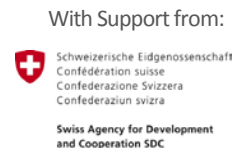


INVESTMENTS IN WATERSHED SERVICES FOR THE RIMAC WATERSHED, DEPARTMENT OF LIMA, PERU

October 2013



About Peru's Incubadora de Mecanismos de Retribución por Servicios Ecosistémicos (Ecosystem Services Incubator)

Recognizing the need to provide national leadership, capacity-building, and coordination to the many local and regional mechanisms facilitating investments in ecosystem services throughout Peru, the Ministry of Environment of Peru (MINAM) partnered with Forest Trends to establish the Peru Ecosystem Services Incubator in 2012. The Incubator aims to enhance investments in nature by society through providing technical, financial, and economic expertise; building capacity; and contributing to the development of national policy. To do this, the Incubator works with a range of non-governmental organizations, development agencies, national authorities, and local and regional governments throughout the country who have worked for years to advance investments in ecosystems. Guided by the national prioritization of improving integrated water management, investment mechanisms linked to watershed services are the first focus of the Incubator.

The following institutions play critical roles in the design and implementation of the Incubator:

Ministry of Environment of Peru (MINAM)

MINAM's mission is to preserve the quality of the environment and ensure that present and future generations will be able to enjoy their right to a healthy environment for the development of life. As the host and leader of the Incubator, MINAM is responsible for the planning, execution, tracking, and monitoring of activities in the technical, economic, and financial arenas.

Forest Trends and EcoDecisión

Forest Trends works to maintain, restore, and enhance forests and connected natural ecosystems, which provide life-sustaining processes, by promoting incentives stemming from a broad range of ecosystem services and products. Forest Trends is a founding partner of the Incubator and serves as a technical, economic, and financial advisor. Forest Trends fulfills this role in a strategic alliance with EcoDecisión, a social enterprise specializing in ecosystem services and funding for nature conservation.

Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN)

CONDESAN is a nonprofit organization aimed at strengthening rational and sustainable management of natural resources and promoting productive and institutional innovations that overcome poverty, exclusion, and inequality. CONDESAN provides technical, economic, and financial advice and provides support to enable the implementation, monitoring, and evaluation of the Incubator's activities.

Swiss Agency for Development and Cooperation (SDC)

An organization that invests in the fight against poverty in developing countries, SDC has contributed significantly to economic integration and poverty reduction in Peru by working with the Peruvian government, civil society organizations, and the private sector. As part of its efforts to provide greater access to basic water and sanitation services, SDC is providing significant support for the Incubator's activities, through a global project with Forest Trends aimed at scaling up investments in watershed services to address the global water crisis.

The following institutions are key partners in the design and implementation of the Rimac project: **GEA Group, Fondo de las Américas (FONDAM), Catholic University of Peru (PUCP), The Nature Conservancy (TNC), Union of Peruvian Breweries Backus and Johnston, Peruvian Society for Environmental Rights (SPDA), and Aquafondo.**

Preferred Citation: Margaret Stern and Marta Echavarría (EcoDecisión). *Investments in Watershed Services for the Rimac Watershed, Department of Lima, Peru*. Peru Investments in Watershed Services Series. Washington, DC: Forest Trends, 2013.

1. Project Characteristics

Lima is the second-largest desert city in the world after Cairo and its water situation is at a critical state due to rapid urban expansion, inefficient use and waste of water resources, and serious pollution and environmental degradation of the watersheds that supply the city. Lima obtains its water from three rivers, the Rimac, Chillón and Lurín, which originate in the high Andes and flow into the Pacific Ocean. The Rimac is the largest of these three watersheds and is considered one of the most polluted rivers in the world. The upper and mid-portions of the watershed are contaminated by mining residues and the lower watershed by organic residues and toxins derived from industrial and domestic waste, agricultural drainage, and poor disposal of solid wastes along its entire length (Echavarría & Zucchetti 2008).

This initiative is a large-scale effort to protect and improve the availability and quality of water resources from the Rimac watershed through investments in watershed services (IWS). The creation of a financial mechanism – Aquafondo – aims to develop an incentive-based approach to work in a cost-effective way with upper catchment communities to address the issues of land ownership, improved land use practices and social equity related to the protection and provision of watershed services.

