



ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE

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CHILCAUNO THERMOELECTRIC PLANT, PERU



Figure 01: General view of the project.

Source: EnerSur.

Francisco Quiñones prepared this case study under the supervision of Cristina Contreras ENV-SP and Judith Rodriguez ENV-SP as part of the Harvard-Zofnass program directed by Dr. Andreas Georgoulas by initiative of IDB for the purposes of research and education.

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EXECUTIVE SUMMARY

The ChilcaUno thermoelectric plant is located in the town of Chilca in the province of Cañete, on the Pacific coast 63 kilometers from the capital of Peru, Lima. It is owned and operated by EnerSur, an energy company specialized in the generation and trading of electric power that was founded in 1997; it is the largest private electricity generation company in Peru, and a part of the French multinational ENGIE Group, known before as GDF Suez. In 2012, the plant underwent a refurbishment, which consisted of the addition of a 270 MW steam turbine to the three original gas-fired simple-cycle turbines, converting the project into a combined-cycle plant. The refurbishment of the plant had a total cost of US \$320 million being the largest thermoelectric plant in the country in terms of installed capacity. Due to the recently installed combined-cycle technology, the ChilcaUno power plant generates 50% more energy than before the steam turbine was added, while utilizing the same amount of gas for its operation and therefore not increasing its emissions of greenhouse gases. The energy produced by the plant is transported by electrical transmission lines to an electrical substation, from which different local companies distribute it throughout Peru.

The ChilcaUno team had two main priorities: the first was to improve the quality of Chilca's natural environment by implementing technologies that allowed it to reduce its impact, the second was to improve the quality of life of the Chilca population through the implementation of social responsibility programs. The work done by the project team to improve the quality of life of the community living around the project represents without a doubt its best performance in this entire evaluation. According to the National Cooperation Fund for Development, the Chilca district is categorized as a "poor" community, and 41% of its inhabitants experience shortages of potable water. Only 40% of its population reaches a secondary education level, and the illiteracy rate for the population over five years old is 9%. These three conditions were the main aspects of Chilca that the project team decided to help improve, through the implementation of two programs designed specifically to address these issues: *Aprende y Emprende* and *Experimento: Ciencia para Todos*. While the former seeks to promote local entrepreneurs who are interested in developing a business idea or who have already started their own micro- or small business, the latter is a program designed to raise the level of scientific knowledge in students in third, fourth, and fifth grade education. The ChilcaUno team also implemented a temporary hiring program for members of the Chilca population interested in participating in the construction of the project. The main intent of all these programs was not only to give solutions to the needs of the community in the short term, but also to expand the knowledge, skills, and capacities of the community workforce in order to improve their ability to grow and develop, and therefore stimulate the sustainable growth and development of the Chilca district.

The most remarkable aspect of ChilcaUno's work with regard to the natural world was the result of the project team's efforts to preserve the wetlands and surface water of the Chilca beach, prevent its contamination, and maintain its functions. Since the operation of the desalination plant – located close to the Chilca beach – could become a hazard to its natural environment, the project team developed a monitoring plan to prevent ocean water contamination both during its construction and operation. There is opportunity to improve in other aspects related to the protection and restoration of the land and biodiversity in the area around the project site.

From a leadership perspective, the ChilcaUno team proved their commitment to the principles of sustainability. Documents they created together with Walsh Perú S.A.—a company dedicated to providing environmental consulting services—thoroughly describe their plans to prevent, correct, or mitigate the negative impacts the project might have on the natural environment, while also establishing operation parameters and monitoring programs to ensure that the quality of ChilcaUno operations will not decrease. A proof of the importance of sustainability practices to EnerSur and the ChilcaUno team can be found in the *Chilcano*, a monthly newspaper edited and distributed by EnerSur, which documents, for example, the implementation of EcoChilca, a program designed as a collaboration with the community aimed at educating the population in general about the care of the natural environment. With the goal of establishing a sustainability management system, the project team created several plans commensurate with the scope, scale, and complexity of the thermoelectric plant. These address not only all of the possible negative impacts the project might have on its immediate context during the construction and operations phases, but also the team's plan to monitor these possible impacts and the measures that could be implemented in case they should happen.

