

CHILCAUNO THERMOELECTRIC PLANT, PERU



Figure 01: General view of the project.
Source: EnerSur.

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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.

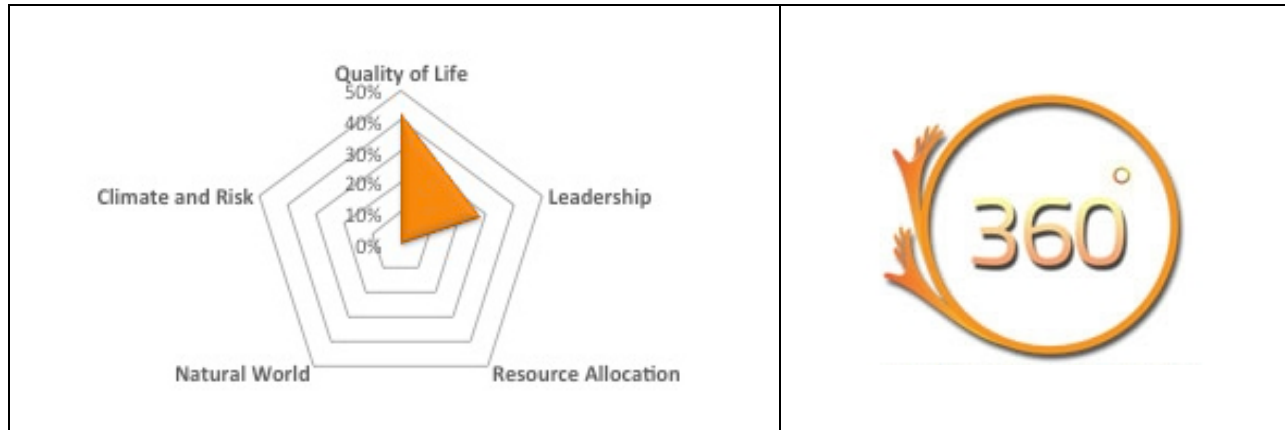


Figure 02: People & Leadership award Summary of results

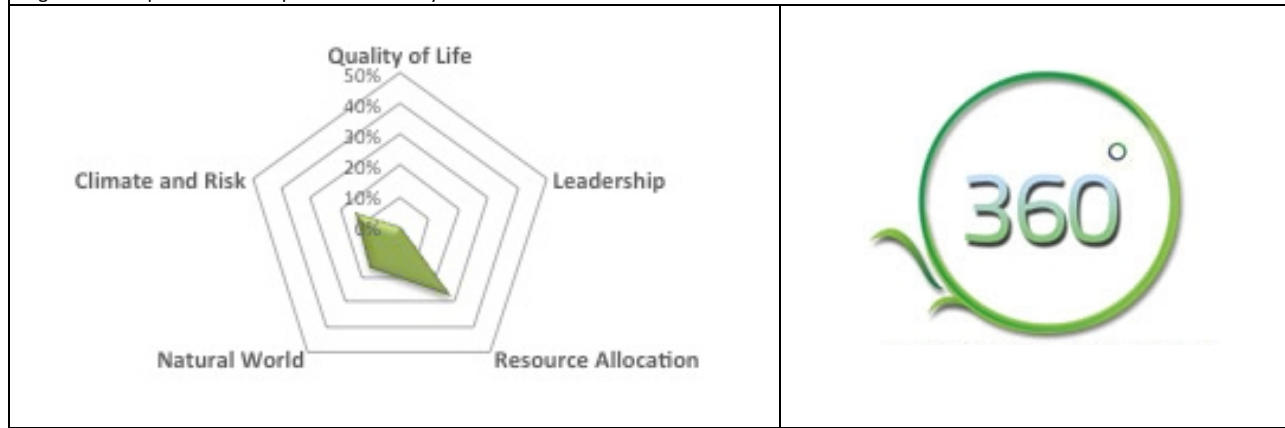


Figure 03: Climate & Environment award Summary of results

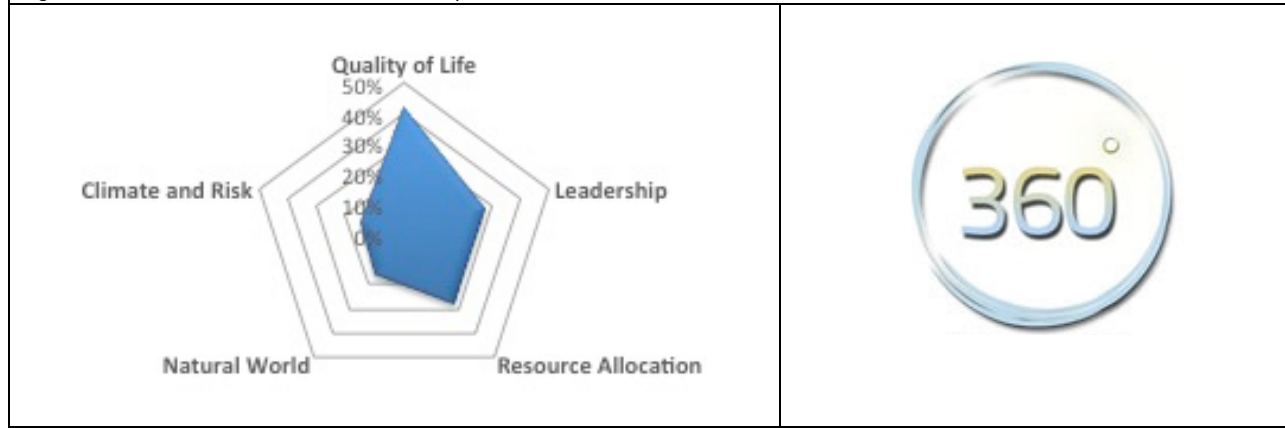


Figure 04: Infrastructure 360 award Summary of results

1. PROJECT DESCRIPTION AND LOCATION

ChilcaUno is a thermoelectric power plant located in Chilca, Peru. It underwent a refurbishment in 2012, which consisted of the addition of a 270 MW steam turbine to the three original gas-fired turbines of the simple-cycle plant, converting it into a combined-cycle. The project was authorized by Peru's Ministry of Energy and Mines (MINEM). The project owner and operator is the Peruvian company EnerSur, the second largest private electricity generation company in Peru, which was founded in 1997 and is a subsidiary of the French multinational ENGIE Group, previously known as GDF Suez. Refurbishing the ChilcaUno power plant had a total cost of US\$111.2 million.

The area where ChilcaUno is located was originally known for its medicinal ponds. Currently it hosts four thermoelectric plants similar to ChilcaUno, the largest of which is the Globeleq-operated Kallpa thermoelectric plant, completed in 2012. This thermoelectric plant has a capacity of 830 MW. ChilcaUno is the second largest in the country in terms of its capacity. The total amount of energy generated by the project when finalized will be 810 MW. Before its refurbishment into a combined-cycle plant, the ChilcaUno plant generated 520 MW, which represented around 20% of all the energy produced in Peru. Today, the four thermoelectric plants located in the area produce more than 60% of the energy in Peru.

The first gas unit of the ChilcaUno power plant began commercial operation in 2006, the second in 2007, and the third in 2009. Finally In 2012, the ChilcaUno power plant was repurposed to take advantage of the hot exhaust gases generated by its three original gas turbines. (It is currently undergoing an expansion to further increase its capacity, which will be finished in 2016.) This exhaust is reutilized by a new steam turbine added to the cycle, to generate more energy. Due to this combined-cycle technology, the ChilcaUno power plant generates 50% more energy than before the steam turbine was added, utilizing the same amount of gas for operation and therefore avoiding additional emissions of greenhouse gases of the power plant.

The energy produced by the ChilcaUno plant is transported by electrical transmission lines to an electrical substation, from which different local companies distribute it throughout Peru. The plant is located on the Panamericana Sur highway in the town of Chilca, in Cañete province 63 kilometers to the southeast of the Peruvian capital, Lima. The site for the location of the project was originally chosen not only due to its proximity to Lima, but also for its closeness to the Camisea gas pipeline and the Chilca electrical substation, and the availability of sufficient land in the area. The project occupies 22.5 hectares of land.

The three original turbines in the thermoelectric plant are gas-operated, with the gas coming from the gas pipelines operated by Transportadora de Gas del Perú, which transport it from the gas fields in Camisea. The plant is located less than 4 kilometers from the Pacific Ocean coast.

One of the main highlights of the project is the efficient use of water, which is provided by a desalination plant. By using desalination, the project reduces additional stress on already overexploited wells in the area. The desalination plant returns brine to the ocean with no toxic component and at the same temperature as the ocean and without impacting the local fishery. In addition, this facility avoids using water for refrigeration processes by using air instead.

The EnerSur team also monitors the power plant's emissions in real time to guarantee that greenhouse gas levels stay below limits established by environmental laws.

2. APPLICATION OF THE ENVISION RATING SYSTEM

The Envision® system is a set of guidelines that aid in optimizing the sustainability of an infrastructure project during the planning and preliminary design phases, as well as a means to quantify the relative sustainability of the project. Envision consists of 60 credits grouped into five categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Each credit pertains to a specific indicator of sustainability such as reducing energy use, preserving natural habitat, or reducing greenhouse gas emissions. Those credits are rated on a five-point scale referred to as a “level of achievement”: “improved,” “enhanced,” “superior,” “conserving,” and “restorative.” Evaluation criteria are provided to determine whether the qualifications for each level of achievement have been met for a particular credit. In each of the five categories there is a special credit called “Innovate or exceed credit requirements.” This is an opportunity to reward exceptional performance that applies innovative methods within the subjects that Envision evaluates.

The criteria for the levels of achievement vary from credit to credit, but generally an “improved” level of achievement is awarded for performance that slightly exceeds regulatory requirements. “Enhanced” and “superior” levels indicate additional gradual improvement, while “conserving” often indicates performance that achieves a net zero or neutral impact. “Restorative” is the highest level and is typically reserved for projects that produce an overall net positive impact. The Envision system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the Envision Guidance Manual, which is available to the public on the ISI¹ and Zofnass Program² websites.

¹ www.sustainableinfrastructure.org

² www.zofnass.org

³ Walsh Perú S.A., “Descripción del área de influencia,” 29, 31–32.
Zofnass Program for Sustainable Infrastructure

3. QUALITY OF LIFE CATEGORY

Envision's first category, Quality of Life, pertains to potential project impacts on surrounding communities and their well-being. More specifically, it distinguishes infrastructure projects that are in line with community goals, clearly established as parts of existing community networks, and consider long-term community benefits and aspirations. Quality of Life incorporates guidance related to community capacity building and promotes infrastructure users and local members as important stakeholders in the decision-making process. The category is divided into four subcategories: Purpose, Well-being, Community, and Vulnerable Groups.

Purpose

The Purpose subcategory addresses the functional assets of communities such as growth, development, job creation, and generally improving quality of life. Positive results from infrastructure projects can include community education, outreach, knowledge creation, and worker training.

Overall, the ChilcaUno project had a good performance in this subcategory. The documentation provided by the project team proved the commitment of all members of the project to improving the quality of life of the community around the plant in all of its aspects. This was a relevant attitude, since the Chilca district has been categorized by the National Peruvian Cooperation Fund for Development as a "poor" community. Perhaps the most relevant factor is the low education levels of the area and the illiteracy rate of 9% for people over five years.³ In response to this situation, the ChilcaUno team created a series of programs designed to help develop the skills and capabilities of the local population. Among the goals of these programs were teaching basic science to third to fifth grade students and teaching local entrepreneurs how to start their own businesses.⁴ By implementing these programs the project owner and team also contributed to stimulating the sustainable growth and development of Chilca.

The ChilcaUno team also proved to be committed to the economic growth and development of the area, implementing programs aimed at economic stimulation. These programs included a temporary hiring program specifically created for local residents who were interested in participating in the construction of the project and a program for local procurement, among others.⁵ With these programs the ChilcaUno team will not only create new employment opportunities in the area, but also help stimulate already existing businesses. Apart from these

² www.zofnass.org

³ Walsh Perú S.A., "Descripción del área de influencia," 29, 31–32.

⁴ GDF Suez, "Peru: Our Activities, Our Commitments," 7-8; Walsh Perú S.A., "Plan de relaciones comunitarias," 6–9.

⁵ Walsh Perú S.A., "Plan de relaciones comunitarias," 8–9.

programs designed to have a direct impact on the quality of life and sustainable growth and development of the region, the project team also implemented programs that contributed to solving these matters indirectly. Some of these included the construction and renovation of sidewalks on major streets, improving the conditions of pedestrian traffic and avoiding accidents in the area.⁶

Well-being

The Well-being subcategory addresses issues related to comfort, health, and mobility of local communities, as well as project workers. Safety is an integral part of the planning process and promotes the expansion of alternative modes of transport. Although the well-being of the community was a concern for the ChilcaUno team since the project's conception, there is still room for improvement in this subcategory. The efforts made by the project team to enhance the community's health and safety were considerable since both the decision to add a steam turbine instead of a gas-operated one to increase the plant's capacity and to cover its water needs through the implementation of a desalination plant had a direct impact on their well-being. However, they did not address the implications of using new materials in the construction of the project. Regarding the operation of ChilcaUno, the project team did not fully address certain issues that could emerge after the construction of the project was finished and it began operating, such as the potential light pollution produced by the plant. Regarding noise and vibration, there is proof that a monitoring plan describing foreseeable effects of the plant on its context was implemented in the past.⁷ In addition, there is also evidence of the implementation of a noise and vibration-monitoring visit to ChilcaUno in 2012 in which a third-party measured these levels both from within the project's site and outside of it.⁸ In terms of the accessibility and mobility around the ChilcaUno plant, the project team concluded that the project would not interfere with the regular traffic flow of the roads that connect the community with the plant and those that connect the latter with the desalination plant.⁹ In response to this conclusion, the project team decided not to build extra roads and instead use the existing ones during the construction of the project, refurbishing the important existing roads. These programs included the renovation of the sidewalks and equipment of Mariano Ignacio Prado Avenue, the construction of sidewalks on Juan Pablo II Street, and the repairs to the Antigua Panamericana Sur Avenue.¹⁰ Although the project team implemented these programs, they did not address the issue of encouraging alternative modes of transportation

⁶ EnerSur, "Suplemento Chilcano Mayo 2012," 2012, 4–5.

⁷ Walsh Perú S.A., "Descripción y evaluación técnica de los efectos previsibles directos e indirectos, acumulativos y sinérgicos en el ambiente," 18–19.

⁸ Social Capital Group, Muestreo de percepciones de ruidos molestos en Chilca (Peru: 2012), 1-24.

⁹ *Ibid.*, 23.

¹⁰ EnerSur, "Suplemento Chilcano Mayo 2012," 2012, 4-5.

among their employees. No proof could be found within the documents provided by the project team of the implementation of any kind of program to improve wayfinding, accessibility, and safety inside the ChilcaUno site.

Community

The main aspects evaluated in the Community subcategory are the efforts made by the project team to preserve the local historic and cultural resources found in the area of the project, the commitment to preserve original views and local character as much as possible, and the interest in enhancing existing public spaces around the project.

