



Summary of CPWF Research in the Andean System of River Basins

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About the Andean System of River Basins

- A system of river basins that runs along the Andes mountain range and through the countries of Bolivia, Colombia, Ecuador, and Peru.
- The climate within the Andean system of river basins varies greatly depending on latitude, altitude, proximity to the sea, and local topography. Temperature and atmospheric pressure increase at lower elevations. Rainfall regimes are very complex and have extreme spatial gradients determined by Amazonian humidity influence, Pacific Ocean currents, or both.
- In the Andes, many different groups of stakeholders rely on access to water resources, including farming communities, urban populations, and hydropower companies.

The Water and Food Challenge in the Andean System of River Basins

Since 2002, the CGIAR Challenge Program on Water and Food has conducted research for development in ten small river basins in the Andean region.

Researchers have sought to identify ways to share the costs and benefits of water resources between all water users, including relatively wealthy, downstream urban water consumers and relatively poor, upstream rural communities.

People in the Andean region are facing many challenges that actualize the need to share water and land resources more equitably. Globalization of trade, changes in food consumption patterns, ecosystem degradation caused by agriculture, pollution caused by mining, climate change, and urbanization is leading to competition and conflicts between water and land users. Often downstream areas are using most of the water, although nearly all of it originates from upstream areas.

At the same time, increased competition over water is slowly creating interest for conserving ecosystems, improving infrastructure, and adopting new water management practices.

The need to share water more equitably brings about the challenge of how to establish benefit-sharing mechanisms. Benefit-sharing mechanisms encourage a redistribution of benefits derived from water resources, for example by fostering investments that promote sustainable production and livelihood resilience in poor rural areas. CPWF regards benefit-sharing mechanisms as tools through which the benefits and risks associated with natural resource management, or development, can be more equitably shared.

Seizing the opportunity for change, CPWF set out to find ways to increase water productivity and reduce water-related conflicts through the establishment of equitable benefit-sharing mechanisms.

Introduction to Benefit-Sharing Mechanisms

Benefit-sharing mechanisms are intended to redistribute the benefits of a healthy watershed equitably between all water users. Typically, a benefit-sharing mechanism is a series of agreements on how to use land and water in ways that protect the environment, are sustainable, and account for climate change. The agreements also outline how downstream water beneficiaries can provide financial and other benefits—including schools and health care—to the upstream communities that safeguard the environmental health of the basin.

To be successful, a benefit-sharing mechanism must be designed with the local social and hydrological context in mind. The mechanism should be continuously revised to respond to the ever-changing needs of communities and the environment.

Benefit-sharing mechanisms are likely to be successful in areas where high demand for water downstream occurs in combination with a seasonal water supply upstream. However, in such areas, the power balance between stakeholders is often skewed; the poorest, who often live upstream, have limited access to information and lack negotiating skills. To achieve equitable agreements that can contribute to poverty alleviation, stakeholders must have access to all relevant information and thus empowered to make informed decisions.

Key Findings on Benefit-Sharing Mechanisms

- One size doesn't fit all. Benefit-sharing mechanisms must be designed within the local social and hydrological context.
- Benefit-sharing mechanisms help create a virtuous circle between the welfare of people and the ecosystems they live in.
- Benefit-sharing mechanisms are most likely to be successful in watersheds where a high downstream demand occurs in combination with seasonal water supply upstream.
- Fair and equitable benefit-sharing mechanisms are designed and implemented when all stakeholders are provided with all necessary information.
- Benefit-sharing mechanisms should be designed as living programs with continuous monitoring and adaptation for best results.
- Benefit-sharing mechanism schemes can be used as tools for integrated water resources management and climate change adaptation.
- Benefit-sharing mechanism schemes can flourish without supporting regulatory frameworks, however thoughtfully designed regulations can greatly assist the design and implementation of a benefit-sharing mechanism.
- Benefit-sharing mechanisms are not simply payment for ecosystem services (PES) by another name. Benefit-sharing mechanisms require a new approach.



Summary of CPWF Projects in the Andes

Designing and Implementing Benefit-Sharing Mechanisms

CPWF set out to identify approaches that can help improve water usage, increase water productivity, allow alternative water allocation, and create enabling conditions for benefit-sharing mechanisms in watersheds in the Andes.

Researchers used a water-crop growth model to identify geographical areas where modifying the use of water upstream or allocating water to different plots downstream could make more water available. By ensuring that the newly available water was used to produce biomass such as crops (thus increasing the productivity of water), CPWF created better conditions for community-driven benefit-sharing mechanisms. Further, any surplus from additional agricultural production could benefit the poor in the watershed.

To indicate where benefit-sharing mechanisms might be successful, CPWF mapped poverty and identified geographical units, the so-called *socially effective hydrological response units*, in which modified use of water and land could improve agricultural production and farmers' competitiveness.

