



ADAPTS: Adaptive Water Management at a Local Scale

Peru Case Study

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GOAL OF ADAPTS

Climate change is expected to result in gradual changes in temperature, rainfall patterns and sea level rise, but also increased climate variability and extreme events, threatening water availability and food security for millions of poor people. Adaptation strategies to deal with these impacts are urgently needed from the level of communities to national governments.

In 2008, the Institute for Environmental Studies, ACACIA Water and Both ENDS started the ADAPTS project. The overall aim of ADAPTS is to increase developing countries' adaptive capacities by achieving the inclusion of climate change and adaptation considerations in water policies, local planning and investment decisions.



Fig. 1 The six case study areas.

To achieve this goal, ADAPTS focuses on:

- **1. Knowledge development:** developing climate change information and studying how local water management can be made climate-proof.
- **2. Local Action:** the identification, support, documentation, analysis and dissemination of innovative, locally-based interventions to ensure that local knowledge and visions are included in basin and national policy dialogues.
- **3. Dialogue:** establishing policy dialogues between local and national stakeholders on the issues of sustainable water management and adaptation to climate change.

ADAPTS sets out to show that adaptation is already taking place at the local scale, and to provide

practical experiences and lessons from various contexts that can feed the discussions on climate-proofing water management from the local to the (inter)national level.

The project is being implemented in six river basins around the world. Project with a three year duration are being carried out in Ethiopia, Ghana and Peru. Studies with a one year duration are being carried out Botswana, Brazil and Vietnam. This factsheet offers an overview of the main challenges and activities in Peru's Ocoña basin, focusing on the Churonga and Arma-Chichas sub-basins in Arequipa.

PERU: The Ocoña Basin

The Ocoña river basin covers 6,322 square kilometers, extending from the Pacific to 6,445 meters above sea level on the Coropuna glacier's peak in Peru's southern Andes. The watershed crosses 7 provinces in 3 departments, and is home to 70,000 people, most of whom live in poverty or, as in the case of families living at higher-altitudes, extreme poverty.

The water in the Ocoña Basin originates from a vast network of glaciers and wetlands that provide the largest dry season discharge into the Pacific of all Peru's Pacific watersheds. This is an arid region, where local livelihoods depend on spring water that probably originates from nearby glaciers. Ocoña Basin livelihoods reflect Andean traditional knowledge of native crops, irrigated farming, llama herding, shrimping and medical plants. The unique natural and cultural resources of the Cotahuasi Canyon and neighboring upland *polylepis* forests are protected in the Cotahuasi National Scenic Preserve and two communal forest reserves.

The main goal of this project is to increase the resilience of families and communities to climate change by improving water availability and management in two sub-basins of the Ocoña watershed. The project builds on local knowledge of water catchment in promoting their construction by municipal governments and the conservation of water by local families.



Fig. 2 High altitude wetland (bofedal) in Condesuyos, Arequipa

CLIMATE CHANGE AND VULNERABILITY

The lower seasonal precipitation and increase in temperatures of 1 degree over the past decades have resulted in accelerated glacier retreat in Peru. AEDES documented a 47 km² reduction in the Coropuna glacier between 1975 and 2009, equivalent to a 37% loss in its area. Global climate change models predict that in coming decades temperatures will continue to rise and inter-tropical glaciers, like those in the Ocoña Basin, will soon disappear.

Such changes will lead to reduced water availability in Peru's glacier-dependent Pacific basins where 70% of Peruvians already rely on a scant 2% of the nation's water. Water scarcity is accompanied by increased conflicts among users. The consumption and contamination of valued water resources by miners in the arid Ocoña Basin is already a cause for concern and conflict.

Water is vital to Andean bio-diversity and communities. When it becomes scarce, harvests decline, and upland pastures and wetlands become parched. Reduced river discharge adversely affects shrimp fishing in the lower Ocoña river. As these subsistence-based livelihoods begin to fail, out-migration increases and investment in land, herds and education declines. Women and children who remain in rural communities are especially prone to suffer the consequences of water scarcity.