In 2011, EnerSur commissioned the Peruvian Ministry of Culture to assess the area where the plant is located in order to figure out whether archaeological remains existed there. The Ministry concluded that there were no archaeological remains in the area.¹¹ The project team created a document describing the qualities of the natural landscape around the plant, but this document does not provide a strategy for how these features will be preserved.¹² On the other hand, the ChilcaUno team is sponsoring a project from the Fondation ULB in Brussels to conduct research on and in relation to the archaeological site of Pachacamac located to the south of Lima.¹³ The project team also implemented the EcoChilca program, a plan to preserve the natural environment and enhance the public infrastructure of Chilca. The first activity of this program, called “Beautifying My Neighborhood,” consists of the maintenance of some streets in Chilca with the help of school members, national police force, firefighters, public institutions, and public dining halls, among others.¹⁴ In addition, the ChilcaUno team is also supporting the preservation of wildlife refuges, such as the Quebrada Seca and the Yaya beach, both located in the Chilca district.¹⁵ ¹⁶ While the project team has identified the most important natural and cultural elements in the context of the project and is contributing to the improvement of the public infrastructure of Chilca, there is still room for improvement in the preservation of the local character of the community.

Vulnerable Groups

The Vulnerable Groups subcategory focuses specifically on the needs of women and other diverse communities, such as indigenous or Afro-descendant people, who are sometimes

¹¹ Ministerio de Cultura del Peru, “Certificado de inexistencia de restos arqueológicos tramo 1 y 2,” Lima, 2011, 4; “Certificado de inexistencia de restos arqueológicos tramo 3,” Lima, 2011, 5–6.

¹² Walsh Perú S.A., “Descripción el área de influencia,” 19–20.

¹³ EnerSur, Sponsorship Agreement (Peru: 2015), 1-4.

¹⁴ EnerSur, “Suplemento Chilcano Septiembre 2012,” 2012, 4–5.

¹⁵ EnerSur, Recuperación del cauce de la Quebrada Seca de Chilca ciclo combinado de ChilcaUno (Chilca, Peru), 1-4.

¹⁶ EnerSur, Proyecto de limpieza Playa Yaya “Promoviendo el Desarrollo Turístico a Través de la Conservación y Protección de Áreas Naturales” (Chilca, Peru: 2014), 1-4.

overlooked. In order to support women and other diverse groups, it is important to first identify their most urgent needs and then decide how to address them. In this regard, no document could be found showing that the ChilcaUno team identified these needs in advance. One of the programs implemented by the project team to support women was directed to health and nutrition. Through this program the project team funded a gastronomic fair in 2012 with the objective of fighting malnutrition by teaching the women of Chilca how to create dishes that are nutritious and made of local inexpensive products.¹⁷ The project team implemented a program called *Aprende y Emprende*, designed to teach the people interested in starting a business of their own how to do it.¹⁸ This program is directed toward the population at large, however, rather than focusing on the specific needs of women and other diverse groups. Although the *Aprende y Emprende* program does stimulate and promote women's economic empowerment as part of the plan to teach entrepreneurship to the community, the project team should consider designing one that focuses on the specific needs of women.

No specific information was provided regarding access and mobility for these diverse sectors of the population. In order to address this, the ChilcaUno team should first assess the state of transport hubs, roads leading to these, the security of passengers in public transport hubs, and the mobility patterns in the area. Once these issues have been understood, the project team could create programs that address the potential barriers that may exist for women and other diverse groups in Chilca.

4. LEADERSHIP CATEGORY

The Leadership category evaluates project team initiatives that establish communication and collaboration strategies early on, with the ultimate objective of achieving sustainable performance. Envision rewards stakeholder engagement as well as encompassing a holistic, long-term view of the project's life cycle. Leadership is distributed into three subcategories: Collaboration, Management, and Planning.

Collaboration

The Collaboration subcategory evaluates project team initiatives that establish collaboration strategies early on in the design process, with the ultimate goal of achieving sustainable performance. In this regard, the ChilcaUno team has shown a strong performance, proving they had a meaningful commitment to the principles of sustainability from the very early stages of the project's conception. The documents provided by the project team thoroughly describe

¹⁷ Gobierno Regional de Lima, "Preparando la Navidad con una alimentación nutritiva, creativa y económica" (Lima, Peru: 2012), 2-3.

¹⁸ EnerSur, "Suplemento Chilcano Mayo 2012," 2012, 4-5; Walsh Perú S.A., "Plan de relaciones comunitarias," 7-8.

their plans to prevent, correct, and mitigate the impacts that ChilcaUno could potentially have on the natural environment, while also establishing operation parameters and monitoring programs to ensure that the quality of the ChilcaUno operations will not decrease.¹⁹

The team's leadership and commitment to the principles of sustainability are confirmed by the municipality of Chilca in the contract signed with EnerSur,²⁰ and proof of the importance of sustainability to the latter and the ChilcaUno team can be found in the *Chilcano*, a monthly publication edited and distributed by EnerSur in which they address the most relevant economic, social, and cultural news taking place in the Chilca community; for example in the implementation of the EcoChilca program aimed at educating the population in general about care for the natural environment.²¹ Regarding the project team's management plan, the ChilcaUno team created a sustainability management system commensurate with the scope, scale, and complexity of the thermoelectric plant. Proof of this management policy can be found in various documents created by Walsh Perú, in which they address not only all of the reasonably conceivable negative impacts the project might have on its immediate area during the construction and operations phases, but also plans to monitor these impacts, as well as the measures that could be implemented if such impacts materialize.

Nevertheless, it is recommended that the project team clearly define the roles and responsibilities of each member of the project team in implementing the sustainability management system. Along the same lines, no documentation could be found regarding the commitment of the project team to fostering their own collaboration and teamwork. On the subject of the involvement of the community and stakeholders at large with the project, however, the ChilcaUno team had a better performance. With the help of Walsh Perú, the team created a document intended solely to define the reach of the programs, and the social compromises of EnerSur and ChilcaUno with the inhabitants of Chilca.²² It is also stated that the involvement of stakeholders in the project would play a role in the project's decision-making process, but it does not address whether this would actually impact the design, or to what extent it would be considered by the project owner and project team.²³ Among the programs established by the project team to identify, engage, and involve stakeholders are a communications program, the public consultation program, the support program for local initiatives, and the temporary local hiring program.²⁴

¹⁹ Walsh Perú S.A., "Programa de monitoreo del proyecto obra o actividad," 1–7; Walsh Perú S.A., "Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos," 1–24.

²⁰ "Segundo convenio de cooperación y apoyo voluntario para la ejecución de obras, programas y proyectos sociales de desarrollo sostenible en el distrito de Chilca," 2008, 1–9.

²¹ EnerSur, "Suplemento Chilcano Abril 2012," 2012, 4–5.

²² Walsh Perú S.A., "Plan de relaciones comunitarias," 2–3.

²³ *Ibid.*, 3.

²⁴ *Ibid.*, 6–9.

Management

Managing and understanding the project as a whole is crucial when designing, building, and operating at the scale of the ChilcaUno combined-cycle plant. In order to do this and to achieve its sustainability goals, the project team requires a broad understanding of all of the subsystems that it is composed of, and of the larger national infrastructure systems into which it fits. In this regard, the ChilcaUno team left room for improvement in creating a more synergistic approach. The project team did take good advantage of both the location of the project and its various components. One of the reasons the plant was located in Chilca was the proximity of the Transportadora de Gas del Perú pipeline, which transports gas from the Camisea deposits in Cusco to Lima.²⁵ This gas is used to feed the three original gas-fired turbines of the ChilcaUno plant. The energy produced by this plant is transported through an electric substation to all local power distribution companies.²⁶

The project team can improve its performance in identifying and pursuing opportunities to use unwanted by-products, discarded materials, or resources from other infrastructure projects in the area. In order to increase the plant's efficiency from a sustainability perspective, the project team should consider integrating not only with existing infrastructure projects but also with future projects. Along the same lines, the project team should consider restoring existing community infrastructure elements if they are not in good condition, and if their integration into the operations of ChilcaUno would benefit both the plant and the community.

Planning

As regards the monitoring and maintenance of its operation systems in the long term, the ChilcaUno team established a monitoring plan whose main goal is to establish the parameters for the project operators to follow in order to maintain the quality of their ecological protection programs and operations.²⁷ This monitoring plan is divided into two sections: one designed for the construction phase of the project, and the other for its operation phase. Both of these are intended to monitor the working conditions of the ChilcaUno equipment, as well as the quality of the air, water, and land inside and around the project. Through another document that addresses in advance the cost of implementing these programs, the project team has also made sure their ecological protection, mitigation, and enhancement measures will continue to be

²⁵ "Central Termoeléctrica ChilcaUno: funcionamiento," YouTube video, 1:20, posted by EnerSur ENGIE, September 22, 2014, <https://www.youtube.com/watch?v=GyDeMTplQLM>.

²⁶ "Central Termoeléctrica ChilcaUno: funcionamiento," YouTube video, 3:01.

²⁷ Walsh Perú S.A., "Programa de monitoreo del proyecto obra o actividad," 1–7.

implemented in the long term.²⁸

The project team has room to improve its performance in regard to identifying and addressing laws, standards, regulations, and/or policies that may unintentionally create barriers to achieving high sustainability levels in the plant's operations. In order to assess these potential barriers, devise alternatives, and mitigate their effects, the project team should work in coordination with local authorities and legal regulators. The ChilcaUno team had a good performance as regards its commitment to contribute to a more durable, flexible, and resilient infrastructure system. By adding a steam turbine to the existing gas turbines of the plant, and by only using water coming from its own desalination plant for the turbine's operation, the project team has shown its concern for extending the project's useful life. In addition, even though the project's construction has already been finalized, the project team should consider assessing the type of materials that were chosen for the refurbishment of ChilcaUno in order to know whether these are easily adaptable for changing configurations, retrofits, or repairs.

5. RESOURCE ALLOCATION CATEGORY

The Resource Allocation category deals with material, energy, and water requirements during the construction and operation phases of infrastructure projects. The quantity and source of these elements as well as their impact on overall sustainability are investigated throughout this section of the Envision rating system. Envision guides teams to choose less toxic materials and promotes renewable energy resources. Resource Allocation is divided into three subcategories: Materials, Energy, and Water.

Materials

Minimizing the total amount of materials used in construction, operation, and maintenance is also fundamental to the sustainability of a project of this scale and complexity. Minimizing the use of materials helps to reduce the amount of natural resources being extracted and processed, as well as the energy being used to transport them. In this regard the ChilcaUno team left room for improvement, since it did not address or just briefly mentioned most of the issues evaluated by this subcategory in terms of energy production.

It is fundamental for a sustainable infrastructure project not only to reduce as much as possible its own energy consumption, but to conserve energy by reducing the net embodied energy of materials used over the project's life. Since the construction of ChilcaUno has already been

²⁸ Walsh Perú S.A., "Costos proyectados del PMA," 1.

finalized, the project team could look into a reduction in the net embodied energy of the materials used for its maintenance. The project team could also improve its performance in regard to procurement practices and the use of recycled materials. The project has ISO 9001, ISO 14001, and OHSAS 18001 certifications, which require a documented quality management system, but no document could be found proving the commitment of the project team to obtaining materials and equipment from manufacturers and suppliers that implement sustainable practices.²⁹ Very little information could be found in regard to the team's commitment to only use regional materials, and their sustainable development policy only briefly mentions their commitment to support the local economy, services, and initiatives.³⁰ Similarly, the project team briefly addresses the reuse of materials during the construction and operation of ChilcaUno in one of the provided documents, stating that recycling practices would be implemented but not saying how and when these would take place.³¹

On the subject of reducing and diverting waste streams away from disposal to recycling and reuse, the project team also left room for improvement. The team touches upon their management plan to decrease waste and divert waste from landfills during the construction and operation of the project in one of the documents created by Walsh.³² However, this document addresses the subject only briefly and does not give details about the length and nature of these programs or whether they were actually implemented. Nonetheless, the project team accounted for the future deconstruction and recycling of ChilcaUno, which is very positive in terms of having a long-term view of the project. In a document created specifically to address this issue, they address all the stages that would be required in order to abandon the site completely once finished. As part of this document they also list the modules in which all parts of this infrastructure project would have to be dismantled.³³

Energy

The Energy subcategory evaluates the practices developed by the project team to reduce energy consumption, as well as the use of renewable energy for the construction and operation of the facility and the monitoring systems in place. Based on the documentation provided, the project team is commissioning the monitoring of its electrical and mechanical systems to a third party. The job of OSINERGMIN—the government agency in charge of the monitoring of ChilcaUno—is to supervise the fulfillment of the obligations the company acquires in legal contracts by making sure the plant continues to operate efficiently. In addition to the third-

²⁹ SGS del Perú S.A.C., ISO 9001 (2013), 1; SGS del Perú S.A.C., ISO 14001 (2013), 1; SGS del Perú S.A.C., OHSAS 18001 (2013), 1.

³⁰ GDF Suez, "Sustainable Development Policy," 2012, 1.

³¹ Walsh Perú S.A., "Medidas de prevención, mitigación, corrección y compensación," 16–20.

³² Ibid.

³³ Walsh Perú S.A., "Plan de abandono," 1–6.

party monitoring, the project team also created a plan to identify opportunities to increase their energy production by daily, weekly, and monthly monitoring operations of their energy systems done by members of their own team.^{34 35}

The main objective of the refurbishment project is to increase the energetic performance of ChilcaUno, which had previously operated as a simple-cycle system, by adding one steam turbine to the three existing gas turbines.³⁶ The ChilcaUno steam turbine operates by combining the heat generated by the three gas turbines of the original project and the water coming from ChilcaUno's desalination plant. By doing this, the project team ensured that the plant would increase its energy production in response to the increasing energy demand of the National Interconnected Energy System, while avoiding any increase in its consumption of energy and resources.

Nonetheless, the team should consider conducting planning and design reviews to identify options for reducing the project's energy consumption during maintenance work. They should also consider conducting a feasibility and cost analysis in order to determine the most effective methods to achieve energy reduction. Once they create reduction programs and implement them, they should consider quantifying the amount of energy being saved. Finally, considering that the project produces energy itself, the project team should consider utilizing the energy produced by the new steam turbine in order to meet the energy needs of its own operation.

Water

Mainly due to the lack of resources in the area of the project – specifically the lack of water – it is critical for an infrastructure project of this scale and complexity to reduce its overall water use, especially its use of potable water. The rational use of water, during both the construction and operation phases, were issues that the project team considered when designing the project but in which they left room for improvement. The project team had one of its best performances in this entire evaluation in its efforts to protect freshwater availability in the area. After conducting a water availability assessment, the team 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.³⁷ One of the main premises of the design was the use of desalinated seawater instead of freshwater for the operation of the new steam turbine. However, they should consider using desalinated water for all of the plant's processes and operations, not only for the operation of the steam turbine.

³⁴ OSINERG, Ley del organismo supervisor de inversión de energía - OSINERG (Lima, Peru: 1996), 2.

