems while bringing immediate and concrete development co-benefits. Adaptation measures bringing long-term benefits, such as coastal marine zoning or implementation of marine protected areas, contribute to create an enabling environment for the successful execution of adaptation measures and to the sustainability of the results. The proposed project is designed to follow this strategy, by articulating four types of adaptation measures (as mentioned before) benefiting two pilot areas in the short and long-term. This will also bring benefits nationwide, by strengthening existing governmental capacity to learn from the pilots and direct apply lessons learned to decision making, enhancing climate change adaptation.

Specifically, the group of short to long-term adaptation measures proposed by the project are aimed to help local communities living in the coastal areas of Huacho and Máncora to cope with climate change impacts and threats that include: (i) vulnerable resource stocks and fisheries productivity, (ii) increased variability and uncertainty of fishery yields, (iii) changes in distribution of fisheries, (iv) increased vulnerability of communities and infrastructure to climatic extremes (precipitation, floods), (v) trade and market shocks (Table 1).

Climate change impacts and threats	Adaptation measures at target pilot areas
Vulnerable resource stocks and fisheries productivity	Reduction of fishing pressure through improved fishing selectivity and implementation of the Ecosystem Approach to Fisheries (EAF) (Component 1) Restoration and co-management of natural banks (Component 1). Improved value of fish and other resource products for human consumption, through sustainable gears, fishery certification and access to high value markets (Component 1)
Increased variability and uncertainty of fishery yields	Diversification of economic activities (ecotourism, aquaculture and conversion of residues to bioproducts) (Component 1) Implementation of Ecosystem Based Adaptation (EBA) and Ecosystem Approach to Fisheries (EAF) (Component 4)
Changes in distribution of fisheries	Bio- oceanographic monitoring and ecological modelling to predict changes in resource availability (Component 2) Ecological risk assessments of key species for integrated adaptive management (Component 2) Precautionary management based on ecological risk assessments and model predictions (Component 2)

[4] The economics of adapting fisheries to climate change, OECD 2010

Increased vulnerability of communities and infrastructure to climatic extremes (precipitation, floods) Trade and market shocks	Improved climatic and oceanographic surveillance and deployment of early warning system (Component 2) Use of scenarios of climate change impacts for ecosystem based adaptation and infrastructure planning (Component 3) Improved self-organization of local fishing communities to make use of science based information, market opportunities and diversification of economic activities (Component 1)

Table 1. Climate change impacts and adaptation measures to be applied in the project (adapted from Daw et al., 2009)

Figure 2 below shows project's components' inter-relations under a climate change impacts framework. Starting from the top of the figure, climate change affects directly the provision of services by the coastal marine ecosystems in Peru at multiple levels (productivity, distribution, biodiversity, etc.), which will put in danger coastal communities' livelihoods in areas already vulnerable (e.g. with significantly high poverty levels) partly due to other non-climatic stressors.

As shown in the figure below, components 2 and 4 tend to share the same "area" of action, that is improving the understanding of climate change impacts on distribution, growth and reproduction of fish-stocks through the deployment of a monitoring system and applied research sub-component seeking to develop long-term scenarios for adaptive planning and also the know-how required for the sustainable exploitation of the selected environmental services; and develop the regulation, policy and administrative capacity to create the enabling environment for the fishing communities effective management of the selected "area of exploitation".

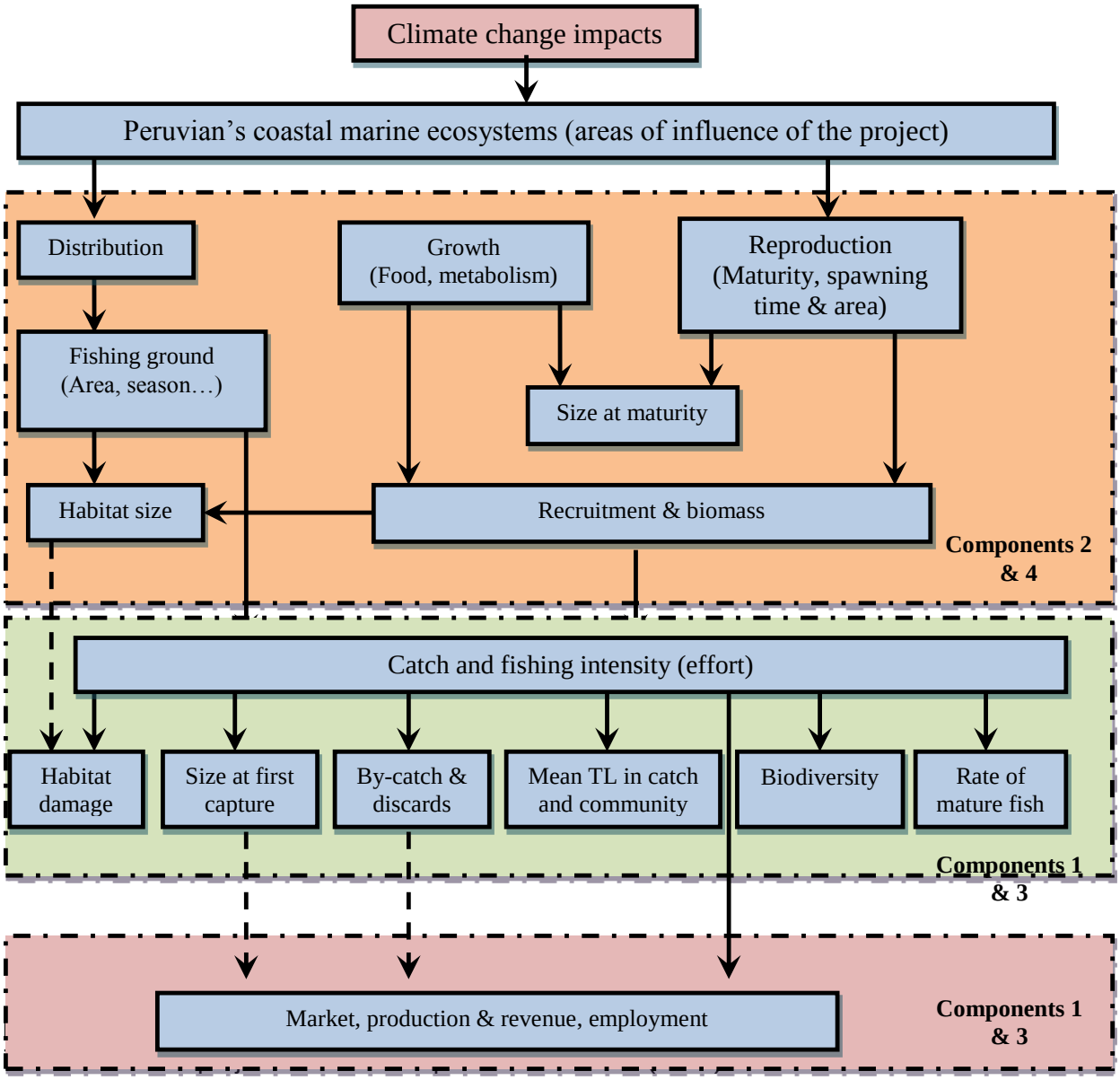
For example, the information from monitoring and modelling activities in component 2 will feed the early warning system, which in turn will contribute to propose regulations of adaptive management considering environmental changes in component 4.

Similarly, components 1 and 3 will be focused on the implementation of a group of site-specific productive activities to enhance the income of the associated fishing community also providing alternative livelihoods and assuring the means to disseminate lessons learned and strengthening the community to execute its role as main partners in the management of their "area of exploitation". Component 3 will have in addition a national area of action.

For example, capacity building about selective fishing, aquaculture, ecotourism and co-management in component 3 will be immediately and directly applied to adaptation measures of economic diversification in component 1 (e.g. scallop aquaculture, razor clam co-management in Huacho, tuna selective fishing and whale watching in Máncora).

As the Peruvian coast is a region of exceptionally high and sustained upwelling, it likely sustains a larger artisanal fishery than less productive coastal areas in other countries. Also, the GoP has defined exclusive fishing rights for an artisanal fishery (boats less than 10 tons, and up to the 5 nautical miles of the coast) and for a minor scale fishery (boats between 10 and 32.5 tons, and from 5 to 10 nm), but they are not restricted to this area and often capture fish as far offshore as 200 nautical miles. They therefore contribute to existing environmental and economic pressures on the Peru's coastal marine ecosystem. Studies carried out by IMARPE between 1996 and 2006 confirmed that natural phenomena like El Niño events had a significant effect on abundance, range and availability of the dominant species in the artisanal fishery catch. It can

therefore be expected that changes in the climate with subsequent impacts on the ecosystems' capacity will put at risk the long-term sustainability of artisanal fishing. Their flexibility in responding to variations in type and location of catch, however, could be an important asset in adapting to future changes.



The artisanal fisheries of Peru produce between 200,000 and 400,000 tons of catch per year according to the data collected by IMARPE. These catches are important not only in terms

The artisanal fisheries of Peru produce between 200,000 and 400,000 tons of catch per year according to the data collected by IMARPE. These catches are important not only in terms of volume but also for its socioeconomic effect, being a source of employment and sustenance for a significant number of Peruvians. Its rate of growth has, however, been slower than other sectors of the economy and the artisanal fisheries sector has not received the needed support

to achieve sustainable growth. Nonetheless, the number of fishers has increased 17% in the last 8 years to almost 44,161, while the number of vessels has increased 66% to almost 16,045 (IMARPE 2004, INEI 2012).

A.2 DESCRIPTION OF PROJECT COMPONENTS

Component 1. Implementation of interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress

Selection of Pilot Areas

The Peruvian coast is affected by two main climate and oceanographic systems. The Northern coast is partly under the influence of warm tropical waters and high precipitations on land, whereas the rest of the coast is subject to the cold coastal upwelling waters and arid conditions on the continent. Current trends in coastal SST exhibit significant warming for the Northern coast (<06°S), contrasting with strong cooling from the central coast to the south (Gutiérrez et al., 2011). This behavior is also associated with different trends in productivity and possibly subsurface water oxygenation (Demarcq, 2009; Quipúzcoa et al*.,* accepted).

The selection of pilot sites is the result of a multidisciplinary analysis based on the different types of exposure to climate change impacts and variability, general ecological characteristics of the Peruvian coast, the presence of artisanal fishers' communities and the availability of resources. It was determined that within the existing resource envelope only two sites could be incorporated. It was also decided that one site should be located in the Northern part of the coast at the southern boundary of the Tropical Eastern Pacific Coastal Ecosystem, subjected to the interplay between the warm tropical waters and the northward intrusion of upwelling waters, currently under a warming trend. The second site is representative of the Peruvian Coastal Upwelling Ecosystem, currently under a cooling trend (Gutiérrez et al., 2011) (Figure 3).

The northern pilot area includes the following towns and/or fishing coves: Máncora, Los Órganos, El Ñuro and Cabo Blanco (04°05 – 04°15'S), from which Máncora is the largest, and therefore this area will be referred as Máncora from here on. In oceanographic terms, Máncora faces the seasonal north-south displacement of the Equatorial Front (EF), where the surface tropical waters (with high temperatures and low salinities) mix with the colder waters and higher salinities that characterize the coastal upwelling. The position of the EF is highly dynamic, exhibiting also interannual shifts in its latitudinal position. A summary presentation of the main characteristics of Máncora as pilot site is shown in Table A1 (Annex I).

The second pilot area is distributed from Don Martín Island to cape Punta Salinas (11°01'S – 11°19'S), and includes the following towns and/or fishing coves: Végueta, Huacho and Carquín, from which Huacho is the main one, and therefore this area will be referred after its name from here on. Here coastal upwelling is the driver for coastal marine life. The islands and Cape Punta Salinas are part of the Guano Islands and Capes National Reserve. The coastal-marine zone of Huacho and Carquín has nutrient rich waters with several important fishing grounds for artisanal fishers. This area has also sandy shores that are used in summer by local population as recreational places, wetlands rich in migratory birds and islands with abundant areas for natural banks of marine invertebrates. A brief of the Huacho pilot area is given in Table A1 (Annex I).

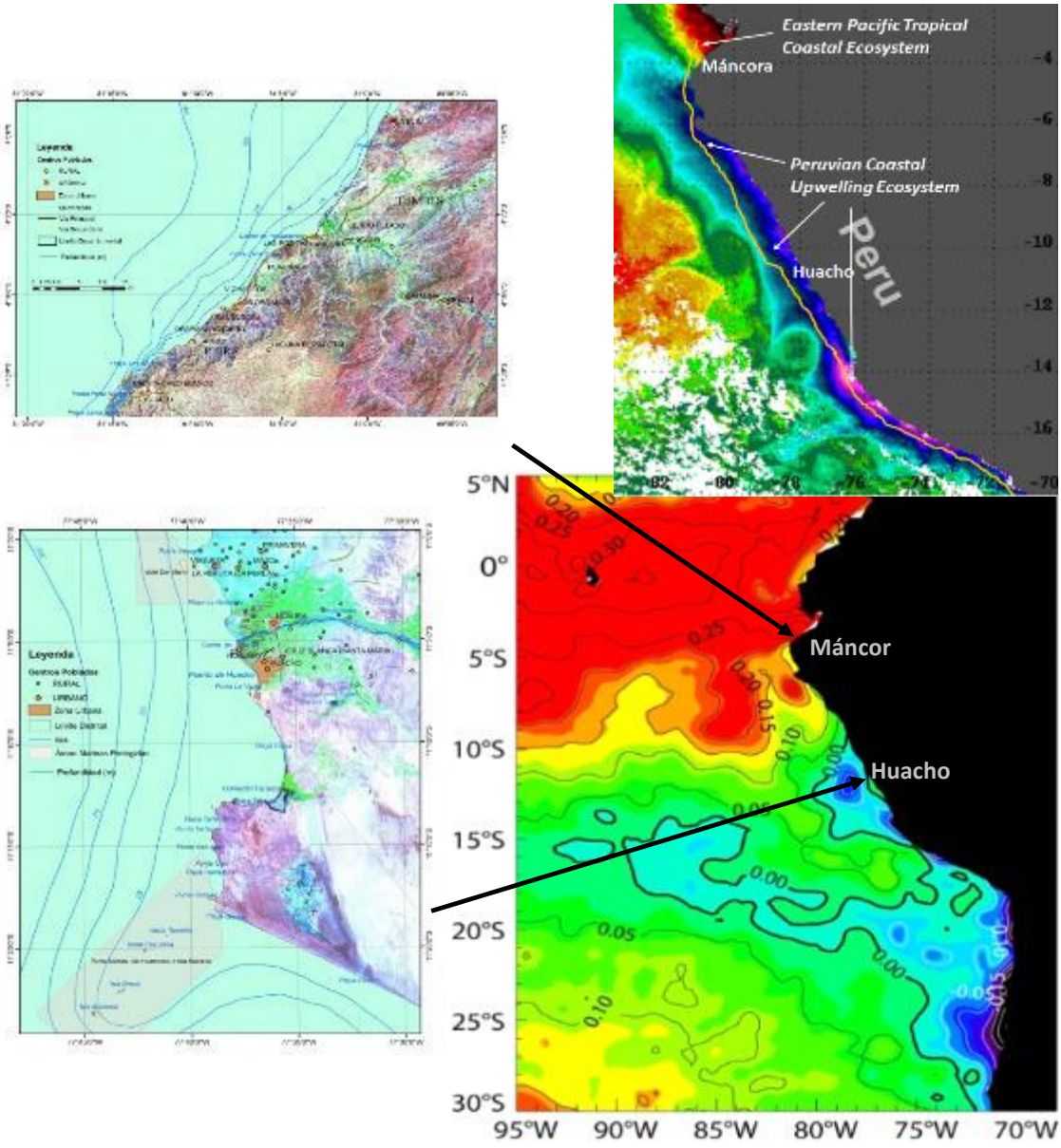


Figure 3. On left: Satellite maps of Máncora (above) and Huacho (below) coastal areas. On right, above: distribution of sea surface temperature (°C) along the Peruvian coast, for April 2005 (modified from Bakun & Weeks, 2008); the approximate distribution of the target ecosystem is shown; the dark yellow line is the continental shelf extension; below: SST trends along the coast (Gutiérrez et al., 2011).

In general terms, the group of adaptation measures to be implemented under component 1 can be classified in four different types: (i) expansion of improved fishing practices and promotion of environmentally friendly gears as well as training in commercialization and certification; (ii) facilitating the emergence of ecotourism activities, (iii) restoration of natural banks and development of sustainable aquaculture in selected areas, and (iv) conversion of fishery and aquaculture residues into biofertilizers.

In order to facilitate the presentation of key information for each of the two specified pilot sites, two summary sheets have been developed, highlighting specific adaptation interventions per site. These are presented below, while additional detailed information can be found in the Annex I.

MÁNCORA

Coastal Marine Zone Characterization

The following table summarizes main factors that define Máncora coastal marine zone.

Factor/feature	General characterization of the pilot area
Area of intervention	Máncora to Cabo Blanco
Key physical forcing	Equatorial front
Coastal marine habitat	Vulnerability to climatic extremes (floodings, ENSO). Domestic (sewage) water pollution
Coastal biodiversity	Panamanian province and ecotone to Peruvian province (south); migration route of cetaceans and turtles
Main target species	Giant squid (*Dosidicus gigas*), Yellowfin Tuna (*Thunnus albacares*), hake (*Merluccius gayi peruanus*)
Main artisanal fishery resources/landings rank (Máncora)	Giant squid, hake, Yellowfin Tuna (rank 21)
Anthropogenic pressure on top predators	Gillnet fishing – cetaceans and turtles
Hazards or conflicts in coastal marine management	Territory use/planning and climatic vulnerability and coastal marine pollution
Climatic projection hypothesis up to 2030	Sea Surface Temperature (SST) has already increased by +0.4 ºC, further increases are associated with increase probability of extreme precipitations and invasions of the sea to estuarine areas

Table 2. Characterization of Máncora pilot site

Fishery

The following table presents a summary of main fishing factors per cove or area of influence of the project, including the number of employed vessels, number of fishers and types of fishing gears used. Use of traditional fishing gears continues to be prevalent, with the use of non-specific gears and poor processing practices. It is estimated that 35 percent of all fishing boats use non-environmentally friendly gears.

Cove	Population	Number of fishers	Number of vessels	Associated to trade unions	Type of fishing gears	Infrastructure	Main target species	Level of poverty
Cabo Blanco	7,101	600	200	496	Purse seine, long-line, hook	Breakwater, pier	Hake *(Merluccius gayi)* and scombrids *(Scomber japonicus)*	Poor
El Ñuro	1,200	450	170	200	Long-line, hook	Breakwater, pier	Hake, Yellowfin tuna	Poor
Los Órganos	8,283	450	120	223	Gillnet, hook	Breakwater, pier	Hake/giant squid	Moderately Poor
Máncora	12,619	700	130	320	Gillnet, longline, hook	Breakwater, pier	Yellowfin tuna, scombrids, Hake	Moderately Poor

Table 3. Summary of fishing data for Máncora, updated to 2015 (Source: IMARPE)

This area is nowadays not a landing zone for the industrial fishery, but lies within the main distribution area of hake (*Merluccius gayi peruanus*), which is the main demersal[5] resource of the Peruvian coast. Also it is the most important artisanal fishing zone for the Yellowfin Tuna, Marlins and for other oceanic large-sized species.

Artisanal vessels perform nearly all of the fishing activities in the coves. They exhibit a high diversity of fishing gears (gillnets, long-line, hook and purse seine) and fishing targets, dominated by the giant squid *Dosidicus gigas* (but with very high variability) and large oceanic fishes, as tunas, sharks, marlins (*e.g*. *Makaira indica* and *Tetrapturus audax*), giant manta (*Mobula thurstoni*), scombrids and coastal demersal fishes, including hake.

In general, the landings are characterized by a large variability in species composition and amount of landings, according to the highly variable oceanic conditions. Among the top three resources in landing statistics for the past decade is the Yellowfin Tuna (*Thunnus albacares*). Its landings have shown an increasing tendency in the past decade. It is worth mentioning that the fluctuations of the landings of Yellowfin Tuna, and of other tropical oceanic species are related to ENSO. For instance, higher catches in 2003, 2007 and 2010, followed the moderate El Niño events in the past decade.

Banks and fishing grounds

Banks of several benthic resources are present in the pilot area but they are not well studied. There have been reports on small banks of the Pearl oyster (*Pteria sterna*), from Máncora to

[5] Describing a fish that lives either close to the seafloor, or that are temporarily in direct contact with the sea bottom (Lalli and Parsons, 2006)

Los Órganos, and of the Oyster (*Crassostrea iridescens*), from north of Máncora to Punta Sal (Carbajal et al., 2010; Ordinola et al., 2010).

Socio-economic conditions

The coast of Máncora is characterized for having several coves and bays from which fishing communities develop their activities. The main settlement is Máncora with a population of 10547 people, composed mainly by fishers (10.3%), drivers of transport vehicles (9.7%), shopkeepers and dealers (9.5%), followed by cooks, hotel personnel and bricklayers (about 5% each). In recent years Máncora has received an increasing number of national and foreign tourists, leading to a rapid building of hotels along its coastal line. Poor sanitary infrastructure (only 58.3% of houses are connected to the public sewer system) cause serious risks of pollution affecting coastal marine activities. Other fishing communities are located in Cabo Blanco (population 7,137, socio-economic level: poor), El Ñuro (population 9,612, socio-economic level: moderately poor), and Los Órganos (population 9,612, socio-economic level: moderately poor).

Proposed adaptation response

Environmentally friendly fishing gears

Currently, tuna fishing is carried out using gillnets, which are not selective enough. The project will finance the installation of new selective fishing gears (long-lines) in 45 boats in Máncora cove. Using these new gears will reduce fishing pressure of non-target species and will improve the quality of the target species while protecting their juvenile stages, thus opening access to high-value markets for artisanal fishers. Also, fish food fairs will be promoted to expand local consumption of artisanal fish products ensuring food security in vulnerable communities. Participation of women will be promoted in this activity. In addition, fishers will be trained on good practices of ecotourism and monitoring incidental catch of marine vertebrates, as well as in recovery, rehabilitation and release of incidentally caught species (e.g. seabirds, turtles and mammals).

Ecotourism

Northern Peru (Mancora, Los Organos and El Ñuro), has a high marine diversity (e.g. whale-watch) favoring the creation of ecotourism enterprises by artisanal fishers. There already exist touristic activities which include mammals, seabirds and turtles watching, diving, surfing, kitesurfing, etc. In these activities, tourism agencies and hotels are involved; however, the involvement of fishing communities is scarce. Therefore, the project proposes the creation of ecotourism enterprises by artisanal fishers.

An activity of “experiential fishing of tuna”, will be implemented by artisanal fishers, using pole and line and hand line. The possibility of using this environmentally friendly fishing gear, in addition to the large environmental and social benefits, allows to present and offer to society, tourists, researchers, and other stakeholders the opportunity to have a direct experiential fishing.

In order to achieve the interconnection between this activity and the tourist interest to know how the artisanal fishing communities take into account the protection of the marine environment by using low impact fishing gear, the project propose the following strategies:

- An innovative adaptation measure, beyond traditional tasks, through a pilot use of pole

and hand line fishing, with sprinklers and living bait. For this, a local boat will be adapted with this fishing gear, also, a prototype fishing boat and an exclusively touristic boat will be acquired. In this way, the tourist will have the option to take the experiential fishery as a main actor, or just to stay in the boat as an observer of the fishing operation.

- The fishing grounds will be established outside the 5 nm, according to resource availability and oceanographic conditions. Experimental fishing will be carried out and monitored by staff from IMARPE and PRODUCE.

- This innovative activity in Peru, will include a video location technology as a tool to implement a verification of origin and traceability system, in order to give certainty to consumers about the origin of the fish arriving to their plates. It also allows to know if this fishing activity takes care of protected species, through the monitoring of fishing and application of good practices, including mitigation measures for protected species. As a result, the application of this technology promotes sustainability of the marine ecosystem.

- The project will transfer the administration of the boats to the organization in charge of the management of the fishing infrastructure, authorized by the Ministry of Production, thus ensuring sustainability of the activity.

Positive environmental and social impacts of this activity are:

- Improvement of the management of marine resources in the area.
- Reduction of negative impacts coming from current practices not compatible with the marine environment.
- Improvement of income of artisanal fishery due to the increase in product quality, more sustainable resources and the support of a traceability system for the valorization of the activity.

In addition, complementary activities will be carried out in order to strengthened ecotourism. Among these activities are: capacity building in ecotourism for the local fishery community (fishers, women, retired elders), courses for tourism guiding, good practices and sustainability of tourism activity, safety, fish quality, marketing and culinary offer, as well as courses for consumers about marine biology, fish diversity, interaction with protected species, environmentally friendly fishing gears, stock status, fishing grounds and fishers livelihoods.

The project will promote the participation on women in activities related to ecotourism in a wide range of roles like business management, tourist guide, production and selling of handicraft souvenirs. Agreements with fishers and continuous monitoring will ensure that good practices of ecotourism operations, noise control and pollutants disposal will be accomplished.

With these interventions, the project will improve and homogenize the touristic quality offer, with a positive impact in the management and sustainability of the ecotouristic activity offered by the local community.

HUACHO

Coastal Marine Zone Characterization

Factor/Feature	General characterization of pilot site
Area of intervention	Don Martín Island/Végueta to cape Punta Salinas
Key physical forcing	Coastal winds
Coastal marine habitat	Subjected to chemical pollution (fisheries, agriculture) and domestic sources. Vulnerability to climate extremes (El Niño)
Coastal biodiversity	Wetlands, islands and inlets; habitats for migratory birds, colonial guano bird and marine mammals
Main resources	Anchovy (Central-Northern stock)
Main artisanal fishery resources, landings rank	Anchovy, scombrids, coastal fishes
Anthropogenic pressure on top predators	Pressure on habitat areas of marine birds and mammals
Hazards or conflicts in coastal marine management	Territory use/planning and climatic vulnerability, coastal marine pollution
Climatic projection hypothesis up to 2030	High degree of uncertainty (cooling or warming)

Table 4. Characterization of the Huacho pilot site

Fishery

Historically the Huacho harbor has been an important landing point for the industrial fishing of anchovy and several factories for fishmeal and oil production are established. Since 2009, the artisanal fleet is fishing the anchovy, encouraged by the government policies to increase the direct human consumption, and now anchovy landings represent over 90% of the total artisanal fishery landings in the Huacho area. As other areas subjected to coastal upwelling, the waters are cold and very productive, being the natural habitat of the Peruvian anchovy *Engraulis ringens*.

However, the use of purse seines with a mesh size of only 38 mm, which is adequate for anchovy, has an impact on the higher prized species because it extracts mostly juveniles and creates conflicts with the gillnet fishers which target the same species. Furthermore, this fishing gear is not appropriate for the pretended use of direct human consumption, because the product arrives in damaged condition due to the character of the fishing practice, so that it is offered for the fishmeal factories. The final effect is adding fishing pressure and increasing the vulnerability of this resource and of other coastal species. Therefore the IDB funded project has initiated an adaptation strategy to effectively reduce the fishing pressure on anchovy, while improving the incomes of the fishing communities, which all together would improve the socio-ecological resiliency to climate change impacts.

Cove	Population	# of fishers	# of vessels	Associated to trade unions	Type of fishing gears	Infrastructure	Type of catch	Level of poverty
Végueta	18,265	160	50	160	Gillnet	No breakwater pier available	Small coastal fish	Poor
Huacho	53,998	907	243	907	Gillnet, purse seine, long-line, hook	Breakwater pier, standard generation set, areas for fish manipulation	Chilean Jack Mackerel and Peruvian anchovy	Acceptable
Carquín	6,091	250	150	250	Gillnet	No breakwater pier available	silverside and lorna drum	Poor

Table 5. Summary of fishing data for Huacho, updated to 2012 (Source: IMARPE)

Exploitation of natural banks of benthic[6] invertebrates

The topography favors the existence of natural banks of benthic invertebrates, among which there are several subtidal mollusk species of high commercial value and demand. Some of the major banks are located onshore Don Martín Island, and in the cape Punta Salinas which are protected areas, offering a chance for their sustainable management. Two of the main benthic resources with high commercial value (for export and for national consumption) are the Peruvian scallop (*Argopecten purpuratus*) and the razor clam (*Ensis macha*).

In the Huacho area, the main natural bank of the razor clam is in cape Punta Salinas, whereby hydraulic dredging has also been reported. Even though law forbids this practice, it is still a threat over the population and its habitat due to the lack of effective control and attractive fishing gears for economic profit. In Punta Salinas, a ban established in 2008 has allowed the recovery of the adult population but the restoration of the silty sand bottoms are slow, putting in danger the renewal of the bank (IMARPE, 2011).

The following table presents a summary of main fishing factors per cove or area of influence of the project, including the number of employed vessels, number of fishers and types of fishing gears used.

Socio-economic conditions

In Huacho, the main economic activity is small scale trade (9.2 % of population), teaching (7.9 %, mainly related to the Huacho University), restaurants (6.1 %), construction (4.6 %), transport (4.6 %) and fishery (3.2 %). In Carquín, economic activities comprise small-scale trade (17.5 %) and fishery (15.3 %), with two fishmeal plants, and artisanal harvest for direct human consumption.

[6] Benthic means "bottom", which encompasses the seafloor (Lalli and Parsons, 2006)

Also, in Carquín other activities such as agriculture, cattle, poultry, bovine and pork industries are developed.

Administratively, this pilot area belongs to the Huaura province (197,384 inhabitants), from which the main district, harbor and population center is Huacho (53,998 inhabitants). The two other districts with coastal populations and fishing coves are Carquín (6,091 inhabitants) and Végueta (18,265 inhabitants). The number of people working in artisanal fishery is 907, 250 and 160, respectively, so that the families that depend directly from this economic activity are about 1,300.

Proposed adaptation response

The three main artisanal fishery resources for Huacho coastal communities (i.e. anchovy, Peruvian scallop and razor clam) are sensitive to climate-driven oceanographic changes and their distribution have responded to the recent environmental changes, but their future behavior is uncertain due to the non-linear character of the climate change impacts in the upwelling ecosystem (Echevin et al., 2011). Therefore adaptation measures need to be applied to maximize the opened commercialization opportunities through added value of fishery products, and to minimize the vulnerabilities of the resources driven by the current fishing practices, limited information of the coastal ocean dynamics/ future regional climate change scenarios, and management limitations.

Aquaculture

Aquaculture of scallops will be carried out in bottom pens as an economic alternative to fishing. The first year, scallop seeds will be acquired from hatcheries located in the Central coast of Peru (*e.g*. Pisco or Casma) and later re-stocking of natural banks in protected areas will serve as sources of larval supply. In addition, fishers will be trained in good aquaculture practices and pollutants disposal. Agreements with fishers and continuous monitoring will ensure the longterm commitment that good practices of aquaculture will be accomplished. Environmental impact of bottom pens will be studied through research thesis.

Co-management

Effective sustainable use and conservation of natural banks need the implementation of a co-management approach, in which the government allows participation of the fishers' community in some aspects of management: monitoring, protection, territorial exclusivity, etc. Restoration of scallop banks in protected areas and co-management planning of razor clam banks will contribute to set the technical and legal basis of this approach. Power sharing arrangements between fishers and government will promote participation of local communities in natural banks monitoring and harvest control.

Bioproducts

Currently, liquid and solid residues of artisanal fishery and aquaculture are disposed to the sea, generating pollution problems. Fishery residues generated during landings at harbors and biofouling residues generated in suspended aquaculture can be converted into biofertilizers, biodiesel and food for animals. The Universidad Nacional Agraria La Molina (UNALM) has developed the technique of bioconversion through a process of crushing, homolactic anaerobic fermentation and stabilization. This technique has not been applied to large scale yet. UNALM will provide this technical support to the project. Conversion of residues into bioproducts is a sound adaptation measure which can be a source of income for artisanal fishers, through

commercialization of these organic bioproducts which are highly effective on agriculture, and at the same time it can reduce environmental impacts generated to the sea. These activities can be carried out by women thus enabling the gender approach in the project.

<u>Component 2.</u> Deployment of a modern and efficient environment surveillance, prediction and information system in the coastal marine ecosystems at regional and local scales supporting marine economic activities and fisheries adaptive management under the EAF principles

The output of this component is a modern system of climatic and oceanographic surveillance, forecasting and long-term prediction, including biological, physical and chemical variables, which will be used for early warning and for supporting ecotourism, aquaculture and fishing activities as well as adaptive fishery management. Local stakeholders will contribute through the protection of instruments and loggers as well as fishers as observers.

Component 2 will support Component 1, by offering opportune information of processes such as harmful algal blooms, sulphidic plumes and extreme events such as El Niño. This information will be quite useful for planning, preventing and correcting actions for decisionmakers and fishers.

The ocean climate and the marine productivity of Peru are controlled by a few main factors, namely: 1) the Walker Circulation, which sets the depth of the thermocline[7], influencing the fertility of the subsurface waters; 2) the intensity of coastal winds that drive upwelling of those subsurface waters and promote mixing in the upper water column; and 3) the spatial distribution of surface to subsurface water masses. In turn, air-sea interactions feedback on the continental climate; e.g. on the precipitation anomalies in the North or on the low-atmosphere cloud cover in the rest of the coast. Current information deficits[8], originated by the lack of: (i) sufficient ground measuring stations and (ii) remote observation and monitoring data, limit the understanding of the interaction among the main factors mentioned above. The proposed adaptation measure is designed to fill the gaps of information, through an improved system of climatic/oceanographic surveillance and prediction.

[7] As one descends from the surface of the ocean, the temperature remains nearly the same from the surface down to a certain depth, but decreases rapidly from that point downward. This boundary is called the thermocline. (NOAA http://www.weather.gov/glossary/)

[8] Current land-ocean climate monitoring platforms are insufficient to determine the key parameters at the right timing for a proper warning system on meteorological and oceanographic conditions, as well as potential events triggered by the warming or cooling processes (e.g. possible increase of El Niño events, more frequent wind storms). Subsurface fields of currents, temperature and salinity (which influence upwelling) are measured in seasonal to semiannual intervals, but little is known on the synergy between large-scale anomalies with smaller-scale local to regional atmospheric processes that can amplify the anomalies physically or ecologically.

Moreover, it is also known that coastal winds over the first 50 km offshore are poorly sampled by satellite data and occasional scientific cruises (Echevin et al., 2011). The meteorological network at the coast is restricted to a few airports, which are not necessarily located in exposed areas to have a better representation of the upwelling winds. Nearly real-time surface water masses distribution is currently inferred from remote-sensing Sea Surface Temperature (SST) fields, but this is severely limited by salinity information, particularly in the North, where a large salinity gradient occurs with the Equatorial Front. Finally, current monitoring of properties, which are not conservative such as oxygen and pH is still sparse in time and in space.

For the surveillance component, at each pilot area, this system will consist of: a) periodic (weekly) 80 km onshore-offshore oceanographic sections (0 – 200 m) carried by autonomous devices (gliders), equipped with sensors of temperature, salinity, oxygen, pH and chlorophyll-a; b) continuous (e.g. hourly) SST and surface salinity recording within bays, capes, islands, oil platforms and/or intervention sites (natural banks or aquaculture areas); c) continuous (e.g. real-time) recording of the weather conditions, coastal winds velocities and directions, by coastal marine meteorological stations located on capes or islands, which will be complementary to the national meteorological stations network; d) periodic bio-environmental monitoring at selected sites and/or the intervention sites, for ecosystem health indicators in plankton, benthic habitat quality, distribution of key species, and supportive chemical variables as pH and oxygen. The latter will enable the development of baseline studies needed to provide the science-basis for management of natural banks and sustainable aquaculture practices.

In addition, IMARPE's facilities will be improved for storing, analyzing and disseminating international satellite data (e.g. winds, temperature, chlorophyll, altimetry and turbidity). These products will allow to monitor generation of Kelvin waves by winds, temperature changes due to El Niño, color changes due to harmful algal blooms or sulphidic plumes, and currents or eddies with altimetric data. These events will in turn trigger preventive and corrective actions beneficial to fishers and decisionmakers.

Data of the marine and meteorological stations will be exchanged with other climate research institutions, and a proper near real-time interface to disseminate the information to the community will be opened in the IMARPE's information center webpage. The data will be accompanied by periodic reports oriented to the early warning on weather, climatic or oceanographic conditions, including those related with ecosystem health, as red tides, anoxia, or jellyfish blooming. These reports will be delivered to all stakeholders (see also Component 3).

Artisanal communities will be sensitized in order to support the operation and maintenance of meteorological and oceanographic equipment, in the context of a participatory early warning system and establishment of marine environment surveillance programs in pilot areas in coordination with local stakeholders. In the longterm, regional governments could contribute to co-finance monitoring programs.