LOCAL ADAPTATION

For over a decade AEDES has actively supported the creation of sub-basin water boards and *Consensus Roundtables*, where different stakeholders negotiate local concerns and propose solutions. The Ocoña Water Platform (2008) focuses on basin-wide water management. ADAPTS introduces climate change

adaptation measures and issues via these local decision-making groups by providing them with information on water management measures and the changes in the hydrological system.

Local adaptive measures, key to farming in the Andes, include terraced slopes, catchment ponds, irrigation engineering and community-based resource management. ADAPTS contributes technical analysis of water, soil, pasture and forests, design of water catchment and irrigation projects and evaluations of the effectiveness of adaptation measures.

The study focuses on technical aspects of pilot measures in water catchment and conservation, but also helps communities to preserve native forests and to combat invasive plants that damage their pastures. Among the technical questions are: the effect of upstream water catchment on lower springs, determining factors for tree regeneration, and the seasonality of glacier melt. Economic questions to be answered include the yield effect of water conservation measures and the cost-benefit of four water catchment ponds constructed by municipal governments, each of a different size, location and use regime.

DIALOGUE AND UP-SCALING

Dialogue is at the heart of community resource management in the Andes, but the concerns expressed and measures taken by those communities rarely reach Peru's national government. AEDES focuses on capacity building with federations of communities, women and irrigators while the ADAPTS project strives to strengthen local-national-international linkages

AEDES, in alliance with Peru's Environment Ministry and Water Authority, municipal and regional governments and universities, supports adaptation to climate change through research, local capacity building and Integrated Basin Management. Planning and Management tools that take climate change into account are key for to regional and local policy-making concerning the Ocoña Basin.



IMPLEMENTED WORK

Studies of Coropuna glacier and the hydrology of two sub-basins are ongoing. Glacier retreat is monitored with Peru's Glaciology Institute, Huaraz, AcaciaWater and IVM analyse the hydrology data for use in modelling water availability in this semi-arid region.

Climate change adaptive measures under evaluation include:

- Small-scale rainfall catchment reservoirs
- Irrigation water conservation (drip, sprinkler)
- Improved water distribution and use
- Community wetland (bofedales) management
- Community managed *Polylepis* forest reserves

Water conservation and management measures

In 2010 AEDES and the Municipal government of Andaray built four rainfall catchment ponds in the water-scarce Churunga sub-basin. These ponds are low cost measures that provide water for drip irrigation, for livestock, or for establishing pastures and forests, and might also recharge groundwater. Water is unequally available in the Ocoña Basin, and within communities. AEDES works with irrigation committees and boards to improve water distribution and with farmers to improve field preparation and water use. Families invest in low-cost improvements for drip and sprinkler irrigation.

Local Management of Natural Resources

Community-based natural resource management is common at high altitudes in the Andes. In Peru ADAPTS works with communities to assess resource condition. As a result, a unique *Polylepis* native forest was declared a Private Conservation Area and community members set-up reserves for natural regeneration and for replanting seedlings provided by AEDES and the District nursery. Forest expansion not only protects upland water sources, but also favors collection of water from fog. Groups of families are now combating a spiny, invader species and using dry-season glacial melt to extend wetlands.

Integrated Basin Management

The Climate Change adaptive actions promoted by AEDES range from field-specific measures to community-based management to basin-wide management. The Integrated Ocoña Basin management plan involves diverse local stakeholders such as farmers, communities, miners, shrimp fishers, youth and academic institutions.

1ST RESULTS

ADAPTS has raised awareness and knowledge about climate change – its consequences and potential adaptive measures – in 5 rural districts as well as 4 indigenous communities that manage critical resources in the upper reaches of the Ocoña Basin. Funds and other resources for pilot adaptive measures come from 1 municipality, 4 communities, several farm families and ADAPTS. Such actions put them, and AEDES, at the forefront of adaptation to climate change.