³⁵ EnerSur, Manual del proceso de despacho de energía eléctrica (Peru: 2014), 1-4.

³⁶ Walsh Perú S.A., "Descripción del proyecto," 1.

³⁷ Ibid., 8.

To reduce potable water consumption, the ChilcaUno team should consider conducting planning and design reviews in order to identify potable water reduction strategies for the operation and maintenance phases, considering the use of nonpotable water such as recycled gray water and stormwater. After implementing a plan to reduce the potable water consumption of ChilcaUno, the project team should consider quantifying the amount of water being saved. In terms of their efforts to monitor the project's water systems, the team created a specific document to address all monitoring plans to be implemented during its construction and operation phases, the main objective of which is to survey ChilcaUno's prevention and mitigation measures in order to ameliorate or eliminate potential negative impacts the plant might have on the environment. By monitoring the water systems, the project team not only complies with the environmental regulations established by the Peruvian Ministry of Energy and Mines but also ensures that the foreseeable negative impacts of the project's activities on the environment remain within acceptable levels. This document also establishes that the monitoring of the water systems during both the construction and operation of the project would be done both by the project team and by the Peruvian National Water Authority, as it is established in the National Water Resources Law.³⁸ This program includes the trimestral monitoring of the quality of the effluent of the desalination plant at the Chilca beach and of the water used for the irrigation of green areas.³⁹

6. NATURAL WORLD CATEGORY

The Natural World category focuses on how infrastructure projects may impact natural systems and promotes opportunities for positive synergistic effects. Envision encourages strategies for conservation and distinguishes projects with a focus on enhancing surrounding natural systems. Natural World is subdivided into three subcategories: Siting, Land and Water, and Biodiversity.

Siting

The correct siting of an infrastructure project of the scale of the ChilcaUno plant is essential to its sustainability. Planners should always seek to avoid areas of high ecosystem value or that serve as a diverse habitat, such as water bodies, wetlands, and others. The site for the original ChilcaUno gas-fired plant was chosen not only due to its proximity to Lima, but also for its closeness to the Camisea gas pipeline and the Chilca electrical substation, and for the availability of sufficient land in the area. Although this area was not considered prime habitat, it did serve as farmland before the area began hosting infrastructure projects. Today, there are at

³⁸ Congreso de la República, Ley de recursos hídricos (Lima, Peru: 2009), 1-37.

³⁹ Walsh Perú S.A., "Programa de monitoreo del proyecto obra o actividad," 1-6.

least four other large infrastructure projects in the area. The conversion of the ChilcaUno plant from a simple-cycle to a combined-cycle adds 2.66 hectares of former farming land known as Fundo San José to the original project.⁴⁰ It is important to note that the Chilca district does not have any zoning laws.⁴¹ The area where the project is located sees projects located next to existing roads and adjacent to uses as diverse as houses, farms, and undeveloped parcels.

The project had a good performance in its preservation of surface water and wetlands. The new steam turbine required the use of water to generate electricity, for which the project team decided to use seawater that would be treated in a desalinating plant and transported to the plant. The site for the desalination plant—with an area of around 1.5 hectares—was located around 600 meters from the sea,⁴² in an area next to the coast where one can also find wetlands.⁴³ Prior to construction, the project team also identified all features of the site's geology that could potentially become a hazard to the plant's safety.⁴⁴ The team concluded that they would need to condition the soil on the site in order to carry out the works, meaning they would have to clear out and excavate the site of the addition in order to reach a stratum adequate for the construction of the foundations.⁴⁵ In terms of efforts to preserve the floodplain functions of the site, the team had a good performance. By avoiding building the desalination plant directly on the coastal wetlands by the Chilca beach and instead setting it back, they helped preserve the natural functions of the beach and its wetlands and thus maintained the quality of their infiltration and water. The ChilcaUno team also identified floodplains that run parallel to the Chilca ravine. Since Chilca is a highly arid valley with almost no rainfall throughout the year, the project team assessed that this ravine would only be flooded in extraordinary circumstances.⁴⁶ Nonetheless, the team analyzed these and other natural elements of the landscape around ChilcaUno in order to avoid having a negative impact on them. The project's location on a steep slope did not represent an issue for the ChilcaUno team, since the site is located in the lowest part of the Chilca basin⁴⁷ and at a considerable distance southeast of its hillsides.⁴⁸

Finally, in order to improve its performance in this subcategory and since the project has already been built, the project team should consider making a thorough assessment of the current state of the context in which it is located. For example, they could consider assessing

⁴⁰ Walsh Perú S.A., "Descripción del proyecto," 1–2.

⁴¹ Walsh Perú S.A., "Descripción del área de influencia," 20.

⁴² Walsh Perú S.A., "Descripción del proyecto," 8.

⁴³ Walsh Perú S.A., "Descripción del área de influencia," 11.

⁴⁴ *Ibid.*, 9–10.

⁴⁵ Walsh Perú S.A., "Descripción del proyecto," 9.

⁴⁶ *Ibid.*, 11–17.

⁴⁷ Walsh Perú S.A., "Descripción del área de influencia," 17.

⁴⁸ *Ibid.*, 12.

whether the project is located close to a natural area or a farmland that needs to be restored and/or preserved. If such an area should exist, the project team should consider creating buffer zones between it and the project. If a gray- or brownfield site should be located close to the project, the ChilcaUno team should consider coming up with a cleanup program to improve that site.

Land and Water

The Land and Water subcategory evaluates the effort made by a project team to promote corrective practices that support the management of stormwater, reduced use of pesticides and fertilizers, and the protection of freshwater from pollutants. The area where the project is located is a highly arid valley with almost no rain throughout the year. During exceptionally rainy years, however, the rainwater from the Chilca hills reaches the ocean. Thus, considering that the project is located between the hills and the Pacific Ocean, it is important for the project team to make an effort to minimize its impact on the quantity and quality of stormwater runoff. According to the project team, since the water in the highest part of the Chilca basin is used for agricultural purposes and due to infiltration and evaporation, even during years with heavy rainfall almost none of that water makes it to the lowest part of the basin where the thermoelectric plant is located.⁴⁹

According to the project team, there are no bodies of freshwater around the premises of the project, for which reason an impact on existing hydrological and nutrient cycles is out of the question. Since the only surface water body nearby is the Pacific Ocean, and since the project does make use of seawater for its operations, the project team is planning to implement a monitoring program in order to prevent the contamination of ocean water during the construction and operation of the project.⁵⁰

Even though the project is located in an arid area, the project team should consider implementing a stormwater management program designed to study whether the project has affected natural hydrological connections. Certain substances, chemicals, and residues might pose a threat to surface or groundwater quality. According to the ChilcaUno team, there are no potable water bodies in the premises of the project. Nonetheless, pollutants such as pesticides and fertilizers that could potentially contaminate water bodies have been avoided. No activities that take place during the plant's operation require the use of such pollutants. However, the residues that result from the operation of the plant are another type of contaminant that could affect surface or groundwater quality. Therefore, the project team put together a document

⁴⁹ Walsh Perú S.A., "Descripción del área de influencia," 16–17.

⁵⁰ Walsh Perú S.A., "Programa de monitoreo del proyecto obra o actividad," 3–5.

which describes a number of plans to detect, handle, store, and transport different types of dangerous and non-dangerous residues, as well as action plans in case of an environmental emergency caused by spillage or leaking of any type of contaminant.⁵¹

Biodiversity

Infrastructure projects of the scale of the ChilcaUno thermoelectric plant should avoid negative impacts on the natural species and habitats of their surroundings as much as possible. In regard to their efforts to identify and preserve the species biodiversity of their context, the project team had a good performance but still left room for improvement. Although the project team together with Walsh Perú did create a document that addresses the species biodiversity of Chilca's Pacific Ocean coastal zone in great detail, they did not create any program to improve any existing habitats or to open corridors to allow for movement of species between habitats. In putting together that document, the ChilcaUno team discovered animal species ranging from large marine mammals, such as sea lions and bottlenose dolphins, to different types of marine and continental birds, and even various kinds of plankton in the seawater.⁵² The team also left room for improvement in terms of efforts to use appropriate noninvasive species and to control or eliminate existing invasive species inside and around the site of the thermoelectric plant. Even though a document listing locally appropriate plant species was created by the project team, no evidence could be found of whether this document was actually implemented in selecting plant species for ChilcaUno's green areas.

There are also opportunities for improvement in better defining the project team's efforts to restore soils disturbed by the project's construction or by previous development. The Chilca team did a better job, however, in preserving the water functions of the ocean by the Chilca beach and its wetlands. Among several documents on this subject, one addresses the monitoring of the quality of seawater along the beach where the project's desalination plant is located during the construction and operation of the plant.⁵³ The team has also implemented measures to avoid disturbing the beach and its surroundings.⁵⁴ The monitoring of the quality of ocean water by the Chilca beach is important because the plant takes water from the ocean for its operation and returns brine as a by-product of the desalination process.⁵⁵ In addition, the project team analyzed the quality of the sediments in the seawater of the Chilca beach. This analysis gave them an understanding of the physical and chemical conditions of the sediments

⁵¹ Walsh Perú S.A., "Medidas de prevención, mitigación, corrección y compensación," 11–20; Walsh Perú S.A., Plan de congestión y/o restricción temporal (Peru), 13–14.

⁵² Walsh Perú S.A., "Descripción del área de influencia," 22–57.

⁵³ Walsh Perú S.A., "Programa de monitoreo del proyecto obra o actividad," 3–5.

⁵⁴ Walsh Perú S.A., "Medidas de prevención, mitigación, corrección y compensación," 12–13.

⁵⁵ Walsh Perú S.A., "Descripción del proyecto," 8–9.

before the beginning of the project's operations, and thus helped avoid negative impacts from the operations on the Pacific Ocean waters and their sediment transport.⁵⁶

7. CLIMATE AND RISK CATEGORY

Envision aims to promote infrastructure developments that are sensitive to long-term climate disturbances. Climate and Risk focuses on avoiding direct and indirect contributions to greenhouse gas emissions, as well as promotes mitigation and adaptation actions to ensure short- and long-term resilience to hazards. Climate and Risk is further divided into two subcategories: Emissions and Resilience.

Emissions

Reducing emissions both of greenhouse gases and of other dangerous pollutants, during all stages of a project's life cycle, is another important factor for infrastructure projects to take into consideration. The ChicaUno plant's conversion from simple-cycle to combined-cycle has optimized the performance of the facility, increasing its electricity generation by around 50% without increasing its greenhouse gas emissions, as it is shown in the carbon monitoring document provided by the project team.⁵⁷

Regarding the project team's efforts to reduce the emission of other types of pollutants, and according to a document provided by the project team, both the emissions of particulate matter during the construction of the project and those of nitrogen dioxide (NO₂) and carbon monoxide (CO) during the operation of the project would not exceed the maximum levels established by national environmental laws.⁵⁸ The project team did not go beyond these basic requirements, however; it is advisable to integrate international standards in order to guarantee higher air quality. Standards that can be applied to improve the performance of the project include the California Ambient Air Quality Standards and the South Coast Air Quality Management Rules.

Resilience

The resilience of a project, its ability to withstand short- and long-term risks, is an important aspect and should therefore be considered in every project. Understanding the various types of risks will allow the project team to design and operate a project that anticipates and adapts to

⁵⁶ Walsh Perú S.A., "Descripción del área de influencia," 44.

⁵⁷ [Generación de emisiones de Central ChilcaUno, 1-2.](#)

⁵⁸ Walsh Perú S.A., "Descripción y evaluación técnica," 15–18, 27–28.

these risks. In this regard, considering the proximity of the Pacific Ocean, the project team should consider creating a climate threat assessment or an adaptation plan in order to be prepared for climate variation and related natural hazards. This assessment should include a calculation of expected changes in flood elevation or sea level rise and an inventory of areas of possible inundation. For the same reason, the ChilcaUno team should consider making a thorough assessment of traps, vulnerabilities, and risks due to long-term changes such as climate change, since one of its most evident effects will be sea level rise.

The ChilcaUno team had a better performance in their plans for the short-term adaptability of the project. As regards the project's long-term adaptability, since its construction is already finished, the project team should consider assessing the current state of all elements that compose the project in order to figure out whether those will be resilient and adaptive to changes and will function under altered climate conditions, supply shortfalls, or other significant long-term changes. In regard to its response and adaptability to short-term risks, the ChilcaUno team lists all potential natural and man-made hazards that could take place in the area of the project during both its construction and operation. This document describes each of these hazards and also lists the people who would be responsible to control and mitigate them in case they should occur. It is also important to consider that many hazards may be worsened by degraded environments, and the ChilcaUno team should therefore also consider restoring and rehabilitating natural systems in order to minimize risks of natural hazards.⁵⁹

On the subject of heat island effects, the project team left room for improvement. It is recommended to assess all surfaces of the project in order to figure out whether some of these have a high solar reflectance index. If they do, the team should consider reducing these surfaces as much as possible in order to minimize localized heat accumulation.

⁵⁹ Walsh Perú S.A., "Plan de gestión y/o restricción temporal," 1–20.

APPENDIX:

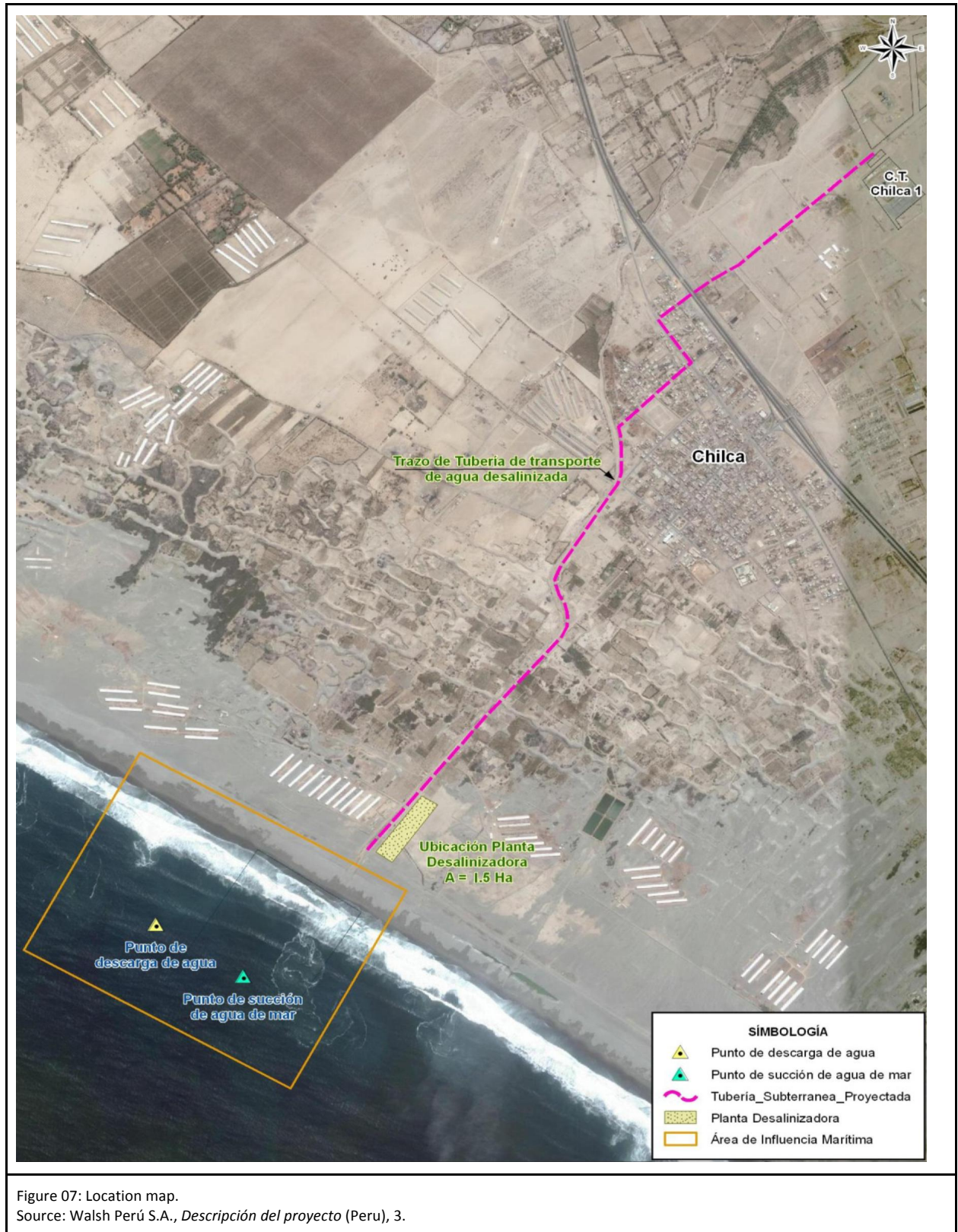
APPENDIX A: PROJECT PICTURES AND DRAWINGS



Figure 05: General view of the project.
Source: EnerSur.



