

## **CONDESAN: Better Knowledge, Better Decisions— Supporting Sustainable Andean Mountains Development**

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# CONDESAN: Better Knowledge, Better Decisions—Supporting Sustainable Andean Mountains Development



**CONDESAN**  
Consortium for the Sustainable Development  
of the Andean Ecoregion

*The Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN) was established in February 1993 after a series of consultations among different regional stakeholders working on sustainable development. Inspired by Agenda 21, which emerged from the Rio 1992 Earth Summit, and influenced by the ecoregional approach, CONDESAN was created as a platform to promote research for development throughout the Andean region. The Consortium is now celebrating its 20th anniversary.*

## Looking back, moving forward

Since CONDESAN was launched in 1993, more than 500 organizations (research centers, nongovernmental organizations, government agencies, and international organizations) have cooperated to bring innovative approaches to the issues affecting Andean people's livelihoods and their natural capital. More than 2000 researchers have participated in different capacities in more than 200 projects carried out under the CONDESAN umbrella. At the same time, these projects have strengthened the capacity of 300 students who form part of the new generation of researchers and decision-makers in the Andes.

Its 20th anniversary provides CONDESAN with the opportunity to review and improve its intervention strategy, capitalizing on its previous work. CONDESAN will seek to integrate knowledge generation with decision-making processes at multiple scales (local to regional), as a way of strengthening capacities and fostering adaptive management of natural resources in the Andes.

## The Andean context

In 20 years many things have changed, but CONDESAN remains committed to the sustainable development of the Andes. CONDESAN's research agenda and institutional structure have evolved to better respond to the increased pressure on this mountain region: growing population and urbanization, changes in land use, unsustainable exploitation of resources, and climate change.

The Andean mountains cover 2,728,750 km<sup>2</sup>, 33% of the area of 7 countries—Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela—or 15% of all South America. Divided into northern, central, and southern regions, the Andes provide a variety of ecosystem services (such as water, biodiversity, and carbon sequestration) that directly benefit more than 100 million people.

The Andes are an important water source for the 7 countries. The Andean people, including those living in several country capitals, occupy territories that depend for water on fragile high-altitude ecosystems like *punas*, *páramos*, and glaciers. Other key areas for Andean economies are located in arid lowlands that depend on rivers that get water from the Andes. Also, in all the Andean countries, electricity generation depends to a high degree on water resources from the mountains. Recent studies show that the high Andean soil contains more than twice as much carbon as other volcanic soils worldwide. The soil and high Andean ecosystems have the potential to be a major reservoir of carbon and a cost-effective mitigation option if there is a change in the patterns of land use and cover.

The Andes are home to a diverse set of ecosystems constituting one of the world's biodiversity hotspots. However, these ecosystems are fragile and susceptible to the combined effects of climate change and unsustainable use. Similarly, agroecosystems make up a large part of the Andean territory, but they suffer from different degradation processes that sometimes lead to desertification. While biodiversity is a source of opportunities to improve the living conditions of rural people, they need food security and fair market conditions in order to benefit from those opportunities. For example, although the native products' export boom is providing better incomes for rural communities, it is leading some of them to stop consuming their own products, prioritizing the income from selling them in national and global markets.

## Changes pose challenges

In the last decade, the Andean population has grown rapidly and become more concentrated in urban areas, partly due to the new dynamics of the urban-rural relationship in the changing context of integration of Andean countries into the global economy. Global change is manifested in the Andes in a variety of interconnected phenomena, such as changes in the environment and in physical and biogeochemical processes, along with the impact of the global financial crisis on the livelihoods and welfare of the population. This forces us to focus our intervention where the population is more vulnerable.

In response to environmental changes, with the intensification of globalization and market influence in

the world economy, the rural sectors of Andean countries are undergoing a series of changes whose nature is related to the heterogeneity of circumstances in which they occur and their linkages with world markets.

The Andean rural economy is based on a constant process of adaptation of livelihood strategies by thousands of people, mostly living in small towns and farmer communities engaged in various forms of agriculture (in the broadest sense), commerce, small-scale services, and manufacturing. These populations, especially the poorest, should make use of all the resources to which they have access—with social capital, in the form of informal and formal networks, the most important and strategic. For this population, agriculture remains the main economic activity, characterized by a low level of technology, strong dependence on natural resources, and high vulnerability to climate change.

In parallel with small-scale agriculture, the Andean region is also undergoing a concentration of land by agro-export companies and biofuels producers, a trend that has the potential to affect food security.

On the other hand, recent global economic dynamics mark an intensification of development models based on natural resource extraction in the Andean countries. Besides mining, intensive exploitation of groundwater, infrastructure megaprojects, power generation and biofuel projects, and expansion of commercial crops in intensive schemes generate ecosystem alterations and changes in land use.

These circumstances, while mobilizing financial resources for the region, are affecting the populations most vulnerable and least able to cope with rapid change. Indeed, the Andean region is one of the 12 most food-insecure and vulnerable in the world. The poorest people, with less access to natural, social, human, and

economic resources, are the most vulnerable and therefore less resilient to changes occurring in their environment. These populations are the ultimate target for CONDESAN's interventions.