ChilcaUno has the biggest opportunity for improvement in regard to the allocation of resources, during both the construction and operation phases. The most important aspect the ChilcaUno team took into consideration when designing the project was protecting the availability of freshwater in the area. After conducting a water availability assessment, they decided it would not be sustainable for the water needs of the project to be met with freshwater coming from deep wells in the area, and instead proposed to incorporate a desalination plant into ChilcaUno's processes. The water produced by this plant will only be used for the operation of its steam turbines and not for the rest of the processes of the project, which has been designed with an air base system to minimize its use of water. The project team created a specific document to address all plans for monitoring the water systems during the project's construction and operation. However, this process will be done in-house and will not be overseen by an independent entity. Besides efficient water use, no specific detail has been

provided on other matters evaluated in this category, such as energy and material consumption, or on efforts to use renewable energy or recycled materials during the construction and operation of the project.

Finally, the project team has little documentation addressing the topic of emissions produced by the project during its life cycle – specifically greenhouse gases – and the project’s adaptability to climate change. The project team briefly mentioned their plans and programs in regard to greenhouse gas and air pollutant emissions, but did not prove that it had implemented them. Thus far, none of the energy used for the operation of ChilcaUno has come from renewable sources, although the project’s refurbishment into a combined-cycle plant does increase plant efficiency and can have a big impact on GHG emissions.

In terms of the adaptability of ChilcaUno to climate change and other natural hazards, the project team created a document listing all potential natural and man-made hazards that could take place in the short term in the area where the project is located, both during its construction and operation. Unfortunately, apart from this no mention could be found of how the project team prepared it to withstand long-term hazards.

In conclusion, this assessment identifies the areas where the project is exceeding as well as the categories where implementation of new practices will improve its sustainable performance. These opportunities for improvement are areas from which the project team can learn and which they can try to integrate into their management procedures. There is no doubt that the work the project team has done thus far with the Chilca community – not only involving the community with the processes that take place inside ChilcaUno, but also through the activities implemented to improve the skills and capabilities of the members of the community – are its strongest assets. However, aspects such as the minimization of the use of resources (materials, energy, and water) both during the construction and operation of the project were scarcely addressed by the project team. Similarly, few mentions could be found in the documents provided of the team’s intentions to minimize the negative impact of ChilcaUno on Chilca’s natural species and their habitats. The project team should also consider increasing ChilcaUno’s long-term adaptability in order to make sure it will be able to meet the future needs of the community.