Figure 06: General view of the project.
Source: EnerSur.



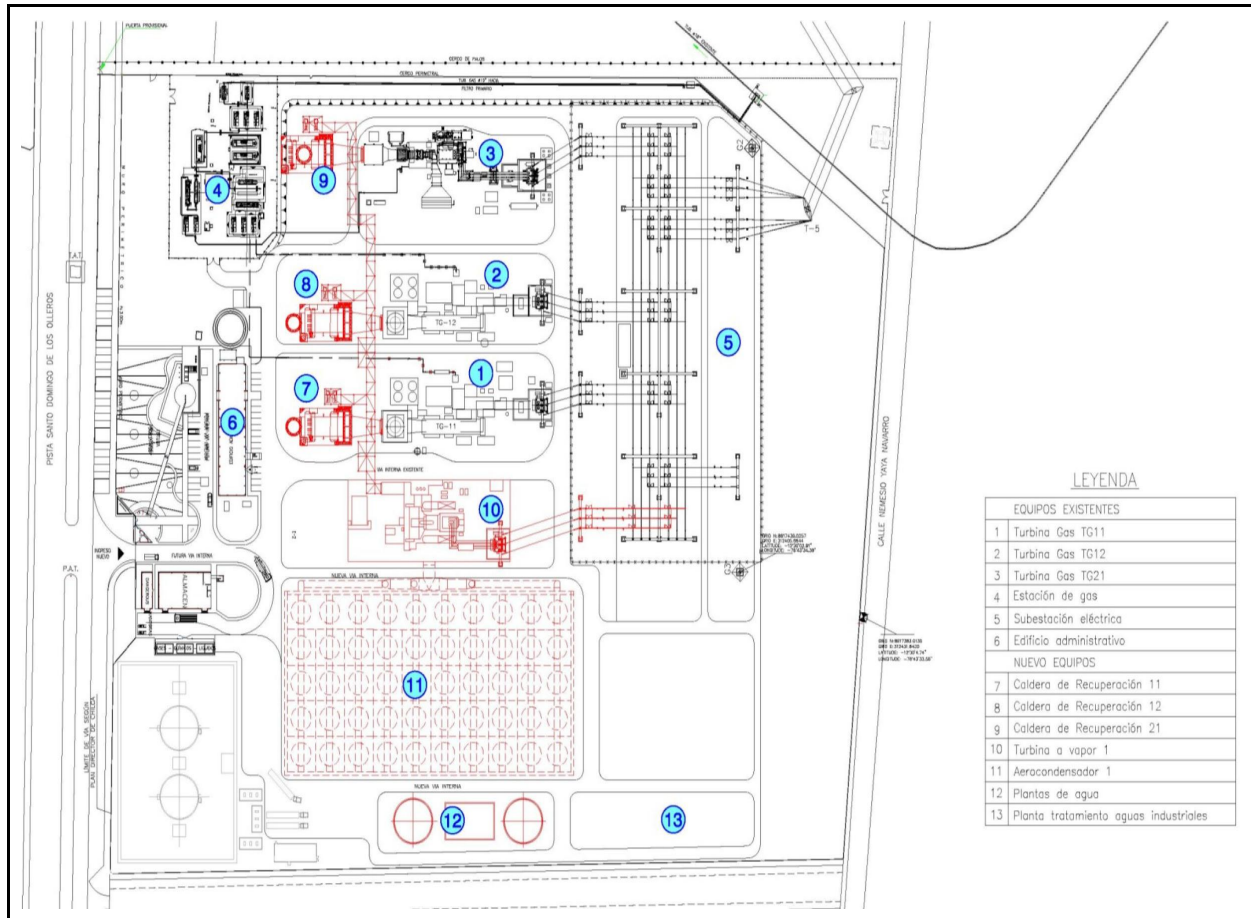


Figure 08: General plan of the project.
Source: Walsh Perú S.A., Descripción del proyecto (Peru), 7.

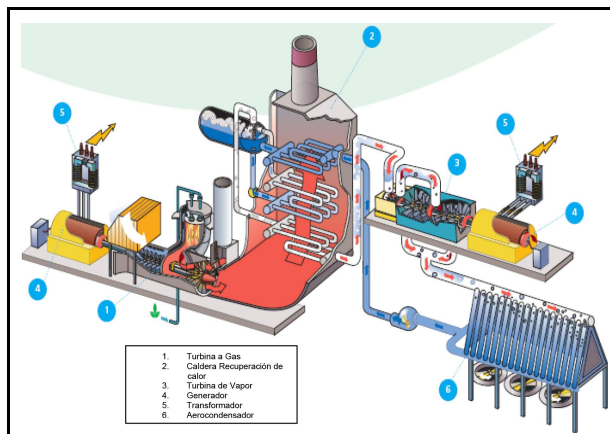


Figure 09: Basic operation of ChilcaUno.
Source: Walsh Perú S.A., Descripción del proyecto (Peru), 13.



Figure 10: Work within the plant.
Source: EnerSur.



Figure 11: Work within the plant.
Source: EnerSur.



Figure 12: Work within the plant.
Source: EnerSur.



Figure 13: Work within the plant.
Source: EnerSur.



Figure 14: "Aprende y Emprende" project.
Source: EnerSur, *Suplemento Chilcano Mayo 2013* (Peru: EnerSur, 2013), 1.



Figure 15: "Experimento: Ciencia Para Todos" program.
Source: GDF Suez, *Peru: Our Activities, Our Commitments* (Peru), 11.



Figure 16: Renovating sidewalks in the Chilca community.
Source: EnerSur, *Suplemento Chilcano Mayo 2012* (Peru: EnerSur, 2012), 5.



Figure 17: Work in the community.
Source: EnerSur.



Figure 18: Refurbishing roads in the Chilca community.
Source: EnerSur, *Suplemento Chilcano Mayo 2012* (Peru: EnerSur, 2012), 1.



Figure 19: Building sidewalks in the Chilca community.
Source: EnerSur, *Suplemento Chilcano Mayo 2012* (Peru: EnerSur, 2012), 5.



Figure 20: Programs to improve the health of the members of the community.
Source: EnerSur, *Suplemento Chilcano Julio 2012* (Peru: EnerSur, 2012), 5.



Figure 21: Program to preserve historic and cultural resources and enhance public space.
Source: EnerSur.



Figure 22: Program to stimulate and promote women's economic empowerment.
Source: EnerSur.



Figure 23: Children participating in the EcoChilca program.
Source: EnerSur.



Figure 24: Collaborative work inside the plant.
Source: EnerSur.



Figure 25: Playa Yaya before implementing ChilcaUno's cleaning program.
Source: EnerSur, Proyecto de Limpieza Playa Yaya (Peru: EnerSur, 2013), 4.

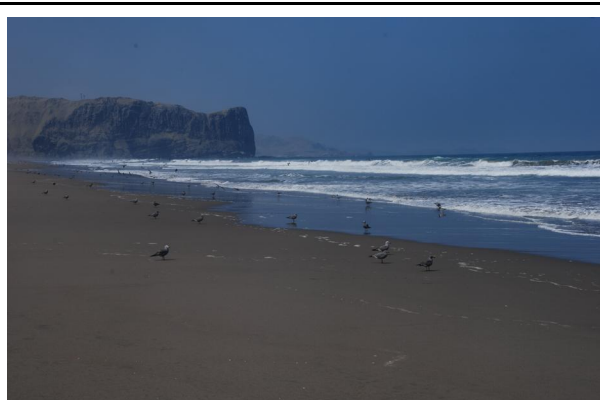


Figure 26: Playa Yaya after the implementation of ChilcaUno's cleaning program.
Source: EnerSur.

APPENDIX B: ENVISION POINTS TABLE

ENVISION POINTS TABLE

		IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE	
QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	2	5	10	20	25
		QL1.2 Stimulate sustainable growth and development	1	2	5	13	16
		QL1.3 Develop local skills and capabilities	1	2	5	12	15
	WELLBEING	QL2.1 Enhance public health and safety	2	—	—	16	
		QL2.2 Minimize noise and vibration	1	—	—	8	11
		QL2.3 Minimize light pollution	1	2	4	8	11
		QL2.4 Improve community mobility and access	1	4	7	14	
		QL2.5 Encourage alternative modes of transportation	1	3	6	12	15
		QL2.6 Improve site accessibility, safety and wayfinding	—	3	6	12	15
	COMMUNITY	QL3.1 Preserve historic and cultural resources	1	—	7	13	16
		QL3.2 Preserve views and local character	1	3	6	11	14
		QL3.3 Enhance public space	1	3	6	11	13
	VULNERABLE GROUPS	QL4.1 Identify and address the needs of women and diverse communities *	1	2	3	4	
QL4.2 Stimulate and promote women's economic empowerment		1	2	3	4		
QL4.3 Improve access and mobility of women and diverse communities *		1	2	3	4	5	
Maximum QL Points:					194**		
LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	2	4	9	17	
		LD1.2 Establish a sustainability management system	1	4	7	14	
		LD1.3 Foster collaboration and teamwork	1	4	8	15	
		LD1.4 Provide for stakeholder involvement	1	5	9	14	
	MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	1	3	6	12	15
		LD2.2 Improve infrastructure integration	1	3	7	13	16
	PLANNING	LD3.1 Plan for long-term monitoring and maintenance	1	3	—	10	
		LD3.2 Address conflicting regulations and policies	1	2	4	8	
		LD3.3 Extend useful life	1	3	6	12	
	Maximum LD Points:					121*	
RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce net embodied energy	2	6	12	18	
		RA1.2 Support sustainable procurement practices	2	3	6	9	
		RA1.3 Use recycled materials	2	5	11	14	
		RA1.4 Use regional materials	3	6	9	10	
		RA1.5 Divert waste from landfills	3	6	8	11	
		RA1.6 Reduce excavated materials taken off site	2	4	5	6	
		RA1.7 Provide for deconstruction and recycling	1	4	8	12	
	ENERGY	RA2.1 Reduce energy consumption	3	7	12	18	
		RA2.2 Use renewable energy	4	6	13	16	20
	WATER	RA2.3 Commission and monitor energy systems	—	3	—	11	
		RA3.1 Protect fresh water availability	2	4	9	17	21
		RA3.2 Reduce potable water consumption	4	9	13	17	21
		RA3.3 Monitor water systems	1	3	6	11	
Maximum RA Points:					182*		

ENVISION POINTS TABLE

		IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE	
NATURAL WORLD	SITING	NW1.1 Preserve prime habitat	—	—	9	14	18
		NW1.2 Protect wetlands and surface water	1	4	9	14	18
		NW1.3 Preserve prime farmland	—	—	6	12	15
		NW1.4 Avoid adverse geology	1	2	3	5	
		NW1.5 Preserve floodplain functions	2	5	8	14	
		NW1.6 Avoid unsuitable development on steep slopes	1	—	4	6	
		NW1.7 Preserve greenfields	3	6	10	15	23
	LAND & WATER	NW2.1 Manage stormwater	—	4	9	17	21
		NW2.2 Reduce pesticide and fertilizer impacts	1	2	5	9	
		NW2.3 Prevent surface and groundwater contamination	1	4	9	14	18
	BIODIVERSITY	NW3.1 Preserve species biodiversity	2	—	—	13	16
		NW3.2 Control invasive species	—	—	5	9	11
		NW3.3 Restore disturbed soils	—	—	—	8	10
		NW3.4 Maintain wetland and surface water functions	3	6	9	15	19
Maximum NW Points:					203*		
CLIMATE & RISK	EMISSIONS	CR1.1 Reduce greenhouse gas emissions	4	7	13	18	25
		CR1.2 Reduce air pollutant emissions	2	6	—	12	15
	RESILIENCE	CR2.1 Assess climate threat	—	—	—	15	
		CR2.2 Avoid traps and vulnerabilities	2	6	12	16	20
		CR2.3 Prepare for long-term adaptability	—	—	—	16	20
		CR2.4 Prepare for short-term hazards	3	—	10	17	21
		CR2.5 Manage heat islands effects	1	2	4	6	
Maximum CR Points:					122*		
Maximum TOTAL Points:					822*		

* Indigenous or afro-descendant peoples

** Not every credit has a restorative level. Therefore totals include the maximum possible points for each credit whether conserving or restorative.