There is a tendency toward greater income inequality, which fuels conflicts over access to and use of natural resources. This intensifies political polarization and disagreement over economic models, both regionally and at the subnational level, and causes social unrest and demands by rural populations. This constitutes an adverse context for development processes that are inclusive of the rural poor and at the same time redoubles the responsibility of organizations like CONDESAN to generate relevant information that facilitates the creation of spaces for dialogue between the productive sectors, local governments, national planning authorities, and local populations.

### **New perspectives needed**

The new dynamics generated in this context increase the need for new perspectives on rural development, for which productivity boosts and the transfer of modern technologies are necessary but not sufficient. Individual capacity building and strengthening of local institutions are priority actions in this new rural dynamic.

Divergent political strategies and positions in the region have generated both tensions and alliances between governments. These trends affect the dynamics of regional bodies such as the Andean Community and the Union of South American Nations, venues in which debate on environmental, economic, and social issues affecting the Andean population is not only appropriate but unavoidable.

The strong influence of international cooperation organizations is generating a growing interest within states in

environmental issues. This in turn is driving the need to strengthen the capacities of environmental ministries and agencies. In the private sector, more and more companies are taking direct action to protect the environment through corporate social responsibility policies.

The dynamics of social movements suggests that they will strengthen their presence and political participation within a context that is likely to increase social inequality and conflicts related to access, use, and distribution of natural resources and economic benefits from them. This context requires a broad spectrum of responses from states and civil society organizations, which must explicitly incorporate environmental issues into the development agenda and their political and economic interventions.

On the subnational level, it is expected that these processes will be accompanied by increasingly decentralized environmental governance, with greater relevance for conservation strategies and sustainable use of resources by community organizations, regional governments, and the private sector. However, this decentralization is not accompanied by the strengthening of technical and institutional capacities and policies to enable local actors to assume the new duties assigned to them and respond to the challenges that this presents.

In this context, informal extractive industries (mining and forestry) are actively looking to gain political clout to curb political control over these activities at the local and national levels.

### **CONDESAN's response**

These trends led CONDESAN, 20 years after its creation, to adjust its intervention strategy to take the necessary actions to strengthen social and institutional capital and to generate timely and relevant

information that enables development actors to properly plan their actions and the authorities to make informed decisions. We must also create appropriate information channels so that development actors and national and local authorities have access to and use information relevant to sustainable development.

CONDESAN's initiatives address the issues outlined above by generating information and knowledge to better understand them, promoting policy dialogue to encourage consensual responses, and encouraging collective actions to address them.

In that direction, CONDESAN has for the last 3 years pursued different activities related to environmental monitoring. These projects are laying the social, scientific, and technological foundations needed to establish monitoring systems that assess the impacts of social and environmental changes in the region. For this we are applying an integrative approach, linking dynamics of land use and climate change to ecosystem processes that secure societal benefits from the persistence of biodiversity, the provision of water, and the maintenance of carbon stocks in the Andes. Concurrently, CONDESAN has the aim of monitoring resource use patterns and their contribution to local livelihoods (Figure 1).

Recognizing that timely and robust information is critical for natural resource management in the region, CONDESAN seeks to integrate knowledge generation with decision-making processes at multiple scales (local to regional) as a way of strengthening capacities and fostering adaptive management in the Andes.

The monitoring activities are being implemented at different scales. One strategy is to work in a variety of sites that represent the array of different environmental and social characteristics of the Andes. At each site, CONDESAN is promoting collaborative work with local

**FIGURE 1** Meeting in Tilacancha, Chachapoyas (Amazonas Region, Peru) on 25 April 2013 between the CONDESAN team and villagers from San Isidro de Mayno to discuss land use, hydrological monitoring, and land protection—key issues in local development. In this private conservation area, people make decisions autonomously. (Photo courtesy of CONDESAN Photo Archive)



researchers and stakeholders to ensure the sustainability of monitoring systems in the long run and their use in local decision-making. Simultaneously, an information system in which research networks strengthened by the project share data will be established and coordinated with the General Secretariat of the Andean Community. In this way, knowledge produced together during the project will be accessible to stakeholders working at different scales and will encourage regional synthesis of knowledge about environmental change in the Andes. Examples of this work are discussed below.

#### **The Hydrological Monitoring Initiative**

One of the key services provided by Andean ecosystems is the supply and regulation of water for urban and agricultural use and hydropower generation. However, current knowledge about the hydrology of the Andes and how it is affected by land use changes, climate change, and other drivers is very limited. We still need basic information about hydrological processes in the Andean ecosystems in order to understand the effectiveness of different climate change adaptation measures that involve land use changes in Andean watersheds.