Project at a Glance

Location	Rimac watershed, Department of Lima, Peru
Project type	Watershed services for ecological and hydrological restoration and the conservation of the natural ecosystems in the watershed; regulation of water supply throughout the year; reduction of contamination & sedimentation; and elimination of pollution from mining activities, industry, and domestic solid waste.
Size of watershed & project area	<ul style="list-style-type: none"> • <u>Rimac watershed and project area</u>: 3,504 km² • <u>Project area</u>: Four sub-basins were selected for priority intervention to demonstrate tangible results towards principal objectives to reduce sedimentation and contamination and regulate water.
Key institutional partners	GEA Group, The Nature Conservancy (TNC), Fondo de las Américas (FONDAM), Union of Peruvian Breweries Backus and Johnston, Catholic University of Peru (PUCP), and the Peruvian Society for Environmental Rights (SPDA), the Lima and Callao water fund-Aquafondo
Water users	Approximately 9 million people living in the city of Lima, industry (e.g. Backus), hydropower plants, mining companies, irrigation committees
Watershed service providers	Families living on the Rimac watershed and its five sub-basins
Project status	The framework to monitor and prioritize Aquafondo investments in the watershed is being developed in conjunction with valuation and hydrological studies.
Project funding & payment mechanism	Aquafondo is a private funding mechanism – including collection, management and disbursement of funds - that complements public sector efforts for ecological and hydrological restoration and watershed conservation. Funds for the trust include investment capital and expendable funds.
Level of investment	Approximately US\$300,000
Scalability	Project interventions began on four sub-basins and, in the future, could be scaled up to others in the watershed or elsewhere in the country.

Project History and Key Developing Institutions

In 2005, initiatives to address the scarce water supply in growing urban areas in Peru were outlined in the *Urban Environmental Assessment* and the *Green Plan for Lima and Callao*. Subsequently, efforts were made to mobilize joint investments and public support for the establishment, in 2010, of the Lima and Callao fund to conserve watersheds and water resources, known as Aquafondo.¹ The objectives of Aquafondo are three-fold: (1) to conserve and manage water resources of the Chillón, Rímac and Lurín watersheds; (2) promote a new culture regarding water use; and (3) support participatory administration and governance of the water resource. Aquafondo works with different stakeholders (water users and watershed service providers) to develop interventions that respond to their interests in watershed management and protection.

Aquafondo is a financial fund created by a consortium led by the GEA Group and including the Fondo de las Américas (FONDAM), The Nature Conservancy (TNC), the Catholic University of Peru (PUCP), the Peruvian Society of Environmental Law (SPDA), and the Union of Peruvian Breweries Backus & Johnston. In parallel, the Regional Government of Lima, the Regional Government of Callao and the Metropolitan District of Lima coordinated the development of the Water Resources Council for the inter-regional watersheds of Rimac, Chillón and Lurín, with support from Fundación Futuro Latinoamericano (FFLA) with funding from the Tinker Foundation.

The *Incubator* is working in close partnership with these institutions, specifically to strengthen the Fund's technical approach and to introduce a framework for cost-effective decision-making that is informed by stakeholder views and priorities, particularly to select projects for payments upstream. Establishing the framework to measure performance will allow Aquafondo to set priorities that ensure improved water flow and quality. This requires an evaluation and description of the Rimac watershed that will support negotiations to delineate environmental goals that are shared by the principal users of the watershed, for example the farming communities, mining companies and hydroelectric plants. An example of an environmental goal is an agreed-upon reduction in the sediment load in the river by a certain tonnage per year².

Environmental markets or payment for watershed services schemes generally use a common performance metric that can be tailored to the specific outcomes desired for the watershed. Kieser & Associates (2012) proposed two metrics for the watershed, one to measure water quality and the other water quantity. For water quality projects they recommended a net reduction in mass per year of common water pollutants such as sediment, total phosphorus, and total nitrogen; a water rate, such as m³/s, was recommended for water quantity projects related to increased infiltration to groundwater or water conservation.