Figure 27: Envision credits with scores by achievement level. This table includes experimental "Vulnerable Groups" credits developed in collaboration with the Inter-American Development Bank.
Sources: Envision™ and the Zofnass Program for Sustainable Infrastructure

APPENDIX C: GRAPHS

		CHILCAUNO THERMOELECTRIC PLANT CENTRAL TÉRMICA CHILCAUNO		IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
				MEJORA	AUMENTA	SUPERIOR	CONSERVA	RESTAURA
QUALITY OF LIFE CALIDAD DE VIDA	PURPOSE PROPÓSITO	QL1.1 Improve Community Quality of Life QL1.1 Mejorar la Calidad de Vida de la Comunidad						
		QL1.2 Stimulate Sustainable Growth & Development QL1.2 Estimular el desarrollo y el crecimiento sostenible						
		QL1.3 Develop Local Skills And Capabilities QL1.3 Desarrollar Capacidades y Habilidades Locales						
	COMMUNITY COMUNIDAD	QL2.1 Enhance Public Health And Safety QL2.1 Mejorar la Salud Pública y la Seguridad						
		QL2.2 Minimize Noise And Vibration QL2.2 Minimizar ruidos y vibraciones						
		QL2.3 Minimize Light Pollution QL2.3 Minimizar Contaminación Lumínica						
		QL2.4 Improve Community Mobility And Access QL2.4 Mejorar el acceso y la movilidad de la Comunidad						
		QL2.5 Encourage Alternative Modes of Transportation QL2.5 Fomentar modos alternativos de transporte						
		QL2.6 Improve Site Accessibility, Safety & Wayfinding QL2.6 Mejorar la accesibilidad, seguridad y señalización						
	WELLBEING BIENESTAR	QL3.1 Preserve Historic And Cultural Resources QL3.1 Preservar los recursos históricos y culturales						
		QL3.2 Preserve Views And Local Character QL3.2 Preservar las vistas y el carácter local						
		QL3.3 Enhance Public Space QL3.3 Mejorar el espacio público						
	VULNERABLE GRUPOS VULNERABLES	QL4.1 Identify and address the needs of minorities QL4.1 Identificar y considerar las necesidades de minorías						
		QL4.2 Stimulate and promote women's empowerment QL4.2 Estimular y promover el empoderamiento femenino						
		QL4.3 Improve access and mobility of minorities QL4.3 Mejorar el acceso y movilidad de minorías						
		QL0.0 Innovate Or Exceed Credit Requirements QL0.0 Créditos innovadores o que exceden los requerimientos						

Figure 28: Quality of Life category_ Summary of results

		CHILCAUNO THERMOELECTRIC PLANT		IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
		CENTRAL TÉRMICA CHILCAUNO		MEJORA	AUMENTA	SUPERIOR	CONSERVA	RESTAURA
LIDERAZGO	COLLABORATION COLABORACIÓN	LD1.1 Provide Effective Leadership And Commitment LD1.1 Proporcionar compromiso y liderazgo efectivo						
		LD1.2 Establish A Sustainability Management System LD1.2 Establecer un sistema de gestión de la sostenibil-						
		LD1.3 Foster Collaboration And Teamwork LD1.3 Promover Colaboración y trabajo en equipo						
		LD1.4 Provide For Stakeholder Involvement LD1.4 Fomentar la participación de las partes interesadas						
LEADERSHIP	MANAGEMENT GESTIÓN	LD2.1 Pursue By-Product Synergy Opportunities LD2.1 Buscar oportunidades de sinergia derivada						
		LD2.2 Improve Infrastructure Integration LD2.2 Mejorar la integración de infraestructuras						
LEADERSHIP	PLANNING PLANIFICACIÓN	LD3.1 Plan For Long-Term Monitoring & Maintenance LD3.1 Planificar el monitoreo y mantenimiento a largo plazo						
		LD3.2 Address Conflicting Regulations & Policies LD3.2 Lidar con reglamentos y políticas en conflicto						
		LD3.3 Extend Useful Life LD3.3 Extender la vida útil						
		LD0.0 Innovate Or Exceed Credit Requirements LD0.0 Créditos innovadores o que exceden los requerimientos						

Figure 29: Leadership category_ Summary of results

CHILCAUNO THERMOELECTRIC PLANT CENTRAL TÉRMICA CHILCAUNO			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
			MEJORA	AUMENTA	SUPERIOR	CONSERVA	RESTAURA
ASIGNACIÓN DE RECURSOS	MATERIALS MATERIALES	RA1.1 Reduce Net Embodied Energy RA1.1 Reducir energía neta incorporada					
		RA1.2 Support Sustainable Procurement Practices RA1.2 Apoyar prácticas de adquisición sustentable					
		RA1.3 Used Recycled Materials RA1.3 Utilizar materiales reciclados					
		RA1.4 Use Regional Materials RA1.4 Utilizar materiales de la región					
		RA1.5 Divert Waste From Landfills RA1.5 Disminuir la disposición final en rellenos sanitarios					
		RA1.6 Reduce Excavated Materials Taken Off Site RA1.6 Reducir los materiales de excavación sacados del local del proyecto					
		RA1.7 Provide for Deconstruction & Recycling RA1.7 Prever condiciones para la remoción de la construcción y el reciclaje					
RESOURCE ALLOCATION	ENERGY ENERGÍA	RA2.1 Reduce Energy Consumption RA2.1 Reducir el consumo de energía					
		RA2.2 Use Renewable Energy RA2.2 Usar energías renovables					
		RA2.3 Commission & Monitor Energy Systems RA2.3 Puesta en servicio y monitoreo de sistemas energéticos					
WATER AGUA	RA3.1 Protect Fresh Water Availability RA3.1 Proteger la disponibilidad de agua dulce						
	RA3.2 Reduce Potable Water Consumption RA3.2 Reducir el consumo de agua potable						
	RA3.3 Monitor Water Systems RA3.3 Monitorear sistemas de provisión de agua						
		RA0.0 Innovate Or Exceed Credit Requirements RA0.0 Créditos innovadores o que exceden los requerimientos					

Figure 30: Resource Allocation category_ Summary of results

CHILCAUNO THERMOELECTRIC PLANT CENTRAL TÉRMICA CHILCAUNO			IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
			MEJORA	AUMENTA	SUPERIOR	CONSERVA	RESTAURA
MUNDO NATURAL	SITING EMPLAZAMIENTO	NW1.1 Preserve Prime Habitat NW1.1 Preservar hábitats de alta calidad					
		NW1.2 Preserve Wetlands and Surface Water NW1.2 Preservar humedales y aguas superficiales					
		NW1.3 Preserve Prime Farmland NW1.3 Preservar tierras agrícolas de alta calidad					
		NW1.4 Avoid Adverse Geology NW1.4 Evitar zonas de geología adversa					
		NW1.5 Preserve Floodplain Functions NW1.5 Preservar funciones de llanura aluvial					
		NW1.6 Avoid Unsuitable Development on Steep Slopes NW1.6 Evitar la ocupación inadecuada en pendientes pronunciadas					
		NW1.7 Preserve Greenfields NW1.7 Preservar áreas sin ocupación					
NATURAL WORLD	LAND + WATER IMPACTOS EN EL AGUA Y SUELO	NW2.1 Manage Stormwater NW2.1 Gestión de aguas pluviales					
		NW2.2 Reduce Pesticides and Fertilizer Impacts NW2.2 Reducir el impacto de fertilizantes y plaguicidas					
		NW2.3 Prevent Surface and Groundwater Contamination NW2.3 Prevenir la contaminación de aguas superficiales y profundas					
NATURAL WORLD	BIODIVERSITY BIODIVERSIDAD	NW3.1 Preserve Species Biodiversity NW3.1 Preservar la biodiversidad					
		NW3.2 Control Invasive Species NW3.2 Control de especies invasivas					
		NW3.3 Restore Disturbed Soils NW3.3 Restaurar suelos alterados					
		NW3.4 Maintain Wetland and Surface Water Functions NW3.4 Preservar los humedales y las funciones de aguas superficiales					
		NW0.0 Innovate or Exceed Credit Requirements NW0.0 Créditos innovadores o que exceden los requerimientos					

Figure 31: Natural World category_ Summary of results

		CHILCAUNO THERMOELECTRIC PLANT CENTRAL TÉRMICA CHILCAUNO		IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
				MEJORA	AUMENTA	SUPERIOR	CONSERVA	RESTAURA
CLIMATE AND RISK CLIMA Y RIESGO	EMISSIONS EMISIONES	CR1.1 Reduce Greenhouse Gas Emissions CR1.1 Reducir las emisiones de Gases de Efecto Invernadero (GEI)						
		CR1.2 Reduce Air Pollutant Emissions CR1.2 Reducir las emisiones contaminantes del aire						
CLIMATE AND RISK CLIMA Y RIESGO	RESILIENCE RESILIENCIA	CR2.1 Assess Climate Threat CR2.1 Evaluar amenazas relacionadas al Cambio Climático						
		CR2.2 Avoid Traps And Vulnerabilities CR2.2 Evitar situaciones de riesgo y vulnerabilidad						
		CR2.3 Prepare For Long-Term Adaptability CR2.3 Establecer estrategias de adaptación de largo plazo, frente al Cambio Climático						
		CR2.4 Prepare For Short-Term Hazards CR2.4 Preparación frente a riesgos de corto plazo						
		CR2.5 Manage Heat Island Effects CR2.5 Administrar el efecto Isla de Calor						
		CR0.0 Innovate Or Exceed Credit Requirements CR0.0 Créditos innovadores o que exceden los requerimientos						

Figure 32: Climate & Risk category_ Summary of results

ChilcaUno Thermoelectric Plant, Peru

ChilcaUno Thermoelectric Plant, Peru			PT.	Performance
1	PURPOSE	QL1.1 Improve Community Quality of Life	10	Superior
2		QL1.2 Stimulate Sustainable Growth & Development	5	Superior
3		QL1.3 Develop Local Skills And Capabilities	12	Conserving
4	COMMUNITY	QL2.1 Enhance Public Health And Safety	16	Conserving
5		QL2.2 Minimize Noise And Vibration	8	Conserving
6		QL2.3 Minimize Light Pollution	0	No score
7		QL2.4 Improve Community Mobility And Access	7	Superior
8		QL2.5 Encourage Alternative Modes of Transportation	1	Improved
9		QL2.6 Improve Site Accessibility, Safety & Wayfinding	0	No score
10	WELLBEING	QL3.1 Preserve Historic And Cultural Resources	7	Superior
11		QL3.2 Preserve Views And Local Character	6	Superior
12		QL3.3 Enhance Public Space	6	Superior
	VULNERABLE GROUPS	QL 4.1 Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)	1	Improved
		QL4.2 Stimulate and promote women's economic empowerment	3	Enhanced
		QL4.3 Improve access and mobility of women and diverse communities (indigenous or afro-descendant peoples)	0	No score
		QL0.0 Innovate Or Exceed Credit Requirements	0	0
		QL	82	

ChilcaUno Thermoelectric Plant, Peru			PT.	Performance
13	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	9	Superior
14		LD1.2 Establish A Sustainability Management System	4	Enhanced
15		LD1.3 Foster Collaboration And Teamwork	0	No score
16		LD1.4 Provide For Stakeholder Involvement	5	Enhanced
17	MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No score
18		LD2.2 Improve Infrastructure Integration	7	Superior
19	PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	3	Enhanced
20		LD3.2 Address Conflicting Regulations & Policies	0	No score
21		LD3.3 Extend Useful Life	6	Superior
		LD0.0 Innovate Or Exceed Credit Requirements	0	N/A
		LD	34	

ChilcaUno Thermoelectric Plant, Peru			PT.	Performance
22	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	No score
23		RA1.2 Support Sustainable Procurement Practices	0	No score
24		RA1.3 Used Recycled Materials	0	No score
25		RA1.4 Use Regional Materials	0	No score
26		RA1.5 Divert Waste From Landfills	0	No score
27		RA1.6 Reduce Excavated Materials Taken Off Site	0	No score
28		RA1.7 Provide for Deconstruction & Recycling	1	Improved
29	ENERGY	RA2.1 Reduce Energy Consumption	7	Enhanced
30		RA2.2 Reduce Pesticide and Fertilizer Impacts	0	No score
31		RA2.3 Commission & Monitor Energy Systems	11	Conserving
32	WATER	RA3.1 Protect Fresh Water Availability	17	Conserving
33		RA3.2 Reduce Potable Water Consumption	9	Enhanced
34		RA3.3 Monitor Water Systems	6	Superior
		RA0.0 Innovate Or Exceed Credit Requirements	0	N/A
		RA	51	

ChilcaUno Thermoelectric Plant, Peru

ChilcaUno Thermoelectric Plant, Peru			PT.	Performance	
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	0	No score
36			NW1.2 Preserve Wetlands and Surface Water	14	Conserving
37			NW1.3 Preserve Prime Farmland	0	No score
38			NW1.4 Avoid Adverse Geology	2	Enhanced
39			NW1.5 Preserve Floodplain Functions	5	Enhanced
40			NW1.6 Avoid Unsuitable Development on Steep Slopes	0	No score
41			NW1.7 Preserve Greenfields	0	No score
42	L & W	NW2.1 Manage Stormwater	0	No score	
43		NW2.2 Reduce Pesticides and Fertilizer Impacts	0	No score	
44		NW2.3 Prevent Surface and Groundwater Contamination	1	Improved	
45	BIODIVERSITY	NW3.1 Preserve Species Biodiversity	2	Improved	
46		NW3.2 Control Invasive Species	0	No score	
47		NW3.3 Restore Disturbed Soils	0	No score	
48		NW3.4 Maintain Wetland and Surface Water Functions	9	Superior	
NW0.0 Innovate or Exceed Credit Requirements			0	N/A	
NW			33		

ChilcaUno Thermoelectric Plant, Peru			PT.	Performance	
49	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	13	Superior
50			CR1.2 Reduce Air Pollutant Emissions	2	Improved
51	RESILIENCE	CR2.1 Assess Climate Threat	0	No score	
52		CR2.2 Avoid Traps And Vulnerabilities	0	No score	
53		CR2.3 Prepare For Long-Term Adaptability	0	No score	
54		CR2.4 Prepare For Short-Term Hazards	3	Improved	
55		CR2.5 Manage Heat Island Effects	0	No score	
CR0.0 Innovate Or Exceed Credit Requirements			0	N/A	
CR			18		
Total points			218	0	

Figure 33: Envision credits with scores by achievement level. This table includes experimental "Vulnerable Groups" credits developed in collaboration with the Inter-American Development Bank.
Sources: Envision™ and the Zofnass Program for Sustainable Infrastructure

APPENDIX D: CREDIT DETAIL

CHILCAUNO: CREDIT SPREADSHEET WITH DETAILS		
CATEGORY I, PEOPLE AND LEADERSHIP		
SUB CATEGORY: QUALITY OF LIFE		
	Score	CHILCAUNO THERMOELECTRIC PLANT
QL1.1 Improve Community Quality of Life	10	Superior
		<p>According to the National Cooperation Fund for Development (FONCODES for its name in Spanish), 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 in age is 9%. The two main aspects the lack of a regular access to potable water and the limited education are the aspects of the community with the need to improve most. In response to these needs, the project team has developed some programs directed toward community education, such as “Aprende y Emprende” and “Experimento: Ciencia Para todos,” among others. However, with regards to water scarcity in the area, the project team could have had a stronger emphasis. Although the water used for the operation of the new steam unit comes from the sea (not from local wells), the project team did not clarify the origin of the water used for the other activities within the plant.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> 1. Walsh Perú S.A., <i>Descripción del área de influencia (Peru)</i>, 29, 31-32. 2. GDF Suez, Peru: <i>Our Activities, Our Commitments (Peru)</i>, 7-8. 3. Walsh Perú S.A., <i>Plan de relaciones comunitarias (Peru)</i>, 6-9.
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider utilizing desalinated seawater for all activities that take place within the plant, not just the steam unit operation. They should also consider helping the community with the potable water scarcity.</p>
QL1.2 Stimulate Sustainable Growth & Development	5	Superior
		<p>GDF Suez (the transnational company owner and operator of ChilcaUno) claims to be committed to the wellbeing of the communities where their projects operate. These efforts for social responsibility and sustainable development are oriented toward four main aspects: development of productive capacities, deployment of infrastructure, the environment, and education and health.</p> <p>The ChilcaUno project team has developed several programs with the shared purpose of economic stimulation within the area of project implementation. Some of these programs include a temporary hiring program directed toward the people who live in the region, and a program for local procurement, among others. Both programs were designed for implementation only during the construction phase. The program “Aprende y Emprende” (Learn and Initiate in English), was designed to teach prospective entrepreneurs of Chilca about ways in which they can start their own businesses. The program lasted a total of ten months and consisted of hour classes held each Saturday. With these three programs, the project team will not only create new employment opportunities in the area, but also help</p>