The repetitive oceanographic sections will deliver useful information both at regional and at local scales, since they will cover from near to the coast to beyond the continental shelf extension down to 200 m of water depth. Therefore the main coastal circulation processes will be monitored. In the North, the meridional displacement of the Equatorial Front and the Equatorial Undercurrent activity will be determined. Off Huacho, the zonal displacement of the upwelling front as well as the cross-shore advection processes and the activity of the Peru-Chile undercurrent will be tracked. It is important to note that the fronts' positions are related with the habitat size of nektonic resources[9], as the anchovy, the giant squid or the yellowfin tuna in the North. Monitoring of chlorophyll-a and dissolved oxygen will indicate the status of biological productivity, as well as the vertical habitat size for pelagic resources and the habitat quality for aerobic demersal and benthic organisms. Measurements of pH will allow recording the response of the acidity conditions that might be amplified or buffered due to variations in SST and coastal productivity.

[9] The collection of marine and freshwater organisms that can swim freely and are generally independent of currents, ranging in size from microscopic organisms to whales. (http://www.thefreedictionary.com/nektonic)

The implementation of the gliders' platform will require a sustained system to ensure proper buoyancy and navigation of the devices, as well as basic capacities for their electronic maintenance. Also, at least one backup device is needed in order to guarantee a continuous surveillance at each pilot area. Therefore five gliders will be acquired by the project, and facilities will be installed at IMARPE headquarters for the maintenance and tests of the equipment. Recruitment and training of personnel will lead to implement an electronics team in IMARPE that will contribute to give sustainability to the surveillance platform beyond the end of the project. Furthermore, the oceanographic instrumentation of the coastal laboratories of IMARPE will be improved in order to complement the surveillance at local level and ensure the data quality from near shore areas.

On the other hand, local weather forecasting will be improved by the information provided by the meteorological stations and the satellite data mentioned above. The meteorological data will be integrated in the network of the Peruvian Survey of Meteorology and Hydrology (SENAMHI), which is the official institute that delivers weather forecast in the country.

For long-term prediction purposes, trained human resources at the modeling laboratory of IMARPE will allow to yield: (i) implemented, calibrated and verified high resolution local models of the physical processes in the coastal marine environments; (ii) implemented, calibrated and verified high-resolution bio-physic-chemical coupled local models representing impacts on high and low trophic levels of ecosystems; (iii) analyses of impacts of climate change by 2030 on biomass production under a pessimistic and optimistic IPCC climate scenarios and (iv) economic valuation of the predicted impacts of climate change on artisanal fisheries (jointly with Component 4).

Currently, there is great uncertainty about the specific impacts of climate change on Pacific coastal upwelling ecosystems. On one hand, the hypothesis of coastal warming (Vecchi, 2010) is based on a potential weakening of the Walker Circulation[10]. On the other hand, the hypothesis of upwelling enhancement (Bakun, 1990) is based on the expected strengthening of the costal winds due to the increase of thermal gradients between the land and adjacent coastal ocean. Recent simulations suggest a warming scenario, but the retrospective trends suggest a cooling scenario for the Central-Southern Peruvian coast.

Therefore this component, through the deployment of state of the art monitoring technology and complementary modeling activities, will help reducing uncertainty of current available estimations of climate change impacts on the Peru's coastal marine ecosystems. This will be achieved with the help of local high-resolution simulations of the physical manifestations like temperatures, salinities and currents, and the biological responses to climate change at local spatial scales, and for short-term and long-term climate scenarios and decision-making.

The physical processes in the Peru's coastal marine ecosystems will be modeled with the Regional Ocean Modeling System (ROMS)[11] (Shchepetkin & McWilliams, 2005; Penven et al., 2005) that will be forced by high resolution data extracted from the Weather Research and

[10] Being the result of a difference in surface pressure and temperature over the western and eastern tropical Pacific Ocean, the Walker Circulation is an ocean-based system of air circulation that influences weather on the Earth. http://www.windows2universe.org/earth/Atmosphere/walker_circulation.html&edu=mid

[11] ROMS is a free-surface, terrain-following, primitive equations ocean model widely used by the scientific community for a diverse range of applications http://www.myroms.org/

Forecasting (WRF) model[12]. Outputs from models of the IPCC (Marti et al., 2010) will be used to provide the initial and boundary conditions for the WRF model. A pessimistic (RCP8.5) and an optimistic (RCP3PD) scenario will be used at different time-slices as required.

This physical model will be coupled to a bioclimate envelope model (Cheung et al. 2008, 2009) in order to predict future changes in habitat distribution, relative abundances and catch potentials of characteristic species from the coastal upwelling systems along the Peruvian coast. The bioclimate model consists in identifying a set of physical (e.g. SST, oxygen) and biological conditions that are suitable to a given species. Thus, shifts in species distributions can be predicted by evaluating changes in bioclimate envelopes under climate change scenarios. The application of this approach has allowed the prediction of global and regional changes in fish biodiversity, biogeography and fisheries production under climate change scenarios (Cheung et al., 2009, 2010). For the achievement of this goal, IMARPE's modeling unit will need to be reinforced so the required technical capacity needed to perform the modeling is met.

Finally, a bio-economic model, characterized by the use of economic information of prices and costs, as well as fishery information of catches and biomasses will be applied to assess the economic impact of climate change on the main fishery resources for both IPCC scenarios (Van den Bergh et al., 2006). These predictions will provide the scientific basis for a better understanding of the economic impacts of climate change on the Peru's coastal marine ecosystem and the assessment of suitable and cost-effective adaptation measures.

Altogether, monitoring, modeling and prediction will contribute to the development of Ecological Risk Assessments (ERAs) related to climate change impacts on biotopes, natural banks and key selected species (see below).

In addition, undergraduate/graduate theses will be carried out on: a) population studies related to the most important artisanal fishing resources in order to guarantee its sustainable use; b) studies of alternative economic activities for artisanal fishers and their families for each pilot area; and c) studies about risks and vulnerability of fishing and aquaculture activities as well as of the coastal communities. These theses will provide support to sustainable management of coastal resources, natural banks and aquaculture, as well as study-cases of ecological risks assessments under climate change, and vulnerability assessments of local coastal communities.

<u>Component 3.</u> Capacity building and knowledge management system for implementing the EBA and the EAF, and for the dissemination of project's lessons learned, targeting government officials, academia, stakeholders and local communities

The main outputs of this adaptation measure include:

1. Development and implementation of a Knowledge Management Strategy (KMS).
2. Training and sensitizing of beneficiaries on key topics such as good fishing practices, formalization, entrepreneurship, fishery surveillance and control.
3. Design of an early warning system through a participatory process and implementation at local and regional scales.

Output 2 directly support the proposed interventions in the Component 1 (sustainable fishing practices, ecotourism, aquaculture and fishery certifications). Output 3 will directly support the

[12] A next-generation mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs http://www.wrf-model.org/index.php

monitoring activities, by building capacities for their operation and sustainability beyond the project (Component 2). Output 1 will be key to build capacities for improving the regulation framework, and the decision-making processes (Component 4).

The project's approach is to increase the resilience of the ecosystems and of the coastal communities by supporting win-win adaptation measures at different levels, in which the main tools are the partnership between the state and the communities for the rational use of the resources, the co-management on the target resources or the incentives for entrepreneurial activities leading to economic diversification.

Thus, a primary condition for the feasibility and sustainability of the adaptation measures and their up scaling to country-level is to build the self-organization capacities of the affected communities. For achieving this goal, seminars and courses will be given to artisanal fishers at each pilot site to increase their awareness of the benefits of having legal recognition, providing the law requirements and regulations which should be followed by establishing formal organizations. In addition, local promoters will provide assistantship to fishers associations that undertake the process, and also will work on engaging other community members for joining the self-organization process. The Direction of Artisanal Fishery in the Ministry of Production has experience in organizational strengthening and they will collaborate in the project during training courses for fishers. As well, the Direction of Biological Diversity of the Ministry of Environment will support the capacity building of fishers.

Replacement of non-selective for selective fishing gears will require demonstrative training. Through agreements with fishers associations, one or a limited number of fishing boats will be equipped with new fishing gears for training the fishers until they acquire the necessary skills; they will also be provided with all the information of the gear life-cycles, maintenance costs and adaptation needs in the fishing units. In parallel, seminars will be offered to fishing communities to transfer the knowledge on the benefits of adopting new fishing practices in terms of resource sustainability, quality of their incomes, and compliance with management policies. The gears' replacement for the target fleet will take place once the training phase will be achieved. In addition, artisanal fishery will benefit from surveillance of fishery operations from fishers.

Technical assistance will be given to initiate fishery certification, first by disseminating the benefits of certification such as improving the value of the fish products, then by giving assistantship during the different phases of the process (pre-certification assessments, steps to encompass to meet the requirements, etc.), including those requirements related to the improvement of management plans for target species. For the latter, technical training will also be given to policy-makers and management scientists.

IMARPE will improve a system of dissemination of fishery and environmental information through cellphones of fishers ("INFOMAR" program). This system will allow fishers to know prices, biological data and other valuable information coming from monitoring devices.

In pilot sites, assistantships for enterprise management, marketing and for business plans will be provided to ensure a profitable demand of the fish products. For those small enterprises to be constituted for ecotourism and aquaculture, training and/or assistantships will not be limited to know-how and technological needs, but also to give the basic skills for an adequate enterprise management, marketing and business plans. Seminars and short course cycles will be organized and offered to local communities and fishermen' family members, particularly local students about these issues. Finally, education and training will also be provided for tasks of basic environmental

monitoring, surveillance and control. These responsibilities will be offered as means of partnership with the project, and they will help to internalize the co-management approach.

Given these elements, it is clear that the capacity building component is an essential part of the adaptation project. Training communities imply a major effort in terms of awareness campaigns, courses, seminars and assistantships. An approach that will be applied is to carry out training and education for local promoters, who will be able to disseminate the education contents for a larger universe of potential beneficiaries, following a well structured Knowledge Management Strategy (KMS). The KMS also includes a continuous, opened and friendly web information system reporting local weather conditions and early warnings for oceanographic or environmental events as red tides, jellyfish blooming, or anoxia for local stakeholders, scientific community and general public (see also Component 2). In addition, the website will publish news, guidelines, technical material, information on good practices and program's lessons learnt targeting the fisheries community and including the general public, stakeholders, local communities and academia (see also section G).

It should be noted that all of these efforts will be articulated with existing agencies or actions plans on entrepreneurial capacity building in the local, regional and government levels. For example, the Ministry of Production, to which the Vice ministry of Fisheries belongs, includes a Vice ministry of Small and Medium Enterprises and Industries, whereby several programs to reduce poverty and increase social inclusion take place. In addition, the project will support communities and fishers associations to make use of the consultation mechanisms for planning annual budget, in order to get funding support for actions oriented to multiply training and education programs for artisanal fishing communities giving sustainability to the project in the longterm.

On the other hand, training and continuous formation of technical and scientific staff are needed to achieve a sustainable expertise in the application and/or implementation of the principles of the EBA and the adoption of an Ecosystem Approach to Fisheries[13] (EAF) by the fishery management system. EAF recognizes the interdependence between ecosystem health and human well-being and the need to maintain ecosystems productivity for present and future generations.[14] This effort will encompass a more intense collaboration with the academic system, and national and international scientific institutions.

The Ecological Risk Assessment methodology will form the basis for an effective implementation of the EAF (Fletcher et al., 2002; FAO, 2003, 2005). The ERAs are currently being used for assessing climate change impacts in fisheries and key species of marine ecosystems. The ERAs can provide thorough assessments of the sensitivity and tolerances of critical life history stages, habitats and phenology of key species to climate change drivers. Then they contribute to identify key issues that will affect policy decisions and management arrangements. These risk assessments and the targeted scientific studies that may follow from this prioritization will be

[13] EAF is defined by Ward et al. (2002) as "an extension of conventional fisheries management recognizing more explicitly the interdependence between human well-being and ecosystem health and the need to maintain ecosystems productivity for present and future generations, e.g. conserving critical habitats, reducing pollution and degradation, minimizing waste, protecting endangered species".

[14] In terms of climate change adaptation and building resilient systems (i.e. including reducing exposure and increasing adaptive capacities), the application of the EAF would be an important contribution to maintaining biodiversity, preserving the resilience of human and aquatic systems to change, and improving our capacity to anticipate and adapt to inevitable climate induced changes in aquatic ecosystems and the related fisheries production systems. (***Fisheries and aquaculture in our changing climate: adaptation and mitigation measures in fisheries and aquaculture*, 29th Session of the Committee of Fisheries, Italy 2011)**

necessary for ensuring that the potential impacts of climate change on key marine resources are also communicated effectively to the government and stakeholders. This approach will help to ensure the development of policies and intervention measures to mitigate existing or future risks, by optimizing adaptation responses (e.g. by providing flexible management arrangements) and seizing opportunities as they arise (e.g. for species where productivity increases) (Pecl et al., 2011).

As this is a relatively new approach to fishery management, adequate training will have to be provided for staff from the Vice Ministry of Production and IMARPE in order to ensure a widespread understanding of its value and effectiveness as well as its correct implementation.

Component 3 will receive inputs from Component 2 as stakeholders will be trained in the use of outputs from scientific models, ocean monitoring and ocean surveillance system, in particular information of local climate change scenarios, harmful algal blooms, sulphidic plumes, and extreme events such as El Niño.

<u>Component 4.</u> Management policies, regulations and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress

Two major external factors are likely to shape Peruvian fisheries in the future: (a) the continuous growth in global demand for fishmeal and fish oil (Merino et al*.,* 2010), and (b) the expected influence of climate change on the frequency and intensity of ENSO events (Tsonis et al., 2003). The degree to which these factors will affect the economic, environmental and social sector's performance will depend largely on the capacity to build a legal and regulatory environment conducive of a more economically viable and biological resilient sector.

In this regard, the business as usual system regarding the management and governance of fisheries, especially the artisanal, is not an option. Currently, artisanal fishery possesses right to fish within 5 nautical miles of the coastline and small scale fishery from 5 to 10 nm. However, due to changes in location and abundance of catch, artisanal and industrial fisheries frequently interfere leading to conflict and increased pressure on the natural resources. Leaving the current system of weak governance and major regulatory gaps in place will likely create additional stress in the biological system and accentuate the cycles of collapse and slow recovery. These will further increase inefficiency in the utilization of the fishing and processing investments, exacerbate stress on the ecosystem and result in poor returns from the sector to Peru's economy. Strengthening the governance of the sector could reduce some of the losses and capture significant benefits in ecosystem resilience to the expected impacts of climate change.

The Peruvian Governement has adopted several control measures for the sustainability of fishing resources that ensure compliance with its "General Law on Fisheries":

1. Measures of conservation of "juvenile" and prohibition of the disposal of hydrobiological resources. Regulatory framework: D.S. No. 008-2012-PRODUCE. Through this legal device, the fishing permit holders are forced to suspend their fishing labors when captured hydrobiological resources surpass the limit of tolerance of juvenile fish, reporting to the competent authority the area in which it had extracted these specimens to facilitate the suspension of extractive activities in the area. Similary it is forbidden strictly to discard hydrobiological resources at sea.

2. Schedule of inspectors on Board of the Ministry of Production. Regulatory framework: D.S No. 008-2012-PRODUCE. Using the reference regulatory framework is implemented program inspectors on board fishing vessels, allowing State to verify in the sea, the proper development of the extractive activities and the compliance with fisheries regulations, giving priority to obtaining information about the presence of copies in less than the permitted sizes; It also obliges holders to allow the monitoring and supervision of inspectors.

3. Fishing vessels monitoring satellite (SISESAT) system. Regulatory framework: D.S.No. 012-2001-PE, D.S.No. 001-2014-PRODUCE. Using the referred legal device undertakes to the vessels of larger scale and smaller-scale fishing permit holders (only extraction of *Engraulis ringens* and *Anchoa nasus*) to having a satellite tracking system that will allow its monitoring and constant monitoring during fishing activities, allowing to identify incursions in prohibited areas or booking.

4. Signing of agreements of supplying resources for anchovy and white anchovy for direct human consumption. Regulatory framework: D.S. N° 010-2010-PRODUCE, R.M. N ° 309-2013-PRODUCE, R.D. N° 133-2014-PRODUCE/DGCHD and its modifications. In order to ensure the traceability and comprehensive utilization of resource hydrobiological intended for direct human consumption, preventing the intrusion of the "black fishing" within the productive chain and the illegal diversion of resources, has established the signature of agreements between holders of fishing permits and owners of processing plants of fishery products for human consumptionthe same who obey directives from subscription and fulfilment.

5. Issuance of certificates of origin (macroalgae and products of processing products for indirect human consumption). Regulatory framework: D.S. No. 019-2009-PRODUCE, Directoral Resolution No. 019-2013-PRODUCE/DGSP. Through the certificate of origin is credited the origin and destination, the traceability of the quantities extracted, collected or produced ant the existing stocks as well as movement for it transport or marketing.

6. Program of surveillance and control of fishing activities and aquaculture at the national level. Regulatory framework: D.L. N° 1047, D.L N ° 25977, D.S. No. 012-2001-PE, D.L N ° 1084, D.S No. 027-2003-PRODUCE, D.S.No. 008-2013-PRODUCE. The referral program provides supervision at the level of entire coastal area actions, carried out by inspectors accredited by the Ministry of Production, as well as inspectors of certifiers hired for that purpose, in order to combat illegal activities of extraction, landings, production, processing and marketing of hydrobiological resources, their discards and waste, as well as illegal activities in the aquaculture.

7. Management plan for anchovy (D.S. 006-2015-PRODUCE), including quotas for direct human consumption.

8. Ministerial Resolution N° 199-2002-PRODUCE authorizes guilds, associations and the social organizations of artisanal fishers to create Surveillance Committees of Artisanal Fisheries within their local area and Regional Surveillance Committees of Artisanal Fisheries (COREVIPAS). Also, R. M. N° 045-2003-PRODUCE states that Regional Governments are in charge of creating these committees.

In addition, specific measures are being adopted to manage artisanal fisheries in three components: a) strategic management (on board surveillance of juveniles, interconnected tracking modules of fishery products in roads, satellite monitoring of small scale fishery, control of weighing systems and inspection of processing plants), b) operative management (preventive

control, concurrent control, closure of juvenile areas, and posterior control) and c) administrative management (inspectors, lawyers, communicators).

Diagnostics and analysis of the current situation with fisheries and artisanal fishing indicate that a great challenge is posed by the fishery surveillance and control of landings in many sites, by many boats targeting different species in the most productive marine ecosystem in the world. The GoP recognizes the following weaknesses and limitations in order to control effectively the artisanal activity:

(i) Limited amount of inspectors,
(ii) The Peruvian littoral has 3080 km long, which makes total control of landing activities of hydrobiological resources very complex, focusing mainly in supervision of large harbors and artisanal coves.
(iii) Weakness of Social Organizations of Artisanal Fishers (OSPAS), which collaborate with the Ministry of Production, with surveillance of enforcement of norms in the fishery sector, through the Surveillance Committees and Regional Surveillance Committess of Artisanal Fisheries (COREVIPAS). Currently, there is no strong presence of surveillance committees and the present ones are not organizationally strengthened because many of them have not appropriated the responsibility of supporting the competent institutions in surveillance and conservation of hydrobiological resources.
(iv) Wide ignorance of the fishery law and behaviors rooted in bad fishery practices which threaten sustainability of hydrobiological resources, both in agents and consumers.

In this sense, new approaches are needed. One such approach is to empower the community through co-management of fishing grounds and create incentives for the management of the natural resources upon which their livelihoods depend. Co-management of coastal marine ecosystem is not new (FAO 2014), but its application and implementation in Peru to artisanal fisheries is. A demonstrative co-management experience in San Juan de Marcona contributed to resource sustainability thanks to fishers participation in surveillance and control (Zavala 2015).

This new approach will be complemented by (i) capacity building and technical assistance to strenghthen fishery organizations in normative and fishery management issues (minimum sizes, legally protected species, time limits, good practices, commitments of responsible fisheries), (ii) strengthening managers from Regional Directions of Production for the control of artisanal fishery activities, (iii) strengthening the regulatory framework of the “Regional Committees of Artisanal Fishery Surveillance” (COREVIPAS) to establish an early warning system, grievance system (DQR), as well as incentives such as donation of confiscated resources to artisanal communities which are involved in surveillance and control of fishery resources, and (iv) promoting education at schools on hydrobiological resources conservation.

The main objectives of this component is to create the enabling condition for the successful implementation of community based management of coastal marine ecosystems in Peru, and to strengthen the current trans-sectoral institutional arrays for the integrated coastal management.

The project aims for the transformation of the sector through the adoption of policies focused on the development of artisanal fisheries according to an ecosystem approach to fisheries which will make them more resilient to future climate variability and change. For example, to achieve the objective of developing competitive artisanal fishery, some of the selected strategies are to improve the levels of formalization of the artisanal fishing community and to promote the strengthening of the organization of fishing associations, cooperatives and small enterprises. For aquaculture, the strategies include supporting a diversified and environmental sustainable

activity, as well as encouraging research, development, adaptation and technological transfer. For sustainable fisheries, a program will be developed for risk assessments, prevention and mitigation of impacts by natural disasters, El Niño and climate change, over fisheries and aquaculture (Ministerio de la Producción, 2012).

The project will provide the scientific basis and strategic guidance for developing the recently proposed guidelines for the fisheries sector established by the current government. These guidelines aim the transformation of the sector through the adoption of policies focused on the development of artisanal fisheries according to an ecosystem-based-management approach, which will make them more resilient to future climate variability and change. As part of such orientation, management documents such as the Fisheries Sector Strategic Plan, the National Artisanal Fisheries Plan and the National Aquaculture Plan 2010-2021 propose climate adaptation mainstreaming as a priority action in their environmental sustainability components.

Therefore, this component seeks to work with all key stakeholders in creating the legal framework and the organization set up required empowering the community in their responsibility to manage their source of income and wealth. As the institutional framework is developed the community will be trained (component 3) to strengthen their organization; to better understand the functioning of the ecosystem to anthropogenic activities; to execute the tasks of surveillance and control; to collaborate in the ecosystem monitoring; in developing effective relations with government agencies involved in coastal marine areas; and, in managerial habits and skills to run community organizations and to co-manage the area under their administration. Co-management plans will define clearly the access mechanisms to hydrobiological resources within these areas in order to avoid conflicts with other communities.

This component seeks to frame the creation of community management of coastal marine ecosystem within efforts developing and implementing a science-based decision-making process concluding in a comprehensive implementation of the EAF[15] in the Peruvian coastal marine ecosystems. In addition to components 1-3, described above, this component will particularly focus on the support to the national and local governments for developing and implementing a governance strategy that takes into consideration all relevant stakeholders, empowers the community to manage the coastal marine ecosystem, regulates the access to the riches of the ecosystem under community management, and creates an enabling environment for the long-term sustainability of artisanal fishery. This governance strategy will include the improvement of current land use policies, e.g. through technical support in adequate risk assessments which consider coastal vulnerabilities to climate change. In addition, it will include the equitable allocation of property and fishing rights in order to ensure sustainable development, the effective application of surveillance and control on the exploitation of the coastal marine ecosystem, a community agreed distribution of social benefits of the common uses of the ecosystem, and the exclusivity of the fishing rights. This will require intense collaboration with artisanal fisheries in order to jointly develop alternative, non-traditional sources of income.

This will be accomplished through: (i) Supporting national and regional governments and trans-sectoral programs enacting regulations and executing policies facilitating the EBA and applying the EAF, such as empowering communities to participate in the management of coastal marine areas, implementation of the Economic and Ecological Zoning of the coastal marine environment, planning and investing on pollution abatement and conservation of coastal habitats; and

[15] EAF recognizes the interdependence between human well-being and ecosystem health and the need to maintain ecosystems productivity for present and future generations.

introducing regulations and policies empowering local communities to co-manage marine concession areas; (ii) Supporting the implementation of the Master Plan for the Guano Islands, Islets and Capes National Reserve System in Huacho area and improve its control capacity over its radius of competence, establishing permanent ”no–take” areas, and other regulations on the use of coastal marine resources; (iii) Supporting local, regional and national agencies for the sustainable management of fishing grounds and fisheries resources, through incentives for community management and improved use of scientific information and knowledge to inform decision-making (i.e. optimal catching volumes) according to EAF; and, (iv) Supporting the implementation of ERAs for selected key species that inhabit the pilot area, incorporating climate change impacts, as tools for adaptive management.

The project governance activities will take place in coordination with the Multisectoral Commission of Environmental Management of the Coastal Marine Medium (COMUMA), created in 2013 by the Ministry of Environment with the aim to coordinate, articulate and monitor the environmental management of the coastal marine medium.

Summary of adaptation measures at both pilot areas

The tables below provide a summary of the main adaptation actions in Máncora and Huacho, which aim to improve the resilience capacity of the main fishing resources and of the local fishing communities. A more comprehensive description is available in Annex I.

COMPONENT	ADAPTATION ACTIVITIES IN MANCORA
Component 1	✓ Expansion of improved fishing practices and promotion of environmentally friendly gears. ✓ Promotion of market incentives for the good practices in the artisanal fishery of yellowfin tuna and hake, following principles of : i) fish stock sustainability; ii) minimal environmental impact; and iii) effective management and access to high-value markets. ✓ Developing alternative and additional sources of income by facilitating the emergence of ecotourism (e.g. boat trips, whale-watching, recreational fishing). ✓ Conversion of fishery residues into biofertilizers.
Component 2	✓ Deployment of a climatic and oceanographic onshore-offshore surveillance system, coupled with local bio-environmental monitoring. ✓ Output of models of local circulation, biochemical fields (oxygen, chlorophyll-a) and habitat distribution for key species, as forced by climatic changes of boundary oceanographic conditions. ✓ Baseline assessments leading to the management of natural banks and know-how for sustainable aquaculture of selected species. ✓ Development of Ecological Risk Assessments (ERA) of key target species and other science based tools for climate change.
Component 3	✓ Support and technical assistances to fishers associations for building self-organization and attain formal registration in the legal system.

	✓ Training and technical assistances to fishers associations for building management and marketing skills for ecotourism and fish products commercialization in order to access directly to high value markets. ✓ Training fishers in environment friendly practices facilitating access to improved fishing gears, and certification process. ✓ Education and training for basic environmental monitoring and for tasks of fishery surveillance and control. ✓ Education and training to students and communities leading to sustainable management of coastal resources, natural banks and aquaculture, taking into account ecological risks under climate change. ✓ Training and strengthening government institutions responsible for creating the enabling environment for long-term sustainability. ✓ Training local scientists and key stakeholders in the use of science based information and tools related to the coastal marine ecosystem, following the EAF and EBA. ✓ Design and implementation of early warning systems of weather conditions, red-tides and extreme events.
Component 4	✓ Support local, regional and national agencies in the selection, analysis, development of management plans and management of marine protected areas. ✓ Support local, regional and national agencies for the sustainable management of fishing grounds and fisheries resources, by introducing incentives for community management and improved information and knowledge to inform on optimal catching volumes, according to EAF. ✓ Support the implementation of an ecological risk assessment process for selected key species that inhabit the pilot area, in relation to climate change impacts, as tools for adaptive management. ✓ Supporting national and regional governments enacting regulations and executing measures for facilitating the EBA and applying the EAF, as: a) pollution abatement and conservation of coastal habitats; and b) introduction of regulations and policies empowering local communities to co-manage marine concession areas.

Table 6. Summary of adaptation measures showing the articulation among project components in the pilot site of Máncora

COMPONENT	ADAPTATION ACTIVITIES IN HUACHO
Component 1	✓ Following-up of sustainable fishing practices and use of environmentally friendly fishing gears for anchovy with profitable products (initiated through the IBD funded project); ✓ Promotion of extensive aquaculture of scallops as an economic alternative and restoration of natural banks in protected areas to create sources of larval supply for new aquaculture projects. ✓ Co-management of natural banks for controlled extraction of razor clam. ✓ Promotion of start-up of the fishery certification process for the artisanal fishery of razor clam, following principles of : i) fish stock sustainability; ii) minimal environmental impact; and iii) effective management and access to high-value markets. ✓ Conversion of fishery and aquaculture residues into biofertilizers.
Component 2	✓ Deployment of a climatic and oceanographic onshore-offshore surveillance system, and a bio-environmental monitoring of the islands, capes, banks and culture systems within and outside the protected areas. ✓ Output of models of local circulation, biochemical fields (oxygen, chlorophyll-a) and habitat distribution for key species, as forced by climatic changes of boundary oceanographic conditions. ✓ Strengthening applied research activities leading to the management of natural banks and know-how for sustainable aquaculture of selected species. ✓ Development of Ecological Risk Assessments (ERA) of key target species and other science based tools for climate change
Component 3	✓ Support and technical assistances to fishers associations for building self-organization and attain formal registration in the legal system. ✓ Training and technical assistances to fishers associations for building management and marketing skills for sustainable aquaculture and fish products commercialization. ✓ Training fishers in environment friendly practices facilitating access to improved fishing gears, and certification process. ✓ Education and training for basic environmental monitoring and for tasks of fishery surveillance and control. ✓ Education and training to students and communities leading to sustainable management of coastal resources, natural banks and aquaculture, taking into account ecological risks under climate change. ✓ Training and strengthening government institutions responsible for creating the enabling environment for long-term sustainability. ✓ Training local scientists and key stakeholders in the use of science based information and tools related to the coastal marine ecosystem, following the EAF and EBA. ✓ Design of an early warning system through a participatory process.
Component 4	✓ Supporting the formulation and implementation of the Master Plan for the Reserve of Islands, Islets and Capes in the Huacho area and improve its control capacity over its radius of competence, leading to

	the establishment of permanent 'no-take' areas, transient 'no-take' areas for the re-stocking of natural banks, areas for special concessions for extensive aquaculture to artisanal fishers, areas for ecotourism use, and also areas for scientific experimentation and environmental monitoring. ✓ Supporting national and regional governments enacting regulations and executing measures for facilitating the EBA and applying the EAF, as: a) implementation of the Economic and Ecological Zoning of the coastal marine environment; b) pollution abatement and conservation of coastal habitats; and c) introduction of regulations and policies empowering local communities to co-manage marine concession areas. ✓ Support local, regional and national agencies for the sustainable management of fishing grounds and fisheries resources, by introducing incentives for community management and improved information and knowledge to inform on optimal catching volumes, according to EAF. ✓ Support the implementation of an ecological risk assessment process for selected key species that inhabit the pilot area, in relation to climate change impacts, as tools for adaptive management.

Table 7. Summary of adaptation measures showing the articulation among project components in the pilot site of Huacho.

B. Describe how the project / programme provides 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 will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The fishing sector employs around one hundred sixty thousand (160,000) people. Fish products make up 11% of Peru's exports. Artisanal fishing is an activity that employs many people. They provide the basic source of protein and food for people living along the coastline. Despite the importance of artisanal fisheries in food production, 54% of artisanal fishers[16] are under the poverty line, lacking basic health and education. Therefore artisanal fishing communities are very vulnerable communities to climate change impacts.

Direct beneficiaries of this proposal will include fishermen receiving environmental friendly fishing gears, support for starting fishery certification, material and support for ecotourism, aquaculture and restocking of natural banks. The artisanal fishing communities that will benefit from these interventions are: Máncora, El Ñuro, Órganos and Cabo Blanco in northern Peru, and Végueta, Huacho and Carquín in central Peru.

[16] Latarsha Dansie "Socioeconomic status and prospects of the fishing industry", Riso Centre, available at: http://www.centrorisorse.org/socioeconomic-status-and-prospects-of-the-fishing-industry.html

An initial number of beneficiaries per type of adaptation measure is summarized in the following table 8.

Intervention	**Beneficiaries**
Sustainable fishery	500 fishers of Máncora, El Ñuro, Los Órganos and Cabo Blanco coves.
Ecotourism	At least 50 fishers, organized in at least 2 small cooperative enterprises.
Aquaculture	At least 50 fishers of 2 fishers associations involved in aquaculture, creation of aquaculture enterprises owned by the artisanal communities.
Co-management	At least 100 fishers of 2 fishers associations involved in natural banks restoration and co-management.

Table 8. Direct beneficiaries of the project.

Indirect beneficiaries include fishers from other coves which will learn successful lessons from the pilot areas and family members of direct beneficiaries. According to updated information from IMARPE sources (Tables 3 and 5), by 2015 the Máncora cove had about 650 fishermen and 125 boats, El Ñuro cove had 350 fishers and 170 boats, Los Órganos cove had 600 fishers and 105 boats, and Cabo Blanco cove had 600 fishers and 200 boats. These numbers give around 2000 fishers in all coves, and taking into account the direct family members, at least 8000 people depending on fishery activities, will be indirect beneficiaries in this pilot area.

Similarly, by 2012 the Végueta cove had 160 artisanal fishers and 50 boats, the Huacho fishing harbor had 907 fishers and 243 boats, and Carquín cove had 250 fishers and 150 boats. These numbers give around 13107 fishermen in all the coves, and taking into account the direct family members, at least 6000 people depending on fishery activities, will be indirect beneficiaries in this pilot area.

An initial group of benefits per type of adaptation measure is summarized in the following table.

Sustainable fishing and marine certification	
Economic benefits	Increased income of fishermen due to increased quality and value of fishes, higher price of fishery products
	Savings in operative costs of fuel associated to change of fishing gear
	Increase of employment for processing and marketing fishery products
	Improved management of fishery resources
	Bioconversion of fishery residues into liquid and solid biofertilizers.
	Start of fishery certification allows access to international market
Environmental benefits	Increased biodiversity, resilience of marine ecosystems and recovery of depleted species

	Increased selectivity of fishing gears and reduction of by-catch
	Reduction of greenhouse gases coming from savings of fuel associated to change of fishing gear
	Improved precautionary and adaptive management of natural banks and fishing grounds using the Ecosystem approach to Fisheries
Sociocultural benefits	Improved food security providing high quality seafood
	Conservation of fishery resources for recreation, ecotourism, education and ethical value
Gender considerations	Participation of women in preprocessing and commercialization of fishery products.
Ecotourism	
Economic benefits	Economic diversification by means of a fee for using the boats, tourist circuit, guidance
	Generation of positive externalities (handcraft, food, etc.)
Environmental benefits	Promote creation of future tropical marine protected area and implementation of Master Plans at existing protected islands and capes
Sociocultural benefits	Increased environmental consciousness of local communities and visitors
Gender considerations	Participation of women in marketing handicraft souvenirs made of marine materials and in tourist guiding or business management.
Aquaculture	
Economic benefits	Increased income due to increased offer of high quality fishery products for exportation to international market.
	Increased employment, through processing and marketing activities.
Environmental benefits	Co-management of natural banks and aquaculture ensure production sustainability through surveillance and control of fishery resources by fishers.
	Restoration of natural banks complementing aquaculture activities with “no-take” zones in marine protected areas.
	Better knowledge of environmental and biological parameters of species under intervention through monitoring and modelling.
Sociocultural benefits	Encourage fishermen to develop their own enterprise, with competitive advantages, potential certification and access to national and international markets.
	Improved management of fishery resources.
	Availability of marine resources for future generations.
Gender considerations	Participation of women in preprocessing and commercialization of aquaculture products.

Table 9. Tangible and intangible benefits derived from interventions

It is expected that incorporating new concepts of operation and management of marine resources, will develop a sustainable and stable production, will increase the commercial value of the catch, and will also contribute to the creation of new and complementary sources of employment, improving the socioeconomic conditions of fishers and their families.

If no interventions are made in a short-time period, the fishery sector of Peru, and the coastal fishing communities that depend on it will be strongly affected. Low ecosystem productivity, foreseen species migrations and changes in their habitats due to changes in ocean temperatures, will lead to a smaller fish stock availability in the ecosystem, directly affecting artisanal and industrial fishers catches and resulting in strong economic losses and an increased unemployment rate. Furthermore, artisanal fishers, with small boats, limited fishing areas and few alternatives, will bear relatively greater socioeconomic impacts than industrial fishers with their larger and more mobile boats and greater access to financial capital and substitute fisheries (Brander, 2007; FAO, 2009; Grafton, 2010).

Through the development of science-based information that will guide policies and management in the ecosystem and the deployment and operationalization of an effective surveillance system that will support fisheries management, the project will contribute to a better understanding of the potential impacts of climate change on the ecosystem productivity and habitat distribution for marine resources along the coast as well as to improve the capacity to predict short-term events and long-term changes in the coastal marine ecosystem triggered by climate change.

Furthermore, by strengthening institutions and governance at national and local levels the project will provide environmental benefits to fishermen by contributing to guarantee the sustainability of fishing practices under a highly variable climate system. Moreover, the project will contribute to the improvement of the adaptive capacity of vulnerable coastal communities to climate change by performing specific interventions in the pilot areas.

Additionally, through the development of a framework that will facilitate capacity building and the dissemination of project's lessons learned, the project will improve the availability to generate and interpret data and information on the potential impacts of climate change on marine ecosystems, and this will help to better identify long-term adaptation measures.

The project does not involve large infrastructure that could alter natural habitats, thus it is a project with few adverse environmental or social impacts. The proposed activities related to extensive aquaculture and stocking/re-stocking of natural banks are considered as minor scale. Instead the project will contribute to improve environmental and social conditions in the target areas, in compliance with the Environmental and Social Policy of the Adaptation Fund.

C. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.

As already indicated the Adaptation to the Impacts of Climate Change on Peru's Coastal Marine Ecosystem and Fisheries applies the concept of piloting community based ecosystem management for artisanal fishers through the introduction of "areas of exploitation" in the regulation. These areas of exploitation are well-defined coastal marine zones upon which the government agrees giving the community the rights for an exclusive use of the marine natural resources and creates the incentives for the community to manage their area in a sustainable manner. To do this the government will also provide training, knowledge and accurate information as well as the implementation of tangible and very specific adaptation measures, selected from the list of good practices recommended by FAO and complementary interventions to provide alternative sources of employment and income to the fishers community (for example ecotourism activities). These no-regret activities will be

complemented with actions to enhance the enabling environment (working with local governments in developing land use plans compatible with and reinforcing the long-term sustainability of the productivity of the coastal marine ecosystem). Furthermore, the Project includes activities to monitor the ecosystems, their productivity and the wellbeing of the fishers community to provide feedback to the day to day operation as well as to secure that lessons learned are identified and used by local and national government in guiding further policy development and facilitating the scaling up of similar interventions.

The cost-effectiveness argument for this integrated approach runs a two prone track. On one hand each individual investment will be tested to produce benefits greater than the costs, on the other hand, the overall program of activities is a pilot at selected sites from which the GoP could learn on the effectiveness and sustainability of empowering local communities to manage coastal marine ecosystems sustainably. Community management will be flexible to the input from science and the information collected through the monitoring system, creating an adaptive management environment to incorporate and cope with the impacts of climate change.

Pilot interventions are proven approaches through which governments experiment complex management options, collect information and lessons learned before embarking in scaling-up (large investment) the initiative. This is a sound and effective way to explore new policy and management options without risking large volume of resources. The approach selected is therefore cost effective.

As indicated, each single adaptation measure will be selected only if it proves to be financially viable. Although at this time there are only preliminary cost benefit analyses for the proposed adaptation measures, the GoP has indicated the need for each individual measure to demonstrate that benefits generated are greater than the costs incurred. Some measures are presented as examples of the cost benefit analysis expected by the GoP.

Sustainable fishing

From the economic assessment point of view this intervention seeks to introduce sustainable fishing practices and promotion of environmentally friendly fishing gears combined with the access to high-value markets for local artisanal fishers.

The cost structure of this intervention includes: Cost of environmentally friendly fishing gears for each boat in the program; costs of installation of the new gears in the existing fleet (45 boats); maintenance and operation costs; reduction of cargo space due to refrigeration needs (as required for certification) implying a reduction in potential catch volume; training costs and incidental expenses such as developing business plans and strengthening community leaders to proactively participate in the development of coastal marine ecosystem management plans.

Benefits are associated with changes in marine activities and the higher value of the catch. For example in the case of yellow fin tuna the price difference is from US$ 6,000/ton to US$ 32,900/ton. These high values are only achievable if the fleet is internationally certified following the principle defined by FAO.

The resulting stream of costs and revenues are calculated based on historical landing statistics and costs figures found in field surveys. The comparison between the costs and revenues stream for a period of 10 years with and without project was calculated. Results are

summarized in Table 10. As shown, this no-regret investment has a high rate of return on investment, which is a condition for its long-term sustainability. The investment required is, nonetheless, beyond the financial capabilities of the individual artisanal fisherman. As a financially viable measure this activity will contribute to improved environmental management in the coastal marine ecosystem, create awareness on environmental management and climate change impacts, strengthen quality control activities and contribute to community management of their fishing grounds. This activity will also benefit from the flow of information from component 2 even if such considerations have not been included in this preliminary benefit and costs analysis.

Sustainable aquaculture

Aquaculture of scallops in bottom pens will generate economic incomes for fishers, part of the harvest will be used to sustain natural banks restoration, and benefits will be invested in capacity building of fishers and monitoring of the larvae. The intervention will include a concession of 10 ha outside the marine protected área. Investment costs cover bottom pens, boats, initial seeds and an artisanal hatchery. Operation costs cover human resources, monitoring of banks, harvest, transport and administrative fees.

Promotion of Ecotourism Activities

Ecotourism is a site-specific activity and a function of the available natural resources upon which the activity could be anchored. Ecotourism as a global industry is growing at rates near 20% per year, as more people become aware of the beauty of nature and the importance of ecological preservation for future generations. The ecotourism specific activities were identified for Máncora pilot area taking into account its particular characteristics. In general the proposed activities are summarized in boat trips with the purpose of: touring and sightseeing; fishing with different gears (fishery-tourism); wildlife sighting (whales and other cetaceans). Although many complementary activities are included in the ecotourism business (food and drink services, handcrafts, clothing, etc.) the economic analysis is centered only in the boat rides component.

The cost structure of this no-regret activity includes all the cost for training, improvement of boats, implementation of adequate safety measures and gears, and operational and administrative costs associated with the activity.

Natural banks restoration and co-management

Restoration of a natural bank of scallops in a marine protected area (Don Martin Island) will be beneficial as a source of larvae for aquaculture. Seed for restoration will be initially acquired from nearby hatcheries, and later will come from larval collectors and from a part of aquaculture harvests. Cost fluxes consider a life span of scallop of four years. Social rentability is calculated with an index of cost-effectivity as no private rentability exists for restoration of natural banks in marine protected areas.

Production of biofertilizers from fishery residues

Fishery industry for human consumption and aquaculture generate residues with a high nutrient content and a great potential of conversion into organic fertilizer for agriculture or into animal food. In this context, the present project aims to valorize fishery residues through a homolactic fermentation process using bioprotecting microorganisms (Bio-Lac), and in

addition it will solve the environmental problem of fishery residues disposals and reduce dependency from chemical fertilizer in agriculture.

Table 10. Cost/benefit analysis for the different adaptation measures

Cost-Benefit Analysis using Net Present Value Method

1. Sustainable Fishing & Certification

Máncora

(in Nuevos Soles)

Description	Period 0	1	2	3	4	5	6	7	8	9	10
Cash Outflows											
Investment	61,927	520,991	516,465	355,436							
Operation Costs without Project											
Fuel		-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883
Change of Fishing Gear											540,000
Sub total		-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-1,282,883	-742,883
Operation Costs with Project											
Fuel		-1,349,005	-1,349,005	-1,349,005	-1,349,005	-1,349,005	-1,349,005	-1,349,005	-1,349,005	-1,349,005	-1,349,005
Annual Audit for Certification					-100,000	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000
New Certification Process									-140,000		
Sub total		-1,349,005	-1,349,005	-1,349,005	-1,449,005	-1,449,005	-1,449,005	-1,449,005	-1,589,005	-1,449,005	-1,449,005
Maintenance without Project											
Maintenance Fishing Gear (gillnet, purse seine)		-204,100	-204,100	-204,100	-204,100	-204,100	-204,100	-204,100	-204,100	-204,100	-204,100
Maintenance with Project											
Maintenance Fishing Gear (long line, hook)		-54,000	-54,000	-54,000	-54,000	-54,000	-54,000	-54,000	-54,000	-54,000	-54,000
Cash Inflows											
Benefits without Project											
Income: Local Sales of Fresh Yellowfin Tuna		1,901,001	1,901,001	1,901,001	1,901,001	1,901,001	1,901,001	1,901,001	1,901,001	1,901,001	1,901,001
Benefits with Project											

Income: Export Sales of Fresh Yellowfin Tuna		1,901,001	2,023,488	2,145,974	2,268,460	2,390,947	2,513,433	2,635,919	2,758,405	2,880,892	3,003,378
Net Flow	-61,927	-437,012	-310,000	-26,484	351,437	473,924	596,410	718,896	701,382	963,869	546,355
VAN	1,451,181										

Notes

1. Discount rate 10%	*10%*
2. Project duration - 10 years	*10*

3. Artisanal fishery is not subject to IGV or IR taxes

Cost-Benefit Analysis using Net Present Value Method

2. Sustainable aquaculture

Huacho

(in Nuevos Soles)

Description	**Period**										
	0	1	2	3	4	5	6	7	8	9	10
Cash outflows											
Investment costs	398,320	796,640	796,640	0	0	0	0	0	0	0	0
Operation & maintenance costs			1	437,012	437,012	437,012	437,012	977,012	437,012	437,012	437,012
Sub total		796,641	1,233,652	437,012	437,012	437,012	977,012	437,012	437,012	437,012	437,012
Cash inflows											
Income		525,000	525,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Net flow		-271,641	-708,652	612,988	612,988	612,988	72,988	612,988	612,988	612,988	612,988
Net Present Value (NPV)	1,166,937										

Notes

1. Discount rate 10%
2. Project duration - 10 years
3. Period for replacement of lines - 5 years
4. Years 1 and have only one harvest
5. Years 3 - 10 have two harvests
5. Artisanal fishery is not subject to IGV or IR taxes

Cost-Benefit Analysis using Net Present Value Method

3. Ecotourism enterprises

Máncora

(in Nuevos Soles)

		Period									
Description	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Cash Outflows											
Investment	449,265	1,150,848	61,078	61,078	0	0	0	0	0	0	0
Operation costs		61,928	61,928	61,928	61,928	61,928	61,928	61,928	61,928	61,928	61,928
Maintenance costs		16,200	16,200	16,200	16,200	16,200	16,200	16,200	16,200	16,200	16,200
Sub total		1,228,976	139,206	139,206	78,128	78,128	78,128	78,128	78,128	78,128	78,128
Cash Inflows											
Growth of demand		0.20	0.40	0.60	0.80	1.00	1.00	1.00	1.00	1.00	1.00
Income		142,730	285,460	428,189	570,919	713,649	713,649	713,649	713,649	713,649	713,649
Net flow		-1,086,246	146,254	288,984	492,791	635,521	635,521	635,521	635,521	635,521	635,521
Net Present Value (NPV)	1,128,297										

Notes

1. Discount rate 10% *10%*

2. Project duration - 10 years *10*

3. Artisanal fishery is not subject to IGV or IR taxes

Cost-Benefit Analysis using Net Present Value Method

4. Natural Banks Restoration and co-management

Huacho

(in Nuevos Soles)

	Period										
Description	0	1	2	3	4	5	6	7	8	9	10
Cash outflows											
Investment	216,600	201,600	191,200	191,200	0	0	0	0	0	0	0
Operation & maintenance costs		117,375	117,375	117,375	117,375	0	0	0	0	0	0
Sub total		318,975	308,575	308,575	117,375	0	0	0	0	0	0
Cash inflows											
Income		0	0	0	0	0	0	0	0	0	0
Net flow		-318,975	-308,575	-308,575	-117,375	0	0	0	0	0	0
Net Present Value (NPV)	-1,073,604										

Notes

1. Discount rate 10% *10%*

2. Project duration - 10 years *4*

3. Artisanal fishery is not subject to IGV or IR taxes

Repopulation	480,000	
Losses	0.2	
Effective / net repopulation	384,000	
Density	38.4	ind/m2

VAN	1,073,604
Effectiveness Index (EI)	38.4
Effectivenes Cost (EC)	27,958.4

Cost-Benefit Analysis using Net Present Value Method

5. Production of biofertilizers

Huacho

(in Nuevos Soles)

Description	Period										
	0	1	2	3	4	5	6	7	8	9	10
Cash outflows											
Investment	1,658,584	0	0	0	0	0	0	0	0	0	0
Operation & maintenance costs		2,132,276	2,132,276	2,132,276	2,132,276	2,132,276	2,132,276	2,132,276	2,132,276	2,132,276	2132276.04
Cash inflows											
Income		-3,496,933	-4,041,755	-4,671,460	-5,399,274	-6,240,481	-7,212,747	-8,336,493	-9,635,319	-11,136,502	-12871568.91
Net flow		-955,260	-1,336,635	-1,777,429	-2,286,898	-2,875,743	-3,556,330	-4,342,952	-5,252,130	-6,302,958	-7517505.008
Net Present Value (NPV)	18,913,704										

Notes

1. Discount rate 10%	*10%*
2. Project duration - 10 years	*4*

3. Artisanal fishery is not subject to IGV or IR taxes

Revenues were estimated for each type of activity (at least three types of boat rides) and demand forecasts are based on the analysis of tourism surveys and studies conducted by PROMPERU and local universities. Costs per ride are taken from tariffs use in locations with similar characteristics in or near the pilot sites. Moreover, a simple progression was used for estimating the capture of the potential demand from tourisms, with an initial attraction factor of 20% growing to 90% by year 5 and 100% by year 7. A 10-year horizon was used in the benefit costs analysis. The economic analysis also includes an estimate of the additional resources the tourists spend in the community for complementary services, some of which might be capture by the fishing community.

Table 10 summarizes the economic analysis, based on a potential demand of only 536 boat trips and a fleet of 8 boats to serve these tourists (12 per ride). The activity shows a very good return on investment (around 20%) confirming the potential to generate additional income and employment opportunities for the artisanal fishing community. This activity will also contribute to create awareness on environmental issues, the need for sustainable use of coastal marine ecosystems, enhance the use of scientific information and strengthen the exclusivity characteristic of the community based management of their fishing grounds.

D. 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.

Project activities are in line with the legal framework of the “General Law on Fisheries” (Ley General de Pesca) which states that fishing management systems should conciliate the principle of sustainability in order to obtain social and economic benefits (article 10). This law, also considered as a measure ordering systems to preserve the hydrobiological resources, in order to achieve sustainability and sustainability of fishing activities; Accordingly, the GoP, through public policy, has determined the regulation of fishing effort, permissible catch quotas, minimum sizes of extraction, methods of fishing and other rules that lead to the preservation and rational exploitation of the hydrobiological resources, whichif violated, are punished in accordance with the Regulations of Inspections and Fisheries and Aquaculture Sanctions approved by Decret Supreme No. 019-2011-PRODUCE.

Moreover, the proposed project is fully aligned with at least five of the eight recently proposed strategic objectives of the fisheries sector developed by the current government (Ministerio de la Producción, 2012):

- Contribute to growing food security, consumption of abundant fishery resources in highlands and zones of extreme poverty.
- Manage and develop competitively aquaculture activity.
- Manage and develop competitively artisanal fishery.
- Accomplish sustainable fisheries based on the best scientific information of hydrobiological resources, and following an ecosystem approach.
- Strengthen the ordinance of fishing and aquaculture activities with an ecosystem approach.

Several of these objectives aim for the transformation of the sector through the adoption of policies focused on the development of artisanal fisheries according to an ecosystem approach to fisheries which will make them more resilient to future climate variability and change. For example, to achieve the objective of developing competitive artisanal fishery, some of the selected strategies are to improve the levels of formalization of the artisanal fishing community and to promote the strengthening of the organization of fishing associations, cooperatives and small enterprises. For aquaculture, the strategies include supporting a diversified and environmental sustainable activity, as well as encouraging research, development, adaptation and technological transfer. For sustainable fisheries, a program will be developed for risk assessment, prevention and mitigation of impacts of El Niño and climate change (Ministerio de la Producción, 2012).

Project adaptation measures such as environmentally friendly gears, start of fishery certification, aquaculture and resources co-management will contribute to achieve food security and sustainable fisheries.

The project will provide the scientific basis and strategic guidance for developing the recently proposed guidelines for the fisheries sector established by the current government. These guidelines aim the transformation of the sector through the adoption of policies focused on the development of artisanal fisheries according to an ecosystem-based-management approach, which will make them more resilient to future climate variability and change. As part of such orientation, management documents such as the Fisheries Sector Strategic Plan, the National Artisanal Fisheries Plan and the National Aquaculture Plan 2010-2021 propose climate adaptation mainstreaming as a priority action in their environmental sustainability components.

The project is also aligned with the National Environmental Policy, the National Environmental Action Plan 2010-2021 and the results and conclusions of the Second National Communication to the UNFCCC, the three of them having identified marine and coastal ecosystems as well as local communities as a priority in the country's adaptation agenda due to their high vulnerability level to future climate change impacts. In this regard the proposed project, through the implementation of key adaptation measures will help coastal communities of Huacho and Máncora improve their coping capacity to climate change impacts.

In this context, the project governance activities will take place in coordination with the Multisectoral Commission of Environmental Management of the Coastal Marine Medium (COMUMA), created in 2013 by the Ministry of Environment with the aim to coordinate, articulate and monitor the environmental management of the coastal and marine ecosystems.

In addition, the project is in agreement with the Multiannual Sectorial Strategic Plan (PESEM) 2012-2016, in particular with the axis: "Promotion of productivity and added value" which is related to the strategic objective 3: "Order and develop competitively the artisanal fishery" and to Policy 5: "Strengthen competivity of the agents of artisanal fishery".

The Ministry of Production (PRODUCE), through the General Direction of Sustainability Fisheries - DGSP, has among its functions the formulation of the Sectoral Strategy on Climate Change, forming the working group responsible for formulating the strategy of adaptation to the climate change in the Fisheries Sector and aquaculture. In this context, the DGSP, scheduled for 2015, the development of the diagnosis of current vulnerability of the fishing sector to climate change, which is a step prior to the strategy.

Also, in the framework of functional competencies, the DGSP has carried out capacity building workshops on management of the climate change to regional Governments, with the purpose of, on the one hand, raise awareness about the potential effects that cause climatic variables on fisheries and aquaculture, and on the other hand, to collect information of the vulnerabilities identified by themselves from their own activities.

E. 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.

According to Peruvian law any infrastructure or concession area at sea should have allowance of the Regional Direction of Production (DIREPRO) and of the Authority of Ports and Harbors (DICAPI). If these are built or requested in a Marine Protected Area (MPA), then the MPA administration, namely the National Service of Natural Protected Areas by the State (SERNANP), should approve it, besides the allowances mentioned above. The regulation, requirements and license costs are well established. Only if the infrastructure is big enough or the activity is considered as large-scale (over 50 metric tons/year), an Environmental Impact Assessment is necessary. Activities at sea (fishing, tourism, science) require the permission of DICAPI by routine. Therefore marine monitoring activities should be informed to DICAPI. For meteorological stations, they will be connected to SENAMHI and if they are installed in the MPAs, they should be approved before by SERNANP, which is a partner of this proposal.

In the case of the project, proposed activities related to extensive aquaculture and stocking/re-stocking of natural banks are considered as minor scale with low environmental impact; and, according to the existing regulations an environmental impact statement (DIA) is required to be submitted to the DIREPRO. The DIA consists in the description of the environmental effects of the proposed action. Specifically it must include: general background of the project (name, amount of the investment, duration, etc.), location, and project's description (goals, phases, infrastructure, activities, and main emissions, effluents and residues). Upon the evaluation of the DIA, the DIREPRO issues an Environmental Certification, that along other requirements to be approved by the DICAPI, enable to initiate the activity.

The proposed project has followed a regular PROFONANPE investment project approval track, which required by default an environmental and social screening to identify potential project's impacts. In the case environmental and social impact studies are required (projects' categories B and C), PROFONANPE will provide to the project team required technical counseling and supervision for the development of said environmental and social assessments.

This proposal has been prepared in accordance with the guidelines provided by the National Strategy for Climate Change (2003), the National Environmental Policy (2009), the Environmental National Action Plan (2010), the Action Plan for Adaptation and Mitigation of Climate Change (2010) and the Scientific Research Agenda for Climate Change (2009). In addition, the proposed activities will be performed under the legal framework established by the Supreme Decree (DS. 02-2008-MINAM) about the water quality standards in marine areas.

Project activities are in line with the legal framework of the “General Law on Fisheries” (Ley General de Pesca) which states that fishing management systems should conciliate the principle of sustainability in order to obtain social and economic benefits (article 10). Specific regulations on certain fish stocks will be considered. Currently legal ordinances for seven fisheries exist:

Giant squid – D.S. N° 013-2001-PE
Tunas and species alike – D.S. N° 14-2001-PE
Mackerel and Jack Mackerel – D.S. N° 24-2001-PE
Patagonian toothfish (*Dissostichus eleginoides*) – R.M. N° 236-2001-PE
Hake – D.S. N° 016-2003-PRODUCE
Anchovy (only for direct human consumption) – D.S. N° 010-2010-PRODUCE
Common snake eel – D.S. N° 013-2011-PRODUCE

Since 1994, Peru has gone through important steps in the environmental agenda, as productive sectors such as mining, energy and fishery have generated legislation to mitigate, protect and recover the environment. The Technical Working Group for the establishment of Water Quality Standards (GESTA AGUA) with the Supreme Decree 02-2008-MINAM approved the water quality standards for different uses including productive sectors. These standards will be taken into consideration and reinforced by the proposed project.

In this sense, the project will obtain all permits requested by the sectorial authorities for the development of the proposed activities, thus following the ESP *Compliance with the Law*. Furthermore, the execution of the activities will have high standards of environmental management in order to avoid negative impacts on coastal marine ecosystems, biodiversity, and people´s health. Therefore, the project will comply with the following environmental principles: *Protection of natural habitats*, c*onservation of biological diversity*, *climate change, pollution prevention and resource efficiency, and public health* (for more details see section K).

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

Activities included in this project, especially those related to early-warning systems and response, have no duplication with other existing or planned programs or projects, but highly complement other interventions currently implemented or designed by the Peruvian government:

1) Towards Ecosystem Management of the Humboldt Current Large Marine Ecosystem (HCLME, 2011-2015): It is a regional Global Environmental Facility (GEF)-funded project, implemented by the United Nations Development Programme (UNDP) in close coordination with IMARPE in Peru and the Instituto de Fomento Pesquero (IFOP) of Chile. The Project’s completion date is 2016. There is no overlap, but complementarity, between the GEF-HCLME funded project and the AF funded proposal, as shown in Table 11. The main target of the GEF-HCLME is the protection of biodiversity and strengthening of marine protected areas, while the proposed project aims to increase adaptive capacity and resilience of artisanal fishing communities and associated coastal ecosystems, complementing the GEF-HCLME project through the following activities: i) pilot areas chosen based on social and resources vulnerability to climate change criteria; ii) support

of the science-based decision-making related to climate change adaptation (e.g. climatic surveillance and prediction) and capacity building in these issues; and iii) specific emphasis on the integration of artisanal fisheries into the regulatory system.

Also, as the GEF-HCLME will finish in 2015, it is expected that coordinations will be established with the second part of this project GEF-HCLME II, which is currently being planned.

	GEF-HCLME project	AF proposal
Main target/beneficiary	Protection of biodiversity and strengthening of Marine Protected Areas	Artisanal fishing communities and associated coastal ecosystems.
Scope	Humboldt Current Large Marine Ecosystem (HCLME)	Peruvian Coastal upwelling ecosystem and Northern Tropical Coastal Ecosystem
Concrete interventions for improving the resilience of coastal communities to climate change impacts	No	Yes
Pilot areas	Three marine protected areas in Peru: San Juan cape, Ballestas Island and Lobos de Tierra Island.	Two coastal areas where artisanal fishing communities live, namely Máncora and Huacho.
Ecosystem approach	EBM[17]	EAF and EBA
Surveillance, early warning and Prediction System	No	Yes
Capacity building	Management of marine protected areas	Adaptations to climate change in the fishery sector

Table 11. Complementarity between the AF proposal and the GEF-HCLME project.

The ambit of the GEF-HCLME is the whole Peru-Chile Humboldt Current Ecosystem, while the AF project is focused on the Peruvian Coastal upwelling ecosystem and the Northern Tropical coastal ecosystem.

The GEF-HCLME project will not implement concrete interventions for adaptation to climate change, but it will coordinate the management of the shared stock of anchovy between Peru and Chile as well as develop a legal framework for implementing marine protected areas. The AF proposal will complement this project by applying concrete interventions for climate change adaptation on fishery artisanal communities as main

[17] Ecosystem-Based Management (EBM) is a globally recognized approach for better understanding and managing the interactions between uses and the natural system, and integrating multi-sectorial interests into decision making for the whole marine ecosystem.

beneficiaries. The general framework implemented by the GEF project will facilitate the concrete interventions on artisanal communities.

The GEF-HCLME project has selected marine protected areas as pilot sites: San Juan cape, Ballestas Island and Lobos de Tierra Island. The AF proposal targets on artisanal fishing communities living in the north of Peru (Máncora and others) and in the central region (Huacho and others), which are associated to different coastal marine ecosystems. Climatic surveillance and early warning are not considered in the GEF-HCLME project, but the outputs provided in these issues by the AF proposal will also contribute to the adaptive management along the coast, including the GEF-HCLME pilot areas.

Finally, the GEF-HCLME project uses the Ecosystem Based Management (EBM) approach, while the AF proposal will use both the Ecosystem Approach to Fisheries (EAF) which focuses explicitly on the fisheries communities and their harmonization with the ecosystems; and the Ecosystem Based Adaptation (EBA) to enhance ecosystem services to adapt to impacts of climate change. It should be stressed, that compared to the EBM which is area-based, the EAF's paradigm is sector-based and focused on target resources and people. In addition, in the EAF the stakeholders are clearly identified as the fishing communities but opened to other stakeholders, while the EBM considers a much broader, but loosely defined universe of stakeholders. Finally, instead of considering protection of specified areas or habitats as the main measures strategy (EBM), the EAF is based on regulation of human activity inputs (gears, effort, capacity), which can also include "no-take" zones as measures to reduce fishing pressure, or output (removals, quotas) and trade (FAO, 2003).

2) "Support to the Climate Change Agenda in Peru" is an Inter-American Development Bank (IDB) Policy Based Loan (PBL) which was disbursed in three tranches during 2010–2013. The PBL focused on the (i) development and strengthening of the basic institutional framework for climate change management at national, sector and regional levels, (ii) implementation of a GHG mitigation agenda, and (iii) implementation of an adaptation agenda. This operation included policy commitments by the General Directorate for Environmental Issues of the Vice Ministry of Fisheries and by IMARPE, such as the formulation of a national plan for climate change adaptation at the sector level, the development of coastal and oceanic climate change scenarios, the identification and characterization of the major impacts associated with such scenarios and the economic valuation of those impacts. This Policy Based Loan will serve as an important basis for the implementation of the proposed project which will build on the political commitment and generated climate change scenarios.

3) Adaptation to climate change in the fishery sector and marine-coastal ecosystem of Perú (PE-G1001/PE-T1297): It is a national IDB-funded project (2014-2016), with a budget of US$ 2.5 million, executed by the Ministry of Production and technical support of IMARPE. Its goal is to reduce vulnerability of coastal communities to climate change impacts through interventions with artisanal fishers in the areas of Huacho-Chancay and Pisco-Ilo (central and southern Peru). This project will complement the present proposal, with activities of modelling and implementing environmental friendly gears for anchovy fishery at Huacho. Close coordination between both projects is ensured through execution of both projects by PRODUCE through the same coordination team Unidad Ejecutora 003 "Fomento al consumo Humano Directo – A Comer Pescado" of PRODUCE (UE-003).

Important sinergies and complementarities will arise from the IDB funded project for this proposal. The modelling infrastructure will set the basis to build national climate change scenarios, which will be used by this proposal for applying these scenarios to the pilot areas with higher spatial resolution. The initial replacement of environmentally friendly fishing gears will allow this proposal to learn lessons acquired during experiences with fishers and other stakeholders for implementation of the co-management framework

4) Strengthening Sustainable Management of the Guano Islands, Isles and Capes National Reserve System Project (P129647): It is a regional Global Environmental Facility (GEF)-funded project, implemented by PROFONANPE in close coordination with SERNANP. The project's global environmental objective is to improve the overall management of marine and coastal ecosystems of the Guano Islands, Islets, and Capes National Reserve System of Peru (RNSIIPG) and protect its biological diversity in representative pilot sites. It will complement the present proposal because it includes as pilot area Don Martín island (with a tourism plan and economic and ecological zoning) and Punta Salinas (with a sport fishery plan, management plan of fishery resources and economic and ecological zoning), both at Huacho area.

On the non-profit side, several initiatives are being implemented by national and international organizations such as:

1) Climate Change Adaptation and Mitigation in Coastal Zones (ADMICCO): A 2010-2014 regional project, under implementation by a network of NGOs from Chile, Ecuador and Peru and with financial support from the European Commission. The project aims to reduce the negative impact of climate change among poor populations in terrestrial coastal zones, mainly associated to drainage basins of the three countries, and to promote adaptation and mitigation actions in those areas. Activities of the project in Peru are concentrated in two pilot areas: Huaral-Huaura (Huacho province) in the north and Ilo, Mollendo and Camaná in the South, thus sharing the Huacho pilot area with the present project. The proposed project will build on the experience of this project especially in diversifying income generating activities of poor coastal communities, especially artisanal fishers. The integration of these communities into the regulatory framework, which will be based on the modeling and monitoring network, is considered as utterly important.

2) Towards an ecosystem-based management of the anchovy fisheries in Peru (November 2009 - November 2011): It was a project of the Environmental Sustainability Center of the Cayetano Heredia University (CSA-UPCH) with technical support of the Fisheries Center of the University of British Columbia and IMARPE. It sought to contribute to an EAF in Peru, by using a model that would integrate existing information (results of IMARPE and university investigations), generating benchmarks on fisheries needed by decision-makers and stakeholders. Nevertheless, the CSA-UPCH project was not related to climate change, does not involve adaptation measures or interventions in local areas, and capacity building activities are very limited.

3) The Humboldt Current Program: An initiative by The Nature Conservancy (TNC) launched in 2008 and aimed to provide information, tools and know-how to: (i) enable the creation of new marine protected areas and the strengthening of existing ones, and (ii) promote sustainable fishing measures to conserve marine ecosystems and resources. This effort includes a research partnership by IMARPE, TNC, the Sustainable Fisheries Group (SFG) and the University of California Santa Barbara (UCSB) to address sustainable fisheries and marine conservation issues in Peru through improved knowledge

of how fish stocks will behave given certain environmental changes other than climate change (e.g. El Niño). Proposed project differs in scope from the TNC project and perfectly complements it by focusing on climate change adaptation measures involving modeling and monitoring interventions in local areas and improvement of governance systems.

4) The International Joint Laboratory 'Dynamics of the Humboldt Current system' (LMI 'DISCOH') is a research program that was launched in 2009 (to be closed in 2014) by a partnership between IRD (French Institute for the Development) and IMARPE. The main objective of the LMI is to study the ocean-atmosphere, biogeochemical and ecological dynamics in the Humboldt Current System off Peru in order to understand and anticipate the effect of intra-seasonal, seasonal, inter-annual, decadal variability and climate change on the dynamics of the coastal ecosystem. Therefore it contributes by providing scientific basis for the implementation of the EAF. From a scientific point of view, the LMI 'DISCOH' complements current ongoing projects between IRD and IMARPE in five working packages: (i) metadata, tools and data analysis methods; (ii) physical forcing; (iii) dynamics of the Oxygen Minimum Zone (OMZ) and productivity at multiple scales; (iv) ecosystem approach to fisheries; and (v) socio-economy and environmental impact of industrial and artisanal fisheries and supply chains. In particular, the LMI aspires to orient part of the scientific activities towards key transversal scientific questions. The proposed project will take advantage from the current training that the LMI 'DISCOH' is providing to the scientific staff of the Modeling Laboratory of IMARPE (e.g. WRF, ROMS and PISCES models). Additionally, outputs from the socio-economy working package will feed the bio-economic modeling and also will contribute to the proper identification of technological adaptation measures for fishing gears.

5) Coastal Fisheries Initiative – SE Pacific: It is a recently organized regional Global Environmental Facility (GEF)-funded project, implemented by PNUD in close coordination with TNC.

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

As described in Section II-F this project interacts with and complements a variety of existing and planned programs. Therefore, knowledge management and exchange is of primary importance in order to ensure that activities are not replicated and that generated information and experience will feed into existing programs and provide the basis for future activities. To this end, the planned project will apply a Knowledge Management Strategy (KMS) which will include a fixed knowledge management structure as well as selective dissemination activities to extend lessons learned and raise awareness of the issue at hand (Figure 4).

As part of its KMS, this project will, on one hand disseminate the monitoring products to the local communities and general public, and on the other, promote the creation, dissemination and re-use of key knowledge on climate change impacts on coastal marine ecosystems and coastal communities' livelihoods and will facilitate a better understanding of its main challenges with the final aim of promoting economic, social and environmental development in the Region.

More specific objectives of the KMS includes the promotion of: (i) up to date knowledge that contribute significantly to the understanding of main ecosystems and local communities'

vulnerability drivers; (ii) promoting relevant activities conducive to the dissemination of knowledge in community and ecosystem-based adaptation allowing for improved responses to the most pressing challenges posed by climate change to the region; and (iii) the coordination between the various stakeholders of the project in such a way that the generation and dissemination of knowledge activities are developed and implemented in line with their initiatives and actions.

The KMS will add value to the Project's effort by:

- Providing the right information/knowledge to local communities on ways to address climate change issues, at the right time, increasing their local adaptive capacity;
- Collecting and sharing good/best practices and tools;
- Learning from the project successes/failures to design/innovate and improve related actions and programs;
- Facilitating cross-project learning inside the project team;
- Guiding the production of updated and properly packaged knowledge products to its intended audiences;
- Connecting the knowledge demand/needs of the audiences with the knowledge offer/production of the project.

The process leading to the production of the KMS consists of the general steps illustrated in Figure 5 and described as following:

Knowledge must first be **created** within or outside the project scope, until it is ready for distribution to stakeholders. The creation process involves the conversion of tacit knowledge into documented explicit knowledge. The explicit knowledge created should be easily understood outside its linguistic, organizational and cultural context. It should facilitate the transfer of this newly categorized knowledge into a form that will be of use to groups beyond the creators of the knowledge.

Figure 4. Proposed project KMS under a "user needs"

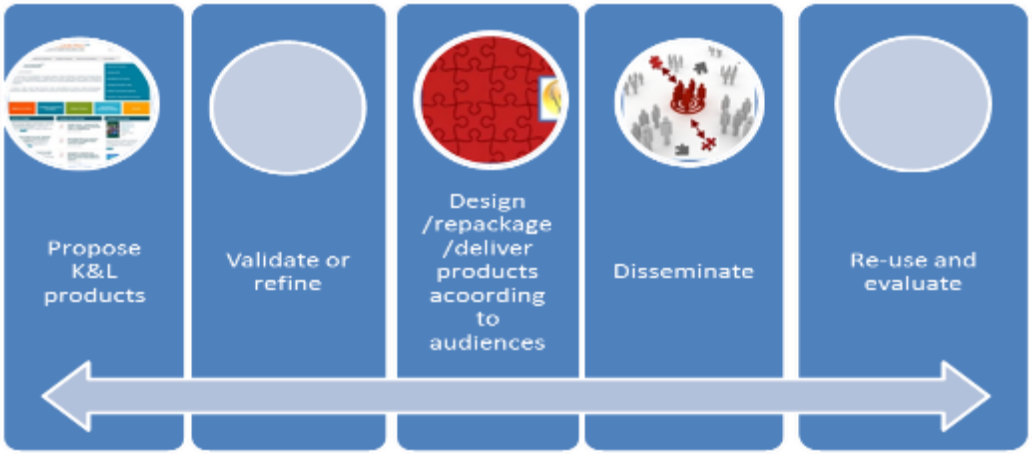


Figure 5. Proposed project KMS building

Once created, knowledge should be **validated** to ensure the highest level of quality. This process will involve project specialists, external experts from universities, centers of excellence or development practitioners.

For the project, knowledge is an essential factor in developing innovation capacity, and its capacity to identify risks on a timely basis and to take steps to mitigate them. Development effectiveness and results-driven programming require that decisions be based on information, evidence, and knowledge on impacts, outputs, and performance.[18] In this context, knowledge needs to be **organized and stored**, but also renewed and brought up to date continuously, so they do not become obsolete or irrelevant.

The objective of dissemination is to publicize the existence of new knowledge in order to promote its re-use. The method and format of dissemination depends on the audience and their needs. In some cases, the knowledge needs to be adapted from its original form.

Re-use is the process by which knowledge is applied in other experiences and / or contexts. It requires a major effort to ensure that this knowledge will be accessible to interested users. It also needs systematic documentation to ensure a demonstration effect. The re-use will ensure the achievement of the project's goal of contributing to the improvement of development results.

The Project will issue technical documents for decision-makers and stakeholders on governance, EBM/EAF implementation in the policies, and progress in monitoring key bio-physical variables. Two workshops will be organized, one at the project start, and the other one near its end, each at the two different pilot areas. The workshops will involve scientists, stakeholders and decision-makers (local and national) associated to this project and also to other ongoing initiatives, in order to promote synergies, exchange of information and knowledge, and also planning for new projects and/or upscaling successful pilot experiences at national level. Furthermore, a digital network of information exchange and discussion about

[18] Inter-American Development Bank, IDB. Institutional Knowledge and Learning Strategy Proposal (2008-2010). April, 2008, Washington DC.

climate change vulnerability and adaptation will be supported, through an internet website developed by the project.

