

# PERU WATER PROJECT: CERRO VERDE CASE STUDY

---

MINING-COMMUNITY PARTNERSHIP TO ADVANCE PROGRESS  
ON SUSTAINABLE DEVELOPMENT GOAL 6  
(ACCESS TO CLEAN WATER AND SANITATION)

By: Jocelyn Fraser, PhD  
University of British Columbia



Canadian International  
Resources and  
Development Institute

© 2017 by the University of British Columbia and Canadian International Resources and Development Institute (CIRDI).

The material in this publication is copyrighted. Quoting, copying, and/or reproducing portions or all of this work is permitted provided the following citation is used:

Fraser, J. (2017). Peru Water Project: Cerro Verde Case Study — Mining-Community Partnership to Advance Progress on Sustainable Development Goal 6 (Access to Clean Water and Sanitation). Canadian International Resources and Development Institute (CIRDI) Report 2017-002.

# Canada

Program undertaken with the financial support of the Government of Canada provided through Global Affairs Canada.

Programme réalisé avec l'appui financier du gouvernement du Canada agissant par l'entremise d'Affaires mondiales Canada.



Canadian International Resources and Development Institute  
Vancouver, British Columbia, Canada

[www.cirdi.ca](http://www.cirdi.ca)  
[info@cirdi.ca](mailto:info@cirdi.ca)

## INTRODUCTION

When operators of the Cerro Verde copper mine in Arequipa, Peru began planning for a mine expansion, a key consideration was how to access the required volume of additional water. As the mine is located in an area of water scarcity, securing access to the water required for mining operations was recognized as both a fundamental operations requirement and potential project risk.

Traditional options, including increasing fresh water withdrawals, accessing ground water, and building a desalination plant were considered. But, in consultation with regional officials, government representatives, civil society groups and water authorities, a decision was made to invest in water infrastructure. In exchange for the company's support for treating the municipal sewage from the city of Arequipa, the mine receives a secured supply of treated wastewater for its expanded operations. Equally important, the city addresses a social issue of concern to Arequipa's one million residents – pollution of the Rio Chili.

This case explores the collaborative approach taken to address a business need and social issue, and illustrates the role mining can play in advancing sustainable development. The case also highlights the return on investment that can be achieved when mining companies place the concept of sustainable development at the core of business decisions.

## PERU

In 2015, Peru was the third largest global producer of copper, silver, and zinc, the fifth largest gold producer and had the second largest known copper reserves in the world. Mining in this resource rich nation is a central component of Peru's economy, accounting for 8-9 per cent of the country's gross domestic product (GDP) and providing direct employment for close to 200,000 people. In 2013, the industry contributed US\$2B to the Peruvian government via tax and royalties.

Despite its financial contribution, there is little public trust in mining and Peru has been one of many countries around the world where mining-community conflict has increased in recent years. In 2014, it was predicted that opposition to mining projects in Peru would cost the country \$57 billion in foreign investment with a further \$21 billion worth of mining projects delayed due to social conflict.

While the causes of mining company-community tension are complex, water quality and quantity represent one of fastest growing economic and social challenges to mining. Mining companies need considerable volumes of water and communities also need water – for basic human consumption, for farming and agriculture, and for other industrial uses. The point of intersection between a company's needs and a community's need creates the potential for conflict. It also creates an opportunity for mining companies to make a significant contribution to sustainable development.

## THE CONTEXT

- Arequipa, with a population of one million people is the capital city of the southern coastal Arequipa department and Peru's second largest city. The city's population has grown rapidly in recent years, primarily due to in-migration from the Andes highlands. Many of the new neighbourhoods which have sprung up on the outskirts of Arequipa were not predicted in the city's development plans. Consequently, these new neighbourhoods are not connected to municipal services.

- The principal water source for the city and the nearby agricultural area of La Joya is the Rio Chili, which provides 95 per cent of the area's water needs. Until November 2015, municipal sewage and waste water from Arequipa city was discharged directly into the river. In five spots along the river, the level of fecal coliform exceeded World Health Organization standards set to provide safe levels for agricultural irrigation and water consumption for livestock. Yet, after these discharge spots, more than 26,000 ha of agricultural land is irrigated at the medium and lower Rio Chili basin.
- The Cerro Verde copper mine is located 30 kilometres southwest of the city, in the Atacama Desert. Majority-owned by Freeport-McMoRan, Cerro Verde is one of the world's largest copper mines with estimated reserves of 4.63 billion tonnes of ore grading 0.4 per cent copper. In 2014, before a planned expansion was completed, Cerro Verde's operations and investments generated a total impact of US\$4.13 billion, an amount equal to 2 per cent of Peru's GDP in that year.

