

Reducing Emissions and Helping Balance Environmental Flows with Support from the Prototype Carbon Fund: Chile's Chacabuquito Small Hydropower Project

BACKGROUND

Hydropower is a renewable low carbon source of electricity and an important component in reducing greenhouse gas emissions from energy production. The Prototype Carbon Fund (PCF) established by the World Bank in 1999 funds projects—including hydropower projects—that produce high quality greenhouse gas emission reductions that can be registered with the United Nations Framework Convention on Climate Change (UNFCCC) for the Kyoto Protocol and its Clean Development Mechanism. Emission reductions are calculated by offsetting grid electricity, which in most countries is generated by thermal fossil fuel-fired plants, and replacing it with a zero-emission source of power. To increase the likelihood that the reductions will be recognized by the parties of the UNFCCC, independent experts provide baseline validation and verification procedures for emission reductions. The Chacabuquito Small Hydropower Project made history as the first PCF project to become operational in 2002.

The Chacabuquito Project, currently under implementation, is a run-of-the-river hydropower project. Run-of-the-river projects differ from conventional hydropower projects in that they require no water storage and are less likely to alter environmental flows. Run-of-river projects can be developed on appropriate sites with little, if any, negative impact on either aquatic or terrestrial habitat.

PROJECT DESCRIPTION

The Chacabuquito project is located on the Aconcagua River, 100 km north of Santiago. For the past 40 years, human settlements, mining activities and hydroelectric projects have been established in the project area. The river flows through a steep canyon and then drops into a valley 190 km long, before discharging into the Atlantic Ocean. The project uses well-proven technologies for run-of-the-river power generation. With support of PCF, the project aims to substitute energy from coal plants with a renewable source of energy at a lower cost. Chacabuquito's 26 megawatt plant is scheduled to deliver one million tons of emissions reductions to PCF participants. In return, the project developer, a power company called Hidroeléctrica Guardia Vieja S.A., will receive US\$ 3.5 million. Carbon finance was instrumental in the developer's decision to proceed with the project, even though carbon funds only cover a small part of the project's cost. Concurrently with the PCF, Mitsubishi Corporation has independently contracted to purchase another 100,000 tons of emission reductions.

Since the project required improved access to the Aconcagua River, two new bridges were constructed, existing roads will be upgraded, and new roads built. To determine the potential environmental and social impacts of the Project, an Environmental Impact Assessment was prepared. The assessment included an in-depth hydrological

CHILE AT A GLANCE

Population: 16.4 million — 88% urban, 12% rural;
0.8% annual growth rate

Surface area: 756,630 km²

Life expectancy: 78.3 years

GNI per capita: US\$ 7,050

Human Development Index Ranking:
40 out of 177 countries

% below the basic needs poverty line: 17% (1998)

MORE INFORMATION

Chacabuquito Hydroelectric Power Project. Project Information Document. World Bank, 2002.

Delivering More than Electricity: Chile Kicks Off the Global Carbon Market. Website Feature Story, LAC Region. World Bank, 2003.

Chacabuquito. Project Design Document. UNFCCC Clean Development Mechanism Website. 2004.

Chile Chacabuquito Small Hydro. Carbon Finance Unit Website, World Bank.

Hornitos Hydropower Project. Project Appraisal Document. World Bank, 2004.



analysis to establish the minimum flow of 2m³/s as the appropriate ecological flow for the river system. The water intake needed for the project will not affect water flows and water levels if hydropower plant operations adhere to water resource management regulations. The project actively engaged local stakeholders.

PROJECT OUTCOMES

The Project is still being implemented, but some expected outcomes include:

- *Cleaner energy for Chile.* The project is connected to a regional subsystem within the central system that accounts for about three-quarters of Chile’s power generation. It will help replace the coal that currently provides 25 percent of the region’s power.
- *Environmental and socio-economic benefits.* The environmental and socio-economic benefits are expected to include: reforestation of 18 hectares with native trees; employment of local people at the Chacabuquito plant; new access to small villages in the area as a result of the roads and bridges built to service the plant; and demonstration of environmentally friendly power production techniques. The project is also expected to raise broader environmental awareness and create interest in low carbon energy technologies.

LESSONS LEARNED

A report prepared by the World Bank Carbon Finance Unit assessed the design of the project. Recommendations for future carbon finance projects include the following:

- *Ensure transparency in baseline study.* The assumptions made when developing the possible project scenarios should be identified and articulated in a transparent manner in the baseline study; in particular, the specific assumptions underlying the selected scenario should be provided.

- *Establish Monitoring Verification Protocol Algorithms.* Verification algorithms typically form the basis for initial project savings estimates. Those presented in the Monitoring Verification Protocol for the Chacabuquito project, as well as the supporting information, were well grounded. The project’s Monitoring Verification Protocol should be a benchmark for future protocols in the same sector.
- *Calculate emissions reductions.* To be more accurate in calculating the amount of greenhouse gas emission reductions, the specific emission factors for the type of fuel used in marginal plants should be used instead of generalized country values found in the national inventory guidelines of the Intergovernmental Panel on Climate Change.

SCALING UP

The Chacabuquito project is a model that shows how carbon finance can open new possibilities to implement renewable energy projects. As a follow-up project, the Hornitos Hydropower Project (Chacabuquito II) with a 55 megawatt hydroelectric power plant is currently under implementation. Besides generating additional hydropower, the Hornitos project is expected to further strengthen government and private sector understanding of how to achieve and sell high-quality emissions reductions. Both projects are expected to have significant positive influences on Chile’s power sector, and generate incentives for the implementation of similar projects in the future to contribute to the reduction of greenhouse gas emissions.

RELEVANT PROJECTS

Chacabuquito Small Hydropower Project

Project ID: P074619
 Start Date: July 2002
 Project Cost: US\$ 34 million

Hornitos Hydropower Project

Project ID: P081743
 Time Frame: 2005–2013
 Project Cost: US\$ 62.8 million