The project will also organize workshops and awareness raising campaigns in regular intervals during the project directed to the public and especially fishers' communities and social groups from both pilot areas (Huacho and Máncora) which livelihoods are primarily impacted by climate change. The objective of the workshops and awareness raising campaigns is to exchange lessons learned and extend information on the value of proper management of marine resources and impacts of climate change to the local communities in order to promote support/participation in the program activities. The target audiences include (i) fishers, (ii) ecotourism operators, (iii) coastal communities, (iv) private sector, and (v) students from both pilot areas. The campaigns will include the following activities: Seminars and public debates for fishers and the local communities, meetings with local authorities, associations of artisanal fishers and other local stakeholders as well as lectures and other educational activities for local schools (e.g. knowledge and artistic contests and announcement of awards for students). Furthermore, the campaigns will include the distribution of booklets and flyers, broadcasting of audiovisual information on climate change as well as on adaptation measures, ecosystems and conservation.

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

Senior government officials, including the staff at the Ministry of Environment, Ministry of Production and Vice Ministry of Fishery, and at specialized agencies, such as IMARPE, fully support the proposed project.

A consultative workshop with local and national stakeholders took place at IDB headquarters in Lima, on September 22, 2011. The goal was to present the project and to survey for inputs and suggestions, particularly those related with the adaptation measures at pilot areas. For this, seven to nine people from each pilot area were invited to the workshop, including local fishers, town mayor's representative, and other local authorities. From the government there were invited several directors from the Vice Ministry of Fishery and from the Ministry of Environment. Also, experts from universities and science institutions (Peruvian Geophysical Institute and the Peruvian Meteorological Service), and a number of NGOs that are involved in other initiatives related to climate change and marine conservation issues participated in the meeting.

In addition, various interviews were carried out at each pilot site, from March 6 to March 11, 2011 in the fishing coves of the Máncora pilot area, and from March 22 to April 9, 2011, in the coves of the Huacho pilot area. The goal was to collect first-hand information from local communities, authorities, academia, NGOs and regulatory agencies, on potential adaptation measures they could identify that would help them cope with climate observed and anticipated impacts on natural resources (fish stocks), a big contributor to their livelihoods. At the same time interviews were very helpful to better identify main stakeholders and potential local contacts during project execution phase within local communities. A map of stakeholders was generated together with summaries of issues raised by the communities that include also the

identification of external factors outside of climate change that could be of threat to the success of the project. These reports are available in the project preparation files.

The consultation workshop of the Máncora pilot area took place in Máncora town in March 10, 2011, with the participation of representatives of the local and regional governments, the official from the local IMARPE station, including the Production and Environmental Regional Agencies, as well as fishers associations from each cove. For the Huacho area, the workshop took place in March 23, 2011, at the Huaura provincial government auditory. Participants also included representatives of the local and regional governments, fishers associations from each cove, IMARPE local station and a group of professors from the local University (Universidad Nacional José Faustino Sánchez Carrión).

Results from the interviews and workshops contributed to the elaboration of the intervention proposals, as well as to map the risks and strengths for the sustainability of the adaptation measures. Interventions proposals include participation of women in preprocessing of fishery and aquaculture products, as well as in marketing of handicraft souvenirs made of marine materials. These workshops allowed finishing the Conceptual Note, which was approved by the Adaptation Fund in June 2012.

Later, in order to identify capacity building activities for implementation of adaptation measures, two Workshops were carried out in Huacho (September 10th, 2012) and Máncora (September 6th, 2012). The list of stakeholders consulted in 2012 is presented in Annex IV (Workshops at Huacho and Máncora).

In addition, several coordination meetings have been carried out with stakeholders from other projects, such as the IADB, PROFONANPE, SERNANP and GEF-Humboldt. In particular, in May 2014 IMARPE and IADB organized an inception meeting for capacity building on management tools for project execution.

Finally, an update of the consultation process was done through workshops in Huacho and Máncora, on August 22 and 28 of 2015, respectively. Fifty-five people participated at the workshop in Huacho (from which 28 were women) and 38 in Máncora (from which 15 were women). The list of participants is found in Annex IV.The objectives of the workshops were to determine the participation of beneficiaries including fishermen and women; participally tune the main activities in which the women of the project will be involved; and determine the gender goals and/or indicators. In that sense, all participants expressed their conformity with the project and women manifest their adherence by signing a social adhesion act. Amongst the identified activities that could be implemented by women are ecotourism companies, nets fix-up, sustainable restaurants, and certifications for certain actions such as fishing, recycling of fishing wastes, artcrafts and others. Additional information is found in Annexes VI and VII.

During the beginning of the project and elaboration of the Project Implementation Plan a participative consultation and reporting mechanism will be used to gather inputs from the communities. There is great confidence in this proposal project approval by the community as IMARPE has coastal laboratories in Huacho and Paita (near Máncora) with permanent interaction with fishers and previous coordinations about the project.

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

Justification for full funding is divided into two elements. First the importance of the project is highlighted, as part of the GoP priorities associated with climate change, adaptation and economic development. The second element discusses the logical framework for the project design. It is argued that all activities are integrated (and are necessary) and linked to produce an adaptation program that gives due attention to climate, climate monitoring and its impact on the primary productivity of the Peruvian coastal marine ecosystems and fisheries, while at the same time support policy definition and management decisions towards a sustainable and productive utilization of the most productive fishing ground in the world.

Background: Expected climate change impacts on fisheries

As indicated previously, there is mounting evidence that climate change and changes in the chemical composition of the atmosphere are altering the physical and chemical characteristics of the oceans. The IPCC in its Fourth Assessment Report devotes an entire chapter of its Climate Change 2007 The Physical Science Basis, to "Observations: Ocean Climate Change and Sea Level". It concludes as unequivocal from observations of increases in global average ocean temperatures and widespread changes in ocean salinity, wind patterns, heat waves and the intensity of tropical cyclones. Moreover, changes in ocean biogeochemistry have been observed; including increased total inorganic carbon content, changes in acidity and reductions in oxygen content.

Locally, studies by IMARPE and others (Chávez et al., 2008; Demarcq, 2009; Gutiérrez et al., in press) have verified the presence of these global trends and explored the ecological response to such changes. Their conclusions point to a reduction in primary productivity that leads to a decrease in anchovy production, which impact the food chain with expected reductions in predators (fish, mammals, and birds) that feed on the anchovy. The process described is expected to accentuate with further global warming.

The proposed project is in line with the new strategic guidelines (PRODUCE, 2012) that the GoP has outlined for the fisheries sector, with clear emphasis in improving the conservation and management of fish resources, especially at the artisanal and aquaculture segments of the sector, in order to improve the resilience to the impacts of future climate change on marine ecosystems and the resources associated with them. It will also help in the implementation of national and local level policies regarding coastal land-use planning and in the identification and pilot testing of income diversification alternatives for coastal population that will need to leave the fishing activity due to the application of sustainable fish management measures.

A study (Libélula, 2011) has calculated the amount of financial resources needed to mainstream climate change adaptation in the freshwater, agriculture and fisheries sectors in Peru, identifying a set of basic adaptation measures and the costs related to their development. In the case of fisheries, the study focused in anchovy fishing for direct human consumption and aquaculture, finding investment needs reaching to US$ 678 million and US$ 175 million, respectively, for the 2010-2030 period.

The following description will provide a more detailed justification for each of the planned adaptation measures.

Component 1 Implementation of interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress and **Component 2** Deployment of a modern and efficient environment surveillance and prediction system in the coastal marine ecosystems at regional and local scales supporting fisheries adaptive management under the EAF principles.

Baseline (without AF financing):

Component 1. The current problematic of the two pilot strategic areas is described in Annex I and summarized in Table A1. Vulnerability of coastal communities to climate change in those areas is amplified by other stressors, as fishing practices, pollution and improper territory use. Current development plans for the fisheries industry in these regions fail to consider climate change as a risk factor.

Component 2. In the recent past the GoP has adopted a quota system associated with greater control on the fleet size but it only covers the industrial fleet, and follows a mono-specific approach and an empirical use of environmental information. On the other hand, there are advances in the knowledge of the resource variability related to climatic conditions, but gaps persist in terms of monitoring cover of circulation changes and downscaling of global warming impacts at the upwelling ecosystem level.

With AF financing:

Component 1. This component aims at conducting the identification, feasibility and implementation of alternative productive options for those displaced by the implementation of the new management strategy in pilot areas selected by the GoP as areas where reallocation of fishers will be needed. The project aims at developing those options that are found to be environmentally, socially and financially sound. Incentives for early adoption of these opportunities will be studied and developed to facilitate broad acceptance. Also, environmental awareness and environmental education will be promoted in local communities, as part as a wide range of measures, which are fully described in Annex I.

Component 2. The GoP, with the scientific advice from IMARPE, is required to define the sustainable quota for each fishing season. Defining this target capture is the core scientific and technical task of the adopted management strategy. This component is aimed at building this capability within Peru. It is envisioned that once the project is implemented the sustainable quotas will be estimated following the EAF framework, through the use of proven and verified ecological models, and utilizing oceanographic and climatologic data from field stations and satellite information properly organized as an indicators' dashboard. The continued collection of field data, including physical, chemical and biological will provide the inputs required to improve the quality of the analysis and the ability to model and project ecosystem behavior, which is not currently possible. The execution of this component would allow for a science based/data based policy and management alternative.

Component 3 Capacity building for implementing the EAF as a means for dealing with the consequences of climate change and to disseminate and inform project's lessons, targeting government officials, academia, stakeholders and local communities and **Component 4** Management policies, regulations and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress as well as other anthropogenic stressors such as pollution, coastal marine infrastructure construction and operations, and exploration and exploitation of oil and gas resources.

Baseline (without AF financing):

The GoP has been developing policies and management options for the sustainable use of the natural fisheries resources for many years, but without an integrated governance framework that ensures the application of these policies and disseminates the outputs for the stake-holders and the community. Coordination with other government agencies is poor at best, with limited resources devoted to deal with stressors outside the scope of their legal mandate. Emphasis has been on industrial fishing, with artisanal fisheries receiving less attention due to the smaller volumes of catch and the enormous difficulty for adequate inspection, fishery surveillance and control. Within the context of climate change, the limited application and enforcement of the GoP management policies increases the vulnerability of resources, particularly those that support artisanal fishing. One of the current obstacles is the limited human resources for the generation of science-based information for decision-makers, and also the limited human resources at the managerial level specialized in the EAF and in the climate vulnerability criteria.

With AF financing:

Detailed modeling and extensive data collection is not enough to assure a sustainable management of fisheries. Both, environmental policy and management require equal attention. The GoP is prone to implement EAF in the decision-making process including artisanal fishing. Adaptation measures (iii) and (iv) therefore focus on the development of a framework to facilitate capacity building, both at scientific and managerial levels, with a particular emphasis on the development of policy and regulatory tools as the Ecological Risk Assessment and other EAF methodologies, applied to the industrial and artisanal fisheries. Also, the support that the project will give for the development of the information exchange network with local and national stakeholders, will promote the dissemination of the project's lessons, and the synergies with other ongoing initiatives. The project also recognizes the need to respond to other stressors or threats to long-term sustainability of coastal ecosystems, such as pollution and exploitation of gas and oil. The approach taken is to work with the authorities in charge of land use/territorial planning to support the implementation of existing regulations, so municipalities define detailed land use plans, in consultation with all stakeholders. The project will support such planning processes and will aim at incorporating provisions promoting long-term sustainability of critical coastal marine ecosystem in pilot areas.

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

As it was explained before in section H, different visits have been made to Huacho and Máncora to meet with the different project's stakeholders and obtain first-hand information on their immediate needs and priorities to facilitate an effective adaptation process. This has allowed the project team to develop a map of stakeholders and better understand main community's climate vulnerability drivers and non-climate threats that could compromise the successful accomplishment of project objectives. Dialogues with local communities have been instrumental to have a better idea of perceived present and future risks of climate change on their livelihoods and initially identified solutions to improve their adaptive capacity. Likewise, project activities have been socialized with officials from the different involved ministries (e.g.

production and environment) to ensure their alignment with national priorities for the project areas and ensure long-term sustainability.

The main identified actions that need to be enforced during project preparation and execution to guarantee the sustainability of project outcomes are:

1) *Ensure access to information, technical assistance and commitments with local stakeholders.* The proposed project includes a component that will allow the dissemination of knowledge and lessons learned generated by the project through various tools that include Internet and workshops. The design of a project knowledge management strategy will allow the identification, organization and prioritization of different types of users and their information needs, including a validation phase.

   The project considers active participation of fishers during the design of early warning system and environmentally friendly fishing gears. Fishers will commit themselves with the project by providing their boats for fishing experiences, field monitoring, and surveillance of resources under co-management approach. Sustainability of the project will also be achieved through scaling-up of good fishing practices in other areas, under microcredits scheme and direct human consumption programs.

   The combination of investment, training and start of certification through technical assistance becomes a very attractive program with direct and tangible benefits for local communities that depend on fisheries. For example new investments on environmentally friendly fishing gears and aquaculture activities, accompanied by a training program to fishers followed by a certification represents an approach through which they may have access to new markets and get better prices for their products, while helping to conserve an already stressed natural resource. If this model proves to be as economically successful in practice as the initial cost-benefit analyses have shown, it could be attractive enough for other communities to replicate and maintain even after the project is finished. In this regard the financial help from national or regional government through established fisheries programs connected to the project is a key to guarantee long-term sustainability. This brings to the following two key factors.

2) *Create an enabling environment that allows the* ***ownership*** *of the project by local communities.* The proposed project is full attuned to the notion of a plurality of interest. On one hand, individual aspirations are legitimized through the trend towards specialization in the use of environmental friendly fishing gears and additional economic activities such as aquaculture and ecotourism. On the other hand, common interest (protecting the environment and fish resources through co-management practices lead by the community) creates a sense of cohesion that encompasses the entire community.

3) *Ensure the compromise and active involvement of national and regional governments' highest levels*. A solid project implementation unit will help maintain a constant and effective flow of information regarding the accomplishment of project milestones to the different governmental stakeholders engaged to the project such as the Environment and Production Ministries, as well as regional designated authorities. Long-term sustainability of project outcomes is guaranteed as long as these are aligned with current and planned strategies to develop the fishing sector by regional authorities. In this sense the adaptation process presented by the project should build on current national work on fisheries' sustainability and contribute to start building climate resilience within the fishing sector. In addition, the project will support communities and fishers associations to make use of the

consultation mechanisms for planning the annual budget, in order to get funding support for actions oriented to complement and replicate the project's experiences.

The GoP is implementing a Results oriented Budget program, which is a public management strategy vinculating resource allocation and measurable results in favour to the society. This strategy is implemented progressively through Budgetary Programs.

In the fishery sector there are two Budgetary Programs executed by PRODUCE:

a) Budgetary Program 094 "Management and Development of Aquaculture, which has as objective the improvement of quality and productivity of aquaculture activity. This program provides three products: services of sanitary certification in aquaculture, services for the promotion of investments and management of aquaculture and technological transfer.

b) Budgetary Program 095 "Strengthening of Artisanal Fishery", which has as objective the improvement of competivity of agents of artisanal fishery. This program has two products: technical assistance on good fishery practices for agents of artisanal fishery, and capacity building to improve commercialization of hydrobiological products.

The activities involved in Component 1 of the Project are aligned with these budgetary programs, in this way, ensuring sustainability of the Project. For example, in the framework of the Budgetary Program 094, technical assistance will be given to the beneficiaries of the small scale aquaculture activities In the framework of the Budgetary Program 095, support will be given to the creation of enterprises for artisanal fishers for direct commercialization of their products. Through the Market Information System (SIM) and the Artisanal Fishery Extensionist Service (SEPA), PRODUCE will carry out diffusion actions, advising and support to artisanal fishers for the direct commercialization of their products.

In particular for component 2, the following points are to be highlighted in order to guarantee long-term sustainability:

The Peruvian Institute of Marine Research (IMARPE) has the mission to provide science-based information to the government related to the status of the marine ecosystems, the fishery resources and the oceanographic and environmental conditions off the Peruvian coast. Currently IMARPE is divided in several research departments, oriented to fisheries evaluation and monitoring, aquaculture, environmental quality and oceanography, among others. The research activities matrix of IMARPE includes oceanographic monitoring and modeling, though they are currently limited in frequency, spatial resolution and human resources. In addition, there are several coastal laboratories of IMARPE along the coast. Two of them are located close or within the pilot areas. Máncora site is under the domain of Paita coastal laboratory, whereas Huacho site is studied and monitored by Huacho coastal laboratory.

IMARPE ensures the sustainability of the climatic surveillance and prediction system, by optimizing human and material resources from the centralized research platforms and the coastal laboratories, and also by providing the additional resources needed beyond the project. Thus, improving the facilities of the coastal laboratories will be prioritized to sustain the local monitoring tasks. For this, development proposals will be presented for consideration to the regional governments of Piura (Máncora site) and Lima (Huacho site), so that additional funding can be accessed. The capacity building given by the project will be used by IMARPE to expand the data acquisition, the information system and the prediction capacities beyond the project. The weather monitoring stations will be operated in agreement with the National

Meteorological Service (SENAMHI), and access to additional funding for the maintenance costs and data sharing will be obtained.

In the case of activities of Component 4, as they are aligned to national policies and priorities, the sustainability of the Project is ensured. For example, co-management areas will be framed within the National Environmental Policy, through his Policy Axis 1: Conservation and sustainable use of natural resources of biological diversity, and within the Multiannual Sectorial Strategic Plan of the Production Sector 2012-2016, through his Objective 5: Achieving sustainable fisheries based on the best scientific and technical information available managed through ecosystem approach and with an efficient and transparent monitoring system.Sustainability of the project will also be achieved through replication of cost-beneficial adaptation measures in other areas applying the co-management framework.

In conclusion, the success and sustainability of adaptation activities encompassed in Component 1 will depend largely on the degree of the beneficiaries' involvement, on the technical assistance and training provided by the GoP and on the conditions for an enabling environment for investments (e.g. regulatory framework, opportunities for access to information and market, among others).

As mentioned previously the main beneficiaries of the project are artisanal fishermen associations and organized groups of women who provide services related to this activity. During the participative workshops carried out on August 2015 in both pilot sites, 8 associations participated in Huacho and 8 in Máncora. These associations expressed their support and willingness to participate in project implementation, as can be verified in the minutes annexed to the project (Annex VII).This commitment made by local stakeholders should be understood as the main element that will support sustainability of the project in the long term.

Technical assistance and training provided by the GoP to stakeholders, in order to maintain project outputs, will be given through the inclusion of these activities in the aforementioned PRODUCE´s budgetary programs of artisanal fisheries and aquaculture. On the other hand, through activities under Components 2 and 3, the local communities will have the opportunity to access the information generated by the project and improve their knowledge and skills for adaptation activities undertaken. Furthermore, it is through Component 4 that the project will seek to improve governance, policies and regulations for sustainable use and resilience of coastal and marine resources.

Regarding the institutional arrangements, it is planned to subscribe specific agreements between the execution entity and beneficiaries of project outputs (component 1). In these agreements, commitments of the parties to implement the activity, as well as actions to ensure its sustainability, will be specified.

It is expected that supervision of maintenance of these activities once the project end, be carried out in the framework of the institutional competencies of each sectoral authority, for example PRODUCE for artisanal fishing and the Ministry of Foreign Trade and Tourism (MINCETUR) for ecotourism activities.

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

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	X	
Access and Equity		X
Marginalized and Vulnerable Groups	X	
Human Rights	X	
Gender Equity and Women's Empowerment	X	
Core Labour Rights	X	
Indigenous Peoples	N/A	
Involuntary Resettlement		X
Protection of Natural Habitats	X	
Conservation of Biological Diversity		X
Climate Change	X	
Pollution Prevention and Resource Efficiency		X
Public Health	X	
Physical and Cultural Heritage	X	
Lands and Soil Conservation	N/A	

An analysis of the implementation of the15 environmental and social principles of the Adaptation Fund in the project design is presented down below.

Compliance with the Law:
The design and formulation of the project has taken as reference the law of Peru, both the environmental sector as production (fishery). The project will comply with obtaining all permits requested by the sectorial authorities for the development of the proposed activities.

Access and Equity:

The project ensures fairness in the selection process of the direct beneficiaries. Moreover, it plans to implement a "positive discrimination" to ensure access to the active participation of women in the capacity building and decision making processes.To ensure their participation in these processes, the calls for meetings and / or workshops will be made with due notice and consultation about their time availability will be made in terms of dates and schedules[19].

Furthermore, the project will develop periodic meetings to report on progress, especially oriented to women leaders and / or boards of women social organizations.

[19] During participatory workshops held on 22 and 28 August 2015 in Huacho and Mancora, respectively, women reported that the best day for workshops and / or meetings are weekends, always in the evening. This measure allows women to finish their workday, personal hygiene and take daily tasks at home.

The project promotes equal access to the benefits thereof, in particular through the participation of artisanal fishermen (main beneficiaries) in the following activities:

- Adoption of sustainable fishing methods.
- Restoration and co-management of natural banks.
- Sustainable aquaculture through small-scale concessions.
- Creation of ecotourism enterprises.
- Production of bio-fertilizers from fishery and aquaculture residues.
- Access to the benefits of ocean climate information to be generated through implementation of component 2.
- Training and sensitizing on key topics such as formalization, entrepreneurship, normative, fishing gear and fishing surveillance and control.
- Design and implementation of early warning systems.
- Social equity seeks to promote a process of advocacy to improve governance including participation of artisanal fishermen and women social organizations in the sector.

However, potential minor social risks have been identified by the implementation of adaptation activities mainly under Component 1. Therefore, a set of mitigation measures to manage these risks have been proposed in the ESMP (see Table 13 and Annex V).

Marginalized and Vulnerable Groups

Artisanal fishermen are considered in poor strata of the population. Therefore, they are highly vulnerable to climate change impacts. In addition, the project promotes the participation of women in all profits generated by it.

Human Rights

The project is oriented to expand access of marginalized and vulnerable population to greater human rights, since it promotes food security of these groups and the country as a whole through the strengthening of artisanal fisheries in environmentally and socially sustainable practices.

Gender Equity and Women's Empowerment

The project promotes the participation of women in income diversification activities such as ecotourism, aquaculture and production of bio-fertilizers, promoting the empowerment of women and men alike, to assume the management, organization and social sustainability in the initiatives diversification of family income.

During the participative workshops of the project, the women thoroughly expressed the need of being part of the component related to the strengthen of capacities and decision making, which will allow them to be empowered in subjects specially linked to conservation, adaptation to climate change, business development, strengthening of organizations in the case of Huacho, and associations in the case of Mancora; and other spaces that the project develops.

Therefore, the project will take several measures that facilitate the participation of women in the workshops and/or work terms that are organized as part of the capacity strengthening an decision making subjects, for example, through the paperwork for the installation of the Program

CUNAMAS[20], where the women will be able to obtain a daily caring service for their children up until 3 years old, attention for food and nutrition, caring of children's health, children's learning and work with the families. These measures, added to the other measures described in the title Access and Equity, will allow women to enter these spaces, without neglecting the work under their responsibility at home.

Core Labour Rights

The project is not designed to promote employment under the standards of the International Labor Organization. However, by promoting ecotourism, aquaculture and bio-fertilizers initiatives, definitely it will create jobs for artisanal fishing families (wives of fishermen), under the principle of equal pay for equal work. Therefore, the project will ensure that the associations with which implements economic activities are officially registered. The project will not generate in any way child labor.

The project is designed to respect the laws of Peru in relation to child labor, the same that are aligned to international standards for the protection of the rights of children. In the case of artisanal fisheries, work practices exist where children support parent activities in land. These are traditional practices where children basically help with the selection of fishes and some other tasks to support their parents in the market. In no case these practices violate the norms of protection of children and their fundamental rights to health, education and recreation, moreover, these traditional practices allow children to acquire skills and tools that enable them to improve their career opportunities in their future.

The monitoring system of safeguards of the project incorporate, as a measure of prevention of child labor, an item to ensure full compliance with the rights of girls and boys. This monitoring will allow detecting children working in the pilot areas. In case of ocurrence, it will be reported to the DEMUNA (Office of Advocacy for Children and Adolescents). This instance has specialized personnel and protocols to fulfill their tasks of promotion, protection and compliance of children rights. They are responsible for reporting this to the Ministry of Labour in order to guarantee children basic rights to health, education and recreation.

Indigenous Peoples

This principle does not apply to the project, since in both pilot sites, there is no presence of indigenous peoples, as artisanal fishermen are not identified as such.

Involuntary Resettlement

The project will not be implemented on land or population centers. In that sense, it will not generate involuntary resettlement. However, it is likely to restrict the use of resources due to the delimitation to be held for the strict protection of benthic species natural banks as well as the establishment of aquaculture concessions. This restriction may involve a level of conflict between the project beneficiaries and those fishermen who do not participate in the project (social risk). Therefore a set of mitigation measures to manage these risks have been proposed:

[20] The National Program Cunamas is a focused social program in charge of the Ministry of Development and Social Inclusion (MIDIS for its name in Spanish) whose goal is to improve the development of children, boys and girls, under the age of 3 in regions with poverty or extreme poverty, to overcome the gaps on their cognitive, social, physical and emotional development.

- *Develop economic alternatives for income generation*.- With those affected by the restriction of use of fisheries resources it should be implemented compensation measures, such as: (i) registration of affected to determine how many they are, (ii) develop income-generating initiatives with registered, such as bio-fertilizers production, ecotourism, etc. and (iii) implement a training plan for income generation initiatives.

Protection of Natural Habitats

The project will contribute to the protection of marine and coastal habitats within protected areas, as it will promote the restoration of natural banks of benthic species in islet Don Martin and Punta Salinas which belongs to the Guano Islands, Islets and Capes National Reserve System, in co-management with artisanal fishing communities and authorities to protect these banks. Furthermore, it will support the governance of marine protected areas.

Conservation of Biological Diversity

The project will not cause significant reduction or loss of biological diversity, or introduce exotic species. On the contrary, the proposed activities will contribute to the conservation of marine and coastal biodiversity, since the project will promote the development of sustainable economic activities, as well as policy and management instruments for the conservation and responsible use of marine ecosystems. However, it have been identified minor environmental impacts and risks outlined below and which mitigation measures to avoid or mitigate them, are presented in Table 13:

- Mortality of marine vertebrates (mainly birds and sea turtles) associated with bycatch in fishing gears due to the replacement of nets for longlines.
- Incidental capture of juvenile tuna fishes or use of juvenile anchovies as baits due to tuna fishing pilots with pole and line and hand-line (experiential fishing).
- Change in the composition of benthic species and possible population decline of these species due to aquaculture infrastructure installation (bottom pens).
- Disturbance of marine vertebrates (mammals, birds and turtles) due to the noise of boat engines and human presence (wildlife watching and experiential fishing). It is noteworthy that ecotourism is already been conducting in Máncora pilot site, therefore with the proposed mitigation measures the project will also help to mitigate this impact in the area.

For the establishment of aquaculture concessions, the Regional Directions of Production (DIREPRO) requests an environmental impact statement (DIA by its acronym in Spanish). It is noteworthy that according to the descentralization process of the national government to the regional governments, now the DIREPROs are in charge of approving and delivering environmental impact declarations of minor scale aquaculture concessions. These Directions depend administratively and from a budget point of view, on sub-national governments (Regional Governments). However, they are governed by the legal framework established by PRODUCE. Thus, there will not be a risk of conflict of interest with the project Executing Agency (PRODUCE).

In order to ensure that Adaptation Fund´s Social and Environmental Policies are incorporated in this environmental impact instrument, PROFONANPE will include this responsibility in the contract of the environmental consultant.

Furthermore, impacts and risks and their mitigation measures arising from this environmental impact instrument will be updated and included in the project´s ESMP.

Climate Change

The project will not develop activities that involve a significant increase in emissions of greenhouse gases or other climate change stressors.

Pollution Prevention and Resource Efficiency

Project activities include the development of good practices in the management of solid and oily waste, so the risk of environmental pollution should be avoided. However, potential risks generated by activities such as aquaculture and ecotourism that could affect water quality, have been identified. Furthermore, the bio-fertilizer producing activity has a potential risk of soil pollution. Therefore, mitigation measures for avoiding these risks are proposed as part of the ESMP (section 4.1).

Public Health

Project activities involve no risk to human health. On the contrary, the promotion of bio-fertilizers, will be made under an efficient use of waste from fishery and aquaculture, which means in practice to implement actions of recycling solid waste pollutants and harmful to health, turning them into products of commercial value.

Physical and Cultural Heritage

There is no cultural heritage in the project´s pilot areas. Only some activities are proposed within Guano Islands, Islets and Capes National Reserve System (Huacho pilot area). However, the protected area will not be affected.

Lands and Soil Conservation

Project activities will be conducted mainly in marine ecosystems, therefore there will be no soil degradation or conversion.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme implementation.

The project will be implemented through a simple and efficient structure that will facilitate the active participation and coordination of all project stakeholders as presented in figure 6. PROFONANPE will serve as the **National Implementing Entity (NIE)** responsible for the oversight of the project. In its role, PROFONANPE will contribute to the preparation, implementation and monitoring of the project, through its headquarters and country office in Peru. These will include among others the following activities: (i) support project preparation and evaluation, (ii) guide the definition of monitoring and evaluation arrangements including outcome and output indicators, (iii) contribute building local capacity through specialized training/workshops on fiduciary and procurement-related aspects of project execution in accordance with PROFONANPE's policies and guidelines, (v) provide sectorial policy advisory as requested, (vi) provide support on technical and quality assurance issues in accordance to PROFONANPE's policies.

The Republic of Peru will be the Beneficiary of the project, and the Ministry of Production of Peru (PRODUCE) will be the **Executing Agency (EA)** responsible for the execution of the project in its fiduciary aspects. The EA will execute the project in accordance with the purposes and activities agreed upon with PROFONANPE, following its policies and procedures.

The EA will carry out its responsibilities through the Unidad Ejecutora 003 “Fomento al Consumo Humano Directo – A Comer Pescado” (UE-003) of the Vice-Ministry of Fisheries of PRODUCE, which will host a **Project CoordinationTeam (PCT)**, financed through the project. The UE-003 is currently responsible of carrying out the project “Adaptation to climate change in the fishery sector and marine-coastal ecosystem of Perú” (PE-G1001/PE-T1297) financed by the IADB (see Part II F). In order to facilitate the complementarity of both projects, PRODUCE decided to assign the same UE-003 to execute this proposal. The UE-003 will program and facilitate the meetings of the **Project Steering Committee (PSC)** and will distribute the project reports to its members (PRODUCE, IMARPE, MINAM, SERNANP).

The PCT will be led by a Project Coordinator (PC) and consists of a group of professionals who will give support to the EA in all project related administrative and fiduciary aspects, in order to execute the following tasks: (i) preparation and execution of project work plans; (ii) contracting external annual audits and preparing required documentation for this purpose; (iii) preparation and monitoring of annual project budgets including periodical budget revisions; (iv) administration of funds including the preparation of disbursement requests to PROFONANPE; (v) carrying out procurement processes according to PROFONANPE procurement policies; (vi) carrying out financial and progress reporting; (vi) prepare the project’s operations manual (POM), which will be approved by the PSC; with the prior non-objection of PROFONANPE; (vii) hire the external audit of the project’s financial statements for submission to PROFONANPE; and (viii) compliance with monitoring and evaluation protocols established in the POM to be designed following PROFONANPE´s procedures.

Additionally, the EA will coordinate the collaboration with PSC members, such as IMARPE, for technical support during project execution and the implementation of specific components, including the local governments of Máncora and Huacho. The coordination between the entities involved in the execution of the project will be further detailed in the POM.

The **Project Steering Committee (PSC)** will be established to provide high-level technical and managerial guidance to the PCT in charge of the project. The PSC will be composed of designated senior-level representatives from the EA (PRODUCE), the Ministry of the Environment (MINAM), the Peruvian Marine Research Institute (IMARPE) and the Peruvian National Service of Protected Areas (SERNANP). Presided by the Ministry of Production and with the participation of IMARPES’s Executive Direction, MINAM and SERNANP, the PSC will provide strategic guidance to the project by: (i) approving POM and required updates or modifications; (ii) supporting the Project Coordinator by ensuring an enabling environment to assure technical quality, financial transparency and overall development impact of the project; (iii) serving as forum for the analysis of policy implications, political feasibility and building consensus for policy and regulation implementation among project stakeholders; (iv) maintaining, through its presidency, regular communication among its members and ensuring that their interests are addressed and communicated effectively to project stakeholders.

The PCT includes a procurement specialist, an administrative assistant and a local project coordinator. The PCT main responsibilities include: (i) assure compliance with all fiduciary requirements (both financial and procurement) of PROFONANPE, including also the Adaptation Fund Social and Environmental Policy; (ii) provide support as required by the Project Coordinator

and EA in the preparation of the POM, Annual Operating Plans (AOP), Procurement Plans, Project Execution Plans, disbursement requests for submission to PROFONANPE, prepare and update project financial balance sheet and (iii) monitor project's disbursement against goals established in the POM. The local coordinator based in Máncora will have a key role in disseminating knowledge and exchanging information with all stakeholders and the public in general, including other units within IMARPE, PRODUCE, MINAM, universities, other national science institutions, NGOs, community based organizations (CBOs), local governments, as well as associations of artisanal fishermen from local areas.

The **Project Coordinator (PC)** will be a dedicated professional hired by the project and designated for the duration of the project (4 years) to lead the PCT. The PC's prime responsibility is to ensure that the project produces the results specified in the agreement between the PROFONANPE and the EA. With the support of the local coordinator, the PC will oversee progress of technical project components, including day-to-day operations of the project, and the overall operational and financial management and reporting. The PC will count on the support of both the Technical Secretary (TS) and PCT for the successful execution of project activities. PC's core functions include: (i) lead the preparation and execution of the POM and present it to the PSC for its approval; (ii) lead the preparation and present annual reports of project status to the PSC and PROFONANPE, following the indications highlighted in the POM; (iii) revise and approve project disbursement requests to be presented to PROFONANPE; (iv) coordinate with local project coordinators and discuss with them the POM; (v) lead the preparation of project's final evaluation; (vi) serve as the liaison between the project and other national, regional or local activities that could complement or generate synergies with the objectives of the project.

The **Technical Secretary (TS)** will oversee critical technical decisions and will make sure that the technical quality of project outputs has the highest standards. The TS will be composed by a group of professionals from the Vice-ministry of Fisheries and the Ministry of Environment (MINAM), and IMARPE will preside it. IMARPE, as the chair of the TS, will be responsible of the approval of the terms of reference for the procurement of all goods and services. On the other hand, MINAM will provide technical guidance in the mainstreaming of the climate change adaptation approach in the activities of all the involved institutions. Specifically, the TS will be responsible for: i) technical and scientific oversight of the project; ii) monitor the technical implementation of services and other contracts; iii) coordination with other national science institutions to complement the surveillance and prediction system, iv) give direct technical support to the PCT in the preparation of the Annual Operating Plans (AOP) and the Project Implementation Plan that will define the execution timeframe for each activity and the responsible parties for their supervision, and v) review and approve the POM that incorporates project activities and results to be delivered through the plan.