## THE CHALLENGE

In 2008, Cerro Verde began to plan for a mine expansion – increasing production from 120,000 metric tonnes per day to 360,000 metric tonnes per day. The project expansion team knew that attempting to triple production while operating in an area of water scarcity had the potential to create social conflict of the type that could impose risk to the project schedule and budget, could impede existing operations, create legal challenges, and damage reputational capital.

## THE OPPORTUNITY

At the time of the expansion planning less than 10 per cent of Arequipa's municipal wastewater was being treated, with the remainder discharged directly to Rio Chili. Conversations were begun to determine if wastewater treatment could be an option to secure the water supply required for the proposed expanded operations, while also supporting regional water infrastructure and helping to advance regional sustainability.

## THE APPROACH

Cerro Verde has a history of working with stakeholders to address water issues in Arequipa. The company has been a member of the multi-sectoral water users' committee since 1983. In 2006, the company signed an agreement with regional officials, elected representatives and social groups to collaborate to support investment in water infrastructure. Past company efforts had included financing the Bamputañe dam, as well as co-financing 40 per cent of the Pillones dam, completed between 2004 and 2006. These dams collect fresh water, increasing the volume of water available for regional use. With the addition of these facilities, the regulated system was enhanced to store water that would otherwise flow to the ocean. This resulted in increased water rights for the local population, farmers, and Cerro Verde.

Having built a model for collaboration with authorities, social leaders and other water users, Cerro Verde continued working with stakeholders on common goals: securing potable water for Arequipa and rehabilitating the Rio Chili. In 2006, discussions on the provision of water and sanitation services resulted in two decisions: local mayors agreed to secure a site and finance construction of a waste water treatment system; and, Cerro Verde agreed to finance a potable water plant. Commissioned in 2012, La Tomilla II provides potable water to 300,000 city residents and its modular construction means the

plant can be expanded to provide 750,000 homes with 24-hour access to the potable water network.

In 2008, as detailed mine expansion planning got underway, Cerro Verde representatives, recalling an earlier suggestion by social leaders, decided to explore the possibility of using treated wastewater for mining operations. At that time, the only wastewater treatment facility in the city of Arequipa was operating at capacity treating just 100 litres/second of municipal sewage. As noted above, this meant most of the city's wastewater was being discharged directly into the Rio Chili.

Following a period of consultation and engagement with city representatives, local, regional and nationally elected officials, water authorities, social groups, members of the agricultural community and other stakeholders, it was agreed that Cerro Verde would partner with regional and municipal governments and water management authorities to plan, build, finance, and operate a wastewater treatment plant. In exchange, Cerro Verde would receive a guaranteed volume of treated waste water for use in mining operations. The remaining treated water would be returned to Rio Chili. Agreeing to partner with local authorities to build and operate a wastewater treatment plant made the mine expansion possible and secured social benefits including helping to rehabilitate the Rio Chili and improve its water quality, reducing water borne illness and improving agricultural output.

Originally, Cerro Verde's role was to finance the technical studies of the waste water treatment plant. The mayors were to finance the plant on land secured by the municipality, and then SEDAPAR (the water utility company) would operate and maintain the plant. Local governments in the Arequipa department would access canon minero would access canon minera (a special tax fund) to finance the plant. However, two challenges were encountered which resulted in an amended agreement. The first challenge was that not all local governments secured the required canon minero funding. In addition, efforts to find a suitable site for the wastewater treatment plant encountered opposition from residents worried about odour from the plant. As Cerro Verde was evaluating water options for its expansion, it was proposed that Cerro Verde pay for the final engineering, construction, operation and maintenance of the plant, which could be built on land inside the mine concession.

## ROLES AND RESPONSIBILITIES

Engaging stakeholders on a topic with business and social impacts required a multi-disciplinary and inter-agency team.