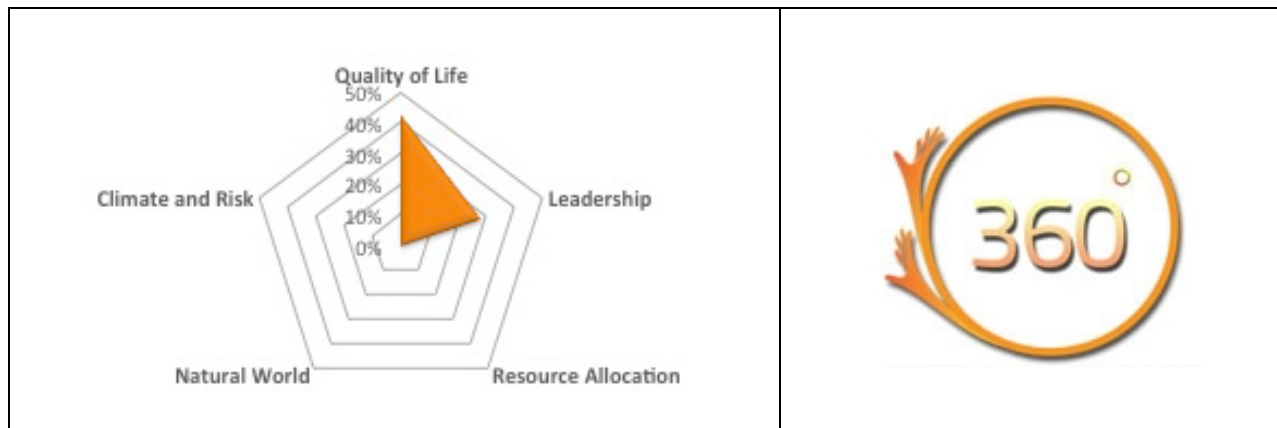


Figure 02: People & Leadership award Summary of results

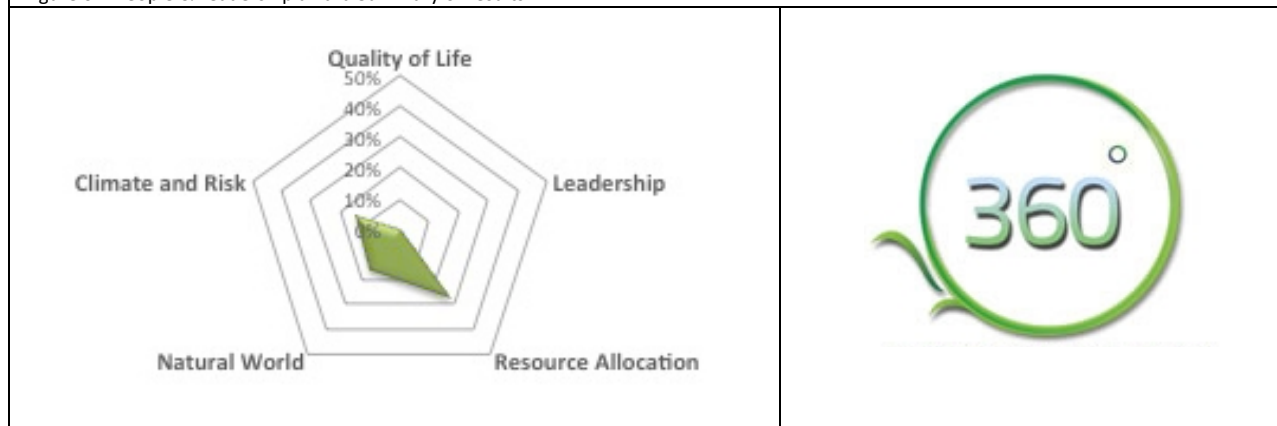


Figure 03: Climate & Environment award Summary of results

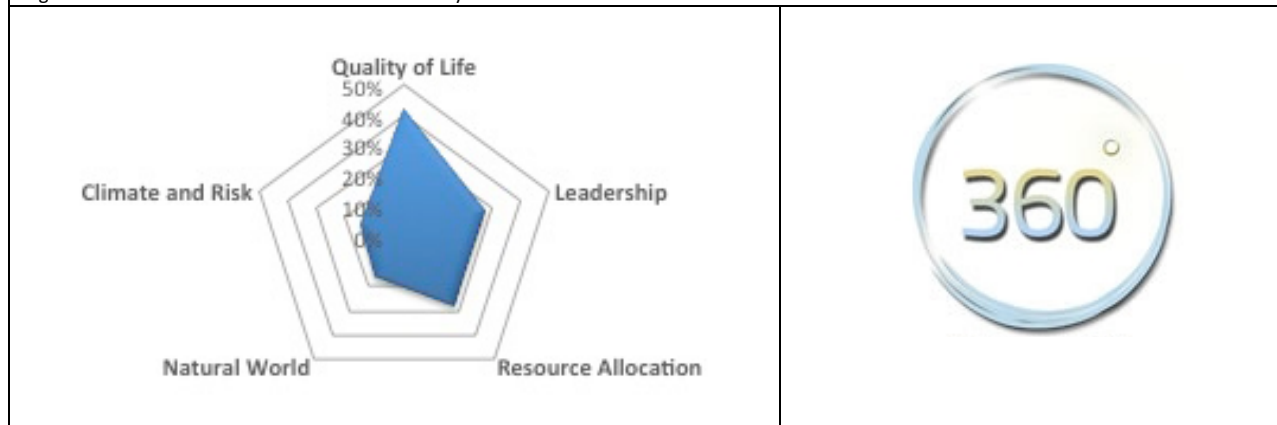


Figure 04: Infrastructure 360 award Summary of results