Project Location and Description of the Problem

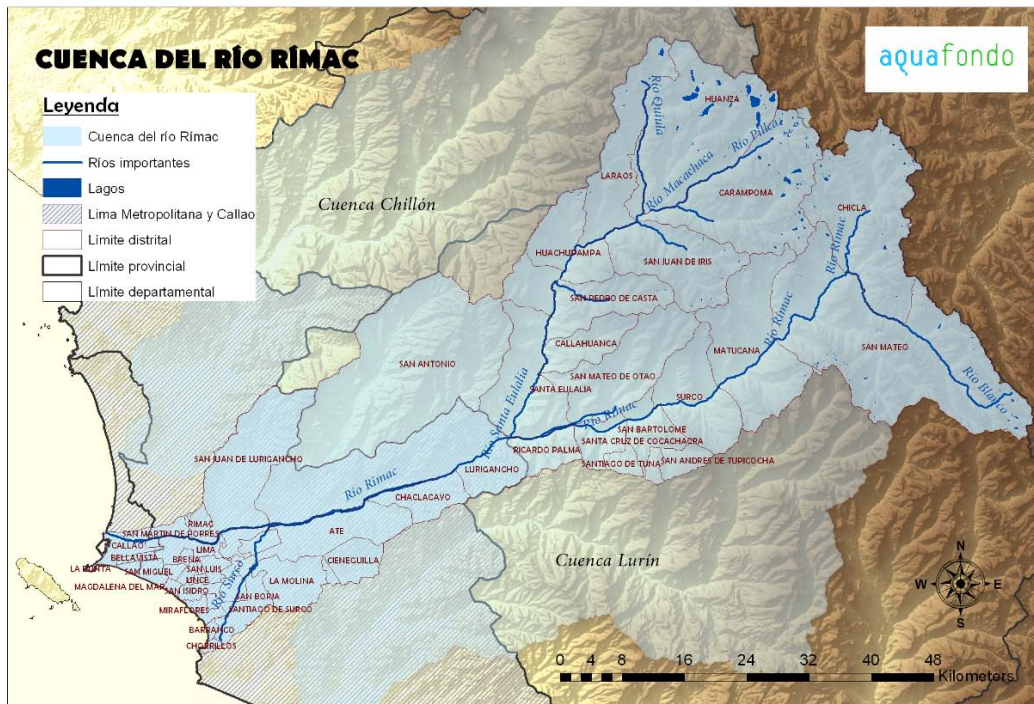
The Rimac watershed is located in central Peru, where it descends from an elevation of 5500 m to the Pacific Ocean at Callao (Lima). The total area of the watershed is 3,504 km² comprised of nine hydrographic units³ (ANA-DCPRH-ALA 2010) (Map 1). Its water is used for agriculture, domestic needs, industry, mining, aquaculture (fish farming) and production of hydroelectricity. During the dry season, the highland lakes and dams that regulate the flow of the Rimac River do not provide enough water to satisfy the demand of the Lima Metropolitan District, particularly during drought years, and water scarcity creates social conflicts when there is more demand for irrigation water. Additionally, multiple contamination sources on the watershed result in the presence of heavy metals (e.g. lead, iron, magnesium) and noxious substances such as fecal coliforms at higher than legally permitted levels.⁴

¹ <http://www.aquafondo.org.pe/>

² http://www.aquafondo.org.pe/index.php?fp_cont=1014

³ The Lower Rimac River sub-watershed and a number of streams and rivers including the Jicamarca, Santa Eulalia, Párac, Upper Rimac and the Blanco.

⁴ <http://www.aquafondo.org.pe/cuenca-rimac-info.php>



Source: AquaFondo 2011

Map 1. The Rímac Watershed with Its Sub-basins, Flanked by the Chillón Watershed to the North and the Lurín Watershed to the South

The important problems on the watershed are numerous and are listed here, as described by different stakeholders during the consultation process and summarized by Kieser & Assoc. (2012):

- Water scarcity due to lack of access to and insufficient water quantity, especially during the dry season. This is exacerbated by closed floodgates on hydropower reservoirs and rationed water for irrigation purposes by watershed Irrigation Boards. Stakeholders are concerned about inefficient and irrational water consumption by industry and urban communities, the lack of regulation, and illegal water use.
- Lack of irrigation supply due to inadequate infrastructure or lack thereof. There is concern about poor irrigation management by the agriculture sector.
- Insufficient drinking water supply and quality in some communities due to inadequate and/or aging infrastructure. Some urban water is untreated and there is concern that private drinking water suppliers may sell contaminated water. There is need for more water capture and treatment.
- Drop in groundwater levels in the lower watershed that threatens the water supply of metropolitan Lima. Increased infiltration is a major goal expressed by stakeholders.
- Degraded natural lakes that have a reduced capacity for water storage and infiltration to groundwater.
- Lack of flood protection that threatens agricultural and some urban areas.
- Threats to the sustainability of agriculture due to poor pasture management including inappropriate use of agrochemicals, livestock access to water, and soil erosion that raise concerns about water quality and cropland conservation.
- Lack of wastewater treatment for most communities and direct discharge of sewage and wastewater to irrigation canals that affects water quality.
- Lack of solid waste management that has negative impacts on agriculture, irrigation canals, river habitat and water quality.
- Mining contamination that affects water quality. Stakeholders are concerned about illegal mines and lack of regulation and monitoring.