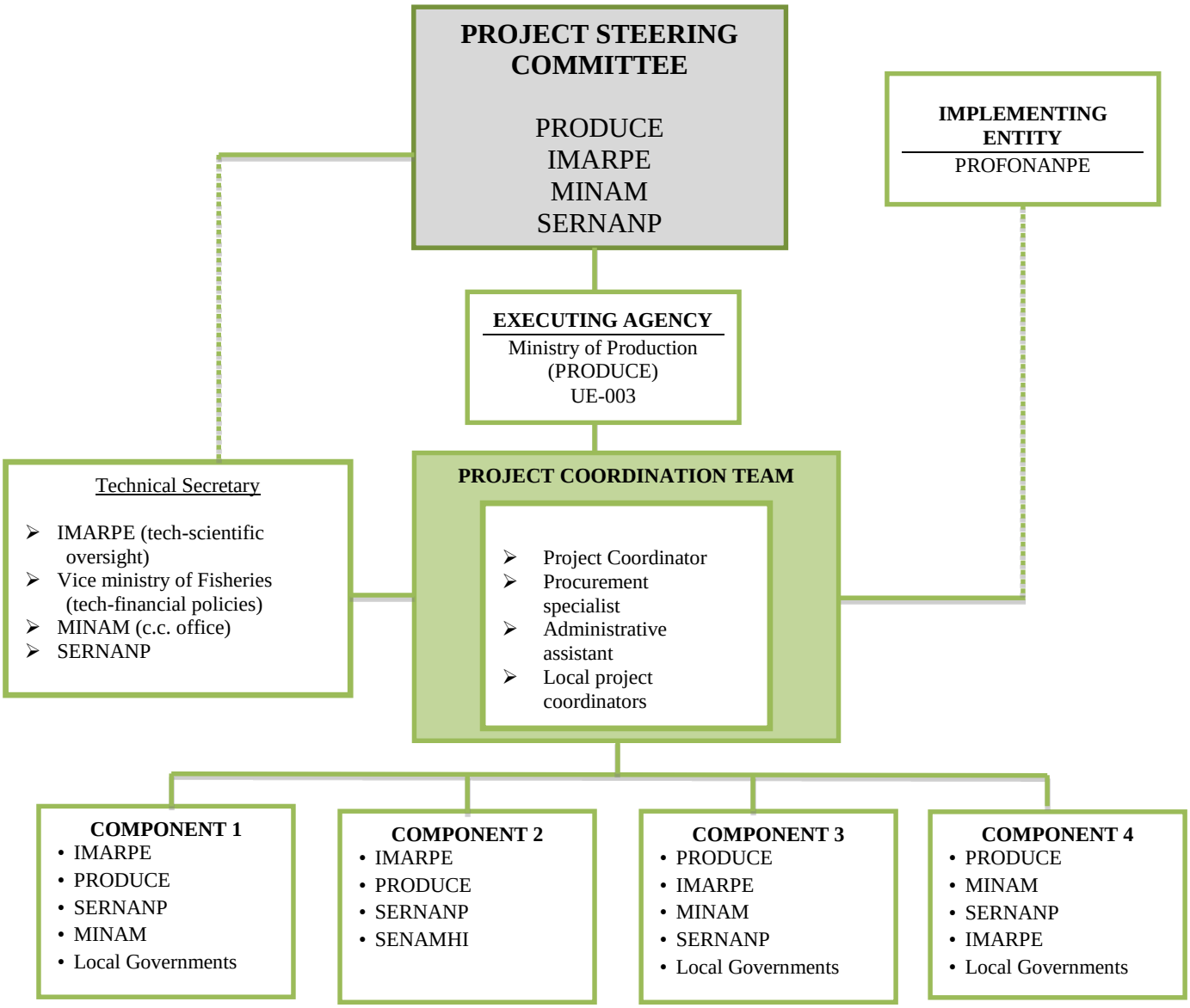


Figure 6. Project Implementation structure

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

A risk management strategy is a key component of project management activities. This is in line with PROFONANPE risk management approach. PROFONANPE should provide support to the PCT and EA in the monitoring and mitigation of risks; the results should be tracked and reported as agreed with PROFONANPE. Risks should also be systematically monitored as part of the Monitoring & Evaluation (M&E) Plan by PROFONANPE staff carrying out the oversight related tasks. Reporting on risks and mitigation strategies should take place as part of the semi–annual reports. In addition to this and keeping with PROFONANPE practices, a dedicated budget lines exists for M&E, to ensure that the necessary resources are allocated to execute such framework.

The correct and ongoing management of risk will not eliminate risks, but will help improve the probability of satisfactorily achieving project results and impacts. For this reason project risk management will include the following principles: (i) integrated approach, (ii) on-going process that takes into account all of the information that is created during periodic evaluations and decisions adopted, (iii) decisions taken during the risk management process must be documented, (iv) inclusion of effective communication with interested parties in all aspects of the process, (v) guarantee of integrity of risk evaluation process, (vi) regular assessment of quality risk management standards and procedures becomes an integral part of project's supervision and monitoring tasks.

Potential risks for the development of the proposed project are limited, and measures to control them have been defined in the following table 12.

#	Type	Risk Description	Lev	Mitigation Strategy
1	Regulatory	Climate change adaptation has not been incorporated in the policies, strategies, and plans of the Ministry of Production (PRODUCE) nor local governments.	L	PRODUCE recently presented its new strategic guidelines and climate change adaptation is one of the main lines of action proposed. Additionally, IDB and the Ministry of Economics and Finances (MEF) have discussed with PRODUCE in order to advance the formulation of the climate change adaptation strategy for the fisheries subsector. Participation and consultation of local policy and decision makers in workshops, field visits and meetings during the project preparation, implementation and evaluation phases. Communication plan for disseminating the project strategy, its components, expected outcomes, results and lessons learned from the adaptation processes in order to promote awareness and understanding of adaptation and climate risk reduction processes. Capacity building actions (for example how to use scientific information/results/lessons learned in the formulation of policies/strategies/plans).
2	Political	Artisanal fishing has not been included into national development policies; the focus of the sector has been directed to industrial fishing and exports.	L	Influence policy makers for the inclusion of artisanal fishing (and its relation to climate change) into national development policies. Assure the active participation and consultation with artisanal fishing communities and decision makers in workshops, field visits and meetings during the project preparation, implementation and evaluation phases. Communication plan for disseminating the project strategy, its components, expected outcomes, results and lessons learned from this project.

				Capacity building actions (for example how the artisanal fishing is a key player in the formulation of the national policy).
3	Regulatory	Insufficient regulation proposing environmental friendly fishing practices and the sustainable use of ecosystems.	L	Promote through workshops, the application of environmental friendly fishing practices and the sustainable use of ecosystems in the artisanal fishery sector. Provide support/technical assistance to the governmental agencies to develop regulation and enforce its implementation.
4	Regulatory	Weak enforcement and lack of compliance with regulation; various gray areas in the interaction between artisanal and industrial fishing.	M	Ensure the participation of the DICAPI (Port stewards and Coastguard), COREVIPAS (local delegate for the surveillance of fishing activities), regional governments and regulatory agencies in the enforcement of and compliance with sector specific regulation, through the active support of the Ministry of Production and the Ministry of Environment (for example workshops, meetings and field visits to the project showing the problematic between artisanal and industrial fishing).
5	Financial	There may be insufficient financial resources for the sustainability of the project activities once the grant financing the project is spent.	M	The EA will take advantage of current and rising opportunities of public funding for climate change adaptation, risk management, food security and sustainable fishery management national programs in order to give sustainability and scale up the adaptation measures launched during the project. Fundraising capacity of key stakeholders for accessing public and private funding is further enhanced; the benefits to have a portfolio with several donors and the opportunities from the lessons learned from this project need to be highlighted. The improved commercialization capacity of fishers will provide higher incomes to beneficiaries, favouring sustainability of adaptation measures.
6	Operational	Few or lack of coordination instances for the key stakeholders involved does not ensure the adequate prioritization of project activities.	L	Ensure the participation and consultation of key stakeholders and decision makers via workshops and meetings during the project preparation, introduction, implementation and evaluation phases. Implement a strategy among regional and local governments, IMARPE, PRODUCE and representative fishermen organizations, to inform, validate and execute the actions provided by the project in a participatory way.

Table 12. Financial, regulatory, political and operational risks of the project and respective response measure (L=low, M=medium, H=high).

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

The project execution may generate few potential environmental and social impacts that should be reversible and easy to avoid or mitigate. Therefore, the project is categorized as Category B. Potential environmental and social risks and measures to control them have been defined in the following table 13. Furthermore, it has been develop an environmental and social management plan (ESMP) that will be implemented during project execution (Annex V). This plan consists of two main programs:

(i) Environmental prevention and mitigation program, in which specific measures are established to prevent, correct and/or mitigate adverse environmental impacts and risks identified, and

(ii) Monitoring, assessment and oversight program, in which the implementation arrangements for M&E of the compliance with mitigation measures and grievance mechanism is defined.

#	Type	ESP	Risk Description	Lev	Mitigation Strategy
1	Social	Access and equity	Resistance from specific artisanal fisheries or groups within those areas to the proposed measures.	M	Support the marketing of fishing products. The project will work with the wives of fishermen in activities of selection, handling and preparation of artisanal fisheries products, in order to canalize them to direct consumer market through weekly and / or daily fairs of fishing products, promoted by PRODUCE, local and regional governments. This means working previously in coordinated action and establishing agreements for cooperation between the stakeholders involved: fishermen, PRODUCE, local and regional governments. Stage workshops and training programs for community leaders and civil authorities to raise awareness of important local issues related to climate change and adaptation. Work through local associations to promote dialogue and build trust among stakeholders, as well as facilitate the incorporation of lessons learned and replication in specific geographical areas.

					Ensure visibility of climate adaptation strategies and economic benefits in the eyes of all beneficiaries, through workshops, training, field visits. Provide technical assistance to the key stakeholders of the project for formalization and certification of artisanal fisheries. Promote women participation in aquaculture, ecotourism and bio-fertilizers production. Develop periodic meetings to report on progress, especially oriented to women leaders and / or boards of women social organizations. Promote education of children by NGOs and regional governments, in order to support working women in fisheries activities.
2	Social	Access and equity	Conflicting interests among stakeholders regarding the rights and access to the use of natural resources.	M	Two working groups (one for each pilot area in the project) will work towards promoting dialogue and building trust among key stakeholders to assure equity conditions and promote auto-regulation through co-management strategies. Design and implement a sustained information program prior to project initiation targeted to fishermen communities involved in the project. With fishers affected by restriction of use of natural resources due to aquaculture, compensation measures will be implemented, such as: (i) registration and quantification of affected people, (ii) develop income-generating initiatives with registered, such as bio-fertilizers production, ecotourism, etc., and (iii) implement a training plan for income generation initiatives. Implement an administration institutional arrangement with defined responsibilities to provide social and economic sustainability to the experiential tuna fishing activity in the Máncora pilot site. Institutionalize the arrangement through an act or agreement.
3	Social	Access and equity	Interinstitutional or internal conflicts between the entity that administrates the	L	Implement an administration institutional arrangement with defined responsibilities to provide social and economic sustainability to

			artisanal fishing dock and the sectorial authority, due to the lack of definition in the responsibilities for the experiential tuna fishing activity		the experiential tuna fishing activity in the Máncora pilot site. Institutionalize the arrangement through an act or agreement
4	Social	Core labour rights	Children working on adaptation activities proposed in the pilot sites	L	Report the case to the DEMUNA (Office of Advocacy for Children and Adolescents) in case of occurrence.
5	Social	Invountary resettlement	Reduction of artisanal fishermen family income due to adoption of new fishing gears		Cover the cost of pilot sustainable fishing gears Reduce the commercial intermediation of marine products coming from the adoption of new fishing practices, by supporting the marketing of fishing products through weekly and / or daily fairs of fishing products, promoted by PRODUCE, local and regional governments Training and increase of awareness for the fishermen aiming towards the adoption of the new fishing practices and species sustainability
6	Environmental	Conservation of biological diversity	Mortality of marine vertebrates (mainly birds and sea turtles) by incidental capture in fishing gears.	L	Establish an on board monitoring program to track bycatch of marine vertebrates (mammals, birds and turtles), which will contribute to provide recommendations to reduce bycatch of species and their associated mortality and improve fishing practices.[21] Train artisanal fishermen in techniques for recovery, rehabilitation and release of bycatch species.
7	Environmental	Conservation of biological diversity	Change in the benthic species composition due to aquaculture infrastructure installation (bottom pens).	L	Develop research aimed to generate information on the impact of aquaculture on benthic species and implement recommendations.

[21] In Peru, researches on incidental catches of seabirds in artisanal longlines are scarce, and observation efforts are minimal, due to the complexity of this kind of fisheries which operate with small boats, using several fishing gears, spatiotemporally dynamic and multispecific. Some studies carried out in the country do not report catches (Ayala 2008) and others report mortality of albatross *Thalassache melanophrys* (Mangel et al. 2006) and petrel *Procellaria aequinoctialis* (Alfaro et al. 2010).

In this sense, in order to develop mitigation measures viable and safe for small boats and crew which operate fishing gears manually, it is required to carry out an onboard monitoring in pilot areas to establish recommendations (Goya *et al*. 2011). Among the possible mitigation measures for the project are: a) implementation of scarecrows in longlines to keep seabirds away from hook bait, b) blue colored bait to reduce bait visibility, c) night fishing to avoid interactions with seabirds, and d) lateral fishing to limit access of seabirds with baited hooks. However, the implementation of these measures, will depend on the onboard monitoring program established as a mitigation measure.

8	Environmental	Conservation of biological diversity	Marine vertebrates' displacement or habitat abandonment (mammals, birds and turtles) due to vessels' sound and human presence where sightings are held.	L	Develop good practices codes of conduct for marine wildlife watching and experiential fishing, to be implemented by conformed ecotourism enterprises. Subscribe agreements or commitments with beneficiaries to comply with watching best practices. Develop training modules for beneficiaries on ecotourism best practices. Ensure compliance with legal standards related to tourism operation. Oversee the adequate development of ecotourism operation.
9	Environmental	Conservation of biological diversity	Incidental capture of juvenile tuna fishes or use of juvenile anchovies as baits due to tuna fishing pilots with pole and line and hand-line (experiential fishing)	L	Release the juvenile individuals caught. Verify that the anchovies used as bait are within the official size. Implement a comprehensive system of traceability and monitoring of good practices.
10	Environmental	Conservation of biological diversity	Incidental capture of marine vertebrates in pole and line and hand-line artisanal fishing boats	L	Establish an on board monitoring program to track bycatch of marine vertebrates (especially seabirds and sea turtles), which will contribute to provide recommendations to reduce bycatch of species and their associated mortality and improve fishing practices. Train artisanal fishermen in recovery techniques, rehabilitation and release of bycatch species.
11	Environmental	Conservation of biological diversity	Guano seabirds disturbance	L	Coordinate with the PA´s staff (SERNANP) regarding location and entry time to Don Martín islet.
12	Environmental	Pollution prevention and resource efficiency	Seawater pollution by solid and oily waste generation from aquaculture activities.	L	Elaborate the Environmental Impact Statement (DIA) requested by the competent authority (Production Regional Direction). Develop and implement a solid and oil wastes management plan, which must be part of the fishing area or concession´s management plan. Conduct periodic revisions of boat engines to avoid oils or lubricants spills, which must be part of the fishing area or concession´s management plan. Consider training modules on solid and oil wastes management and

					good aquaculture practices, within component 3 regarding capacity building. Oversee the appropriate development of aquaculture.
13	Environmental	Pollution prevention and resource efficiency	Seawater pollution by solid and oily waste generation from ecotourism activities (e.g. wildlife sightings and experiential tuna fishing).	L	Develop and implement a solid and oily waste mangement plan from ecotourism activities. Conduct periodic revisions of boat engines to avoid oils or lubricants spills. Develop training modules for beneficiaries on solid and oily waste management.
14	Environmental	Pollution prevention and resource efficiency	Generation of solid waste due to installation of weather stations in guano islands	L	Evacuate all solid waste generated outside the natural protected area (Don Martin islet)
15	Environmental	Pollution prevention and resource efficiency	Solid waste and effluents generation during the process of bio-fertilizer production	L	Develop a management plan for solid waste and effluents
16	Environmental	Pollution prevention and resource efficiency	Soil pollution due to leakage of effluents during the process of bio-fertilizer production	L	Develop a management plan for effluent control Soil insulation
17	Environmental		Environmental pollution associated with sewer waste from the coastal cities and industrial activities have a negative effect on the implementation of interventions related to natural banks, and aquaculture activities.	L	Avoid polluted or polluted-threatened areas when designating potential aquaculture and co-management areas for the project.
18	Environmental		El Niño events, other climatic events and red tides affect the PAs habitats and local communities.	M	Ensure that the design and implementation of early warning system, as well as local strategies on dissemination, are part of the project's goals. Contingency plans to be included in the interventions design and costs so that losses for the beneficiaries are lowered.

Table 13. Environmental and social risks of the project and respective response measure (L=low, M=medium, H=high).

Grievance mechanism

Participatory spaces will be generated to develop consensus forms for negotiating where complaints and local demands (social, environmental or any other issue related to the Project) are

processed. For example, through the conformation of “dialogue tables”, rounds of negotiations and other that have an authorized representation by competent bodies and local organizations.

Furthermore, PROFONANPE’s website have an online form that allows users to make suggestions, queries, information requests and complaints (http://www.profonanpe.org.pe/index.php/es/buzon-de-sugerencias). This form is sent to the Administration and Finance Director and the Development and Supervision Director, who have the responsibility to reply when applicable, within 8 business days.This procedure will be informed to the Project stakeholders at the begginig and during the execution, specifically at workshops and meetings scheduled in the Project. Additionally, is important to mention that PROFONANPE´s Direction of Development and Supervision will be in charge of oversee the ESMP implementation.

On the other hand, a Manual of Social and Environmental Safeguards Implementation will be developed at the beginning of the Project. In this document, a detailed description of the process for resolving complaints, which include mechanisms for permanent information to beneficiaries, will be developed.

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

The Monitoring & Evaluation (M&E) Plan will be conducted in accordance with PROFONANPE standard procedures. The Results Framework defines execution indicators for project implementation as well as the respective means of verification. The monitoring and evaluating system for the Project will be established based on these indicators and means of verification. Monitoring activities will seek progress of processes and project milestones completion, while the evaluation will focus on the achievement of results and overall project impact based on the stated objective.

Monitoring and evaluation at the project level, including the day-to-day monitoring of project activities, will be responsibility of the Project Coordinator, with support from the procurement specialist assigned for this operation. Periodic monitoring of implementation progress will be undertaken by PROFONANPE through quarterly meetings with the Project Coordinator, or more frequently as deemed necessary. This will allow parties to take stock and to troubleshoot any problems pertaining to the project in a timely fashion to ensure smooth implementation of project activities.

Resources targeted for M&E are represented in a portion of the time of the Project Coordinator, Procurement specialist, Administrative assistant and the technical staff from the participant institutions working in the various Components, this is estimated at one quarter of their work time. Dissemination of project progress is part of the estimated communication and information dissemination plan. An external financial audit will be performed each year by a firm approved by PROFONANPE, which will be contracted by the Executing Agency and paid by the project.

The project will have a Project Implementation Plan (PIP) to support project management through a multi-year proposal for the execution of the entire project. The PIP is based on the results matrix and includes the activities and responsibilities throughout the project timeframe. A proposed Annual Operating Plan (AOP) will be developed at the middle of each year of project execution, and approved by the PSC. A Project Initial Report will include a detailed description of first year’s

AOP execution, divided in quarterly sections, related budget and progress indicators to guide the project implementation during the first year.

The M&E Plan

The Project Steering Committee (PSC), presided by Ministry of Production and with the participation of the Vice-Minister of the Ministry of Environment, IMARPES's Executive Direction and SERNANP's Direction (as described in section A of Part III) will be part of the project's evaluation activities and will be informed of the progress of the monitoring process. Annual Progress Reports (APR), as well as the Mid-Term and Final Evaluations (including lessons learned and good practices) will be presented to the PSC, and shared with other relevant stakeholders (i.e. government, civil society and participating organizations or beneficiaries). In the APRs comparison between the baseline and the indicators will be carried out.

Initial evaluation

- The Project Inception Workshop (PIW) will be held within the first 2 months of project start-up with all stakeholders. The IW is crucial to build ownership of the project results and to plan the first year annual operating plan. A fundamental objective of the IW will be to present the modalities of project implementation and execution, document mutual agreement for the proposed execution arrangements amongst stakeholders, and assist the PCT to understand and take ownership of the project's goals and objectives. Another key objective of the IW will be the introduction of the PCT which will support the project during its implementation. An IW Report will be prepared and shared with participants to formalize the various agreements taken during the meeting.

- Within the first six months of the project, the Project Coordinator will also be responsible for consolidating all baseline information required for the indicators identified in the Results Framework.

Progress Monitoring

- Quarterly Reports will be prepared by the PCT and verified by the PROFONANPE.
- An Annual Progress Report (APR) will be prepared by the Project Coordinator, and shared with all stakeholders. The APRs will include progress against set goals, objectives and targets, lessons learned, risk management and detailed financial disbursements. APRs will be prepared to monitor progress made since project start and in particular for the previous reporting period. The APRs will include, but are not limited to, the following:

    - ✓ Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative); information related to product indicators will be collected mainly through documentation and records within institutional stakeholders, as well as through the review of meeting reports and agreements of the Steering Committee.
    - ✓ Project outputs delivered per project Outcome (annual);
    - ✓ Lessons learned/good practices;
    - ✓ Annual expenditure reports;
    - ✓ Risk management, and a critical assessment of project administration, coordination and execution
    - ✓ Effectiveness of project and individual component design including progress in inter-institutional coordination and execution

- Government authorities, the PCT, and PROFONANPE staff will conduct regular field visits to project sites based on the agreed schedule in the project's Inception Report/Annual Operating Plan to assess first hand project progress.

Mid Term Evaluation

- The project will undergo an independent Mid-Term Evaluation (MTE) at the mid-point of project implementation. The MTE will determine progress made toward the achievement of outcomes and will identify corrective actions if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated in a Mid-term Report.

- The Mid-term Evaluation, carried out when 40% of the AF resources are disbursed, or twenty-four months after the project contract goes into effect (whichever comes first), will determine progress towards results' achievement, the level of stakeholder participation, any positive changes in beneficiaries' practices due to the intervention, as well as identify necessary changes to be made.

Financial monitoring

- The PCT will provide PROFONANPE with certified periodic financial statements, and with an Annual Audit of the financial statements relating to the status of fund´s execution according to the established procedures set out in PROFONANPE´s Operations Manual. The Audit will be conducted in accordance with PROFONANPE Financial Regulations and Rules and applicable audit policies on PROFONANPE projects by a legally recognized auditor of the GoP, or by a commercial auditor engaged by the GoP.

Final evaluation

- A Final External Evaluation will be conducted three months before project closure (three months before the Project Steering Committee meets for the last time) and will focus on the same issues as the Mid-Term Evaluation. The Final Evaluation will also look at the impact and sustainability of project results.

  The budgeted M&E plan, which is included in the PEC costs, is presented in Table 14, and the break-down of how Implementing Entity's fees will be utilized in the supervision of the M&E function is included in Part III, Section G.

#	Type of M&E activity	Responsible party	Budget US$	Time frame
1	Inception workshop and report	• IMARPE • PROFONANPE • Project Steering Committee	7,000 (PROFONANPE staff travel costs to be charged to IE fees)	Within first two months of project start up in one of the pilot areas Report within one month of the IW
2	Measurement of Means of Verification for Project Progress and Performance (measured on an annual basis)	• Project Coordinator	None	Annually

3	Quarterly Reports	• Project Coordinator (EA) • PROFONANPE	None	Quarterly
4	Annual Progress Reports	• PCT (EA) • PROFONANPE	None	Within two months of the next year.
5	Meetings of the Project Steering Committee (PSC)	• Project Coordinator (EA) • PROFONANPE	None	
6	External Mid-term evaluation	• PCT • PROFONANPE External consultants	15,000	At the mid-point of project implementation
7	Late-term Workshop and report	• IMARPE • PROFONANPE • Project Steering Committee	10,000 (PROFONANPE staff travel costs to be charged to IE fees)	Nine months before the end of project implementation, in one of the pilot areas Report within one month of the workshop
8	External Final Evaluation	• Project Coordinator • Technical Secretary, • PROFONANPE, external consultants	30,000	Three months before the end project implementation
9	Final Report	• PCT • PROFONANPE	None	At least one month before the end of the project
10	Audits	• PCT • PROFONANPE	32,000	Annually - Following PROFONANPE procedures
11	Manual of environmental and social safeguards implementation Training workshop aimed to PC and local coordinators	• PCT • PROFONANPE	26,000	
12	Monitoring Visits to Field Sites	• PCT • PROFONANPE	10,000 (PROFONANPE staff travel costs to be charged to IE fees)	To be determined annually by PCT and PROFONANPE
	TOTAL			**US$ 130,000**

Table 14. M&E budget.

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

Results framework for the project proposal, including milestones, targets and indicators

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
OBJECTIVE/COMPONENT 1: Implementation of interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress.		No. of artisanal fishers in PA adopting climate change adaptation measures that improve their livelihoods and the resilience of the ecosystem % of women adopting climate change adaptation measures	0 – artisanal fishers are adopting climate change measures at PA	700 artisanal fishers in PA adopted climate change measures 80% of women adopting climate change adaptation measures	Survey report	(See below)
OUTCOME 1.1. Increased resilience and reduced vulnerability of targeted coastal marine ecosystems to observed effects of climate change and variability-induced stress	OUTPUT 1.1.1.Adoption of sustainable fishing methods to tackle non-selective fishing gear based on EAF principles directed to target species vulnerable to climate change	% of non-selective fishing gears that are replaced by selective fishing gears by the fishing units in PAs. (from a total of 120 fishing boats in Máncora).	0% - Artisanal fisheries perceive that the resources are being depleted due to over extraction and other factors such as pollution and bad fishing practices (blast fishing, dinghy, buzzer)	At least 30% of non-selective offshore gillnets (used for fishing tuna) are replaced by long-line in Máncora cove, (tropical coastal PA).	Surveys report, site visits	Risk: Resistance by artisanal fishers to change traditional practices for sustainable practices. Assumption: Support to sustainable artisanal fishery and direct human consumption in the fishery policy.

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
	OUTPUT 1.1.2. Restoration and co-management of natural banks	# of natural banks restored	Historical records of natural bank of scallop in Don Martin island	1 natural bank of scallop restored in the Marine Protected Area	Survey report	Assumption: Normative framework promulgated for restoration and co-management of coastal marine area
		# of natural banks co-managed	Natural banks of razor clam in Punta Salinas	1 natural bank of razor clam under co-management principles	Survey report	Assumption: Climate conditions not exceeding predicted scenarios.
						Risk: Granting rights for other activities.
						Assumption: Strategy for the definition of priority areas by Ministry of Production.
						Assumption: Active participation of stakeholders and adequate monitoring from the authorities
OUTCOME 1.2. Improved adaptive capacity of local participating communities through the diversification	OUTPUT 1.2.1 Planning and development of sustainable aquaculture through small-scale concessions	# of artisanal fishers associations developing sustainable aquaculture	There are organizations interested in promoting the development of this activity; i.e. an association of artisanal fishers, aquaculture and related extractors "St. Martín de Porres" in Huacho	At least two artisanal fishers association developing scallops sustainable aquaculture	Progress reports (at local level); site visits	Assumption: It assumes a positive impact of sensitization and training activities according to the needs identified

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
and strengthening of their livelihoods and sources of income as they face climate change induced modifications of biomass and fish distribution		# of aquaculture concessions granted in Pilot Areas reporting profits	In Huacho, aquaculture was practiced for mullet and scallop. In 2009, fishermen (200 extractors) participated in a repopulation project for scallop in Don Martín Island. The project failed because of the low salinity and lack of technical assistance. SERNANP, who manages the island has expressed interest to make an agreement and develop a pilot plan.	At least 1 aquaculture concession granted in Huacho reporting profits		Assumption: Aquaculture activities defined with seasonal criteria and structured management plans with local communities
		# of projects with business plans	No antecedents of oyster aquaculture in Mancora.	1 business plan on aquaculture resource	Progress reports	
	OUTPUT 1.2.2. Creation of ecotourism enterprises	# of fishers associations participating in ecotourism ventures reporting	There is one company that employs artisanal fishers who now dedicate full time to ecotourism in Máncora	At least 2 fishers associations incorporating ecotourism as a complementary economic activity.	Progress reports (at local level); site visits	Assumption: Positive impact of sensitization and training activities according to the needs identified

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
		complementary income # of women association that incorporates ecotourism as a complementary economic activity.	In Máncora there is infrastructure for tourism development. In Huacho there are ongoing efforts from the local and regional governments to improve the ecotourism potential, but it's on initial stages planning	At least 1 women association incorporates ecotourism as a complementary economic activity.		Risk: Rejection of social organizations of artisanal fishers (SOAFs) to establish formal companies, resistance to paying taxes
	OUTPUT 1.2.3 Improvement of market power capacities for sustainable artisanal fisheries	% of fishers reporting increased income per fishing ton sold. (from a total of 300 fishers in Máncora).	Intermediaries capture a large percentage of the value of the production price and consumer price. The sale price received by fishers is significantly lower than the market price. High percentage of fishers below the poverty line.	20% of artisanal fishers increase their revenue per ton sold	Field (assessment) reports; progress reports; annual reports; surveys, site visits	Assumption: Positive impact of sensitization and training activities according to the needs identified
		# of trade agreements between SOAFs and middlemen / final consumer (i.e. restaurant, supermarket) # of trade agreements managed in partnership with a women association.	Existence of various intermediaries that reduce the purchase price of artisanal fisheries products. Low market power due to lack of transport and infrastructure for cooling.	At least one trade agreement in each PA managed in partnership with civil society organizations At least one trade agreement in each PA managed in partnership with a women association.		

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
	OUTPUT 1.2.4. Start-up of certification process for local artisanal fisheries	# of SOAFs with ongoing certification processes started	The three performance conditions to start the certification process (sustainability of the stock, minimizing environmental impact and effective management) are not fully met in any of the pilot areas.	2 SOAFs have performed a pre-assessment for the fisheries certification	Progress reports	Assumption: Technical support and investment in the adoption of sustainable and environmental friendly fishing methods
	OUTPUT 1.2.5. Production of biofertilizers from fishery and aquaculture residues	# of artisanal fishers associations producing biofertilizers # of women associations producing biofertilizers.	National Agrarian University La Molina (UNALM) has developed the technology of homolactic fermentation to produce biofertilizers from fishery residues	At least two artisanal fishers associations producing biofertilizers from fishery and aquaculture residues At least two women associations produce biofertilizers from fishery and aquaculture residues.	Progress reports	Assumption: Technical support from UNALM
OBJECTIVE/COMPONENT 2: Deployment of a modern and efficient environment surveillance and prediction system in the coastal marine ecosystems at regional and local scales supporting fisheries adaptive management under the EAF principles		No. of modern systems for environment surveillance and prediction implemented	Partial and non-articulated studies, surveys and assessments have been carried out at PAs	One modern system for environment surveillance and prediction implemented	Technical reports	(See below)
OUTCOME 2.1.Increased response	OUTPUT 2.1.1. Development of a climatic and an	# of coastal meteorological	Information generated by the Don Martín station (outdated by disuse).	1 operational coastal meteorological station (in Don Martín island)	Field (assessment) reports;	Assumption: Available sites for installing

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
capacity of the government at a national and local level at PAs to address climate change induced physical and ecological stresses on the coastal marine environment, ecosystem services and resources availability	oceanographic surveillance system.	stations operative and transmitting data	There is an operational meteorological station in Cabo Blanco by a private company which has an agreement with IMARPE.		progress reports; environmental monitoring reports, annual reports, site visits, websites.	meteorological facilities with adequate protection
		# of marine autonomous gliders in operation	Do not exist (zero)	5 marine autonomous gliders		Assumption: Awareness of the local communities for the protection of facilities
		Interface for data sharing with other environmental or climate agencies	Do not exist (zero)	One interface implemented		Assumption: Mechanisms for co-funding the maintenance and operational costs (e.g. at institutional and regional governments level)
		# of satellite products incorporated in the surveillance system	There are ongoing projects between IRD and IMARPE to develop satellite oceanography, but are not operational yet	4 satellite products incorporated in the monitoring and surveillance system: winds, temperature, chlorophyll and altimetry.		
	OUTPUT 2.1.2. Establishment of marine environment surveillance programs in pilot areas in coordination with local stakeholders	Baseline assessments of environmental quality	Partial studies and baseline assessments of environmental quality and biodiversity, but are not integrated and do not include all elements required	1 baseline assessment achieved in each PA by the end of the first year	Field (assessment) reports; progress reports; environmental monitoring reports, annual reports, site visits, websites.	Assumption: Active participation of local stakeholders and other stakeholders in the monitoring programs and baseline studies
		Quality environmental and red tides monitoring program with local stakeholders	Do not exist (zero)	3 sensors and data loggers for high-frequency observation of SST and conductivity		Assumption: Awareness and engagements of the local communities for the protection of

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
						instruments and loggers
				1 operational monitoring program of environmental quality (DO, pH, harmful algal blooms) at selected points and on a seasonal basis		Assumption: Mechanisms for co-funding the maintenance and operational costs (e.g. at institutional and regional governments level)
		Ecosystem resilience monitoring program designed with other stakeholders and including fishermen as observers	Do not exist (zero)	1 proposal developed for an ecosystem resilience monitoring program		Assumption: Awareness and engagement of other stakeholders for participation in the ecosystem resilience monitoring program
	OUTPUT 2.1.3. Development of a modelling and prediction system at local scales	Oceanographic scenarios under optimistic and pessimistic IPCC greenhouse gas concentration trajectories (RCP 8.5 and RCP 3-PD)	Qualitative scenarios for climate change impacts developed at local scales	2 scenarios developed (optimistic and pessimistic)	Technical reports, publications.	Assumption: Adequate institutional mechanisms for recruitment of experts to carry out the tasks
		Catch potential scenarios of key resources under IPCC greenhouse gas concentration trajectories RCP 8.5 and RCP 3-PD	Qualitative scenarios for climate change impacts developed at local scales	2 scenarios developed (optimistic and pessimistic)		

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
	OUTPUT 2.1.4. Building capacity on monitoring and development of new science-based tools such as Ecological Risk Assessments (ERA) for climate change directed to IMARPE, decision makers and academia.	# of trained scientists at IMARPE and academia and/or other centres	No training on ERA for climate change adaptation exists.	At least 15 trained scientists in IMARPE, and a similar number in academia and/or other centres.	Project reports; briefing materials; workshop reports, internet	Assumption: Labour stability of scientific staff
		# of workshops and seminars for decision-makers	There have been many technical training workshops, but have not been translated into public policy strategies aimed at decision makers	4 workshops / seminars directed to decision-makers within the framework of the project		Assumption: Ministry of Production promotes climate change adaptation strategy in the fishery sector
		# of undergraduate and graduate thesis developed related to project outcomes (baseline studies, aquaculture impact, ERAs, etc.),	No. thesis developed on ERA in Peru.	At least 6 theses incorporating issues related to project		
OBJECTIVE/COMPONENT 3: Capacity building and knowledge management system for implementing the EBA and the EAF, and for the dissemination of project's lessons learned, targeting government		No. stakeholders with improved capacity in order to reduce vulnerability to climate change	Do not exist (zero)	At least 10 fishery associations and 6 public institutions (PRODUCE, IMARPE, MINAM, SERNANP,	Project reports	(See below)

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
officials, academia, local communities and other stakeholders		% of women with improved capacity		local governments) with improved capacity 80 % of women with improved capacity		
OUTCOME 3.1. Strengthened institutional capacity to assess the extension and magnitude of climate change impacts on fisheries and effective actions to cope with these changes, providing limits on climate induced loss of income in local communities.	OUTPUT 3.1.1. Development and implementation of a Knowledge Management Strategy (KMS)	# of tools to support the processes of production, storage, update, circulation and knowledge (re)use	Do not exist (zero)	Formal communication, storage, classification and distribution systems of the information generated	Project reports; briefing materials; workshop reports, internet, website for dissemination of monitoring products	Assumption: Coordination with ongoing activities and co-financing
		# of documented lessons by users type	Do not exist (zero)	As part of the learning process there are identified at least 2 replication strategies for scale up (technical and management) by characterized user type (governmental, non-governmental, private, beneficiaries)		Assumption: Joint assessments across sectors, incorporating the assessment of beneficiaries
		# of replication strategies for scale-up	Do not exist (zero)			
OUTCOME 3.2. Strengthened awareness and ownership of adaptation and climate risk reduction processes on impacted communities in	OUTPUT 3.2.1. Training and sensitizing of beneficiaries on key topics such as good fishing practices, formalization, entrepreneurship and fishery surveillance and control.	# of artisanal fishers and other key agents trained in issues related to Component 1: fishing sustainable methods, self-organization, legal formalization, entrepreneurship, fisheries certification, marketing,	Artisanal fishermen have received several sensitization workshops on various issues, but they are not continuous and do not target specific local problems in the PAs	30% of the target population trained	Workshop reports	Assumption: Incorporation of stakeholders in defining training needs and schedule.

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
the project target areas		aquaculture, ecotourism, fishery surveillance and control, etc.				
		# of debate spaces for sharing successful experiences	Do not exist (zero)	3 network-wide debates for beneficiaries at each PA to generate synergies and share learning	Project reports; internet blogs	Assumption: Commitment and ownership of beneficiaries to create opportunities for joint learning and successful experiences with a proper technical support
	OUTPUT 3.2.2. Design and implementation of early warning systems through a participatory process at local and regional scales	# early warning systems associated to environmental variables	Do not exist (zero)	Two early warning systems developed with a set of reference levels and indicators associated to environmental variables to identify and timely evaluate the emergence of short-term deviations for taking appropriate action	A website created for dissemination of monitoring products of climatic and environmental events	

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
OBJECTIVE/COMPONENT 4: Management policies, regulations and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress.		No. regulations or instruments proposals to promote resiliency of ecosystems and communities to climate change	Do not exist (zero)	At least 4 regulations or instruments proposals to promote resiliency of ecosystems and communities to climate change	Document proposals	(See below)
OUTCOME 4.1. Improved governance, policies and regulations at a national and local level to enhance the sustainable use and resilience of coastal marine resources	OUTPUT 4.1.1. Support of the cross-sector working group for the promotion of common actions addressing coastal ecosystems' resilience to climate change impacts	# of cross-sector management proposals addressing coastal marine issues related to climate change. # of representatives of artisanal fishermen and of women involved in coastal and marine activities, incorporated into the Board of Directors of the Multisectorial Commission.	Multisectoral Commission of Environmental Management of the Coastal Marine Medium (COMUMA), created in 2013 Regional Offices for Environmental issues and Natural Resources.	One cross-sector draft plan incorporating coastal and marine environments in climate change adaptation strategies and instruments for defining sector policies related to Integrated Management of Coastal Marine Areas. Multisectorial Commission incorporates into the Board of Directors, at least one representative of the artisanal fishermen and of women involved in coastal and marine activities.	Project reports	Assumption: Financial and human resources to enable opportunities for coordination and cross-sector policy making.