- Cerro Verde led the consultation effort to explain the process for wastewater treatment, the infrastructure requirements, and how the mine would use the treated water.
- SEDAPAR (Servicio de Aqua Potable y Alcantarillado de Arequipa), Arequipa's regional water and sewage utility, filed the environmental assessment and permit applications for plant operations and the discharge of treated water back to the Rio Chili.
- Mayors of district municipalities within Arequipa department, who are shareholders in SEDAPAR, represented their constituents' interests.
- The federal government and national water authority (ANA) conducted water studies, approved the Environmental Impact Assessment, issued the necessary permits, and ensured permit commitments were met. (The regional water authority was among those who encouraged Cerro Verde to consider the use treated water when options for the mine expansion were being evaluated).
- Farmers were active in discussions about water allocation, river water quality, the use of treated wastewater, and water efficiency initiatives.

- Social and professional groups, including the Chapter of Engineers of Arequipa, brought forward the original proposal for the mine to consider wastewater treatment, and were active in the consultation effort and discussions about water conservation and efficiency.

## FROM PLANS TO ACTION

The waste water treatment plant, named La Enlozada, (capital cost US\$550 million) was commissioned in November 2015 and now treats 85 per cent of Arequipa’s municipal sewage . The current plant capacity is 1.8m<sup>3</sup>/second. In exchange for building, operating and maintaining the plant, the mine gets 1m<sup>3</sup>/second of the treated waste water for use in mining operations. Local water authority – SEDAPAR – manages distribution of the remaining treated water discharged to the Rio Chili. To meet the growing population needs of Arequipa, the capacity of La Enlozada is projected to increase in two future expansions: in 2029 to 2.1m<sup>3</sup>/second with a final expansion in 2036 to increase treatment capacity to 2.4 m<sup>3</sup>/second until 2043.

Under the original agreement, plant ownership and operation was to be transferred to SEDAPAR, two years after commissioning, at which time the company would begin to pay for the use of treated wastewater. However, the cost of operations and technical challenges associated with maintaining the quality of water required for mining operations has resulted in an interest in renegotiating the agreement. Currently, Cerro Verde will continue to assume operations and maintenance costs until 2043. Representatives of SEDAPAR, which is owned by regional municipalities, work closely with personnel from Cerro Verde to collect the wastewater, monitor water quality, and supervise the return of the treated water to the river. Cerro Verde is responsible for day-to-day monitoring of plant operations and the reporting mandated by regulatory authorities. Cerro Verde personnel work closely to ensure SEDAPAR representatives receive the training necessary to oversee plant operations. The co-management of La Enlozada will support a smooth transition when SEDAPAR ultimately assumes responsibility for the wastewater treatment plant.

Cerro Verde’s approach was to build a business case with sustainability at the core. It was recognized that to reduce the risk of the type of conflict that had disrupted or stalled other mining projects in the country, it would be critical to avoid placing the mine in competition with farmers for clean water. The decision to build a wastewater treatment plant was also aligned with Cerro Verde’s internal sustainability strategy and with regional water basin management plans. In addition, the re-use of effluent is being promoted by the Peruvian government as a sustainable water supply for the mining sector, which meant the project could help to meet an important policy objective of a key stakeholder.

## MEASURING SUCCESS

For the company, there are five key measures of success:

1. The concentrator expansion project was completed on schedule. The capital cost of \$4.5 billion, the project was within 5 per cent of the capital budget set when construction began.
2. Unlike other projects in the region, Cerro Verde did not experience any lost production due to community opposition.
3. A water supply for expanded operations was secured.
4. By agreeing to operate the wastewater treatment plant, the mine can monitor water output thereby reducing the risk to concentrator operations associated with variability in water quality.

5. By using treated waste water, which is not a water source included in agricultural allotments, Cerro Verde avoided competition with farmers for scarce water resources.

Equally important when assessing sustainable development is the fact that the wastewater treatment plant delivers clear benefits to the community.

- More than 95 per cent of city sewage is now treated.
- Fecal coliform levels in the Rio Chili have been reduced, which will reduce incidents of water-borne illness.
- The improved water quality in Rio Chili basin will enhance agricultural production, as well as recreational activities and tourism opportunities for the region.
- Part of the wastewater treatment plant operations includes measuring water intake from the Rio Chili. This systematic approach means that water authorities ANA and ALA have access to scientifically measured water volumes. Sharing this information has helped to answer questions from stakeholders about water allocation and availability.