- Deforestation on the upper watershed that decreases water infiltration and storage in aquifers and negatively impacts water quality; large-scale reforestation efforts are needed.
- High levels of sedimentation and siltation that requires river beds to be dredged and affects water quantity and quality.

Water Users

The project beneficiaries are the nine million inhabitants of the city of Lima or about one-third of Peru's total population. Other water users are large, medium, and small-scale farmers who rely on this watershed for crop irrigation; hydroelectric plants; the mining sector; and other industrial users.

Water users' fees for watershed services have yet to be established. Such fees will have to be approved by city authorities, the water utility or another regulating body, and changes in regulations will be needed to allow fee payments to be transferred to Aquafondo, a private entity. Implementation of policy to finance Aquafondo could slow down or be a legal barrier to the advancement of this project.

Present Water Supply and Demand

The total annual water supply provided by the Rimac watershed is 781 million m³, from superficial water in the watershed. The Rimac watershed is in deficit during the months of June to November and excess during the months of December to May (ANA-DCPRH-ALA 2010).

The total annual demand for water from the Rimac watershed is 635 million m³, distributed towards the following uses: domestic use 501 million m³, mining 27 million m³, irrigation 105 million m³, and industrial use 1 million m³. Domestic use is by far the most significant for this watershed (ANA-DCPRH-ALA 2010).

The difference between supply and demand for water is an annual excess of 147 million m³ (ANA-DCPRH-ALA 2010).

2. The Watershed Service

Watershed Service Providers

The principal service providers are the families living on the middle and upper Rimac watershed (including its sub-basins). The middle and upper Rimac watershed is the most important source of water for human consumption, farming and electricity for Lima, and at the same time, suffers severe environmental problems that jeopardize the quality of those watershed services. As it becomes ever more difficult and costly to decontaminate and recover the environmental condition of the Rimac over time, Aquafondo aims to generate and channel resources for the implementation of multiple upstream projects that contribute to the environmental recovery of this watershed with the objective to maintain and guarantee its environmental services into the future.

Processes for consultation and participation

To manage the water fund, Aquafondo is required to solicit stakeholders' input. To this end, the first year of projects included 13 workshops run by the Basin Water Resources Council (CHRC) on the Rimac, Lurin and Chillón watersheds, designed to inform local representatives of problems and needs of the watershed and to identify organizing entities within the watershed. The CHRC received feedback from stakeholders regarding watershed problems along with potential solutions. Existing policy mandates that the CHRC must consist of a representative from the National Water Authority (ANA), each regional government, local governments, the water user organizations (both for agricultural and non-agriculture purposes), rural communities, professional associations, and universities. These representatives were present at the series of workshops held throughout the basins. As a result of these consultations, it was clear that stakeholders were concerned about many issues surrounding water quantity and quality in the watershed, as reported in the section above that describes the major problems on this watershed.

3. Identification and Engagement of Investors

Potential investors in this initiative are water users and large companies that will want good return on their investment. These could include hydroelectric companies (e.g. EDEGEL) with power plants on the Rimac River and other sub-watersheds, Lima's Drinking Water and Sewage System Service (SEDAPAL) that receives water for treatment in its plants, and the Coca-Cola subsidiary that obtains its water from the drainage.

EDEGEL is Peru's largest power generation company with five of its hydroelectric plants located on the Rimac watershed. According to the Oxford Business Group, Edegel is using only 63% of its installed capacity, which may lead to the expectation of increased future production and an interest in supporting a sustainable financial mechanism to improve watershed services (Edegel Power 2012).

SEDAPAL is the only company that is authorized to provide drinking water to households in Lima. It will be important to consider whether SEDAPAL should be responsible for paying for watershed services or if Lima residents – the final water users - should be financially responsible, or both. In other words, decisions will be needed to determine if financial compensation should be drawn from the SEDAPAL general budget or from specific fees passed on to water users and the legal implications of both prospective scenarios.