Project Strategy		Objectively Verifiable Indicators				
Goal: Support the GoP in reducing the vulnerability of coastal communities to the impacts of climate change on the coastal marine ecosystems and fishery resources.		Indicator	Baseline	Target	Source of verification	Risks and assumptions
		# of economic ecological zoning proposals in PA.	Zoning proposal at regional scale	1 zoning proposal have been developed in coordination with the MINAM (Territorial Ordination Office)		
	OUTPUT 4.1.2. Development of regulations and proposals for co-management in coastal marine areas	# of proposals for the update and/or development of the current fisheries normativity and regulations, with focus on co-management	Various co-management experiences promoted regionally, but not promoted at national level.	At least one normativity or guideline is incorporated for co-management at the sectorial and regional level	Project reports Technical documents	Assumption: Financial and human resources to enable opportunities for coordination and cross-sector policy making.
	OUTPUT 4.1.3. Development of regulation to implement incentives for the participation of artisanal fishermen, adopting sustainable practices, in the National Direct Human Consumption Program.	# of regulations and/or administrative procedures for the implementation of incentives approved	The use of non-selective gears and the low quality of fish products prevent the access of artisanal fishermen to the direct human consumption high-value markets.	1 regulation incorporated to promote artisanal fishing products for Direct Human Consumption, applying sustainable fishing methods, in the national and regional laws and regulations	Project reports, normative publications	Assumption: Leadership from PRODUCE

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

Alignment with Adaptation Fund Results Framework: The project's proposed results framework, presented in Part III E is aligned with the Adaptation Fund (AF) Results Framework[22] architecture and directly contributes to the overall objective "Reduce vulnerability and increase adaptive capacity to respond to the impacts of climate change, including variability at local and national levels".

There is perfect alignment between the stated objective of this proposal and the AF overall objective. Proposed project's objective (see Part I, Project Objectives) indicates that it supports the efforts of the GoP (a particularly vulnerable country to the adverse effects of climate change and party to the Kyoto Protocol) reducing the vulnerability of coastal communities to the impacts of climate change on their main source of income, wealth and wellbeing; the coastal marine ecosystems and fisheries resources in Peru. The project is limited to well-defined coastal marine areas to be co-managed with the community of users.

Alignment between the AF Results Framework and the project is also clear at the impact level. The project expected impact on the target population (selected pilot coastal fisheries communities) is to increase the resilience at the community level to climate variability and climate change.

In particular, the proposed project is aligned with the following outcomes and outputs of the AF (Table 15):

Project Objective(s)[23]	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Objective 1. Implementation of interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress	No. of artisanal fishers in PA adopting climate change adaptation measures that improve their livelihoods and the resilience of the ecosystem	**Outcome 6.** Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	6.2. Percentage of targeted population with sustained climate-resilient livelihoods	3,124,800
Objective 2. Deployment of a modern and efficient environment surveillance and prediction system in the coastal marine ecosystems at regional and local scales supporting fisheries adaptive management under the EAF principles	No. of modern systems for environment surveillance and prediction implemented	**Outcome 1.** Reduced exposure at national level to climate-related hazards and threats	1. Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	2,055,200

[22] Results Framework and baseline guidance, project level, Adaptation Fund, 2011
[23] The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

Objective 3. Capacity building and knowledge management system for implementing the EBA and the EAF, and for the dissemination of project's lessons learned, targeting government officials, academia, local communities and other stakeholders	No. stakeholders with improved capacity in order to reduce vulnerability to climate change	**Outcome 2.** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses **Outcome 3.** Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	2.1. No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks 3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	420,000
Objective 4. Management policies, regulations and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress.	No. regulations or instruments proposals to promote the resiliency of ecosystems and communities to climate change	**Outcome 7.** Improved policies and regulations that promote and enforce resilience measures	7. Climate change priorities are integrated into national development strategy	250,000
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Outcome 1.1. Increased resilience and reduced vulnerability of targeted coastal marine ecosystems to observed effects of climate change and variability-induced stress.	% of non-selective fishing gears that are replaced by selective fishing gears by the fishing units in PAs. No. of natural banks restored No. of natural banks co-managed	**Output 5.** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	994,854
Outcome 1.2. Improved adaptive capacity of local participating communities through the diversification	No. of artisanal fishers associations developing sustainable aquaculture,	**Output 6.** Targeted individual and community livelihood strategies	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or	2,130,216

and strengthening of their livelihoods and sources of income as they face climate change induced modifications of biomass and fish distribution	ecotourism and conversion of residues to bioproducts	strengthened in relation to climate change impacts, including variability	community-livelihood strategies 6.1.2. Type of income sources for households generated under climate change scenario	
Outcome 2.1. Increased response capacity of the government at a national and local level at PAs to address climate change induced physical and ecological stresses on the coastal marine environment, ecosystem services and resources availability.	No. of marine autonomous gliders in operation No. of trained scientists at IMARPE and academia and/or other centres	**Output 1.** Risk and vulnerability assessments conducted and updated at a national level	1.1. No. and type of projects that conduct and update risk and vulnerability assessments 2.1.1. No. of staff trained to respond to, and mitigate impacts of climate-related events	2,055,200
Outcome 3.1. Strengthened institutional capacity to assess the extension and magnitude of climate change impacts on fisheries and effective actions to cope with these changes, providing limits on climate induced loss of income in local communities.	No. tools to support the processes of production, storage, update, circulation and knowledge (re)use	**Output 2.1.** Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	120,000
Outcome 3.2. Strengthened awareness and ownership of adaptation and climate risk reduction processes on impacted communities in the project target areas	No. artisanal fishers and other key agents trained in issues related to Component 1: fishing sustainable methods, self-organization, legal formalization, entrepreneurship, fisheries certification, marketing,	**Output 2.2.** Targeted population groups covered by adequate risk reduction systems	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	300,000
		Output 1: Risk and vulnerability assessments conducted and	1.2. Development of early warning systems	

	aquaculture, ecotourism, etc. No. early warning systems associated to environmental variables No. of debate spaces for sharing successful experiences	updated at a national level		
		Output 3. Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	
Outcome 4.1. Improved governance, policies and regulations at a national and local level to enhance the sustainable use and resilience of coastal marine resources.	No. of regulations and/or administrative procedures for the implementation of incentives approved No. of proposals for the update and/or development of the current fisheries normativity and regulations, with focus on co-management	**Output 7.** Improved integration of climate-resilience strategies into country development plans	7.1. No., type, and sector of policies introduced or adjusted to address climate change risks	250,000

Table 15. Contribution of the project components to the AF Results Framework

G. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Detailed budget

Objectives/Outcomes/Outputs		Total	N°	Note
Objective 1: Implementation of interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress		**3,124,800**		
Outcome 1.1. Increased resilience and reduced vulnerability of targeted coastal marine ecosystems to observed effects of climate change and variability-induced stress.		**994,584**		
Output 1.1.1. Adoption of sustainable fishing methods to tackle non-selective fishing gear based on EAF principles directed to target species vulnerable to climate change	Consultants	130,483	1	Contracts for the Consultants carrying-on this activity
	Travel	38,621	2	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	105,517	3	Workshops and meetings to coordinate the development of the Output and provide technical assistance
	Contractors	19,473	4	Hiring of third-parties for field experiences and conditioning of boats
	Equipment	78,166	5	Fishing gear needed for the adoption of new fishing methods
	Sub total 1.1.1	372,259		
Output 1.1.2. Restoration and co-management of natural banks	Consultants	100,000	6	Contracts for the Consultants carrying-on this activity
	Travel	7,704	7	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	7,704	8	Workshops and meetings to develop the Output and provide technical assistance
	Contractors	461,695	9	Hiring of third-parties for the prospection and safekeeping of the restored banks
	Equipment	45,222	10	Fishing gear and boating equipment needed for the restoration process
	Sub total 1.1.2	622,325		
Outcome 1.2. Improved adaptive capacity of local participating communities through the diversification and strengthening of their livelihoods and sources of income as they face climate change induced modifications of biomass and fish distribution		**2,130,216**		

Output 1.2.1 Planning and development of sustainable aquaculture through smallscale concessions	Consultants	420,000	11	Contracts for the Consultants carrying-on this activity
	Travel	7,704	12	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	7,704	13	Workshops and meetings to develop the Output and provide technical assistance
	Contractors	35,556	14	Administrative and maintenance costs
	Equipment	654,273	15	Aquaculture and boating equipment needed to develop selected areas
	Sub total 1.2.1	1,125,236		
Output 1.2.2. Creation of ecotourism enterprises	Consultants	73,081	16	Contracts for the Consultants carrying-on this activity
	Travel	8,825	17	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	13,882	18	Workshops and meetings to develop the Output and provide technical assistance
	Contractors - Máncora	212,146	19	Operational costs of pole and line experiential fishing, cost of living bait, traceability system.
	Contractors - Huacho	66,119	20	Development of tourism infrastructure
	Equipment	288,357	21	Boating and security equipment needed for the development of ecotourism
	Sub total 1.2.2	662,410		
Output 1.2.3 Improvement of market power capacities for sustainable artisanal fisheries	Consultants	100,000	22	Contracts for the Consultants carrying-on this activity
	Travel	16,000	23	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	16,000	24	Workshops and meetings to develop the Output and provide technical assistance
	Sub total 1.2.3	132,000		
Output 1.2.4 Start-up of certification process for local artisanal fisheries	Consultants	63,570	25	Contracts for the Consultants carrying-on this activity
	Travel	16,000	26	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	16,000	27	Workshops and meetings to develop the Output and provide technical assistance
	Miscelaneous	5,000	28	Incidental expenses
	Sub total 1.2.3	100,570		
Output 1.2.5 Production of biofertilizers, biodiesel and food through bioconversion of solid and liquid fishery and aquaculture residues.	Consultants	10,000	29	Contracts for the Consultants carrying-on this activity
	Travel	5,000	30	Travel costs for site visits, workshops and meetings

	Workshops & Meetings	10,000	31	Workshops and meetings to develop the Output and provide technical assistance
	Contractors	4,000	32	Habilitation of the plant
	Equipment	76,000	33	Equipment for biorremediation plant
	Miscelaneous	5,000	34	Incidental expenses
	Sub total 1.2.3	110,000		
Objective 2: Deployment of a modern and efficient environment surveillance and prediction system in the coastal marine ecosystems at regional and local scales supporting fisheries adaptive management under the EAF principles		**2,055,200**		
Outcome 2.1.Increased response capacity of the government at the national and local level at pilot areas (PAs), to address climate change induced physical and ecological stresses on the coastal marine environment, ecosystem services and resources availability		**2,055,200**		
Output 2.1.1. Development of a climatic and oceanographic surveillance system	Consultants	64,000	35	Contracts for the Consultants carrying-on this activity
	Travel	8,000	36	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	8,000	37	Workshops and meetings to develop the Output and provide technical assistance
	Contractors	192,000	38	Maintenance and management of scientific equipment
	IT Equipment	100,000	39	IT equipment to be used as part of the climatic and oceanographic surveillance system
	Equipment	910,000	40	Scientific equipment for climatic and oceanographic surveillance system
	Sub total 2.1.1	1,282,000		
Output 2.1.2. Establishment of marine environment surveillance programs in pilot areas in coordination with local stakeholders	Consultants	84,000	41	Contracts for the Consultants carrying-on this activity
	Travel	8,000	42	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	8,000	43	Workshops and meetings to develop the Output and provide technical assistance
	Contractors	95,000	44	Maintenance of scientific equipment
	Equipment	143,000	45	Scientific equipment for marine environment surveillance program
	Sub total 2.1.2	338,000		
	Consultants	187,200	46	Contracts for the Consultants carrying-on this activity

Output 2.1.3. Development of a modeling and prediction system at local scales	Travel	9,000	47	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	9,000	48	Workshops and meetings to develop the Output and provide technical assistance
	IT Equipment	50,000	49	IT equipment to be used for the modeling and prediction systems
	Sub total 2.1.3	255,200		
Output 2.1.4. Building capacity on monitoring and development of new science-based management tools and development of Ecological Risk Assessment (ERA) for climate change directed to IMARPE, decision makers and academia	Consultants	20,000	50	Contracts for the Consultants carrying-on this activity
	Travel	50,000	51	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	108,200	52	Workshops and meetings to develop the Output and provide technical assistance
	Miscelaneous	1,800	53	Incidental expenses
	Sub total 2.1.4	180,000		
Objective 3: Capacity building and knowledge management system for implementing the EBA and the EAF, and for the dissemination of project's lessons learned, targeting government officials, academia, stakeholders and local communities		**420,000**		
Outcome 3.1. Strengthened institutional capacity to assess the extension and magnitude of climate change impacts on fisheries and effective actions to cope with these changes, providing limits on climate induced loss of income in local communities.		**120,000**		
Output 3.1.1. Development and implementation of a Knowledge Management Strategy (KMS)	Consultants	48,000	54	Contracts for the Consultants carrying-on this activity
	Travel	6,000	55	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	6,000	56	Workshops and meetings to develop the Output and provide technical assistance
	IT Equipment	48,000	57	IT equipment (i.e. servers) to be used in the development and implementation of a KMS
	Communications	10,800	58	Development and implementation of communication strategy
	Miscelaneous	1,200	59	Incidental expenses
	Sub total 3.1.1	120,000		
Outcome 3.2. Strengthened awareness and ownership of adaptation and climate risk reduction processes on impacted communities in the project target areas		**300,000**		
Output 3.2.1. Training and sensitizing of beneficiaries on key topics such as good fishing practices, formalization,	Consultants	100,000	60	Contracts for the Consultants carrying-on this activity
	Travel	18,000	61	Travel costs related to capacity building workshops and meetings

entrepreneurship, fishery surveillance and control r	Workshops & Meetings	110,000	62	Capacity building workshops and meetings to develop the Output
	IT Equipment	4,000	63	IT equipment to support training and sensitizing of beneficiaries
	Miscelaneous	8,000	64	Incidental expenses
	Sub total 3.2.1	240,000		
Output 3.2.2. Design of an early warning system through a participatory process and implementation at local and regional scales	Consultants	40,000	65	Contracts for the Consultants carrying-on this activity
	Travel	8,000	66	Travel costs related to capacity building workshops and meetings
	Workshops & Meetings	8,000	67	Capacity building workshops and meetings to develop the Output
	IT Equipment	4,000	68	IT and communications equipment to support the early warning system
	Sub total 3.2.2	60,000		
Objective 4: Management policies, regulations and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress.		**250,000**		
Outcome 4.1. Improved governance, policies and regulation at a national and local level to enhance the sustainable use and resilience of coastal marine resources		**250,000**		
Output 4.1.1. Support of the cross-sector working group for the promotion of common actions addressing coastal ecosystems' resilience to climate change impacts	Consultants	80,000	69	Contracts for the Consultants carrying-on this activity
	Travel	8,000	70	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	8,000	71	Workshops and meetings to develop the Output and provide technical assistance
	Miscelaneous	4,000	72	Incidental expenses
	Sub total 4.1.1	100,000		
Output 4.1.2. Development of regulations and proposals for co-management in coastal marine areas	Consultants	57,000	73	Contracts for the Consultants carrying-on this activity
	Travel	8,000	74	Travel costs for site visits, workshops and meetings
	Workshops & Meetings	8,000	75	Workshops and meetings to develop the Output and provide technical assistance
	Miscelaneous	2,000	76	Incidental expenses
	Sub total 4.1.2	75,000		
Output 4.1.3. Definition of incentives for the participation of artisanal fishers, adopting sustainable practices, in the	Consultants	57,000	77	Contracts for the Consultants carrying-on this activity
	Travel	8,000	78	Travel costs for site visits, workshops and meetings

National Direct Human Consumption Program	Workshops & Meetings	8,000	79	Workshops and meetings to develop the Output and provide technical assistance
	Miscelaneous	2,000	80	Incidental expenses
	Sub total 4.1.3	75,000		
Total Project Cost (TPC)		5,850,000		
Total Project Execution Costs (PEC)		**555,750**	81	PEC costs managed by the Executing Agency. Refer to Part III, Section G: PEC Costs" for details
TPC + PEC		**6,405,750**		
Project Cycle Management Fee (PCMF)		**544,489**	82	PCMF managed by the Implementing Entity. Refer to Part III, Section G: PCMF costs" for details
Financing Requested		**6,950,239**		
Notes				
1. PEC: charged by the Executing Agency, up to 9.50% of TPC				
2. PCMF: charged by the Implementing Entity, up to 8.50% of TPC + PEC				

Project Cycle Management Fee (PCMF)

Description	Profonanpe services	Estimated Cost of Profonanpe Services (USD)	%
Development and Preparation	• Provide technical support for Project preparation. • Detailed screening against technical, financial, social and risk critera. • Assist in the determination of Implementation Arrangements and negociation with other sectors. • Assist in verifying complementarity with other projects • Verify quality of preparation. • Obtain clearances from Adaptation Fund • Respond to information requests, arrange revisions, etc.	27,224	5.0%
Implementation and Supervision	• Provide technical and operational support for Project team. • Technical support in preparing TORs and verifying expertise for technical positions. • Regular reporting. • Verify technical validity of all reports. • Support and follow-up to project procurements • Project financial follow-up • Carry-out supervision missions and field visits. • Mid Term Review. • Receipt, allocation and reporting to the AFB of financial respources. • Oversight and monitoring of AF funds. • Participate as necessary during Project activities.	408,367	75.0%
Final Evaluation and Closing	• Undertake technical analysis, validate results and compile lessons. • Disseminate technical findings. • Support and follow-up to project procurements. • Project financial follow-up. • Final evaluation and Implementation Completion and Results Report.	108,898	20.0%
Total		**544,489**	**100.0%**

Project Execution Costs (PEC)

(in US$)

Description	2016	2017	2018	2019	Total	%
Staff						
Project Coordinator	23,550	51,600	51,600	51,600	178,350	32.1%
Procurement specialist	10,800	21,600	21,600		54,000	9.7%
Administrative assistant	4,200	8,400	8,400	8,400	29,400	5.3%
Project Officer - Máncora	20,000	24,000	24,000	24,000	92,000	16.6%
Project Officer - Huacho		24,000	24,000	24,000	72,000	13.0%
Sub total Staff	58,550	129,600	129,600	108,000	425,750	76.6%
M&E	20,489	31,793	10,598	67,120	130,000	23.4%
Total	79,039	161,393	140,198	175,120	**555,750**	100.0%

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

A comprehensive disbursement schedule with time-bound milestones has been developed for the proposed project and presented down below.

Description	Amount					Percentage			
	Y1	Y2	Y3	Y4	Total	Y1	Y2	Y3	Y4
Objective 1	**690,376**	**1,246,137**	**751,025**	**437,263**	**3,124,800**	**22.1%**	**39.9%**	**24.0%**	**14.0%**
Outcome 1.1	**275,838**	**257,973**	**247,973**	**212,799**	**994,584**	**27.7%**	**25.9%**	**24.9%**	**21.4%**
Output 1.1.1	81,340	108,698	108,698	73,523	372,259	21.9%	29.2%	29.2%	19.8%
Output 1.1.2	194,498	149,276	139,276	139,276	622,325	31.3%	24.0%	22.4%	22.4%
Outcome 1.2	**414,538**	**988,163**	**503,051**	**224,464**	**2,130,216**	**19.5%**	**46.4%**	**23.6%**	**10.5%**
Output 1.2.1	217,936	453,650	366,569	87,081	1,125,236	19.4%	40.3%	32.6%	7.7%
Output 1.2.2	174,098	440,418	23,947	23,947	662,410	26.3%	66.5%	3.6%	3.6%
Output 1.2.3	-	-	66,000	66,000	132,000	0.0%	0.0%	50.0%	50.0%
Output 1.2.4	14,357	28,721	28,721	28,771	100,570	14.3%	28.6%	28.6%	28.6%
Output 1.2.5	4,750	34,800	34,800	35,650	110,000	4.3%	31.6%	31.6%	32.4%
Objective 2	**146,300**	**1,444,967**	**231,967**	**231,967**	**2,055,200**	**7.1%**	**70.3%**	**11.3%**	**11.3%**
Outcome 2.1	**146,300**	**1,444,967**	**231,967**	**231,967**	**2,055,200**	**7.1%**	**70.3%**	**11.3%**	**11.3%**
Output 2.1.1	20,000	1,094,000	84,000	84,000	1,282,000	1.6%	85.3%	6.6%	6.6%
Output 2.1.2	25,000	199,667	56,667	56,667	338,000	7.4%	59.1%	16.8%	16.8%
Output 2.1.3	51,300	101,300	51,300	51,300	255,200	20.1%	39.7%	20.1%	20.1%
Output 2.1.4	50,000	50,000	40,000	40,000	180,000	27.8%	27.8%	22.2%	22.2%
Objective 3	**105,000**	**129,000**	**93,000**	**93,000**	**420,000**	**25.0%**	**30.7%**	**22.1%**	**22.1%**
Outcome 3.1	**-**	**24,000**	**48,000**	**48,000**	**120,000**	**0.0%**	**20.0%**	**40.0%**	**40.0%**
Output 3.1.1	-	24,000	48,000	48,000	120,000	0.0%	20.0%	40.0%	40.0%
Outcome 3.2	**105,000**	**105,000**	**45,000**	**45,000**	**300,000**	**35.0%**	**35.0%**	**15.0%**	**15.0%**
Output 3.2.1	84,000	84,000	36,000	36,000	240,000	35.0%	35.0%	15.0%	15.0%
Output 3.2.2	21,000	21,000	9,000	9,000	60,000	35.0%	35.0%	15.0%	15.0%

Objective 4	**62,500**	**100,000**	**62,500**	**25,000**	**250,000**	**25.0%**	**40.0%**	**25.0%**	**10.0%**
Outcome 4.1	**62,500**	**100,000**	**62,500**	**25,000**	**250,000**	**25.0%**	**40.0%**	**25.0%**	**10.0%**
Output 4.1.1	25,000	40,000	25,000	10,000	100,000	25.0%	40.0%	25.0%	10.0%
Output 4.1.2	18,750	30,000	18,750	7,500	75,000	25.0%	40.0%	25.0%	10.0%
Output 4.1.3	18,750	30,000	18,750	7,500	75,000	25.0%	40.0%	25.0%	10.0%
Total Project Costs (TPC)	**991,484**	**2,963,165**	**1,154,553**	**740,799**	**5,850,000**	**16.9%**	**50.7%**	**19.7%**	**12.7%**
Project Execution Costs (PEC)	**105,605**	**144,509**	**124,914**	**180,723**	**555,750**	**19.0%**	**26.0%**	**22.5%**	**32.5%**
TPC + PEC	**1,097,088**	**3,107,674**	**1,279,466**	**921,522**	**6,405,750**	**17.1%**	**48.5%**	**20.0%**	**14.4%**
Project Cycle Mgt Fee (PCMF)	**136,122**	**136,122**	**136,122**	**136,122**	**544,489**	**25.0%**	**25.0%**	**25.0%**	**25.0%**
Financing Requested	**1,233,210**	**3,243,796**	**1,415,589**	**1,057,644**	**6,950,239**	**17.7%**	**46.7%**	**20.4%**	**15.2%**

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

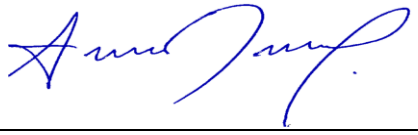
A. Record of endorsement on behalf of the government[24]

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Viviana Grissel Zaldivar Chauca (Advisor); Asesora, Gabinete de asesores de la Alta Dirección, Ministry of Environment (MINAM)	Date*: January, 11 th 2016*

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 (National Strategy of Climate Change) 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.	
Alberto Paniagua Villagra Implementing Entity Coordinator	
Date: *(*01, 11, 2016*)*	Tel. and email: (511) 3155700 apaniagua@profonanpe.org.pe
Project Contact Person: Cynthia Céspedes	
Tel. And Email: (511) 3155700 ccespedes@profonanpe.org.pe	

[22.] 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.

ANNEX I Detailed description of pilot areas and planned intervention actions

Description of the pilot areas and proposed adaptation interventions per selected site

The Peruvian coast is affected by two main different climatic and oceanographic systems. The Northern coast is partly under the influence of warm tropical waters and high precipitations on land, whereas the rest of the coast is subject to the cold coastal upwelling waters and arid conditions on the continent (Figure A1). Nevertheless, the southernmost coastal marine area presents a very narrow shelf and is more exposed to the intrusion of oceanic waters with lower productivity. Current trends in coastal SST exhibit significant warming for the Northern coast (<06°S), contrasting with strong cooling from Callao (12°S) to the south (Gutiérrez et al., 2011) (Figure 8). This behavior is also associated with different trends in productivity and possibly subsurface water oxygenation (Demarcq, 2009; Quipúzcoa et al., accepted).

Taking into account these features, the different adaptation interventions proposed in the coastal zone focus on two representative areas: one at the Northern coast (Máncora, 04°06' – 04°15'S, Piura Region), and one at the Central coast (Huacho, 11°01 – 11°20'S, Lima Region is one of the main fishing harbors in the Lima Region, the second in terms of industrial fishery due to the exploitation of the Northern-Central stock of Peruvian anchovy (*Engraulis ringens*). Máncora is nowadays not a landing point for the industrial fishery, but lies within the main distribution area of hake (*Merluccius gayi peruanus*), which is the main demersal[25] resource off the Peruvian coast.

Adaptation measures to reduce the impact of climate change on natural resources should necessarily address the issue of overfishing in the face of climate change, which will involve measures to reduce current catches. In this context adaptation interventions for the selected sites will promote fishery resource conservation, sustainable fishery management programs and economic alternatives outside fishery harvest.

[25] Describing a fish that lives close to the floor of the sea or a lake (http://www.thefreedictionary.com/demersal)

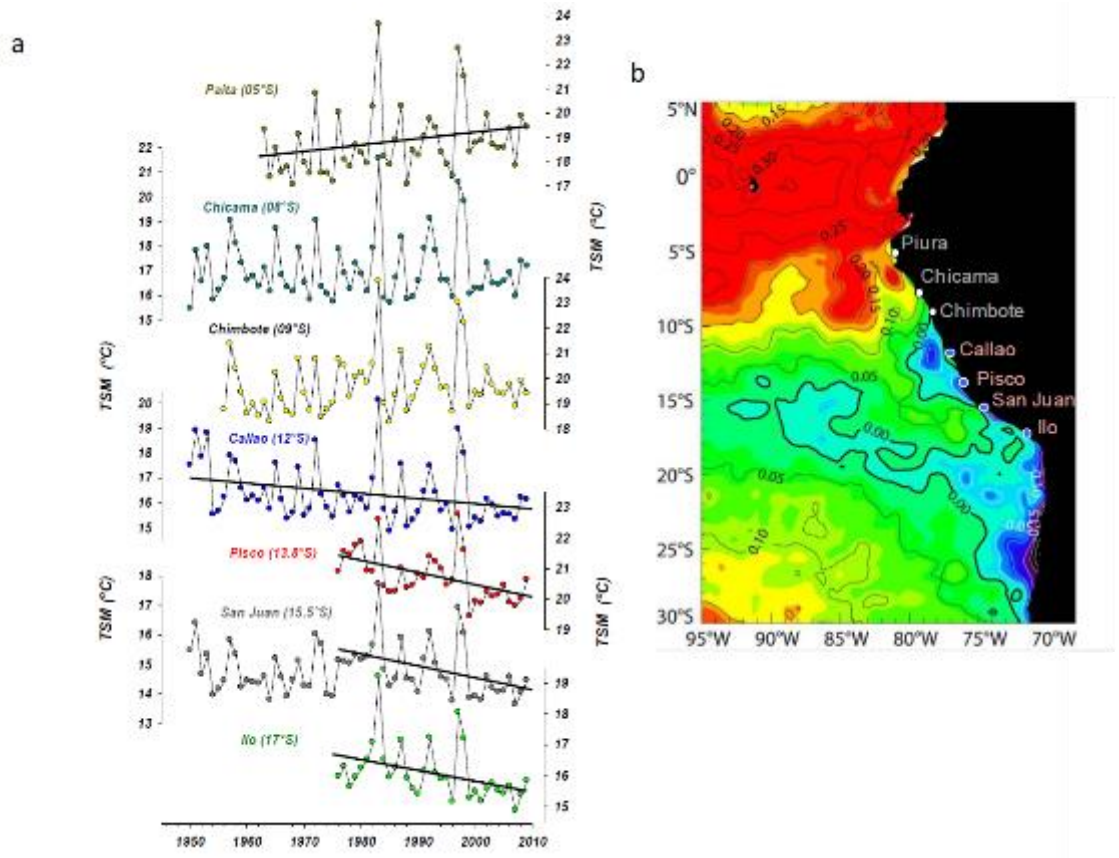


Figure A1. a) Trends in mean annual sea surface temperatures (SST), as measured in piers along the coast. Bold lines indicate statistical significance. For Paita, trend is +0.15±0.10°C, for Callao, -0.22±0.08°C decade^{-1}; p=0.01, for Pisco, -0.43±0.13°C decade^{-1}, p<0.01 (no data before 1976), for San Juan, -0.42±0.14°C decade^{-1}; p<0.01 (since 1976), for Ilo, -0.18±0.06°C decade^{-1}; p<0.01; **b) Trends in °C/decade for SST since 1984 to 2010 for the region, using the Reynolds database**. Modified from Gutiérrez et al. (in press).

In addition, participative workshops involving artisanal fishermen will be carried out in order to gather information about traditional fishery practices, and to involve local fishers in the decision-making process about the fishing gears selected at each pilot area. The sites are characterized in terms of proposed adaptation interventions, specific environmental, socio-economical and fisheries management issues as follows:

Approach for the interventions at pilot sites

The main objective of the interventions is to increase the communities' adaptive capacity at pilot areas based on a better understanding of their conditions and needs matched with a better understanding and monitoring of the ocean's productive capacity. They will be implemented in a highly interactive and participatory process with the coastal communities which apply artisanal fishing techniques. Through a mutual learning process, common ground is aimed to be found on activities which will not only ensure long-term sustainability of fish populations but also the social and economic needs of the communities. Adaptation

actions to be implemented will be prioritized with respect to their specific cost/benefit ratio and their strategic contribution towards a long-term artisanal fisheries management system.

In order to improve the current adaptive capacity of these local coastal communities, the adaptation pilots are divided in immediate and second phase actions. At the start of the project, immediate actions, the activities include an intensive consultation and mutual learning process between the coastal communities and the project team, training for the local fishers and populations, strengthening of climatic and oceanographic monitoring, support of pilot projects on ecotourism and 'fishery-tourism', support of new or ongoing territorial planning projects or policies, and realization of local workshops to discuss the implementation of co-management. In the second phase, the activities comprise promoting the use of new technologies, eco-labeling and certification, development of aquaculture of

Table A1. Summary of vulnerability factors in the two pilot strategic areas.

Factor / Feature	Máncora	Huacho
Key physical forcing	Equatorial Front	Coastal winds
Shelf/upwelling	Narrow/episodic plumes	Wide/wide
Coastal marine habitat	Vulnerability to climatic extremes (floodings, El Niño). Untreatment of waste waters	Subjected to chemical pollution (fisheries, agriculture) and domestic sources. Vulnerability to climatic extremes (El Niño).
Coastal biodiversity	Panamanian province and ecotone to Peruvian province (south), migration route of cetaceans and turtles	Wetlands, islands and inlets; habitats for migratory birds, colonial guano birds and marine mammals
Main resources	Giant Squid, Yellowfin Tuna	Anchovy (Central –Northern stock)
Main artisanal fishery resources; landings rank	Giant Squid, Yellowfin Tuna; 5th	Anchovy, scombrids, coastal fishes; 19th.
Anthropogenic pressure on top predators	Gillnet fishing – cetaceans and turtles	Pressure on habitat areas of marine birds and mammals
Hazards or conflicts in marine coastal management	Territory use/planning and climatic vulnerability and coastal marine pollution	Territory use/planning and coastal marine pollution
Climatic projection hypothesis up to 2030	SST increase in +0.4°C, > probability of extreme precipitations	High degree of uncertainty (either cooling or warming).

native species, support improvement of aquaculture systems, and environmental education in local schools.

Several potential types of concrete interventions have been defined during a joint workshop between IMARPE and members of the communities of both pilot areas. These include: (1) promote the use of environmental friendly fishing gears, ameliorating the status of the coastal marine resources; (2) reduce by-catch resulting in unintentional mortalities of top-predators, as marine mammals, birds and turtles; reducing the stress of the ecosystem food-chains; (3) promote sustainable aquaculture activities and ecotourism, where they are environmentally, financially and socially suitable, providing alternate economic activities for artisanal fishermen, reducing their vulnerability to climate change effects on their ecosystem; (4) support territorial planning, coastal marine habitats conservation or rehabilitation in agreement with the Ecosystem based Adaptation (EbA) approach (CBD, 2009); (5) promote co-management of benthic resources as a way to apply the Ecosystem Approach of Fisheries (EAF) at micro-scale; and (6) increase awareness of the impacts of climate and extreme events and the need for integrated coastal zone management, for the population and local authorities. These interventions will be further discussed, refined and complemented during a continued consultation process with the communities and throughout the implementation of the project.

1) Máncora, Piura Region, Tropical Coastal Ecosystem

General environmental description

In oceanographic terms, Máncora is located in southern tip of the Tropical Eastern Pacific Coastal Ecosystem, facing the seasonal north-south displacement of the Equatorial Front (EF) (Figure A2), where the Surface Tropical Waters (with high temperatures and low salinities) mix with the waters of moderate temperatures and higher salinities that characterize the HCS. The position of the EF is highly dynamic, exhibiting also interannual shifts in its latitudinal position. In winter, the Máncora area is influenced by the advection of upwelling waters from the south, lowering sea surface temperature values around 19°C, while in summer it is exposed to the advection of the Tropical Surface Waters, reaching 27°C (source: IMARPE, unpub. data).

Máncora town is both a seaside resort and a fishing cove in Northern Peru. On land, the Máncora area is cut by several ravines, which are filled in wet periods. The air temperature varies from 17°C to 27°C in the annual cycle, but during El Niño, the air temperature can reach 40°C. According to pluviometric measurements in Talara and in Tumbes, about 60km south and north of Máncora, respectively, mean monthly precipitation values range from 0-7mm (dry season) to 70-470mm (wet season) in the annual cycle, but during the last two extreme El Niño events (1982-83 and 1997-98), precipitation increased in about one order of magnitude during the wet season (Pouyaud et al., 2001), leading to the overflowing of the ravines and to coastal flooding. It is remarkable that in the last extreme El Niño, the combination of delivery of high amounts of particle material to the ocean and wave-driven sediment transport led to a regression of the shoreline in Máncora (Figure A3). The coastline presents fine sand beaches and

wetlands. The sub-tidal sediments are oxidized muddy fine sands with relatively low contents of organic matter (~3%) (Carbajal et al., 2010).