Different organizations have joined efforts to better understand

Andean hydrology. In July 2010, after several technical discussions, CONDESAN promoted the creation of a regional hydrological monitoring network with the aim of increasing and strengthening knowledge about the hydrology of Andean ecosystems and, in this way, supporting decision-making processes related to the integrated management of Andean water resources. Those organizations agreed on the following goals for the network:

- Generation and management of information, according to common standards, about the hydrology of natural Andean ecosystems and those affected by human interventions
- Promotion of interactions among research, public, private, and community entities interested in Andean hydrology
- Strengthening of the technical capacities of local entities interested in their water resources
- Diffusion, at all levels, of the results of research on Andean hydrology.

Later several other organizations joined the Hydrological Monitoring Initiative. Currently the network monitors 17 microbasins at 8 places throughout the Andes, which will soon make it possible to draw conclusions at the regional level and

**FIGURE 2** Training in Huaraz, Peru, on 24 January 2013: CONDESAN adopts the GLORIA methodology as a tool for monitoring the effects of climate change on mountain biodiversity in Peru. (Photo courtesy of CONDESAN Photo Archive)



to identify spatial variability in a given region. This monitoring program fills the gap in data from the national hydrometeorological networks, initiatives on monitoring of glaciers under climate-change conditions, and hydrological modeling studies, which have been insufficient for calibration in the Andes (Figure 2).

#### Other efforts

These monitoring systems are not only providing results and conclusions in the short term but also generating data for long-term analysis. With our partners, we are seeking answers to questions such as: How do land use changes (conversion of a natural ecosystem by agriculture, livestock grazing, deforestation, reforestation, and afforestation) or conservation actions affect the total water yield and water regulation in the basin?

For example, in Piura and Huaraz in Peru, Nature and Conservation International (NCI) and The Mountain Institute (TMI), respectively, are studying the impact of overgrazing on the hydrology of *puna* and *páramo* ecosystems. Colleagues at the Universidad Mayor San Simón are looking at the response of the basin hydrology to the introduction of potato crops in the *puna* of Cochabamba, Bolivia. The local municipality of Cotabambas is trying to understand the hydrological

impact of the pine afforestation associated with infiltration trenches in Tambobamba, Peru.

After 3 years of work, the network has realized that it is more meaningful to monitor a few variables at many sites than to carry out detailed monitoring at a few sites. It is also clear that the network has provided an opportunity for capacity building and knowledge generation, connecting researchers, local authorities, and development organizations.

There are important challenges ahead regarding not just the sustainability of each of the monitoring sites but also open access to the data collected and coordination of the monitoring program with the national hydrology and meteorology networks.

#### The way forward

After 20 years, the need remains for a platform that mobilizes different stakeholders to work together for the sustainable development of the Andes, with the additional challenge of incorporating adaptive management. The collective action coordinated by CONDESAN is still required to integrate and synthesize knowledge, to promote policy dialogue, to connect new knowledge with decision-making processes at

multiple scales (local, subnational, national, and regional), and to strengthen the capacities of key stakeholders.

#### FURTHER READING

- Buytaert W, Cuesta-Camacho F, Tobón C.** 2011. Potential impacts of climate change on the environmental services of humid tropical alpine regions. *Global Ecology and Biogeography* 20:19–33. <http://dx.doi.org/10.1111/j.1466-8238.2010.00585.x>.
- Buytaert W, De Bièvre B.** 2012. Water for cities: The impact of climate change and demographic growth in the tropical Andes. *Water Resources Research* 48. <http://dx.doi.org/10.1029/2011WR011755>.
- Céleri R, Buytaert W, De Bièvre B, Tobón C, Crespo P, Molina J, Feyen J.** 2010. Understanding the hydrology of tropical Andean ecosystems through an Andean Network of Basins. In: Herrmann A, Schumann S, editors. *Status and Perspectives of Hydrology in Small Basins*. (Proceedings of the Workshop held in Goslar-Hahnenklee, Germany, 30 March–2 April 2009). IAHS [International Association for Hydrological Sciences] Publication 336. Wallingford, United Kingdom: IAHS, pp 209–212.
- Cuesta F, Becerra MT.** 2012. Biodiversidad y cambio climático en los Andes: Importancia del monitoreo y el trabajo regional. *Revista Virtual REDESMA* 6(1). [www.cebem.org/cmsfiles/articulos/REDESMA\\_13\\_art02.pdf](http://www.cebem.org/cmsfiles/articulos/REDESMA_13_art02.pdf); accessed in May 2013.
- De Bièvre B, Bustamante M, Buytaert W, Murtinho F, Armijos MT.** 2012. Síntesis de los impactos de los efectos del cambio climático en los recursos hídricos en los Andes Tropicales y las estrategias de adaptación desarrolladas por los pobladores. In: Cuesta F, Bustamante M, Becerra MT, Postigo J, Peralvo J, editors. *Panorama andino de cambio climático: vulnerabilidad y adaptación en los Andes tropicales*. Lima, Peru: Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN), Secretaría General de la Comunidad Andina (SGCAN), pp 65–107.
- Tovar C, Seijmonsbergen A, Duivenvoorden J.** 2013. Monitoring land use and land cover change in mountain regions: An example in the Jalca grasslands of the Peruvian Andes. *Landscape and Urban Planning* 112:40–49. <http://dx.doi.org/10.1016/j.landurbplan.2012.12.003>.

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