On the upper Rimac watershed, mining companies are heavy water users. In 2011, five mining companies (Casapalca, San Valentin, Los Queñoales, Nyrstar Coricancha and Corona) were in operation for gold, silver, copper, zinc and lead on the upper Rimac watershed.⁵ These companies may be interested in investing in the initiative as an opportunity to demonstrate social responsibility by contributing to the conservation and restoration of these watersheds.

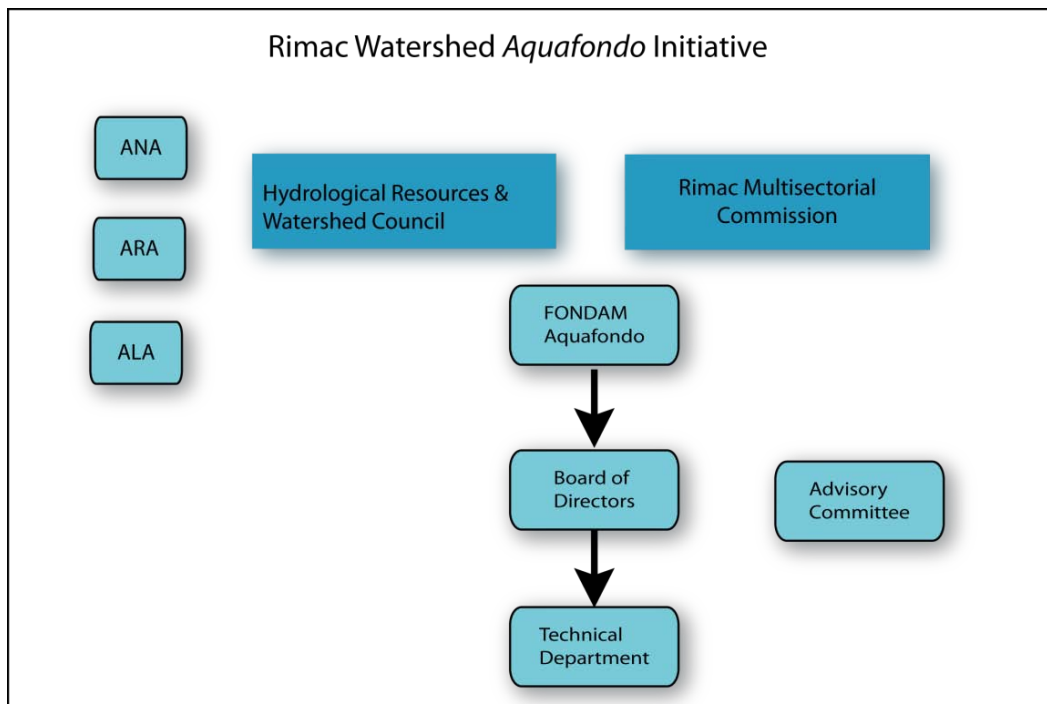
Current Investment

The seed capital for the creation of the Lima and Callao water fund comes from the six institutions that created it. As of 2012, TNC, through a GEF-funded project through the IDB, will be providing \$500,000 in seed capital (as a 1 to 3 match) and \$180,000 for studies and institutional capacity. Additional funds will potentially be raised from national and international cooperating institutions, private businesses, and citizens who wish to support the fund.

Institutional Structure and Use of Proceeds

Aquafondo was created as a financial mechanism to improve the quality and quantity of water in Lima's watersheds; it provides a way to generate public-private partnerships for investment in the three watersheds (Chillón, Lurín, and Rimac) that serve Lima and Callao. As illustrated in the schematic diagram that follows (Figure 1), FONDAM is responsible for the financial administration of contributions to the Aquafondo that finance project development and implementation. The national, regional and local water authorities, a hydrological council and the Rimac multi-sectoral commission oversee FONDAM prior to fund disbursement to the Aquafondo Board of Directors. Aquafondo has an Advisory Committee and a Technical Department that ultimately sets criteria and establishes priorities for projects and programs according to its strategies, which are in line with national, regional and local policies for the management of water resources.