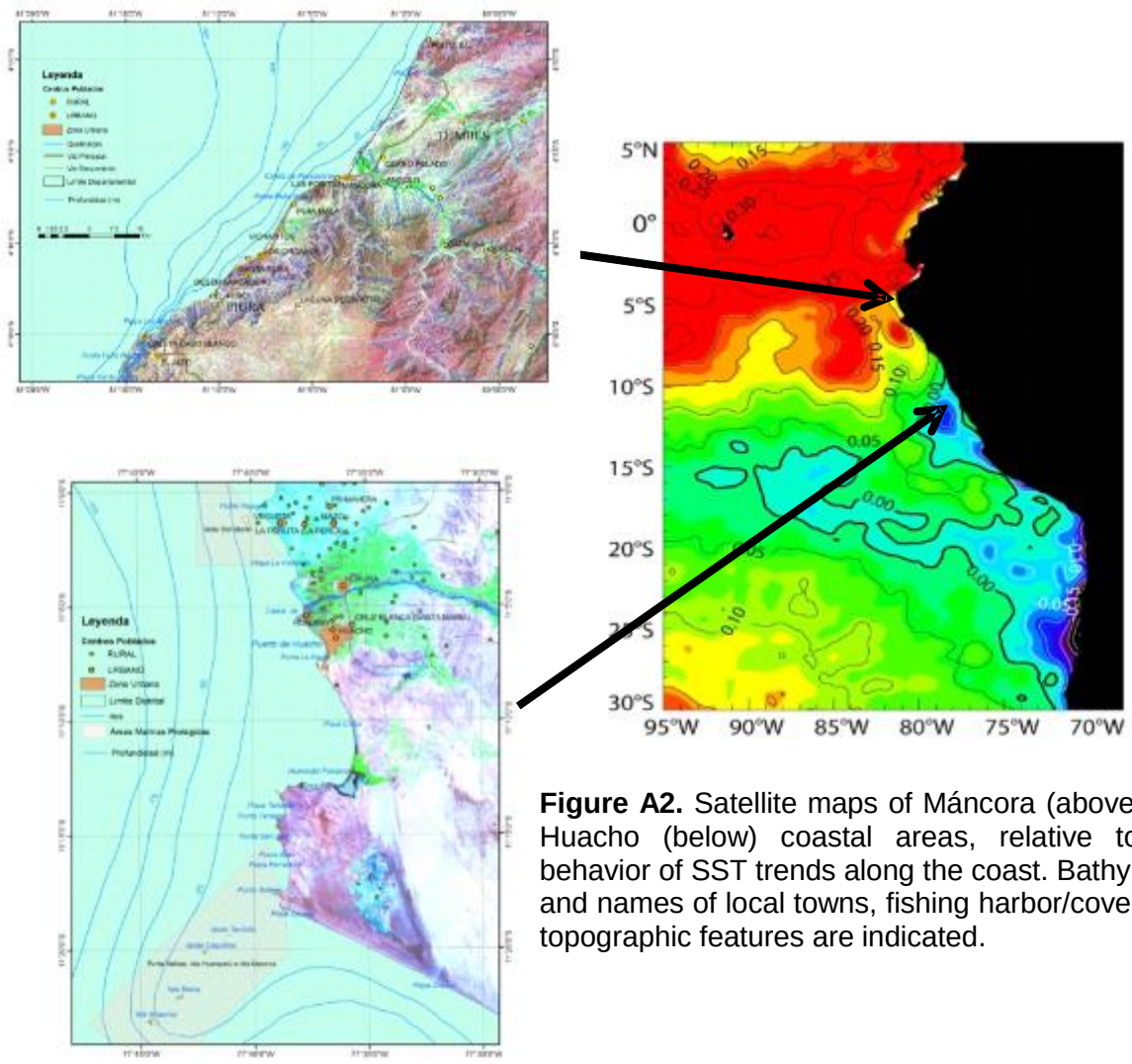


Figure A2. Satellite maps of Máncora (above) and Huacho (below) coastal areas, relative to the behavior of SST trends along the coast. Bathymetry and names of local towns, fishing harbor/coves and topographic features are indicated.

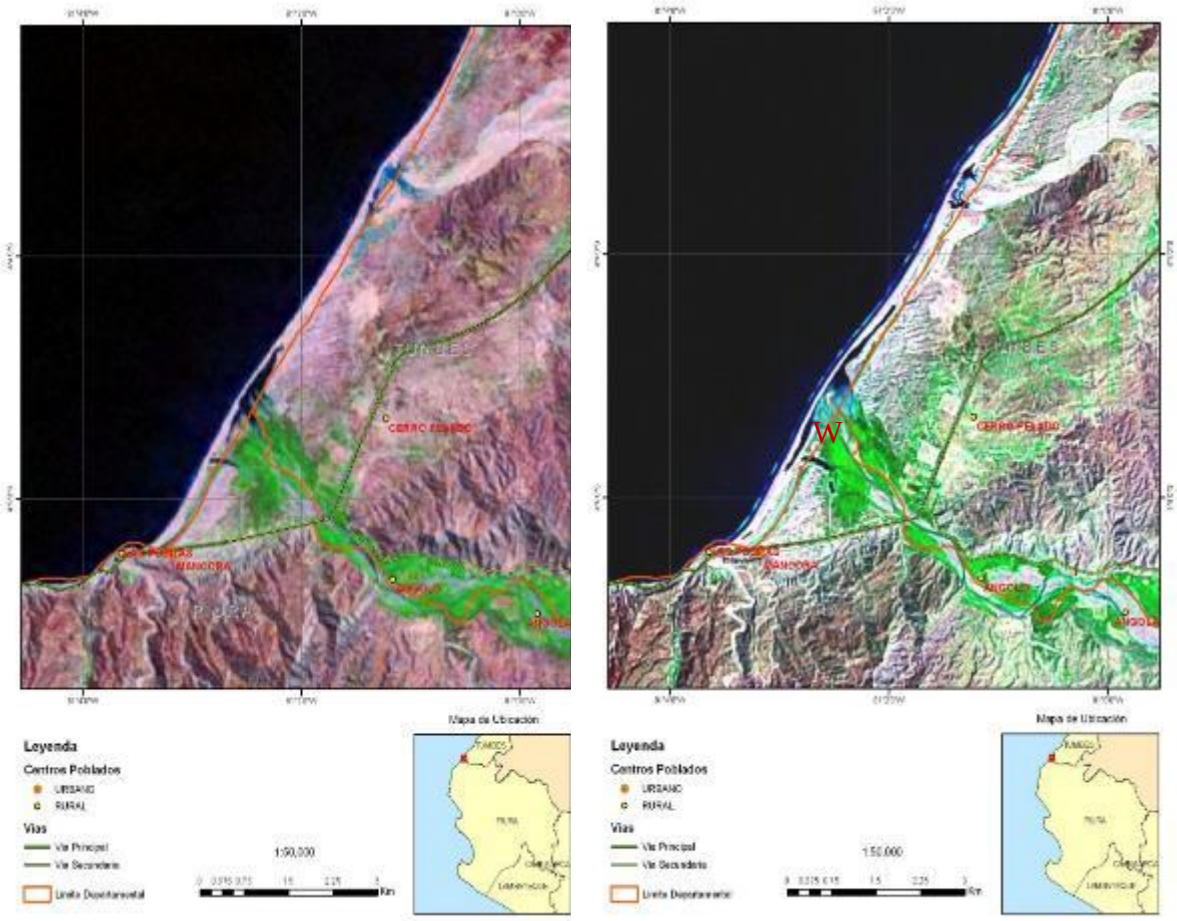


Figure A3. Change in the coastline induced by the 1997-98 El Niño around Máncora. Left: before the El Niño event; Right: after the El Niño event. Wetlands (W) associated to the ravine Quebrada Fernández are marked.

Economic activities and social conditions

According to the National Institute of Statistics (INEI), the population of Máncora is 10,547 people, and the working population is composed mainly by fishers (10.3%), car drivers (9.7%), shopkeepers and dealers (9.5%), followed by cooks, hotel personnel and bricklayers (about 5% each). Accordingly, the main economic activities of Máncora are: fishing, trade, hotels and restaurants, construction and transport. It is remarkable that in the recent years, Máncora has received an increasing number of national and foreign tourists, leading to a rapid building of hotels along its coastal line. One of the main social problems of Máncora is the housing sanitary conditions. 76.1% of the houses are connected to the public network of drinking water, and only 58.3% are connected to the public sewer system. On the other hand, 81.3% of the houses have access to electrical current.

Coastal marine zone management issues

A high coastal marine biodiversity characterizes Máncora due to its latitudinal position. The coastline presents wetlands, particularly associated to the mouth of the ravine Quebrada Fernandez (Figure 10), which are poorly studied in terms of their flora and fauna, and the ecological services they provide. The fine sand beaches and the clear coastal waters attract tourism and recreation activities, including scuba diving and dive fishing. The biogeographic and oceanographic conditions sustain an active artisanal fishery oriented to oceanic, coastal and benthic resources[26]. An issue of concern is the impact of human populations and fishing activities on the habitat of large marine mammals and marine turtles.

Incidental fishing and stranding of whales, dolphins and turtles are frequent in the area, the latter due to injuries caused by gillnets deployed in the fishing areas. Therefore, an adequate management of the territory use, including the coastal marine zone, is still a pending task. Pollution and sanitary problems have not yet been solved for the whole area, though since 2010 the government is developing a project to improve the sewer system and to recover one of the wetlands located just next to Máncora town. Building hotels and resorts has been very rapid, increasing the pressure on the beaches and coastline, which are otherwise very sensitive to the El Niño-driven fluvial sediment transport and flooding.

Fishery and Landings

The following description is based on previous IMARPE surveys and fisheries database. Nearly all of the fishing activities in Máncora are performed by artisanal vessels, though they exhibit a high diversity of fishing gears and fishing targets, comprising large oceanic fishes, as tunas, sharks and scombrids, smaller pelagic[27] fishes, coastal demersal fishes, giant squid and benthic invertebrates. Figure A4a shows the relative contribution of the main nektonic resources to the landings in Máncora. It is remarkable the relatively large contribution of oceanic and coastal demersal fishes to overall landings, as well as the dominance of purse seines, gillnets and hooks (Figure A4b). Long-lines and surface-gillnets (which are included in the gillnet category) are oriented to oceanic fishing, as well as harpoons for sharks and marlins.

In general, the landings are characterized by a large variability in species composition and amount of landings (Figure A5). The top three resources in landing statistics for the past decade were Giant Squid (*Dosidicus gigas*), Pacific Harvestfish (*Peprilus medius*) and Yellowfin Tuna (*Thunnus albacores*), reaching annual catches of about 710 t, 610 t and 300 t, respectively. Landings of Yellowfin Tuna have shown a tendency to increase in the past decade (Figure A5b). Among the pelagic and coastal nekton, catches of Giant Squid and of Mackerel *Scomber japonicus* are episodic, while catches of Jack Mackerel *Trachurus murphyi* have almost disappeared since 2003 (Figure A5c). Among the coastal demersal nekton, catches of Hake (*Merluccius gayi peruanus*) are also episodic, while those of Common Snake Eel (*Ophichthus pacifici*) exhibit a declining trend.

[26] The collection of organisms living on or in sea or lake bottoms (http://www.thefreedictionary.com/benthic)
[27] Relating to or living in or on oceanic waters (http://www.thefreedictionary.com/pelagic)

Landings of Pacific Harvestfish are sustained, but with large fluctuations (Figure 12d). Finally, benthic invertebrates' landings are mainly composed by Oyster (*Ostrea iridescens*) and Brown Shrimp (*Farfantepenaeus californiensis*). In Peru, the last three El Niño appear to have negatively impacted landings of Brown Shrimp (Figure A5e).

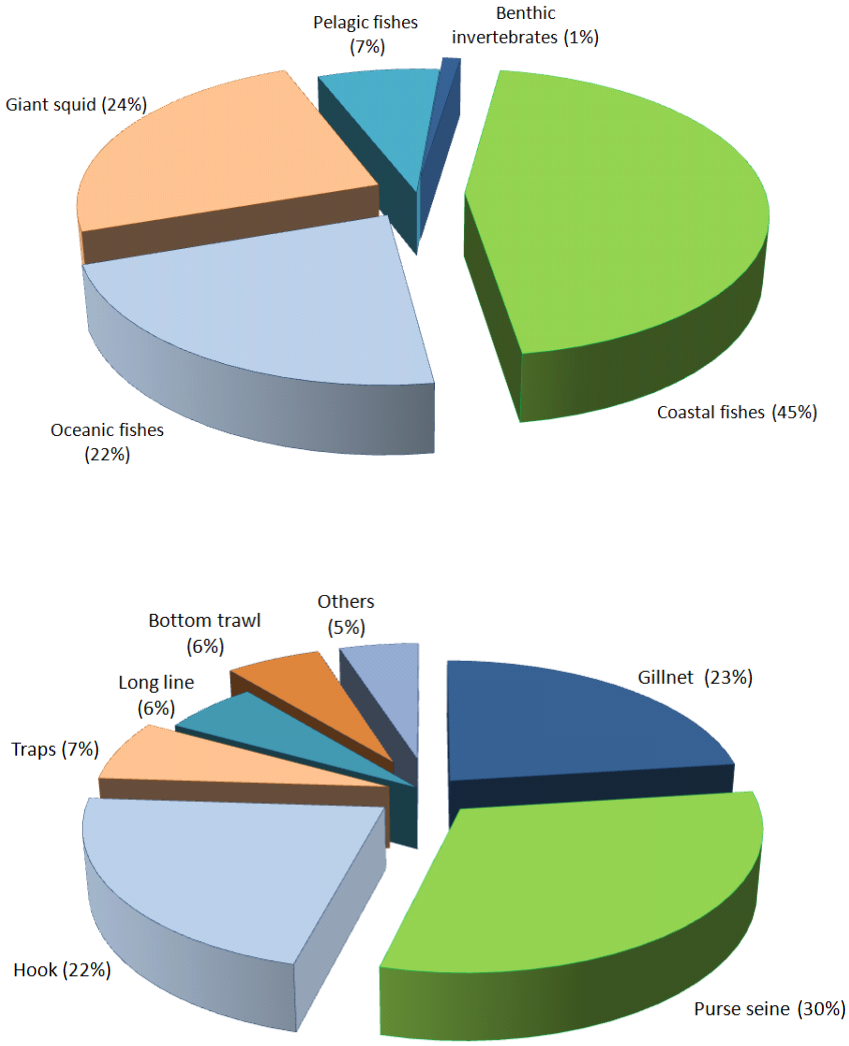


Figure A4. Summary of landing statistics from 2001 to 2010 in Máncora: a) Composition of landings by fishery resources; **b)** Composition of landings by fishing gears.

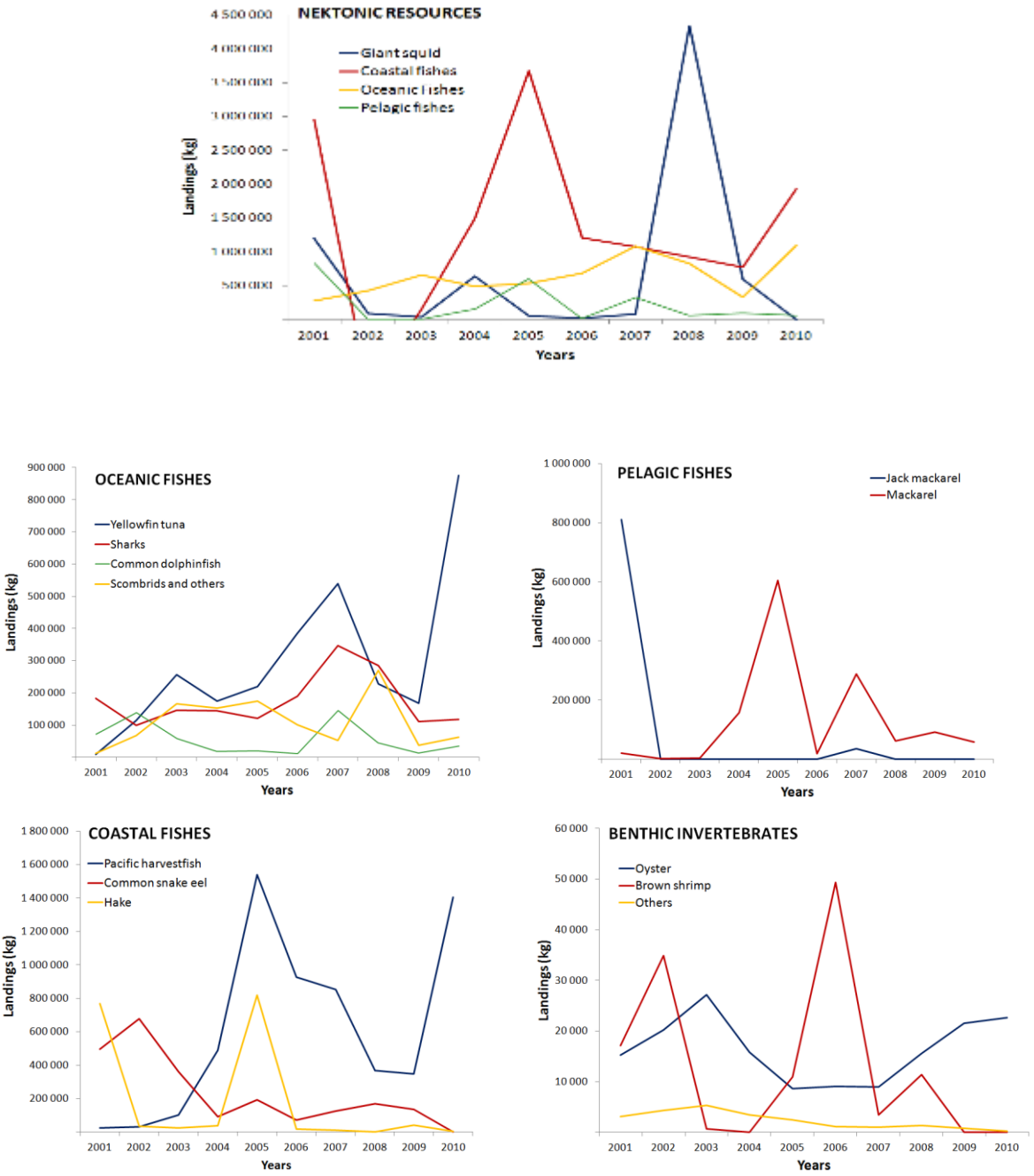


Figure A5. Time-series of landings (kg) by resource categories in Máncora and their main species: a) All nektonic resources; b) Oceanic fishes (tuna, sharks, common dolphin fish, scombrids and others); c) Pelagic fishes (jack mackerel and mackerel); d) Coastal fishes (Pacific harvestfish, common snake eel, hake); e) Benthic invertebrates (oyster and brown shrimp).

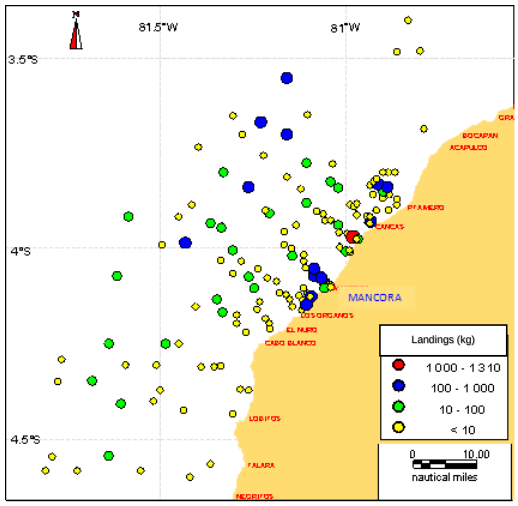
Banks and fishing grounds

Banks of several benthic resources are present off Máncora and nearby areas. The most important ones are those of the Pearl oyster (*Pteria sterna*), from Máncora to Los Órganos, Baby clams (*Donax* spp), mostly just south of Máncora, and Oyster (*Ostrea iridescens*), north of Máncora to Punta Sal (Carbajal et al., 2010; Ordinola et al., 2010). However the knowledge about biology and ecology of these resources is still limited. In terms of fishing grounds, a large portion of the fleet fishes off Máncora, Los Órganos and Punta Sal, within 30 miles off the coast. The fishing grounds of Yellowfin Tuna extend further, and the most important one is the so-called 'Banco de Máncora', a submarine elevation located about 30 miles north of the area. This elevation bears fossil reefs and a very high bathyal[28] benthic and nektonic biota, attracting large mammals and marine birds (Figure A6).

Proposed interventions

A map of the interventions in the Máncora pilot area is shown in Figure A7. As mentioned before, landings are characterized by a large variability in species composition and amount, according to the highly variable oceanic conditions. Among the top three resources in landing statistics for the past decade there is the Yellowfin Tuna. It is worth to mention that the fluctuations of the landings of Yellowfin Tuna, and of other tropical oceanic species are related to ENSO. For instance, higher catches in 2003, 2007 and 2010, followed the moderate El Niño events in the past decade. Therefore it is expected that the availability of this resource would increase with climate change, but sub-optimal fishing practices lead to poor values of fish products, while affecting other components of the ecosystem with by-catch. Also, given the uncertainty of the behavior of El Niño with climate change (e.g. increase in extreme events or just change in average conditions), it is necessary to apply a precautionary approach to safeguard the resilience of the resource and of the fishers. Therefore, promoting the replacement of current fishing gears by long-line represent a win-win condition, both for the ecosystem and the artisanal fishing community. Likewise, there is a traditional fishing on hake at El Ñuro, using hook instead of nets. This community is already using sustainable fishing method so is a good candidate to start certification processes and thus to open alternatives for increasing the value of the products. The project will assist towards this goal. Hake is known to be sensitive to changes in subsurface dissolved oxygen, a parameter that varies at interannual and decadal scales (Bertrand et al., 2011) and possibly with ocean warming and increase stratification. Given that hake is an important human consumption resource in the North, the success of this process might lead to replicate it to other coves, reducing the vulnerability of this species to oceanographic changes.

[28] Related to the region of the ocean bottom between the sublittoral and abyssal zones, from depths of approximately 200 to 2,000 m (656 to 6,560 ft) (http://www.thefreedictionary.com/bathyal)



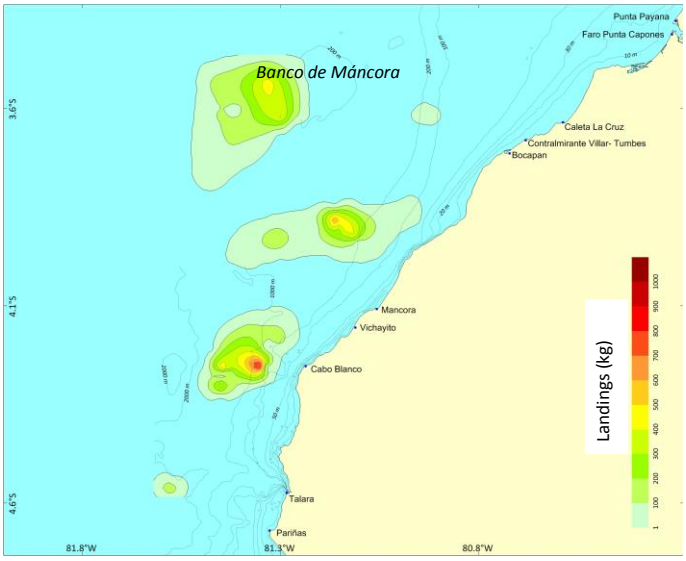


Figure A6. Location of fishing areas of the Máncora artisanal fleet: a) All fishing gears (2009 – 2010); b) Yellowfin tuna (gillnet; 2010).

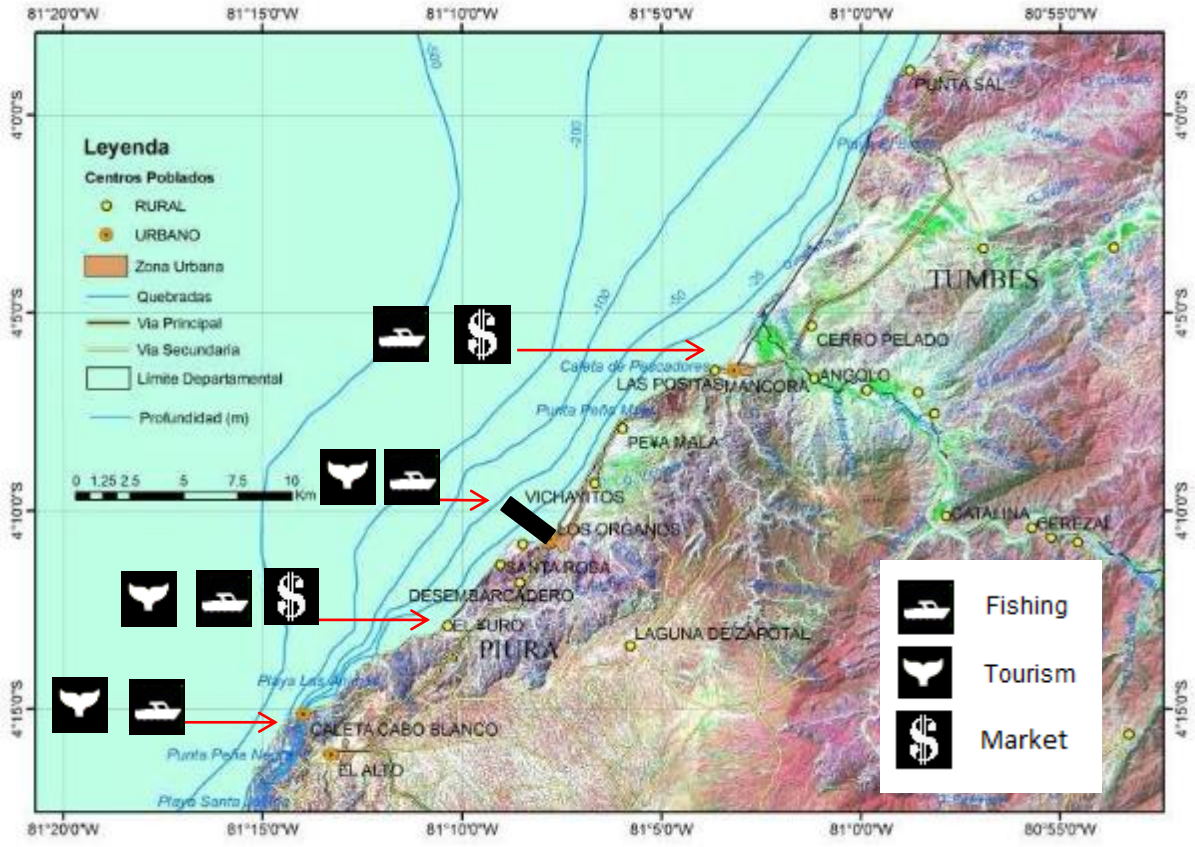


Figure A7. Map of potential interventions in Máncora area: Adaptation with environmental friendly gears imply 100% replacement of purse seines by long-lines (off Máncora, Órganos, Cabo Blanco and El Ñuro) and 100% replacement of gill-nets by long-lines for offshore fishing (off Máncora); improvement of market power capacities for hake fishery with hook in El Ñuro and of Yellowfin tuna in Máncora, including development of business plans; at least one small ecotourism enterprise (landscape watching, whales watching, etc.) in Órganos and the other in Cabo Blanco fishing coves.

2) Huacho area, Lima region, Peruvian coastal upwelling ecosystem

General environmental description

Huacho area is characterized by a complex topography with bays, capes and islands, as well as by the presence of wetlands. The cape Punta Salinas and the islands Don Martín, Huampanú and Mazorca belong to a national marine protected area the Guano Islands, Islets and Capes National Reserve System (RNSIIPG by its acronym in Spanish).The total protected area is 3,312 ha for Don Martín Island, and 14,207 ha for Cape Punta Salinas, Huampanú and Mazorca (Figure A8). As other areas subjected to coastal upwelling, water is cold and very productive, being the natural habitat of the Peruvian anchovy *Engraulis ringens*. The topography favors the existence of natural banks of benthic invertebrates, among which there are several subtidal mollusk species of high commercial value and demand (see below).

Administratively, this pilot area belongs to the Huaura province (197,384 inhabitants, with a surface of 4893 km^2, and a population density around 40 inhab/km^2), from which the main district, harbor and population center is Huacho (53,998 inhab). The two other districts with coastal populations and fishing coves are Carquín (6,091 inhabitants, with a surface of 2 km^2, and a population density of 2,986 inhab/km^2) and Végueta (18,265 inhabitants, with a surface of 254 km^2, and a population density around 72 inhab/km^2). The number of people working in artisanal fishery are 907, 250 and 160, respectively, so that families that depend directly from this economic activity are about 1300.

Huacho city (11º05'21"S; 77º37'36"W, 173.585 inhabitants, with a surface of 124 km^2, and a population density around 1405 inhab/km^2) is the capital of the Huaura province, Lima Department. Huacho harbor is located in the Huacho Bay, limited by La Viuda cape to the south and Carquín cape to the north (Figure A8). South of Huacho Bay is Hornillos beach and El Colorado. North of Huacho Bay is Carquín Bay, where the Huaura river discharges its waters.

Economic activities and social conditions

In Huacho, the main economic activity is small scale trade (9.2% of population), teaching (7.9%, mainly related to the Huacho University), restaurants (6.1%), construction (4.6%), transport (4.6%) and fishery (3.2%). In Carquín, economic activities comprise small scale trade (17.5%) and fishery (15.3%), with two fishmeal plants, and artisanal harvest for direct human consumption. Also, in Carquín other activities such as agriculture, cattle, poultry, bovine and pork industries are developed.

Coastal marine zone management issues

Huacho area contains a high diversity of species and natural banks of benthic invertebrates, due to the complex topography with large bays, capes and islands, as well as the presence of several rivers. Capes and islands belong to the RNSIIPG. However,

in this region there exists a chronic danger of pollution due to industrial activity, domestic sewage and runoff of pesticides from agriculture (Villegas, 2011).

Climate change will affect vulnerable areas such as the coastal zone of Huacho where temperature changes could shift the spatial distribution of species, and consequently fishing grounds and biodiversity. On the other hand, poor populations will be less prepared to adapt to climate change due to the lack of technology and infrastructure.

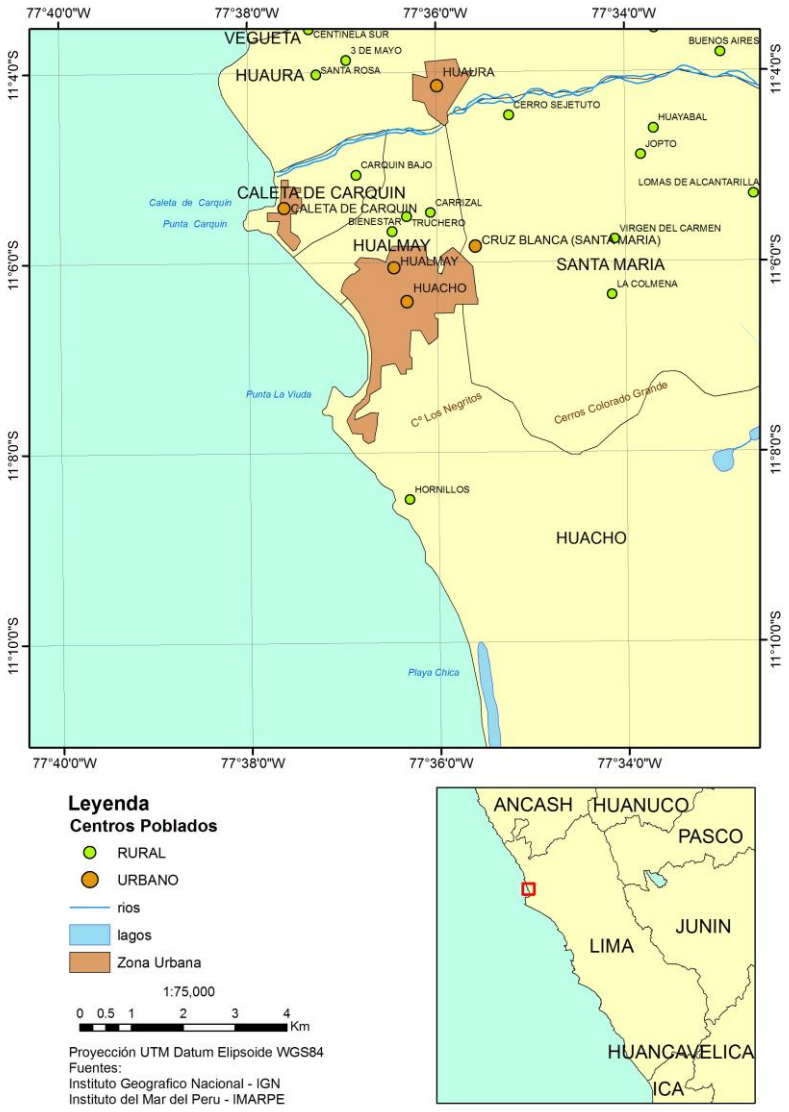


Figure A8. Geographic location of Huacho harbor.

Fishery issues - Landings

The Huacho harbor is considered an important center of industrial and artisanal fishery activity which generates positive impacts to the local and regional economy. The products of artisanal fishery are directed towards the fresh consumption for the local market and the capital (Lima) (Barreto 2005).

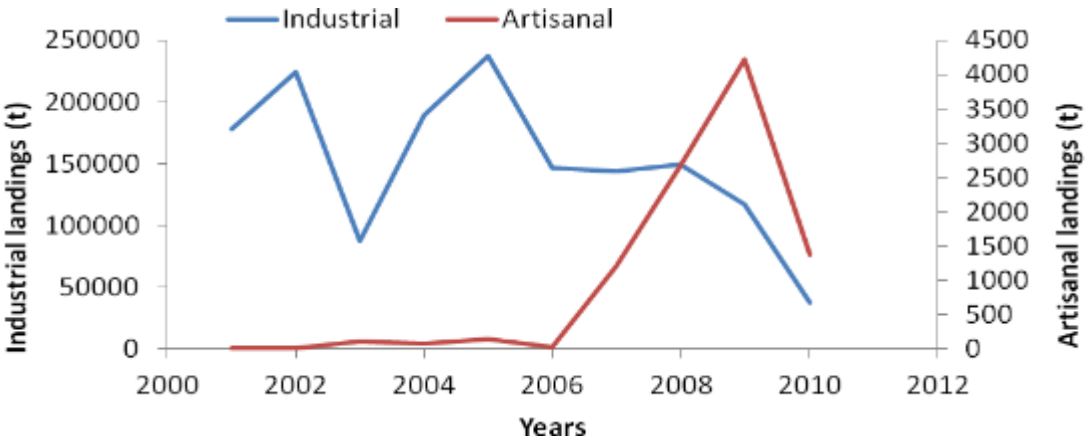


Figure A9. Total industrial and artisanal landings (t) in Huacho harbor, between 2001 – 2010.

The industrial fishery in Huacho during the period 2001- 2010 landed 1,512,652 t, which represented 2.3% of the national landings (65,461,835 t); landings were dominated by anchovy *Engraulis ringens* (97%) (IMARPE data). On the other hand, the artisanal fishery landed 9,797 t of anchovy, during the same period (Figure A9). These numbers show the different relevance of industrial versus artisanal fisheries of Huacho in relation to Máncora.

Artisanal fishing targets in Huacho comprise oceanic fishes (Pacific bonito, dolphinfish, sharks), pelagic fishes (anchovy, jack mackerel, Pacific menhaden and mackerel), coastal fishes (delicious drum, striped mullet, silverside and cabinza grunt) and several invertebrates (razor clam, black snail, squid and black sea cucumber) (Figure A10). Also, several fishing gears are used: purse seine, gillnet, autonomous diving, lung diving, long line, beach seine (chinchorro), among others (Figure A11).

Between 2001 and 2010, catches by the artisanal fleet grew reaching a peak of 4,218 t/year, composed mainly by anchovy, but also by delicious drum, silverside and razor clam (Figure A12). However, harvest under legal size limits could endanger the coastal resources (Gonzalez et al., 2010).

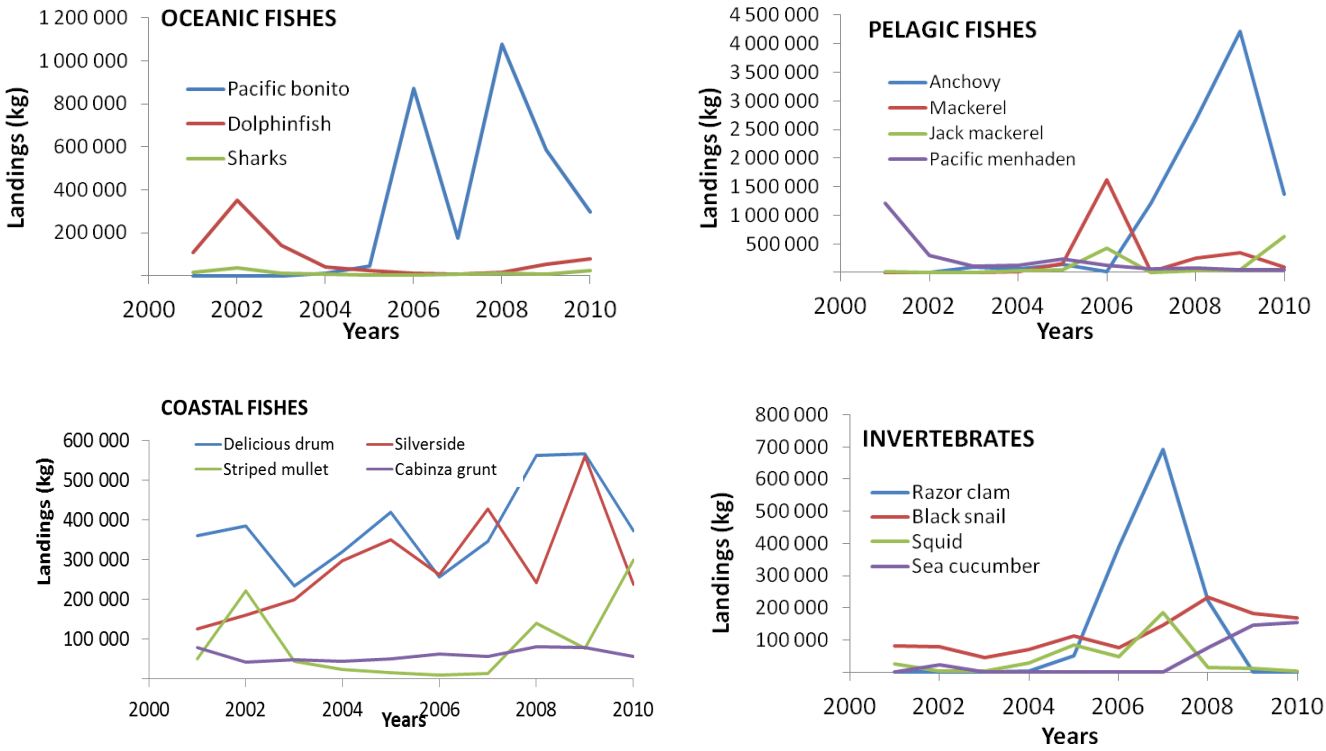


Figure A10. Time-series of landings (kg) by resource categories in Huacho and their main species: a) Oceanic fishes (Pacific bonito, dolphinfish and sharks); b) Pelagic fishes (anchovy, jack mackerel, Pacific menhaden and mackerel); c) Coastal fishes (Delicious drum, striped mullet, silverside and cabinza grunt); d) Invertebrates (razor clam, black snail, squid and black sea cucumber).