Outcomes: Change in Knowledge and Practice

- Prompted by the growing impacts of climate change, CPWF researchers realized the importance of considering subsoil over land cover when looking to ensure sufficient natural infiltration of rainwater on mountain slopes. This discovery can help researchers and policy-makers in Colombia focus future flood prevention efforts on the analysis and strengthening of aquifers in the subsoil.
- CPWF researchers reviewed the Fund for the Protection of Water. The private, commercial fund is regulated by Ecuador's stock market law and tasked with conserving water and protecting biodiversity in watersheds, thereby ensuring ample water supply to Ecuador's capital, Quito. The review of the fund shows that benefit-sharing mechanisms underpinned by an institutional framework, rather than social agreements and market schemes, are feasible.
- CPWF researchers mapped areas where improved water productivity could lead to poverty alleviation. This exercise highlighted the highly variable conditions in the Andes. The mapping also revealed the faultiness of a typical hypothesis: wealthier water users downstream are generally not able to pay to alleviate poverty in upstream communities. Adopting the analytical mapping method introduced by CPWF, the Schools of Agrarian Revolution in Ecuador identified socially-effective hydrological response units and assessed the potential for fighting poverty through increased water productivity.

Assessing and Anticipating Consequences of Benefit-Sharing Mechanisms

CPWF researchers developed methods to anticipate consequences of, monitor, and measure impacts of benefit-sharing mechanisms. The research took place in four river basins in the Andes, where local stakeholders have an explicit interest in developing benefit-sharing mechanisms to improve water quality and increase water quantity for downstream users: the Cañete River watershed in Peru, the Quijos River watershed in Ecuador, the Fuquene Lake watershed and the Fômeque Reservoir watershed in Colombia.

CPWF quantified how changes in land and water management impact livelihoods in upstream rural communities and the supply of water for downstream water consumers, enabling researchers to assess the effectiveness of benefit-sharing mechanisms. They concluded that specific conditions in each watershed, such as the share of water available at different elevations, determine whether a benefit-sharing mechanism can be effective or not.

Outcomes: Change in Policy

- CPWF researchers have contributed to the Ministry of Environment in Peru designating the Cañete River basin as an official pilot site for a national benefit-sharing program. The purpose of this scheme is to allow communities downstream to benefit from water-related ecosystem services, while ensuring that the people who maintain water-related ecosystem services are also receiving benefits. CPWF expects that this reciprocity—in the form of an economic retribution—will promote sustainable use of land and water, a prerequisite for maintaining ecosystems and their biodiversity.
- In drafting a proposed eco-system services law, the Ministry of Environment in Peru involved a range of partners, including CPWF, to seek their advice on how to ensure that the law can foster benefit-sharing mechanisms. As a result of such consultations, the draft law has been carefully phrased in an effort to make it comprehensible to a range of different stakeholders. For example, the law refers to “retribution”—a term that encompasses both compensation and rewards—rather than “payment for ecosystem services”. The careful phrasing of the law is intended to prevent stakeholders from misunderstanding the law as a commoditization of natural resources.

Benefit-Sharing to Improve Water Productivity and Reduce Water-Related Conflicts

CPWF researchers have worked to develop 'hydro-literacy' among communities in basins throughout the Andean region, enabling local communities to use collective action to design and implement benefit-sharing mechanisms for water. CPWF has aimed to improve links between agriculture and water and increase access to water for all water users, with a special emphasis on improving the hydro-literacy of the basin's poorest people.

CPWF has promoted the use of 'conversatorios': a facilitation framework through which stakeholders can come together to define the key issues causing water-related conflicts in the basin and identify any politically and socially acceptable benefit-sharing mechanisms that could prevent conflicts. Stakeholders assess potential mechanisms using two tools: the *AguaAndes Negotiation Support System* and the *Water Evaluation Planning System*, which provide valuable information related to regional water resources and water allocation baselines and can assess the impacts of potential scenarios. By highlighting the benefits and drawbacks of potential benefit-sharing mechanism schemes, the tools can help local stakeholders develop hydro-literacy.

If, after reviewing information and scenarios, stakeholders agree on a way forward, then they can partner to secure funding and implement the benefit-sharing mechanism. In this way, science-based tools are applied to develop benefit-sharing strategies that are equitably negotiated using a common platform, where everyone has access to the same information.

Outcomes: Change in Knowledge and Policy

- Through the use of conversatorios, CPWF researchers helped voiceless communities in the Coello-Combeima Rivers basin in Colombia to become informed participants in political decision-making. After achieving hydro-literacy, capacity for active citizenship, and communications and conflict management skills, the people, particularly the women, in these communities were able to take on active political roles and demand attention to the lack of collective services and goods in their communities. Local stakeholders negotiated with more than 15 local, regional, and national institutions and contributed to 28 binding agreements on investments and management for the conservation and protection of strategic areas, reconversion of productive systems, and basic sanitation and potable water. Most remarkably, institutions now listen and answer to previously voiceless communities.