		<p>to stimulate some that already exist.</p> <p>As part of their social responsibility program, the ChilcaUno project team implemented an initiative to renovate two of the most important roads that connect Chilca with the center of Lima, Peru’s capital. Another project of similar intent was for the creation of sidewalks in the Juan Pablo II street, with the purpose of improving the conditions of pedestrian traffic, and avoiding accidents in the area. Nonetheless, the project team has not taken into consideration any cultural or recreational spaces that already exist in the area and which they could help to reactivate.</p> <p><i>Source:</i></p> <ol style="list-style-type: none"> 1. Walsh Perú S.A., <i>Plan de relaciones comunitarias (Peru)</i>, 8-9. 2. EnerSur, <i>Suplemento Chilcano Mayo 2013 (Peru: EnerSur, 2013)</i>, 4-5. 3. EnerSur, <i>Suplemento Chilcano Mayo 2012 (Peru: EnerSur, 2012)</i>, 4-5. <p>RECOMMENDATIONS</p> <p>Although the project team’s efforts to support and stimulate the growth and development of both the members of the communities of the immediate area and those of the larger district has been considerable, there is still room for improvement in this area. The project team should consider doing an assessment of the state of cultural and recreational public spaces around the plant, and subsequently create programs to restore them.</p>
<p>QL1.3 Develop Local Skills and Capabilities</p>	<p>12</p>	<p>Conserving</p> <p>The ChilcaUno project team has implemented a number of programs with the purpose of stimulating the sustainable growth and development of the Chilca district. Accompanying these programs are a number of activities designed to develop the skills and capabilities of the members of the local population, such as the “Aprende y Emprende” workshop designed to teach the members of the Chilca population the basics of starting a business of their own, or the “Experimento: Ciencia Para Todos” workshop, designed to raise the level to scientific knowledge for third to fifth grade students. These programs have been implemented as a result of identifying community needs. In addition, the project team also implemented a temporary hiring program for the members of the Chilca population interested in participating in the construction of the project. The main intent of these programs is to expand the knowledge, skills, and capacities of the community workforce in order to improve their ability to grow and develop.</p> <p><i>Source:</i></p> <ol style="list-style-type: none"> 1. GDF Suez, <i>Peru: Our Activities, Our Commitments (Peru)</i>, 7-8. 2. Walsh Perú S.A., <i>Plan de relaciones comunitarias (Peru)</i>, 8. <p>RECOMMENDATIONS</p> <p>The ChilcaUno project team should consider extending its hiring program to the operation phases of the project, as well as integrating minority and disadvantaged groups to this program and throughout all project activities. If this such efforts are difficult due to the levels of skills and capabilities of the members of the population, the project team should consider implementing training workshops for those interested in working in the plant.</p>
<p>QL2.1 Enhance Public Health And Safety</p>	<p>16</p>	<p>Conserving</p> <p>The ChilcaUno project team put together a document in which it addresses all of the measures it will implement in order to avoid affecting the health and safety of the community around the project. The section of this document devoted to these measures is divided into two parts: measures to be implemented during the construction phase of the project, and measures for its operation and maintenance phases. These two parts take into</p>

		<p>account both health and safety measures for the protection of the members of the community and natural environment, such as ways to protect the quality of the air and to avoid excessive noise, measures to avoid having a negative impact on the potable water sources and the environment in general, and safety protection measures, among others. It also addresses the health and safety protocols to be followed in case of an emergency. Regarding the health and safety of the workers of the plant, the ChilcaUno project team created another document systematically addressing all measures to be implemented in order to enhance the health and safety of the people working inside the plant. In addition, during the design phase of the project two main aspects of it were changed in order to reduce the risk ChilcaUno might inflict on the health and safety of its employees and the Chilca population at large: first, the decision to build a desalination to cover the project's water needs and in order to avoid using potable water, a scarce resource in the area, and second, the decision to increase the plant's capacity through a less contaminating system such as a combined cycle.</p> <p><u>Source:</u> 1. Walsh Perú S.A., <i>Medidas de prevención, mitigación, prevención, corrección y compensación de impactos ambientales negativos (Peru)</i>, 5-13, 20-24. 2. Walsh Perú S.A., <i>Plan de congestión y/o restricción temporal (Peru)</i>, 8-20. 3. EnerSur, <i>Informe Anual de Gestión Ambiental (Peru)</i>, 1-74.</p> <p><u>RECOMMENDATIONS</u> The project team should consider updating their risk assessment to include the dangers that the new steam unit and all of the processes that come with it poses to its employees and the community at large.</p>
<p>QL2.2 Minimize Noise And Vibration</p>	<p>8</p>	<p>Conserving</p> <p>The project team briefly addressed their plans to monitor the noise levels in the areas that could be affected by it in their monitoring plans document. These plans include the monitoring of the noise levels both during the construction of the project and during its operation. There is proof in a document provided by the project team that a monitoring plan took place during the construction of the project. The before mentioned document describes the foreseeable effects the thermoelectric plant would have on its immediate context. The results of these evaluations showed that the noise levels are below the EQS (Environmental Quality Standards) established in the D.S. 085-2003-PCM law for industrial areas. These evaluations were taken in two different areas: inside the thermoelectric plant and by the Chilca beach, the closest beach to the ChilcaUno plant. Some measures to decrease the noise levels are also addressed in this document, but no proof could be found that these were indeed implemented. In a different document, the project team addressed a monitoring visit done by a consultant to the plant in the year 2012. During this visit the consultant measured noise levels not only from areas within the project's site, but also in 19 points outside of it and near residential areas, specifically the AAHH San José. In addition, the project team also implemented a monitoring plan in 2012 specifically to measure the noise levels produced by the steam that would be blown through the plant's pipes. The measures were taken from four main towns: San Hilarión, Asunción de María, San José y Barrio Asunción. The results of both monitoring plans were that all noise levels inside and around the plant were within accepted standard levels.</p> <p><u>Source:</u> 1. Walsh Perú S.A., <i>Programa de monitoreo del proyecto obra o actividad (Peru)</i>, 3. 2. Walsh Perú S.A., <i>Descripción y evaluación técnica de los efectos previsibles directos e indirectos, acumulativos y sinérgicos en el ambiente (Peru)</i>, 18-19. 3. Nakamura Consultores, <i>Informe tecnico monitoreo de ruido (Lima, Peru: 2012)</i>, 7-15. 4. Social Capital Group, <i>Muestreo de percepciones de ruidos molestos en Chilca (Peru: 2012)</i>, 1-24.</p>

		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider implementing the long term monitoring of noise and vibration evaluations on a regular basis, and not only during the construction phase of the project. They should also consider monitoring these from the residential areas around the project, since these would be the most affected by the increase in noise and vibration levels.</p>
<p>QL2.3 Minimize Light Pollution</p>	<p>0</p>	<p>No score</p>
		<p>The ChilcaUno team did not take into account the minimization of light pollution within the project specifications, and therefore the project cannot receive any points in this category. No document could be found in which it could be demonstrated that the project team made an overall assessment of the lighting needs. Thus, the project team did not design the lighting components of ChilcaUno to reduce its energy requirements, and avoid light spillage at night.</p>
		<p><u>Source:</u> N/A</p>
		<p><u>RECOMMENDATIONS</u></p> <p>First, the project team should consider conducting an overall assessment of the lighting needs of the plant. Taking those needs into consideration, the project team should then design the lighting components of the project in a way that reduces its lighting energy requirements to a minimum. Even though transforming an energy plant from a single cycle to a combined cycle is not usually accompanied by light spillage issues, the ChilcaUno team should also consider implementing measures that help avoid light spillage at night and therefore reduce the project's energy needs.</p>
<p>QL2.4 Improve Community Mobility And Access</p>	<p>7</p>	<p>Superior</p>
		<p>According to a document in which the project team addresses the effects the construction works will have on the community and its environment, the project team concluded that the ChilcaUno refurbishment works would not interfere with the regular traffic flow of both the roads that connect the community with the plant, and those that connect the plant with the desalination plant. Therefore, the team decided not to build additional access roads, and only use existing ones. The impact that the project might have on the mobility and access to the community was only considered during the construction phase of the project.</p> <p>Regarding the refurbishment of existing roads, the ChilcaUno team worked on three main projects: the renovation of the sidewalks and equipment of the Mariano Ignacio Prado Avenue, the construction of sidewalks along the Juan Pablo II Street, and the repairs to the Antigua Panamericana Sur Avenue. The purpose of these infrastructure works is to improve the quality of life of the members of the Chilca community by making pedestrian transit through the district safer, also avoiding accidents on the roads. The decision-making process the project team followed in order to decide which projects would be constructed took into consideration the feedback from all interested parties, such as the municipal government, the owners and operators of adjacent facilities, amenities, and/or transportation hubs, and the members of the Chilca community.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> Walsh Perú S.A., <i>Descripción y evaluación técnica de los efectos previsibles directos e indirectos, acumulativos y sinérgicos en el ambiente (Peru)</i>, 23. EnerSur, <i>Suplemento Chilcano Mayo 2012 (Chilca, Peru: 2012)</i>, 4-5. Municipalidad Distrital de Chilca, <i>Acuerdo del concejo no. 038 – 2012MDCH (Chilca, Peru: 2012)</i>, 1.

		<p>4. EnerSur, Segundo convenio de cooperación y apoyo voluntario para la ejecución de obras, programas, y proyectos sociales de desarrollo sostenible en el distrito de Chilca (Peru: 2008), 5.</p> <p><u>RECOMMENDATIONS</u> The project team should consider dealing with mobility and access issues by collaborating with members of the Chilca community, local authorities, and owners and operators of adjacent facilities, amenities and/or transportation hubs, both during the construction and operation of the project.</p>
<p>QL2.5 Encourage Alternative Modes of Transportation</p>	<p>1</p>	<p>Improved</p>
		<p>Although the project team does have plans to refurbish two roads adjacent to the ChilcaUno plant in order to increase walkability around the plant, they did not consider improving the accessibility to the site of the project for its employees, encouraging in them the use of non-motorized transportation vehicles. Similarly, no proof was found that during the design phase of the project its location was chosen taking into consideration its proximity to multi-modal transportation facilities.</p>
		<p><u>Source:</u> 1. EnerSur, Suplemento Chilcano Mayo 2012 (Chilca, Peru: 2012), 4-5.</p>
		<p><u>RECOMMENDATIONS</u> The project team should consider creating an assessment of the accessibility of its employees to the site of the plant and use the results to generate a plan to encourage alternative modes of transportation among them.</p>
<p>QL2.6 Improve Site Accessibility, Safety & Wayfinding</p>	<p>0</p>	<p>No score</p>
		<p>No proof could be found in the documents provided by the project owner regarding the implementation of any kind of program to improve the accessibility, safety, and wayfinding in the ChilcaUno plant. They also did not add any design elements that improve access and general security in the area around the project. Nonetheless, the ChilcaUno team does have plans to either refurbish or build sidewalks in two important streets of the Chilca district with the purpose of increasing walkability and therefore the access and security to the area.</p>
		<p><u>Source:</u> 1. EnerSur, Suplemento Chilcano Mayo 2012 (Chilca, Peru: 2012), 4-5.</p>
		<p><u>RECOMMENDATIONS</u> The project team should consider developing appropriate signage for safety and wayfinding, not only inside but also outside of the thermoelectric plant. They should also consider extending this signage to protect sensitive sites, such as the Chilca beach.</p>
<p>QL3.1 Preserve Historic and Cultural Resources</p>	<p>7</p>	<p>Superior</p>
		<p>In 2011, EnerSur commissioned the Peruvian Ministry of Culture to make an evaluation of the area where the ChilcaUno plant, the desalination plant, and the pipe that connects these both are. As a result of this assessment, the Ministry of Culture concluded that there were no archaeological remains to be found in the area where the thermoelectric plant, the desalination plant, and the pipe that connects both are. Nonetheless, an undated document produced by Walsh Perú S.A. in which all aspects—cultural, natural, historical, etc.—about the area around the project are thoroughly reported, describes the existence of archaeological remnants along the path of the desalinated water pipe. This brief but thorough recount explains all crucial aspects about these remnants, from their type and dimensions, to their exact location in a map. In this</p>

		<p>document, Walsh also explains it was “impossible not to cross through” the remnants, since their extension is 6 km along the coastline. It also mentions that these remnants had already been altered and destroyed by the construction of a previous path.</p> <p>On the other hand, the EnerSur team is also sponsoring a project to be undertaken by Professor Peter Eeckhout from the Fondation ULB from Brussels, Belgium to conduct research on and in relation to the archaeological site of Pachacamac located to the south of the city of Lima.</p> <p><u>Source:</u> 1. <i>Ministerio de Cultura del Peru, Certificado de Inexistencia de Restos Arqueológicos Tramo 1 y 2 (2011: Lima, Peru), 4.</i> 2. <i>Ministerio de Cultura del Peru, Certificado de Inexistencia de Restos Arqueológicos Tramo 3 (2011: Lima, Peru), 5-6.</i> 3. <i>Walsh Perú S.A., Descripción el área de influencia (Peru), 37-38.</i> 4. <i>EnerSur, Sponsorship Agreement (Peru: 2015), 1-4.</i></p> <p><u>RECOMMENDATIONS</u> The project is recommended to avoid the damage being inflicted on the archaeological remains along the path of the desalinated water pipe. It is also recommended to create a plan together with the Ministry of Culture to restore these remains.</p>
<p>QL3.2 Preserve Views and Local Character</p>	<p>6</p>	<p>Superior</p> <p>A brief description of the natural landscape around the ChilcaUno plant can be found in the document created by Walsh to describe all of the existing features (both natural and man-made) within the project’s context. Apart from this description, no other document could be found where the project team addresses the views and local character of the area around the project. This section of the document provides limited information, and does not provide a final strategy for how the characteristics of these landscapes will be preserved or enhanced with the construction of the project.</p> <p>Nevertheless, the project team created an environmental management plan named “EcoChilca,” with the end goal of promoting the care and preservation of the natural environment of Chilca. The first activity of the “EcoChilca” program under the name “Beautifying my Neighborhood” consists of improving the public infrastructure of Chilca with the help of individuals from schools, the national police force, firefighters, public institutions, and public dining halls, among others. Although the project team has identified the most important ways in which the project interacts with the local community and helps improve the public infrastructure of the Chilca district, the project team continues to seek opportunities to preserve the local character of the community.</p> <p><u>Source:</u> 1. <i>Walsh Perú S.A., Descripción el área de influencia (Peru), 19-20.</i> 2. <i>EnerSur, Suplemento Chilcano Septiembre 2012 (Chilca, Peru: 2012), 4-5.</i></p> <p><u>RECOMMENDATIONS</u> Although the project has already been built, the ChilcaUno team should consider identifying the most important community views and aspects of the local landscape, and incorporate them into the project design.</p>
<p>QL3.3 Enhance Public Space</p>	<p>6</p>	<p>Superior</p> <p>Committed to improving local infrastructure, the project team agreed they would donate a sum of money to the Chilca municipal government for the latter to use in the improvement of local infrastructure within the district. They also implemented a program with the main objective of improving the sidewalks of two of the most important roads in the Chilca</p>