Between 2001 and 2010, landings of 33,873 t of hydrobiological resources comprised 75 species of fishes and 4 species of invertebrates. Species with largest landings were: *Engraulis ringens* (anchovy) with 9,796 t (28.9%), *Sciaena deliciosa* (delicious drum) with 3,826 t (11.3%), *Odontesthes regia regia* (silverside) with 2,868 t (8.5%), *Ensis macha* (razor clam) with 1,191 t (4.0%), *Ethmidium maculatum* (Pacific menhaden) with 2,368t (7.0%), Stramonita chocolata (black snail) with 3,826 t (3.5%), *Mugil cephalus* (striped mullet) with 1,355 t (4.0%), *Isacia conceptionis* (cabinza grunt) with 603 t (1.8%), *Loligo gahi* (Patagonian squid) with 406 t (1.2%) and *Patallus mollis* (black sea cucumber) with 363 t (1.1%) (IMARPE).

The artisanal fleet uses mainly purse seines oriented to catch anchovy, delicious drum, Pacific menhaden, cabinza grunt, striped mullet and Patagonian squid. The seashell fleet uses semiautonomous diving oriented to razor clam, black snail, black sea cucumber and crabs. Another fleet uses beach seine to catch delicious drum, Patagonian squid, striped mullet, Pacific menhaden, snakehead kingcroaker, Pacific guitarfish and flatfish. Finally, a small fleet uses hooks to catch delicious drum, Peruvian morwong, Peruvian grunt, cabinza grunt and Patagonian squid. The use of purse seines with a mesh size of only 38 mm, which is adequate for anchovy, has an impact on the

higher prized species because it extracts mostly juveniles and creates conflicts with the gillnet fishers which target the same species.

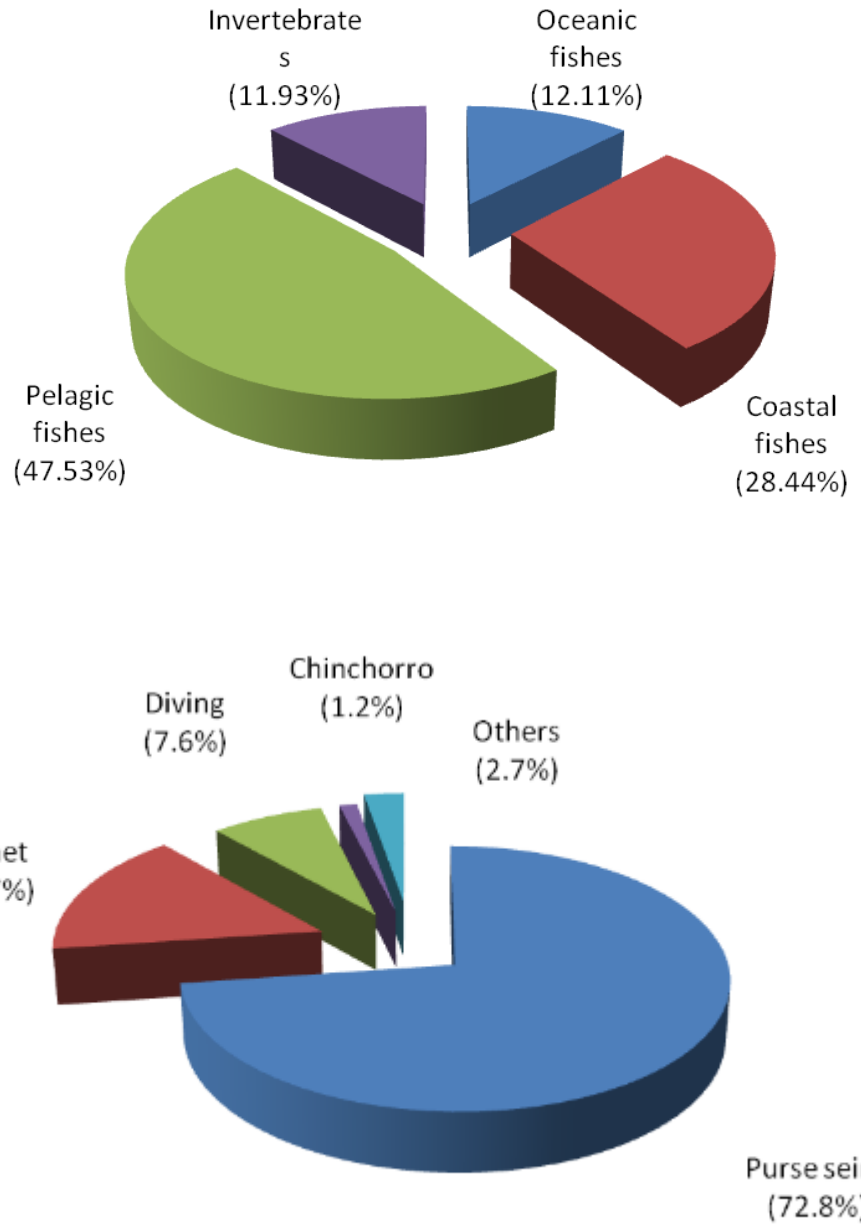


Figure A11. Summary of artisanal landing statistics from 2001 to 2010 in Huacho: a) Composition of landings by fishery resources; b) Composition of landings by fishing gears.

Banks and fishing grounds

The area between Carquín cape and Choza (Playa Grande) has 37 km of coastline, with large sandy beaches, rocky capes and small islands. The latter are spawning areas of silverside (*Odontesthes regia regia*), while small bays are spawning areas of Patagonian squid and habitat for mole crab (*Emerita analoga*) (Figure A13).

The main commercial invertebrate species are: *Cancer porteri* (lemon crab), *Cancer setosus* (hairy crab), *Platyxanthus orbignyi* (violet crab), *Aulacomya ater* (mussel), *Concholepas concholepas* (Chilean abalone), *Ensis macha* (razor clam), *Loligo gahi* (squid), *Sinum cymba* (Peruvian abalone), *Stramonita chocolata* (black snail), *Pattalus mollis* (black sea cucumber) and *Emerita analoga* (mole crab).

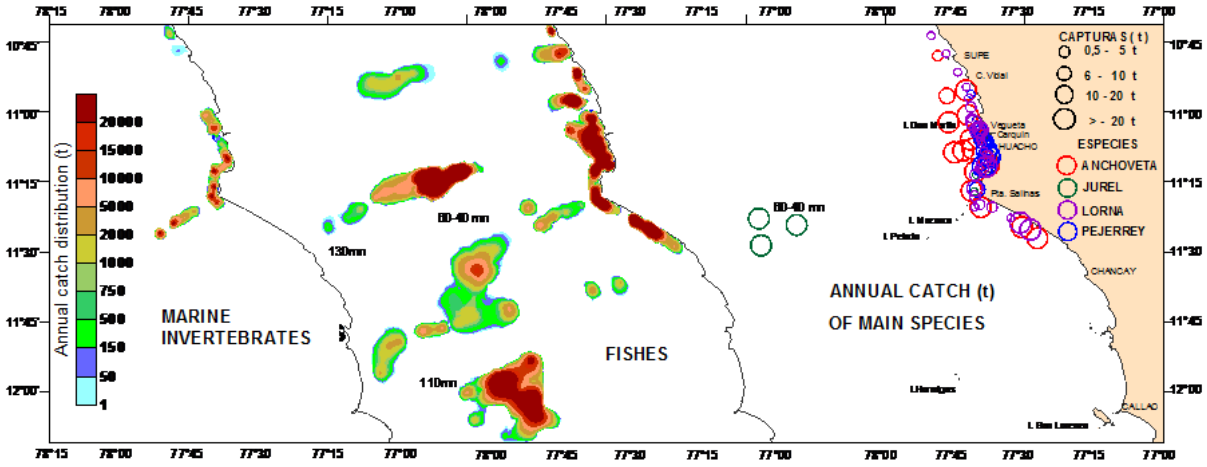


Figure A12. Location of fishing areas of the Huacho artisanal fleet: a) Invertebrates; b) Fishes; c) Annual catch of main species

Climate change impact on Peruvian anchovy population and artisanal fishing

The recent coastal cooling trend of Central and Southern Peru has not been translated in a positive trend of anchovy's biomass, which has exhibited interdecadal fluctuations following changes in upwelling and oxygenation (Bertrand et al., 2011). Since year 2000, the biomass is rather stable at about 10 to 12 million of tons (Fréon et al. 2008). Nevertheless acoustic biomass estimations suggest a northward shift in the gravity center of the population, from about 12 – 14°S in the 1970's to 6 – 8°S in the last decade (M. Gutiérrez et al., accepted). The large fishing capacity by the industrial fleet (Fréon et al., 2008) might have limited the biomass growth, but other ecological factors linked to the environmental change could also have limited the carrying capacity. For example, the cold-water squat lobster *Pleuroncodes monodon* has increased its distribution northward, and its ecological niche partially overlaps with anchovy's. Also, increased coastal wind intensity may induce stronger turbulence and larger mortality of eggs and larvae of the anchovies. The future evolution of the carrying capacity for anchovy is uncertain, because it also depends on predator-prey relationship changes and water

column oxygenation, both of which are related with changes in water mass distribution and circulation processes that are still not well understood (Bertrand et al., 2011; Echevin et al., 2011; Gutiérrez et al., 2011).

Historically the Huacho harbor has been an important landing point for the industrial fishing of anchovy and several factories for fish meal and oil production have established. Since 2009, the artisanal fleet is fishing the anchovy, encouraged by the government policies to increase the direct human consumption, and now anchovy landings represent over 90% of the total artisanal fishery landings in the area.

Exploitation of natural banks of benthic invertebrates

An active diving extraction of benthic resources occurs along the area. However, pollution due to industrial activity, domestic sewage and runoff of pesticides from agriculture (Villegas 2011), compromises the ecological health of coastal environments located near towns, fishing coves and effluents. Some of the major banks are located onshore Don Martín Island, and in cape Punta Salinas, offering a chance for their sustainable management. Unfortunately the 'Master Plan' for the marine protected areas here is still to be formulated, and according to the normativity, it is the legal tool that would permit the marine spatial use planning for the reserve, involving activities as ecotourism, aquaculture and even recovery of natural banks (SERNANP, 2009). Two of the main benthic resources with high commercial value (for export and for national consumption) are the Peruvian scallop (*Argopecten purpuratus*) and the razor clam (*Ensis macha*).

Argopecten purpuratus is an edible marine filter-feeding bivalve, which inhabits sheltered sandy areas between 5 m and 40 m depth, from Panama through the coasts of Peru to Coquimbo in northern Chile. Gonadic maturity is accelerated during El Niño events off southern Peru and Chile due to high temperatures (Wolff, 1987), but sublethal temperature off Peru has been estimated in 29°C (Urban et al., 1994); consequently strong El Niño may have deadly effects on the banks located in the northernmost Peruvian coast. Scallops have a lifespan of up to five years, reaching almost commercial size (65 mm) in 180 days (Mendo et al., 2011). The species has a wide distribution along the Peruvian coast, being present in Don Martín Island. In the last decade, coinciding with the cooling trend and the absence of strong El Niño, the main productive area has changed from Independence Bay in the south (14°30'S) to Sechura (6°) in the north, though in the latter most of the production derives from extensive aquaculture which is connected to the management of the natural banks.

On the other hand, *Ensis macha* is a deposit feeding clam, which prefers silty sand and fine sand subtidal environments (5 to 20 m) for larval recruitment. Cannibalism for larvae is one of the characteristics of the species, limiting the recruitment area around the adult fields. Its main region of distribution is the Chilean coast, but the species has also expanded its latitudinal range northwards to even 06°S in the Peruvian coast in the last one to two decades (Espinoza et al., 2010). Off Peru its growth rate is more rapid than off Chile and it can attain the commercial size (125 mm) in about 2 years. The colonization of the Peruvian subtidal habitats triggered an uncontrolled extraction with hydraulic dredging, which damaged the population and the sedimentary properties, leading to the collapse of the banks in Independencia Bay in the mid 2000's (Espinoza et al., 2010). In the Huacho area, the main natural bank is in cape Punta Salinas, whereby hydraulic dredging has also been reported. Despite that this practice has been

forbidden by law, it is still a threat over the population and its habitat due to the lack of effective control and attractive fishing gears for economic profit. In Punta Salinas, a ban established in 2008 has allowed the recovery of the adult population but the restoration of the silty sand bottoms are slow, putting in danger the renewal of the bank (IMARPE, 2011).

Integrality of the adaptation measures

The above mentioned coastal resource cases are examples of the threats and opportunities that climate change represents for a large portion of the Peruvian's coastal upwelling ecosystem and its stakeholders, particularly the artisanal fishery. The three resources are sensitive to climate-driven oceanographic changes and their distribution have responded to the recent environmental changes, but their future behavior is uncertain due to the non-linear character of the climate change impacts in the upwelling ecosystem (Echevin et al., 2011). Therefore adaptation measures need to be applied to maximize the opened opportunities and to minimize the vulnerabilities of the resources driven by the current fishing practices, limited information of the coastal ocean dynamics/ future regional climate change scenarios, and management limitations.

The proposed interventions will be mainly oriented to improve the resilience capacity of these three resources and of the local fishing communities; by means of: i) promotion of extensive aquaculture as an economic alternative (e.g. Peruvian scallop); ii) stocking and re-stocking of natural banks of benthic invertebrates (e.g. razor clam), and ii) following the implementation of sustainable fishing practices with profitable products (e.g. anchovy).

Access to markets will accompany the whole process in order to give sustainability to the adaptation measure. Start of fishery certification will increase the product's value and demand, which in turn will also add sustainability to the process. Better economic revenues will allow reducing the overall fishing pressure on the resources, also reducing its vulnerability to climate change manifestations. For extensive aquaculture as an economic alternative, the management of a concession area to culture *Argopecten purpuratus* will be carried out. The management will involve the participation, by agreement, of local shellfish fishers, and technical assistance will be provided for establishing a small enterprise formed by local fishers which will ensure management sustainability beyond the project. The intervention will involve: i) technical assistance for the formulation of the project dossier and the formal requests to obtain the approval of the concession project; ii) investment on the infrastructure, acquisition of the seeds and harvest; and iii) management of the concession area during the project. Operational costs, like the security surveillance of the area, maintenance and monitoring of the cultures will be shared with local shellfish fishers association. According to similar experiences that have taken place in other Peruvian sites, net profits are expected from the second year of the project. The intervention will comprise an area of 10 ha south of Huacho in front of Colorado and Hornillos beaches (Figure A13). Part of the scallops' yield will be used to stock a natural bank of this resource, onshore Don Martín Island and/or onshore Punta Salinas, according to the zoning established by the Master Plan of the Guano Islands, Islets and Capes National Reserve System (see below).

In addition, part of the profits will be re-invested for monitoring and aquaculture research in the area. In this way, at least one source of natural larvae production will be established in the marine protected area, which would supply larvae for other

aquaculture concessions along the Huacho coast, providing a sustainable alternative economic activity for the fishing community.

For re-stocking and/or management of natural banks, the main intervention will be focused on the *Ensis macha* razor clam fishery. As exposed above, the lack of effective management has put in danger the local banks of this resource, which otherwise had expanded its latitudinal range in accordance with coastal cooling. The intervention consists in two main actions. First, a technical assistance will be funded to identify an alternative extraction method with minimal impact on the substrate but attractive catch per unit of effort. Next, this extraction method will be promoted among the community by demonstrative training.

In parallel, based on the Master Plan of the protected area, the natural bank in the cape Punta Salinas will be spatially co-managed with the shellfish fishermen under the control of the national reserve. The management strategy will combine ”no-take” areas for the preservation of a spawning stock with areas under controlled extraction. The latter will reduce clam cannibalism and allow substrate availability for the settling larvae that will permit the renewal of the bank and a sustainable yield. The implementation of these practices fulfills the MSC principles for the fishery certification, so that a process towards this goal will be carried out. The certification will bring or ease the access to international markets with fair values of the product. In this way, the razor clam’s extractors will become allies and beneficiaries of a sustainable fishery, ending with a win-win resilience condition, both for the resource and for the fishing community.

The interventions will be complemented by specific long-term adaptation measures to improve governance and the response capacity of the government to address climate change effects on the coastal marine ecosystem and resources availability, as mentioned in Part II A of the proposal.

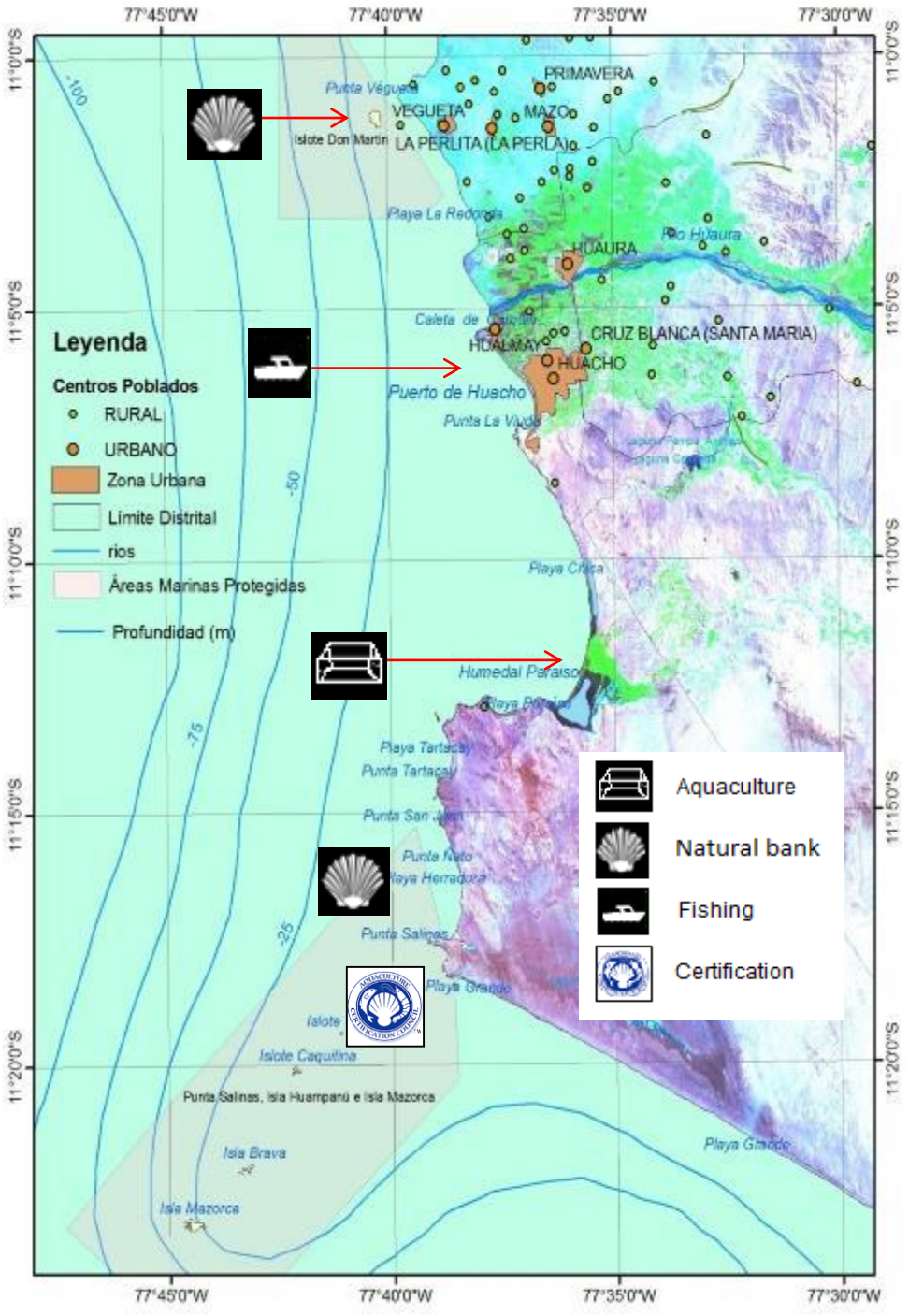


Figure A13. Map of potential interventions in the Huacho pilot area: The interventions might imply following-up of the use of environmentally friendly gears for artisanal fishing of anchovy in vessels under less than 20 tons of store capacity (Huacho harbor); start-up of certification of the razor clam extraction, following sustainable practices; a concession area for extensive and profitable aquaculture of the Peruvian scallop, linked to the restoration and co-management of natural banks in the marine protected areas.

ANNEX II - REFERENCES

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ANNEX III. GLOSSARY

AF, Adaptation Fund

AOP, Annual Operating Plan

Bathyal, relating to the region of the ocean bottom between the sublittoral and abyssal zones, from depths of approximately 200 to 2,000 m (656 to 6,560 ft).

Benthic, describing a fish that lives close to the floor of the sea or a lake.

DGEX, Dirección General de Extracción, General Direction of Harvest.

DGPA, Dirección General de Pesca Artesanal, General Direction of Artisanal Fishery.

DGA, Dirección General de Acuicultura, General Direction of Aquaculture.

DGAAP, Dirección General de Asuntos Ambientales de Pesquería, General Direction of Environmental Issues of Fisheries.

DIREPRO. Dirección Regional de Producción, Regional Direction of Production.

EA, Executing Agency

EAF, Ecosystem Approach to Fisheries, an extension of conventional fisheries management recognizing more explicitly the interdependence between human well-being and ecosystem health and the need to maintain ecosystems productivity for present and future generations, e.g. conserving critical habitats, reducing pollution and degradation, minimizing waste, protecting endangered species (Ward et al. 2002).

EBA, Ecosystem Based Adaptation, integrates the use of biodiversity and ecosystem services into an overall strategy to help people adapt to the adverse impacts of climate change (CBD, 2009).

EBM, Ecosystem Based Management, is a globally recognized approach for better understanding and managing the interactions between uses and the natural system, and integrating multi-sectorial interests into decision making for the whole marine ecosystem.

EF, Equatorial Front; latitudinal range off Northern Peru where surface tropical waters mix with colder waters with higher salinities from coastal upweling.

ENSO, El Niño Southern Oscillation.

ERA, Ecological Risk Assessment, is an effective and transparent methodological structure to assess potential risks to all essential components of a studied fishery, namely the ecological as well as the human well-being.

GEF, Global Environment Fund.

GoP, Government of Peru

IMARPE, Instituto del Mar del Perú (Peruvian Marine Research Institute)

M&E, Monitoring and Evaluation

MIE, Multilateral Implementing Entity

MTE, Mid-term Evaluation

NIE, National Implementing Entity

PA, Pilot Area

PC, Project Coordinator

PIP, Project Implementation Plan

PCT, Project Coordination Team

PIW, Project Inception Workshop

PRODUCE, Ministry of Production

PROFONANPE, Fondo de Promoción de las Areas Naturales Protegidas del Perú

PSC, Project Steering Committee

SENAMHI, Servicio Nacional de Meteorología e Hidrología

SERNANP, Servicio Nacional de Areas Naturales Protegidas

SOAF, Social Organizations of Artisanal Fishers

TS, Technical Secretary

UE-003. Unidad Ejecutora 003 “Fomento al consumo Humano Directo – A Comer Pescado” of PRODUCE.

ANNEX IV. LIST OF STAKEHOLDERS AT PILOT AREAS WORKSHOPS

Participants of Workshop in Huacho

Date: September 10, 2012
Hour: 9 am – 1 pm
Place: House of Culture, Huacho.

N°	NAME	INSTITUTION	E-MAIL / PHONE
1	Wilfredo Suarez Morales	ASAECAPA	Larry122012@hotmail.com
2	Heli García Canales	IMARPE	heligarciac@hotmail.com
3	Walter Elliott R.	IMARPE	welliott@imarpe.gop.pe
4	Einel Fritz Pumahagua Rosales	IMARPE	einelfritz@imarpe.gop.pe
5	Juan Manuel De Fina Fuentes	IMARPE	juanmadefina@yahoo.com/988713812
6	Juan Zenai Resurrección Huertas	UNJFSC	juanresuc_9@hotmail.com
7	Walter Huaman Rodríguez	COOPERACCION	whuaman@cooperaccion.org.pe
8	Gilberto Silva Silva	IMARPE	g_silva_1@hotmail.com
9	Lidia Francisca Alvarado Arroyo	IMARPE	alvaradoarroyo@gmail.com
10	Arsemio Sosa Llangamaqui	ARSBDF	956320072
11	María Hurtado Zamora	IMARPE	ingmary01@hotmail.com
12	Anselmo Ontanzoa Loarte	IMARPE	989361898
13	Adrian Magno Ramírez Quezada	IMARPE	aramirez@imarpe.gop.pe
14	Roberto Teikeira Montoya	CAPITANIA DE HUACHO	soclu00@dicapi.mil.pe
15	Walter Maldonado Quispe	MUNI VÉGUETA	-
16	Rubén De los Santos Espodia	MUNI VÉEGUETA	rubense_810@hotmail.com
17	Nelly Blas Flores	-	nellyblas@heli.esquin
18	Luis Eduardo Meza Collantes	UNJFSC	lume3000@hotmail.com
19	Hugo Alejandro Veliz Montes	UNJFSC	huveliz@hotmail.com
20	Yann Tremblay	IRD-IMARPE	yann.tremblay@ird.fr
21	Alberto Gonzales Ynope	IMARPE	agonzales@imarpe.gop.pe
22	Carlos A. Castillo García	Asoc. Pesc. Artes "Caleta Sn. Martín"- Végueta	-
23	Carlos Martín Salazar Céspedes	IMARPE	csalazar@imarpe.gop.pe
24	Juan C. Sueiro Cabredo	CSA - UPCH	jcsueiro@csa-upch.org
25	Luis Hooker Mantilla	SERNANP	lhooker@sernanp.gop.pe
26	Oscar García Tello	SERNANP	ogarcia@sernanp.gop.pe

Participants of Workshop in Máncora

Date: September 6, 2012
Hour: 9 am – 2 pm
Place: Association of Fishermen, Máncora

N°	NAME	INSTITUTION	E-MAIL / PHONE
1	Ricardo Vallares Barrietos	Gobernador Politico-Máncora	968757796
2	Martín Maceda Ozivos	Presidente Agrepesar	macedamco@hotmail.com/969527062
3	Shaleyla Kelez Sara	Ecoceanica	Shaleyla.keres@ecoceanica.org/997667051
4	Jorge Tam	IMARPE	jtam@imarpe.pe/6250836
5	Carlos Carrasco Prieto	Regidor-M.D.M	Cpca26@hotmail.com/#956501742
6	Ruben Carrora Calderon	Municipalidad Distrital Moncova	jhonmarcc@hotmail.com/#989936996
7	Lucia Echecopar	Asoc. Ambiental distr. Máncora	luciaeche@yahoo.com/#981936858
8	Jose Rodolfo Chuye Purizaca	DPA. Los Órganos	Dpa_losorganos@hotmail.com/*0204131
9	Jose de la cruz Pazos Anton	Gremio Pescadores-Los Órganos	Joserodolfochuo_12@hotmail.com
10	Jorge Walter Guerrero Chinchay	Desembarcadero Pequero Máncora	Jwguerrero@hotmail.com/950932665
11	Juan Daniel Morocho Ruiz	Municipalidad dist. Máncora	Opi_Máncora2012@hotmail.com/968312155
12	Oswaldo Serna Fernandez	Municipalida de el Alto	oserna@munielalto.gob.pe/968912324
13	Victor R Hidalgo Lopez	Máncora	MuniMáncora_1908@hotmail.com/#97458380
14	Veronika Roncall Peña	As. De jóvenes de Máncora, cámara turistica	Ejercitos1@hotmail.com/975522450
15	Fernando A. Adrianzen	Direpno-Ozapno-Talara	
16	Angelica Lucia Rumiche	Regional MDM	#956490440
17	Candelario Anton Pingo	Presidente grepesar Cabo Blanco	gremiopesar@hotmail.com/968064793
18	Javier Mogollon Delgado	Gremio Los Órganos	968997365

Participants of Workshop in Huacho

Date: August 22, 2015
Hour: 9:30 am – 3 pm
Place: Desembarcadero pesquero artesanal del puerto de Huacho.

N°	NAME	INSTITUTION	DNI
1	Felix Pizarro Mendez	Mesa de trabajo Huaura	15599002
2	Wilfredo Suarez Morales	ASAECAPA	22294358
3	Ivan Humareda Dominguez	Capitanía de puerto Huacho	02919357
4	Yeny Sanchez Mallqui	Biceradora	46608736
5	Flor Ramos	Biceradora	22284572
6	Gloria Gomez Obregón	Biceradora	27578739
7	Julieta Obregón Fabian	Biceradora	22748630
8	Evaluz Acosta Chavez	Biceradora	46211622
9	Accilia Vara Isidro	Biceradora	22709732
10	Victor Hugo Toledo Guerrero	Presidente APAEMSPER	15639607
11	Walter Maldonado Quispe	Vegueta	15718336
12	Anselmo Ontaneda Loarte	IMARPE	40200898
13	Henry Palma García	A. Pescadores A. Vegueta	15718762
14	Inés Collantes Diaz	Esposa de pescador de Vegueta	15715407
15	Nolberto Callantes Palma	A. Pescadores A. Vegueta	15715093
16	Yolanda Palma Ramirez	A. Pescadores A. Vegueta	15718190
17	Manuel Querevalú Fiestas	Pescador Huacho	15897283
18	Pablo Cabello Arellano	ASPAPCH Chancay	15979922
19	Jorge Baya Ramirez	Carretillero	15604031
20	Reyna Villegas Rumiche	Armadora	15723644
21	Caren Maldonado Vasquez	MPH GDH	08858446
22	Carmen María Bazales Arévalo	Vendedora de pescado	15584821
23	Rogelio Pedro Orrespi Loyola	Pescador	15606024
24	Silvio Rosales Castillo	Fiscal DPA	15614890
25	Hector Araya Romero	Armador	15607310
26	Milto Romero Dominguez	Pescador artesanal	43374079
27	Emilio Ramos Morante	Presidente APAERO	15638491
28	Rosa Elvira Chinga Galindo	Armador	15727564
29	Máximo Cotrina García	Pescador caleta Vegueta	15787662
30	Carlos R. Araya Velasquez	Pescador artesanal	15724511
31	Jose Luis Alvarez Flores	Pescador	157227308

32	Rafael Hurtado Trujillo	Pescador artesanal	15595423
33	Gilberto Silva Silva	IMARPE	17529044
34	Lia Morales Espinoza	Pescador artesanal Huacho	15547858
35	Silvio Velazque Mano	Pescador artesanal Huacho	18597055
36	Manuel Ramirez Quispe	Pescador artesanal Huacho	43437899
37	Jeovanda Chavez Valverde	Armadora artesanal	32123510
38	Lidia Alvarado Arroyo	IMARPE	19205398
39	Rafael Gonzales Bazalar	IMARPE	15581105
40	Emma Elvira Ojeda	Vendedora	15638801
41	Yolanda Fuentes Riveras	Fileteadora	10615471
42	Rosalinda Araujo Romero	Comercializadora	15605172
43	Norma Moquino Ramirez	Armadora	15735244

Participants of Workshop in Mancora

Date: August 28, 2015
Hour: 9:30 am – 3 pm
Place: Gremio de pescadores de Máncora.

N°	NAME	INSTITUTION	DNI
1	Henry Navarro Carlin	AGREPESAR - Mancora	03867777
2	María E. Lopez Zapata	Teniente Gobernadora	03869409
3	Ricardo Garay Felipa	ETSUNP - Mancora	47572444
4	Vanessa Cordova Carrasco	ETSUNP - Mancora	42298250
5	Yennifer Peña Mogollon	ETSUNP - Mancora	48095232
6	Brayan Manchan Agurto	ETSUNP - Mancora	76661939
7	Lucia Echecopar	Asoc. Ambiental Mancora	10587023
8	Luisa de Talleri	Asoc. Ambiental Mancora	06625181
9	Javier S. Mogollón Delgado	IMPARPE: El Ñuro	03871702
10	Jhonatam Karls Montenegro Cotrina	IMARPE	45437813
11	Geinner Edinson Olaya Neshato	ETSUNP - Mancora	71080110
12	Norma Paucar Chamba	ETSUNP – Mancora	76076093
13	Carmen Maribel Hidalgo Moscoso	ETSUNP – Mancora	73800462
14	Jackeline del Pilar Contrera Arica	ETSUNP – Mancora	47751671
15	Maceda Pardo Carlos Martin	ETSUNP – Mancora	43653905
16	Marin Ojeda Karina	ETSUNP – Mancora	41577291
17	Araujo Carlin Xiomara	ETSUNP – Mancora	76554449
18	Martín Maceda Olivos	AGREPESAR Mancora	03869052
19	Segundo Callan Marquezado	Juez de Paz	03851733
20	Angel Moises Calderon López	IMARPE	41159827
21	Julio Balladares Aldana	AGREPESAR	46034419
22	Mercedes Mena Valladares	Vaso de Leche Presidenta	42240364
23	Sandy Maire Cruz Lopez	Instituto Privado Tecnologico NSC	45928108
24	Judith Rodriguez Valladares	ETSUNP – Sede Mancora	977751876 (teléfono)
25	Paola Ramirez Moran	Vaso de Leche San Juan LO	41600905
26	Katty Farias Rugel	Vaso de Leche San Juan LO	43590134
27	Jose Carrasco Agusto	ETSUNP – Mancora	78015158
28	Miguel Pacherres Cobeñas	ETSUNP – Mancora	73462493
29	Yohana Carrasco Guevara	Vaso Leche	03869133

30	José V. Antón Chapa	Armador	03866750
31	Oswaldo Serna Fernandez	Municipalidad Distrital El Alto	07953821
32	Wilfredo Lopez Zegarra	Pescador	00365094
33	Javier Zapata Moreno	ETSUNP – Sede Macora	47601692
34	Carlos E. Medina Querevalú	Socio Gremio	03895883
35	Martin Calderón Peride	Asociación	03866845
36	Marianela Macarón Calderón	Comedor Santa Rosa	41883143
37	Jorge Walter Guerrero Chinchay	DPA – Mancora	09984713
38	Braulio N. Díaz Solano	IMARPE - Mancora	09334063

ANNEX V. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

A. Céspedes, C., N. Ortiz. 2015. Evaluación ambiental. Proyecto: "Adaptación a los impactos del cambio climático en el ecosistema marino costero del Perú y sus pesquerías". PROFONANPE.

B. González, S. 2015. Aspectos sociales a tomar en cuenta en el desempeño del Proyecto "Adaptación a los impactos del cambio climático en el ecosistema marino costero del Perú y sus pesquerías". PROFONANPE.

ANNEX VI. WORKSHOP RESULTS

González, S. 2015. Informe de resultados de la realización de los talleres de Huacho y Máncora: Proyecto "Adaptación a los impactos del cambio climático en el ecosistema marino costero del Peru y sus pesquerías". PROFONANPE.

ANNEX VII. ACT OF ADHESION RENEWAL

A. Acta de renovación de la adhesión de los pescadores y mujeres de la zona de Huacho al proyecto: Adaptación a los impactos del cambio climático en el ecosistema marino costero del Perú y sus pesquerías.

B. Acta de renovación de la adhesión de los pescadores y mujeres de la zona de Máncora al proyecto: Adaptación a los impactos del cambio climático en el ecosistema marino costero del Perú y sus pesquerías.

ANNEX VIII. DESIGNATED AUTHORITY ENDORSEMENT LETTER

PERÚ | Ministerio del Ambiente | Viceministerio de Desarrollo Estratégico de los Recursos Naturales

"Decenio de las Personas con Discapacidad en el Perú"
"Año de la consolidación del mar de Grau"

Lima, January 11, 2016

Letter N° 001-2016-MINAM/DM/VZCH

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

Subject: Endorsement for Project *"Adaptation to the impacts of Climate Change on Peru's Coastal Marine Ecosystem and Fisheries"*

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

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by our National Implementing Entity – PROFONANPE and executed by the Ministry of Production.

Sincerely,

Viviana Zaldívar Chauca
Adviser Minsitry of Environment
Designated Authority

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