- The main water management challenge in the La Paz/El Alto region of Bolivia is to increase water supply for the rapidly expanding city of El Alto, while at the same time ensuring that enough water remains available for irrigation. Adding further complexity is the fact that the region's glaciers are retreating, thereby changing the hydrological conditions in the watershed. CPWF helped a group of decision makers, established by the Bolivian Ministry of Environment and Water, consider new mechanisms for sharing water resources in the face of this challenge. CPWF researchers developed an application of the Stockholm Environment Institute's Water Evaluation and Planning (WEAP) system that can represent current water management systems as well as benefit-sharing mechanisms under consideration. By reviewing these models, members of the group were prompted to shift their discussions from focusing solely on how to increase water supply for the main cities in the watershed to understanding the need for establishing an integrated water resources management strategy that boosts benefits for all water users.
- CPWF researchers partnered with students and professors at universities in Bolivia, Colombia, and Peru to increase their knowledge about benefit-sharing mechanisms. As a result, tools to promote benefit-sharing mechanisms are now better integrated into academic institutions and policy. For example, hydrologists from the Institute of Hydraulics and Hydrology (IHH) of the University Mayor de San Andres, who were trained by CPWF, were able to influence water resources planning in Bolivia.



Coordination and Change

The CPWF Coordination and Change project connected researchers with external stakeholders such as policy makers in the Andean region in order to contribute to benefit-sharing mechanisms that can increase water production and be used as replicable models for sustainable rural development.

CPWF has been successful in collaborating with high-level policy makers in Ecuador, Colombia, and especially in Peru. The impact of these partnerships is difficult to quantify, but CPWF has contributed to a better understanding of the limits of benefit-sharing mechanisms that are being designed or implemented in the region. The CPWF coordination project produced a time line study on the trends that mark the evolution of water sharing concepts: from payment for environmental services to benefit-sharing mechanisms and watershed investments. The study is also contributing to increased understanding throughout the region.

CPWF has given specific hydrological advice to many river basins in the Andes region. For example, through specific assistance to the incubator for benefit-sharing mechanisms in Peru, CPWF has been able to advise the Peruvian government on its draft of the Law for Environmental Services, considerably increasing the impact of CPWF's research.

In addition, CPWF projects developed a variety of tools that can help river basins in the Andes region set up benefit-sharing mechanisms, including the AguaAndes Negotiation Support System, the Water Evaluation Planning system (WEAP), and protocols for Rapid Hydrological Assessment and Hydrological Monitoring of Andean Ecosystems. CPWF intends for the tools to be flexible enough to consider regional differences, a necessity in a region with extreme biophysical and social diversity.

Uptake of CPWF Research in Policy

- The National Strategy for Payment for Environmental Services in Colombia is intended to improve environmental management. The Corporación Autónoma Regional de Caldas (CORPOCALDAS, a public entity in charge of environmental management in Caldas) and Central Hidroeléctrica de Caldas (CHEC, a private-public hydropower company) investigated how potential payment for ecosystem services schemes could work, but eventually identified legal limitations and knowledge gaps. Seeking alternative options, CORPOCALDAS and CHEC contacted CPWF to learn more about benefit-sharing mechanisms. As a result, CORPOCALDAS and CHEC have decided to implement a program on benefit sharing mechanisms, promoting a concept that is broader than just payment for hydrological environmental services.
- The Ministry of Environment of Peru, with support from the NGO Forest Trends, is implementing an incubator for mechanisms for ecosystem services retribution at the national scale in Peru. The incubator aims to facilitate conservation and recovery of ecosystem services through new public policies and by implementing retribution mechanisms. The incubator builds on ten years of CPWF research on benefit-sharing mechanisms in the Andes region: it includes the sites of three CPWF research projects as pilot cases, which could influence other benefit-sharing initiatives in the region; it has adopted the broader concept of benefit-sharing mechanisms rather than payment for ecosystem services; and it promotes the use of tools such as the Rapid Hydrological Assessment.



CPWF Andes projects in Phase 2

Designing and implementing benefit-sharing mechanisms

AN1
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Assessing and anticipating the consequences of introducing benefit-sharing mechanisms

AN2
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Benefit-Sharing to improve water productivity and reduce water-related conflicts

AN3
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Coordination and multi-stakeholder platforms

AN4
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About CPWF

The CGIAR Challenge Program on Water and Food was launched in 2002, with the aim to increase the resilience of social and ecological systems through better water management for food production (crops, fisheries and livestock). We do this through an innovative research and development approach that brings together a broad range of scientists, development specialists, policy makers and communities, in six river basins, to address the challenges of food security, poverty and water scarcity.

The CPWF is part of the CGIAR Research Program on Water, Land and Ecosystems. WLE combines the resources of 11 CGIAR centers and numerous international, regional and national partners to provide an integrated approach to natural resource management research. The program goal is to reduce poverty and improve food security through the development of agriculture within nature. This program is led by the International Water Management Institute (IWMI).

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