		<p>district: Mariano Ignacio Prado Avenue, and Juan Pablo II Street. The main goals of these two projects are to improve the conditions of pedestrian traffic, and to decrease the number of accidents, thus improving the quality of life for the members of the Chilca community.</p> <p>In addition to the improvement of existing public spaces, the project team is also supporting the preservation of wildlife refuges, such as the Quebrada Seca and the Yaya beach, both located in the Chilca district. The former is the site along which the project’s water pipes run from the desalination plant to the main ChilcaUno plant. According to a document provided by the project team the original idea was to only install the pipes in the Quebrada Seca, but after visiting the site and realizing its state they decided to bring it back to its original conditions. The latter, the Yaya beach, is a beach in the Chilca district that has seen in the last couple years an increment in its visitor numbers, which has caused for it to be more polluted. The ChilcaUno project seeks to clean it in order to bring it back to its original state.</p> <p><u>Source:</u></p> <ol style="list-style-type: none"> 1. <i>Municipalidad Distrital de Chilca, Acuerdo de concejo no. 048 — 2012-MDCH (Chilca, Peru: 2012), 1.</i> 2. <i>EnerSur, Suplemento Chilcano Mayo 2012 (Chilca, Peru: 2012), 4-5.</i> 3. <i>EnerSur, Recuperación del cauce de la Quebrada Seca de Chilca ciclo combinado de ChilcaUno (Chilca, Peru), 1-4.</i> 4. <i>EnerSur, Proyecto de limpieza Playa Yaya “Promoviendo el Desarrollo Turístico a Través de la Conservación y Protección de Áreas Naturales” (Chilca, Peru: 2014), 1-4.</i> <p><u>RECOMMENDATIONS</u></p> <p>The project team should consider conducting an assessment of the current state of other public spaces such as parks, plazas, and recreational facilities around the site of the thermoelectric plant, the desalinated pipeline, and the desalination plant. Once the team has assessed the state of these areas, they should consider creating plans to preserve, enhance, or restore them. These programs should be created in collaboration with municipal authorities.</p>
<p>QL 4.1- Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)</p>	<p>1</p>	<p>Improved</p> <p>EnerSur did fund a gastronomic fair in the year 2012 organized by the Regional Government of Lima. The main goal of this fair was to fight malnutrition by teaching the women of Chilca how to create dishes that are nutritious and made of local inexpensive products. Regarding the protocols and methodologies implemented by the project team in order to improve the security and health of the communities of the Chilca district, none of these were specially directed toward women and other diverse communities, but rather to the general population (which is addressed in a different credit). An example is in the case of the measures which have implemented during the construction and operations phases of the project, in order to prevent the project from having an impact on the environment, and therefore on the health of the population as a whole.</p> <p><u>Source:</u></p> <ol style="list-style-type: none"> 1. <i>Walsh Perú S.A., Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos (Peru), 5-13.</i> 2. <i>Gobierno Regional de Lima, “Preparando la Navidad con una alimentación nutritiva, creativa y económica” (Lima, Peru: 2012), 2-3.</i> <p><u>RECOMMENDATIONS</u></p> <p>The project team should consider assessing the needs of women and minorities in the Chilca district. It will be also recommended to create programs directed toward fulfilling those needs, and toward improving the quality of life for these groups.</p>

QL4.2 - Stimulate and promote women’s economic empowerment	3	Enhanced
		<p>As part of the program “Aprende y Emprende,” the ChilcaUno team supports women (among all other members of the population) with interest in starting a business of their own. This program lasts four months, and teaches the members of the population of Chilca the basics of starting a business, how to legally establish it, and how to make it competitive. Apart from this initiative, the ChilcaUno team does not specifically implement any programs with the purpose of empowering women by helping them acquire a sustainable way of earning a living, and/or by helping them to develop their abilities.</p>
		<p><u>Source:</u> 1. EnerSur, <i>Suplemento Chilcano Mayo 2013 (Chilca: 2012)</i>, 4-5. 2. Walsh Perú S.A., <i>Plan de relaciones comunitarias (Peru)</i>, 7-8.</p>
		<p><u>RECOMMENDATIONS</u> The project team should consider creating programs with the purpose of improving the quality of life of the women of the Chilca district. In order to do this, they should consider creating programs that teach women sustainable ways of earning a living and that develop their abilities through training. It is also recommended to consider developing strategies to increase the number of women occupying positions in local companies, starting with the number of women working at the plant.</p>
QL4.3 - Improve access and mobility of women and diverse communities (indigenous or afro-descendant peoples)	0	No score
		<p>There is no evidence of the implementation of any programs designed to help improve the access, mobility, and security of women and minorities of the Chilca district. An option could have been for the project team to address the security of public transportation passengers, specifically for women and children, and to assess the state of the routes to access transportation hubs.</p>
		<p><u>Source:</u> N/A</p> <p><u>RECOMMENDATIONS</u> In order to score in this credit, the project team should consider making assessments of the state of transportation hubs and the routes to access them, and also of the mobility patterns of the area. Once they understand these elements, the project team could create programs that address barriers for women and other minorities in the Chilca district.</p>
QL0.0 Innovate Or Exceed Credit Requirements		
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SUB CATEGORY:LEADERSHIP		
	Score	CHILCAUNO THERMOELECTRIC PLANT
LD1.1 Provide Effective Leadership And Commitment	9	Superior
		<p>Through the documents created by Walsh Perú, the project team proofed to have a meaningful commitment to the principles of sustainability. These documents thoroughly describe the 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 the quality of the ChilcaUno operations will not decrease. This leadership and commitment to the principles of sustainability is corroborated by the municipality of Chilca in the contract signed with EnerSur. Proof of the importance of sustainability to EnerSur and the ChilcaUno team can be found in the ChilcaUno, for example in the implementation of the EcoChilca program, aimed at educating the population in general about the care of the natural environment.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> 1. Walsh Perú S.A., Programa de monitoreo del proyecto obra o actividad (Peru), 1-7. 2. Walsh Perú S.A., Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos (Peru), 1-24. 3. Segundo convenio de cooperación y apoyo voluntario para la ejecución de obras, programas y proyectos sociales de desarrollo sostenible en el distrito de Chilca (Peru: 2008), 1-9. 4. EnerSur, Suplemento Chilcano Abril 2012 (Chilca: 2012), 4-5.
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider publishing more of their sustainability activities in the Chilcano newspaper. Some of the statements found in the documents listed above are still very general. The project team should consider revising their programs in order to be more specific about the issue their tackling, how they are doing it, and who or what would benefit from it.</p>
LD1.2 Establish A Sustainability Management System	4	Enhanced
		<p>The ChilcaUno team created a sustainability management policy commensurate with the scope, scale, and complexity of the thermoelectric plant. This management policy can be found throughout various documents created by Walsh Perú, in which they address not only all of the possible negative impacts the project might have on its immediate area during the construction and operations phases, but also its plan to monitor these impacts, and also the measures that could be implemented in cases where there is impact to the natural environment. In these documents, the quality of air, water, and soil are always taken into consideration. In order to ensure that these sustainability programs will continue to be implemented, not only during the construction of the project, but also during its operations phase, the costs of these have been considered by the project team in advance in a document created by Walsh Perú. Nonetheless, it is not clear which members of the organization will be in charge of each of the phases of the sustainability management system.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> 1. Walsh Perú S.A., Programa de monitoreo del proyecto obra o actividad (Peru), 1-7. 2. Walsh Perú S.A., Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos (Peru), 1-24.

		<p>3. Walsh Perú S.A., Costos proyectados del PMA (Peru), 1.</p> <p>RECOMMENDATIONS The ChilcaUno team should consider creating an organizational chart for their sustainability management system, showing what each member of the project will be responsible for. They should also consider not only taking into consideration the impact that the project might have on the natural environment, but also that on the community as well.</p>
<p>LD1.3 Foster Collaboration And Teamwork</p>	<p>0</p>	<p>No score</p>
		<p>The main purpose of this credit is to evaluate the collaboration established between project owner and construction team, and what is the delivery method that was followed in order to establish a collaboration from an early phase of the project. There is no information available to this regard, however the only information provided regarding ChilcaUno’s teamwork is addressed in the Community Relations Plan. In a section of it, the project owner included the code of conduct for the employees of the ChilcaUno plant. Nonetheless, the main purpose of this code of conduct is to avoid for the project to have substantial negative impacts on its natural environment surrounding, not that of optimizing the collaborative processes within the plant, or with other parties involved in the process.</p>
		<p><u>Source:</u> 1. Walsh Perú S.A., Plan de relaciones comunitarias (Peru), 9-10.</p>
		<p>RECOMMENDATIONS The project team should consider assessing all process delivery methods that make the plant work, in order to understand the best ways of collaboration established from the beginning of the project. For the sustainable operation of the project, it is crucial to work in collaboration early on, approaching the project as a set of systems that are interconnected with other systems. The extent of collaboration within the project team and the degree to which project delivery processes incorporate whole systems is crucial to the success of the project team in this area.</p>
<p>LD1.4 Provide For Stakeholder Involvement</p>	<p>5</p>	<p>Enhanced</p>
		<p>The project team, through Walsh Perú created a document intended solely to define the reach of the programs, and social compromises of EnerSur and ChilcaUno with the inhabitants of Chilca. This document starts by establishing an area of influence, and by listing four main responsibilities toward the community; to integrate and interact with the community, to prioritize the needs of the population, to communicate in a transparent and continuous manner, and to create solutions for the population’s issues and needs. In the same document, it is stated that the involvement of stakeholders in the project would be to play a role in the decision-making process of the ChilcaUno plant, but it does not address whether this would have actually had an impact on its design, or to what extent it is considered by the project owner and project team.</p> <p>The programs established by the project team to identify, engage, and involve stakeholders with the project include the communications program, the public consultation program, the support program for local initiatives, and the temporary local hiring program, among others. All of the programs created by the ChilcaUno team with the purpose of helping the local community are consulted with all stakeholders—including the municipal government and the members of the community—and are a direct response to the community’s most urgent needs. Proof of the implementation of some of these programs can be found in the Chilcano newspaper. For example, in the May, 2013 issue of this newspaper, EnerSur published an article on the beginning of the “Aprende y Emprende” program, designed to teach the members of the population interested in</p>

		<p>starting a business of their own the basics of entrepreneurship. The project team also implemented a series of activities with different members of the community as part of a program designed to promote a culture of protection and conservation of the natural environment.</p>
		<p><u>Source:</u> 1. Walsh Perú S.A., Plan de relaciones comunitarias (Peru), 2-3. 2. Ibid., 3. 3. Ibid., 6-9. 4. Apoyo Comunicación Corporativa, Principales problemas, obras prioritarias, y organizaciones que contribuyen a la zona, 14-21. 5. EnerSur, Suplemento Chilcano Mayo 2013 (Chilca: 2013), 4-5. 6. EnerSur, Ficha del programa EcoChilca (Chilca: 2012), 1-3.</p>
		<p><u>RECOMMENDATIONS</u> Although the design of ChilcaUno has already been finalized, the project team should consider making an assessment of the most urgent community needs, in order to understand if there are any aspects of the design that are not contributing to solutions for these issues. If there is any aspect of the project’s design that is not contributing to the solving of the population’s issues, this aspect should be addressed and re-designed.</p>
<p>LD2.1 Pursue By-Product Synergy Opportunities</p>	<p>0</p>	<p>No score</p> <p>There is no proof that the project team looked to identify and pursue opportunities to use unwanted by-products, discarded materials, and resources from nearby operations in order to reduce the amount of waste produced by their activities, improve the project’s performance, and reduce construction and operations costs.</p> <p><u>Source:</u> N/A</p> <p><u>RECOMMENDATIONS</u> The project team should consider assessing the possible areas of the project in which they can make use of un-wanted products, discarded materials, or resources from other infrastructure projects in the area. Once they have identified these areas of opportunity within the project, they should consider identifying whether materials or resources of this kind can be found in the vicinity of the ChilcaUno plant, and consider negotiating with the managers of those facilities in order to secure their unwanted products to be repurposed into the project.</p>
<p>LD2.2 Improve Infrastructure Integration</p>	<p>7</p>	<p>Superior</p> <p>Until the year 2012, ChilcaUno was a simple cycle plant as it was composed of three gas-fired turbines. During that year the plant underwent a refurbishment through which a steam turbine was added which would take advantage of the hot exhaust gases produced by the original gas-fired turbines; and which would allow for the project to produce 50% more energy than before this addition and transforming it into a combined-cycle plant. The ChilcaUno plant also takes advantage of its location by feeding the three original gas-fired turbines with gas coming from the “Transportadora de Gas del Perú” pipe, which transports gas from the Camisea deposits in Cusco to Lima, and which passes by the plant. The energy produced by this plant is transported through an electric substation to all local power distribution companies.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del proyecto (Peru), 1. 2. “Central Termoeléctrica ChilcaUno: Funcionamiento,” YouTube video, 1:20, posted by “EnerSur ENGIE,” September 22, 2014,</p>