Ongoing projects are helping to solidify the company's reputation capital. The company is working with farmers in the important agricultural district of La Joya to support water efficiency and conservation programs, and to provide education and training to enable farmers to transition from inundation irrigation to technical methods such as sprinkler and drip irrigation.

In addition, the company, through its charitable association, is working in collaboration with a non-governmental organization to support crop diversification initiatives. The objective of these programs is to help farmers move away from water-intensive crops such as alfalfa, to crops such as avocados and certain types of berries that need less water to thrive.

## LESSONS LEARNED

### **1. Build a Multi-disciplinary Team**

- Cerro Verde's expansion project team included technical and operations experts, community and government relations personnel, social scientists, lawyers and risk managers. The team worked closely with community stakeholders to identify opportunities and to collaborate to negotiate mutually beneficial agreements.
- Although the expansion project did not lose any days due to social conflict, there were incidents that had to be managed. For example, there were massive traffic jams in Arequipa when the principal pipe to carry wastewater was being installed in the main road. When confronted with an angry public, the team – trained in public engagement – could address concerns, seek solutions, and prevent conflict from escalating.

### **2. Engagement, Flexibility and Innovation Contribute to Success**

- Communities are not homogeneous. They are made up of many different groups, with different – sometimes conflicted – needs and expectations. This means companies need to work collaboratively with stakeholders to identify projects that match community aspirations with business needs. In this case, the idea of the mine treating wastewater in Arequipa was proposed by Regional Water Authority and social leaders and endorsed by the company.
- Cerro Verde's team began work on the wastewater treatment proposal in 2008. Between the

time of the first consultations and commissioning of the plant in 2015, new mayors were elected, agency personnel changed, and new citizens moved to the region. Ensuring there was time for new stakeholders to be briefed on past discussions was critical to facilitate their participation yet meant the project schedule had to be adjusted. Nevertheless, first copper from the expanded operations was produced in September 2015 with full capacity operating rates achieved on schedule in early 2016.

- As social conditions and elected representatives changed, there have been calls to renegotiate the original agreements for wastewater treatment and the provision of water for mining operations. Ongoing engagement is a requirement for continued success.

### **3. Public Private Partnerships can Deliver Business Benefits while also Addressing Social Issues**

- According to one water official, “This project showed us that companies can be good partners to resolve environmental problems and create win-win solutions. In this case the environment benefits, water users benefit, and mining benefits. It’s a virtuous circle.”

### **4. Sustainability Delivers a Return on Investment**

- The Cerro Verde decision to build and operate a waste water treatment plant in exchange for a supply of water for mining operations is a compelling example of an initiative that benefits both mine and community. In addition, the company enhanced its reputational capital by delivering on its social commitment and supporting regional progress on SDG#6 – access to clean water and sanitation.

## CONCLUSIONS

By working collaboratively with water stakeholders, an opportunity that met both a business need and a social need was identified. Finding this point of intersection enabled Cerro Verde to secure water for mining without the conflict that can result from competition for a scarce resource. For Arequipa, the outcome is equally positive: sewage treatment in the city, rehabilitation for the Rio Chili, reduced incidents of waterborne illness, and improved agricultural production. In addition, La Enlozada wastewater treatment plant offers an example of a project which supports the United Nations Sustainable Development Goal #6 (Access to Clean Water and Sanitation) and illustrates the role mining can play in helping to achieve sustainable development in resource-rich countries.

Today, Cerro Verde continues work to support agricultural and water efficiency programs in La Joya, to review long-term options for the management of La Enlozada, and to consider additional sustainable development ideas.

## ADDITIONAL RESOURCES

- Freeport-McMoRan <http://www.fcx.com/>
- Towards a Vision for Mining in Peru 2030 - Brereton, Arts, & Sturman (2016) [https://eiti.org/sites/default/files/documents/peru\\_mining\\_vision\\_15\\_july\\_draft.pdf](https://eiti.org/sites/default/files/documents/peru_mining_vision_15_july_draft.pdf)
- Sustainable Development Goals <https://sustainabledevelopment.un.org/?menu=1300>