Analysis of water samples collected in 2009 and 2010 showed that local precipitation is an important source of water at least during a part of the year, indicating that storage of water during the wet season can be an effective solution to adapt to climate change. Further analysis will provide insight on the impact of glacier melt on the water availability during the full dry season and the downstream impact of catchment reservoirs.

AEDES will begin to measure the effect of catchment reservoirs, irrigation conservation practices, forest reserved and improved pasture condition in 2011. As the catchments fill during the rainy season, the water is expected to be used for livestock and occasional irrigation.

ADAPTS has a positive effects on alliance-building with municipal governments, MINAM, ANA and NGOs and on the forging of links between local authorities and the national government. This locally-based approach to climate change adaptation is attracting interest from Peru's Environment Ministry Climate Change Office.

The longer term effect of ADAPTS actions on basin-wide water management and on water infiltration and spring discharge, will be measured by AEDES beyond this project's lifetime. Ongoing studies of Coropuna glacier retreat and local hydrology provide data used to predict changes in glacial mass and runoff and to model the effects on local hydrology.





Peru's Hydrogeology Program (INGEMMET) included a study of the Ocoña Basin in its 2011 budget that will complement ADAPTS' data on Arma-Chichas and Chorunga sub-basins. ADAPTS builds on existing relations (NGOs, local regional and provincial authorities) to scale up successful adaptive measures and experiences. AEDES and DESCO form an NGO alliance that provides broad geographical coverage in promoting the Integrated Management of all the Ocoña Basin. AEDES, MINAM, Arequipa's Regional Government and the National Water Authority work together to build consensus among diverse stakeholders with divergent interests for an Integrated Ocoña Basin Management Plan.

LESSONS LEARNED

The primary lessons learned in the ADAPTS Peruvian case are:

- The direct link of scientists, local communities and government as facilitated by NGOs and their technical staff is critical for information sharing, the generation of innovation and up scaling .
- Local action is most effective when linked to local government. ADAPTS's link to Peru's participatory budgeting process allows local communities to access public funds and invest them in climate change adaptive measures.
- The time and effort invested in working with local communities and governments and listening to diverse stakeholders are the building blocks for the successful implementation of climate change adaptive measures.
- Horizontal (geographical) and vertical up scaling are mutually fortifying processes, that facilitate broader replication of the locally-based adaptive measures.

PLANNED ACTIVITIES

In 2011 ADAPTS Peru will focus on: 1. alliance and consensus building for Integrated Basin Management and 2. Physical and socio economic impact assessment. AEDES will also help rural municipalities and water boards to design water capture and conservation projects.

The project will produce information and insights on:

- Source of spring water and the effect of upstream water catchment on springs
- Cost/benefit of 4 different catchment reservoirs
- Seasonality and volume of glacial melt.
- Yield effect of water conservation measures
- Continuing effects of climate change in the district

FUTURE ACTIONS

The findings of the project will be discussed in the coming years at local, regional, national and international meetings. AEDES expects to incorporate successful climate change adaptive measures in training for climate change adaptive capacity building beginning in 2011. These demonstration areas and the ADAPTS study results will be shared with NGOs and rural families from Peru's southern highlands.

The nomination of a basin management board, and the drafting and effective implementation of an integrated management plan are enduring challenges for the Ocoña Basin, for Arequipa and for Peru. Similarly challenging is ensuring a continued flow of information about local hydrology and the effects of glacier retreat on communities.

The Peruvian Forum on Water has included the Ocoña Basin in its 2011 work plan. They will provide some support to AEDES's promotion of Integrated River Basin Management and the implementation of the new Water Resources Law.

PARTICIPATING INSTITUTES

Peru's Ministry of Environment Climate Change Office, AEDES, VM/VU University, Both ENDS, Acacia Water

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