⁵ MINEM (2013). Metal production statistics. www.minem.gob.pe



*ANA= National Water Authority; ARA= Regional Water Authority; ALA= Local Water Authority

Figure 1. Schematic Diagram for Investment and Administration of the water Services of Lima & Callao

4. Project Preparation and Monitoring

Project preparation has included actions supported by the MINAM Incubator including the production of a linear schematic illustration of the watershed that identifies the locations of the sources and sites that are known to have critical impacts on the Rimac River watershed (Kieser & Assoc. 2012), thus illustrating how water projects in the area could influence solutions to problems that may be close-by or in distant areas. Also, the schematic diagram provides improved information, reviewed by experts, which will help foster discussion between interested stakeholders. Given the wide range of concerns about the Rimac watershed, Aquafondo has an opportunity to provide funding support to an almost endless portfolio of projects, depending on the amount of available funding. To date, the following six types of projects have been selected as potential solutions in response to the identified needs (Aquafondo 2010):

- Restoration of the ecological conditions associated with the watershed;
- Restoration and construction of hydrological infrastructure to conserve and protect water resources;
- Compensation or payments for water services;
- Sustainable production and integrated rural development;
- Improved eco-efficiency, water decontamination and prevention of water pollution; and
- Environmental education and administration of water resources.

To promote interest in Aquafondo by potential partners and investors, a suite of project synopses were prepared based on preliminary diagnostic information and consultation with key players involved with administration of water resources on the Rimac watershed. The following projects, described briefly in Table 1, have been developed for the Lima and Callao water fund (Aquafondo 2011).

Table 1. Selected Projects to Improve Water Quality and Quantity in the Rimac Drainage within the Proposed IWS.

Name of Project	Objectives
Reforestation the upper portion of the Rimac watershed	Raise consciousness and provide training about hydrological services in farming communities and with local leaders to protect natural resources and agroforestry techniques.
Lima aquifer recharge project	Recharge groundwater aquifers that provide water to the city.
Massive campaign to reduce personal water use in the Lima Metropolitan District	Promote a culture to use less water and reduce pollution.
Conservation and restoration of farming terraces in the upper and middle Santa Eulalia sub-watershed	Promote the restoration of the farming terrace system within the Santa Eulalia valley as a way to adapt to climate change, improve water conservation and management practices and develop family income alternatives.

A valuation study is currently being funded by MINAM to explore the potential development of an IWS scheme in the watershed. In addition, TNC has contracted a hydrological study supported with IDB/GEF funding.

Project Monitoring

At this time no monitoring is taking place. The expectation is that as a result of current efforts and the acquisition of specific technical information, a monitoring process will be institutionalized. For example, results from a recent technical report (Kieser & Assoc. 2012) indicate that two tributaries of the Rimac River stand out as having substantial water quality concerns: the Antarunra in the upper watershed, and the Huaycoloro in the lower watershed. The latter exhibits the broadest array of water quality issues including the presence of select heavy metals and excessive nutrients that are most problematic in the early rainy season (January and February), suggesting substantial pollutant loads during that period in specific locations. This specific information will guide the development and effective implementation of mitigation and monitoring actions.

5. Next Steps for Defining the IWS Scenario

The MINAM Incubator aims to ensure that all projects address each of these four different facets of project development: hydrological, institutional, social and economic at different stages of design and implementation. The following list looks specifically at the Incubator intervention that aims to ensure that all projects address each of these four different facets of IWS project development.

- Items are in process or have been completed
- Items are required as next steps in the process

Phase 1:

- Simplified understanding of the watersheds;
- Identification of key players, goals and interests;
- Selection of indicators to measure project progress;
- Development of the credit system.

Phase 2:

- Examine financial strategies for projects;
- Pilot projects and follow-up;
- Options within the implementation framework of the water fund;

Phase 3:

- Implementation of the framework;
- Institutional adaptive management.

6. Conclusions

The objective of the Aquafondo is to establish a suite of projects that lead to environmental conservation of the upper and mid-watershed and subsequent improved water quality and quantity. To date, the evaluation and characterization of the Rimac watershed has been carried out such that specific information is available that will facilitate negotiation among principal watershed service providers and users, such as farming communities, mining companies, hydroelectric companies, and domestic users, to decide on shared environmental goals. Goals could be expressed, for example, as the reduction of X tons of silt/year for each million US dollars spent.

The development of an initial set of pilot projects and their respective indicators for evaluation and monitoring is in process and it is expected that the implementation phase of project activities will begin to establish an adaptive management system that will permit an ongoing evaluation of results as the project advances.

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