		<p>https://www.youtube.com/watch?v=GyDeMTplQLM. 3. "Central Termoeléctrica ChilcaUno: Funcionamiento," YouTube video, 3:01, posted by "EnerSur ENGIE," September 22, 2014, https://www.youtube.com/watch?v=GyDeMTplQLM</p>
		<p>RECOMMENDATIONS In order to improve the project's integration, the project team should consider not only identifying the existing infrastructure elements within its context, but also the elements which are planned. The team should also consider restoring existing community infrastructure elements if these are not in a good state, and their integration into the operations of the plant would benefit not only the community, but also the efficiency of ChilcaUno. All of these plans should be coordinated with the municipal government and with all members of the community.</p>
LD3.1 Plan For Long-Term Monitoring & Maintenance	3	Enhanced
		The ChilcaUno team has established a monitoring plan with a main goal of establishing the parameters for the project operators to follow in order to maintain the quality of their environmental protection programs and operations in the long term. The monitoring plan is divided into two sections: one designed for the construction phase of the project, and the other for its operations phase. Both of these monitor the working conditions of the equipment, as well as the quality of the air, water, and land. Through another document in which they address the cost of the implementation of these programs in advance, the project team has also made sure that environmental protection, mitigation, and enhancement measures will continue to be implemented over the long term.
		<p><u>Source:</u> 1. Walsh Perú S.A., Programa de monitoreo del proyecto obra o actividad (Peru), 1-7. 2. Walsh Perú S.A., Costos proyectados del PMA (Peru), 1.</p>
		<p>RECOMMENDATIONS The project team should consider further developing their monitoring plan to be more specific about the types of programs, their duration, and the members of the project team involved in their implementation, among other aspects.</p>
LD3.2 Address Conflicting Regulations & Policies	0	No score
		This credit measures the efforts made by the project team to identify and change laws, standards, regulations or policies that may unintentionally create obstacles for the implementation of sustainability goals, objectives, and practices. There was no proof found of collaborative work between the project team and local officials in order to identify and address laws, standards, regulations, or policies that may unintentionally create barriers for the project to achieve high levels of sustainability in their operations.
		<p><u>Source:</u> N/A</p> <p>RECOMMENDATIONS The project team and project owner should consider conducting an assessment of the potential negative impacts caused by the operations of the plant that derive from conflicting regulations and policies. In order to assess these potential conflicts, devise alternatives, and mitigate their effects, the team should work collaboratively with local authorities and regulators.</p>
LD3.3 Extend	6	Superior

<p>Useful Life</p>		<p>By adding a steam turbine to the three previous gas turbines of the original ChilcaUno plant and thus turning the project from a simple cycle to a combined-cycle facility, the ChilcaUno team has shown its compromise to transform this project through a reconfiguration intended to make it more flexible and efficient in the future. In addition, by avoiding to use potable water for the operation of the steam turbine and instead use desalinated water, the project team ensures its operations will not be dependent on this scarce liquid and thus becomes more flexible and resilient to future changes.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del proyecto (Peru), 1.</p> <p>RECOMMENDATIONS Since the project has already been finalized, the project team should consider assessing the type of materials that were chosen for its construction in order to know whether these are easily adaptable for changing configurations, retrofits, or repairs. In order to do this, the project team should consider incorporating full life cycle thinking to their redesign process.</p>
<p>LD0.0 Innovate Or Exceed Credit Requirements</p>		<p>N/A</p>
	<p>34</p>	

CATEGORY II: CLIMATE AND ENVIRONMENT		
RESOURCE ALLOCATION		
	Score	CHILCAUNO THERMOELECTRIC PLANT
RA1.1 Reduce Net Embodied Energy	0	No score
		Embodied energy is defined as the sum of energy that was used in the production of a material or product, including raw material extraction, transport, manufacture, and all the undertaken processes until the material or product is complete and ready. No proof could be found regarding the commitment of the project owner and its team to the procurement of materials that helped reduce the project's net embodied energy from a life cycle energy assessment.
		<u>Source:</u> N/A
		<u>RECOMMENDATIONS</u> Since the transformation of the ChilcaUno project from a simple-cycle to a combined-cycle has already been finalized, the project team should consider finding out an estimate of the net embodied energy of the materials that will be used for the maintenance and operation of the project in its entire life cycle.
RA1.2 Support Sustainable Procurement Practices	0	No score
		This credit measures the percentage of materials sourced from manufacturers who meet sustainable practice requirements, encouraging the procurement of materials that serve to protect human health and the environment, that contain recycled content, and that do not contain hazardous materials in their composition. Although the project has the ISO 9001, ISO 14001 and the OHSAS 18001 certifications, which require a documented quality management system, no document could be found proving the commitment of the project team to obtain materials and equipment from manufacturers and suppliers who implement sustainable practices. The only document in which a sustainable procurement practice is mentioned was created by GDF Suez, but only mentions that this program is destined to build fair and open relationships with suppliers.
		<u>Source:</u> 1. SGS del Perú S.A.C., ISO 9001 (Peru: SGS, 2013), 1. 2. SGS del Perú S.A.C., ISO 14001 (Peru: SGS, 2013), 1. 3. SGS del Perú S.A.C., OHSAS 18001 (Peru: SGS, 2013), 1. 4. GDF Suez, Sustainable Development Policy (Peru: 2012), 1.
		<u>RECOMMENDATIONS</u> Even though the project's construction has already been finalized, the project team should consider defining a viable sustainable procurement program that will ensure the procurement of materials and supplies for the maintenance of the project that will be certified by either reputable third-party accreditations or by standard-setting organizations.
RA1.3 Used	0	No score

<p>Recycled Materials</p>		<p>No document could be found in which the project team makes a specific inventory of all existing materials or structures that may have reuse potential inside or around the site of the project. However, in one of the documents provided by the project team, they do briefly address the issue of reusing materials during the construction and operation of ChilcaUno. They further address this issue in a document created specifically to become a guide for all EnerSur’s employees on how to handle hazardous and non-hazardous solid waste. This document touches upon the type of waste generated in each part of the plant, the minimization in the production of such materials, their proper separation and classification, their reuse, recycling, storage, and transportation inside the plant and to their final destination. All of this is done in compliance with the General Environment Law of Peru.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> Walsh Perú S.A., Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos (Peru), 16-20. EnerSur, Plan de manejo de residuos 2016 (Peru: 2016), 1-45.
		<p><u>RECOMMENDATIONS</u></p> <p>The ChilcaUno team should consider creating a document to address specifically their recycling practices. This document should not only list all existing materials or structures that may have reuse potential, but also explain what each material or structure would be destined for, and finally the percentage of materials being reused or recycled by the project.</p>
<p>RA1.4 Use Regional Materials</p>	<p>0</p>	<p>No score</p>
		<p>This credit measures the percentage of materials used that were sourced within specific distances from the project, encouraging the minimization of transportation costs and impacts while also taking advantage of the regional benefits.</p> <p>No document could be found in which the project team directly addresses the subject of the use of regional materials both during the construction of the project and during its operation. In their sustainable development policy the project team does hint at the idea of supporting the local economy, services, and initiatives. This topic has never directly or further addressed in any other document provided by the project team.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> GDF Suez, Sustainable Development Policy (Peru: 2012), 1.
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider creating a document specifically for their procurement practices of local materials. This document should have a percentage of materials by type and weight sourced within the region of the project.</p>
<p>RA1.5 Divert Waste From Landfills</p>	<p>0</p>	<p>No score</p>
		<p>The ChilcaUno team briefly touches upon their management plan to decrease waste and divert waste from landfills during the construction and operation of the project in one of the documents created by Walsh. In another document created by EnerSur, the company talks in more detail about their overall plan to manage hazardous and non-hazardous waste produced inside the plant. In this document they also address measures to be taken by all employees of the plant in order to minimize the production of waste and ways to recycle and/or reuse this inside the plant and thus divert it from landfills. However, this document does not mention the percentage of waste materials being recycled and/or reused and diverted from landfills and it can therefore not score any points in this credit.</p>
		<p><u>Source:</u></p>

		<ol style="list-style-type: none"> Walsh Perú S.A., Medidas de prevención, mitigación corrección y compensación de impactos ambientales negativos (Peru), 16-20. EnerSur, Plan de manejo de residuos 2016 (Peru: 2016), 1-45.
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider developing a comprehensive waste management plan to reduce waste and thus divert it from landfills and incinerators during Chilca’s operation. It should also consider identifying potential destinations for waste generated on site and quantifying the percentage of waste diverted from landfills.</p>
RA1.6 Reduce Excavated Materials Taken Off Site	0	No score
		No information could be found among the documents provided by the project team regarding their commitment to minimize the movement of soils and other excavated materials taken off-site during the project’s construction.
		<p><u>Source:</u></p> <p>N/A</p>
		<p><u>RECOMMENDATIONS</u></p> <p>N/A</p>
RA1.7 Provide for Deconstruction & Recycling	1	Improved
		The project team created a thorough plan for the potential disassembly or deconstruction of the project at the end of its useful life. Together with Walsh they developed a document specifically to address this issue. In this document they mention more general issues such as the objectives of the plan and address all different stages it would have to go through in order to abandon the site completely once finished. As part of this document they also list the modules in which all parts of this infrastructure project would have to be dismantled. Nonetheless, they do not mention the percentage of materials that could either be easily disassembled or recycled in the future.
		<p><u>Source:</u></p> <p>1. Walsh Perú S.A., Plan de abandono (Peru), 1-6.</p>
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider being more detailed about the future potential of some of the materials to be disassembled and the possible uses they could have after the end of the useful life of the project.</p>
RA2.1 Reduce Energy Consumption	7	Enhanced
		The main objective of this project is to increase the energetic performance of the ChilcaUno plant, which operated before this refurbishment as a simple cycle system. In order to achieve this objective, the project team decided to add a steam turbine to the existing gas turbines of the project, converting it thus into a combined-cycle project. The ChilcaUno steam turbine operates with the steam produced by combining the heat generated by the gas turbines and the water coming from its desalination plant. By doing this, the project team is making sure the project will both increase its energy production and avoid increasing its energy and resources consumption during ChilcaUno’s operation.
		<p><u>Source:</u></p> <p>1. Walsh Perú S.A., Descripción del proyecto (Peru), 1.</p>

		<p><u>RECOMMENDATIONS</u></p> <p>The ChilcaUno team should consider conducting planning and design reviews in order to identify and analyze options for reducing energy consumption during the maintenance of the constructed works. They should also consider conducting a feasibility and cost analysis in order to determine the most effective methods to achieve the reduction of the project’s energy consumption. Once they create reduction programs and implement them, they should consider quantifying the amount of energy being saved.</p>
<p>RA2.2 Use Renewable Energy</p>	<p>0</p>	<p>No score</p>
		<p>No proof could be found regarding the project team’s commitment to meet the energy needs of ChilcaUno both during its construction and operation through renewable energy sources.</p>
		<p><u>Source:</u> N/A</p>
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider figuring out the project’s future annual energy needs broken down by type. Having done this, they should assess how much of those energy needs could be met through renewable energy sources. Finally, they should consider making all necessary changes for this to happen and provide an annual percentage of renewable energy used to meet energy needs.</p>
<p>RA 2.3 Commission & Monitor Energy Systems</p>	<p>11</p>	<p>Conserving</p>
		<p>The ChilcaUno team created a plan to monitor the construction works and later the operation of the project. This plan includes the monitoring of the implementation of measures to improve the environment of Chilca, and the health and security of the inhabitants of the area. According to another document provided by the project team, the third party responsible of monitoring the proper operation of ChilcaUno’s energy systems both during its construction and operation is the OSINERGMIN, an agency that works under the Peruvian National Ministry of Energy and Mines. The job of this agency—among others—is to supervise the fulfillment of the obligations the company acquires in legal contracts by making sure the plant continues to operate efficiently. In addition to the third-party monitoring, the project team created a thorough plan to identify opportunities to increase their energy production by daily, weekly, and monthly monitoring operations of their energy systems done by members of their own team.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> Walsh Perú S.A., Programa de monitoreo del proyecto obra o actividad (Peru), 1-7. OSINERG, Ley del organismo supervisor de inversión de energía - OSINERG (Lima, Peru: 1996), 2. EnerSur, Manual del proceso de despacho de energía eléctrica (Peru: 2014), 1-4.
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider commissioning a third party to monitor the electrical and mechanical systems. They should also consider incorporating advanced monitoring systems in order to enable the project to have more efficient operations.</p>
<p>RA3.1 Protect Fresh Water Availability</p>	<p>17</p>	<p>Conserving</p>
		<p>After conducting a water availability assessment, the project team decided it would not be sustainable for the water needs of the project to be met with fresh water coming from deep wells in the area. Since the refurbishment of the ChilcaUno plant included the addition of a steam turbine that operates with water, one of the main premises of this transformation from a simple cycle into a combined cycle was the use of seawater</p>

		<p>instead of fresh water for its operation. However, since the turbine cannot operate with seawater, the project team incorporated a desalination plant to its processes. On the other side the refrigeration system of the facility does not use water but air, this greatly minimizes the amount of water required for the operation.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del proyecto (Peru), 8.</p> <p><u>RECOMMENDATIONS</u> The project team should consider using desalinated water for all of the processes and operations that take place inside the plant, not only for the operation of the steam turbine.</p>
<p>RA3.2 Reduce Potable Water Consumption</p>	<p>9</p>	<p>Enhanced</p> <p>This credit encourages the reduction of overall potable water consumption in the project and the use of greywater, recycled water, and stormwater to meet water needs as measured by the estimated percentage of water reduced.</p> <p>During the construction of the project, the ChilcaUno team reduced the project’s potable water consumption by acquiring all water from a third party. Around 2,400m3 of water were consumed daily during the project’s construction, all of which were transported to the site of ChilcaUno in road tankers. Afterward, and in response to the increasing energy demand of Peru, the ChilcaUno team decided to increase the project’s capacity by adding a steam turbine to its three existing gas turbines. Since the steam turbine requires the use of potable water for its operation and given that the area where the project is located has a severe water scarcity, the ChilcaUno team decided to build their own desalination plant and use treated seawater for its operation. This first attempt by the project team to reduce the potable water consumption of the project reduces potable water consumption in around 400m3 per day. In addition, the project team decided to build a plant for the treatment of all industrial waters produced by ChilcaUno in order to use these later for irrigation.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del proyecto (Peru), 8-11.</p> <p><u>RECOMMENDATIONS</u> The project team should consider conducting planning and design reviews in order to identify potable water reduction strategies for the operation and maintenance phases of ChilcaUno, considering the use of non-potable water, recycled greywater, and stormwater. After implementing a plan to reduce the potable water consumption of ChilcaUno, the project team should consider quantifying the amount of water being saved.</p>
<p>RA3.3 Monitor Water Systems</p>	<p>6</p>	<p>Superior</p> <p>This credit assesses the procedures incorporated into the design of project systems capable of monitoring water usage in order to study flows, detect leaks to prevent the waste of water, and minimize the embodied energy and emissions associated with its treatment and distribution.</p> <p>The ChilcaUno team together with Walsh Perú created a specific document to address all monitoring plans to be implemented during the construction and operation phases of the project. In this document the project team states that the main objective of these monitoring plans is for these to become a feedback tool for ChilcaUno’s prevention and mitigation measures in order to ameliorate or completely eliminate potential negative impacts the project might have on the environment. By monitoring the water systems, the project team not only complies with the environmental regulations established by the Peruvian Ministry of Energy and Mines (MINEM), but it also ensures that the</p>

		<p>foreseeable negative impacts of the project’s activities on the environment remain under tolerable and acceptable levels. This program includes the monitoring of the quality of the effluent of the desalination plant at the Chilca beach and of the water used for the irrigation of green areas. All of the aforementioned monitoring activities will take place every 3 months. They also establish that the monitoring of the water systems both during the construction and operation of the project would be both done by them and also overseen by the Peruvian National Water Authority as it is established in the National Water Resources Law.</p> <p><i>Source:</i></p> <ol style="list-style-type: none"> Walsh Perú S.A., Programa de monitoreo del proyecto obra o actividad (Peru), 1-6. Congreso de la República, Ley de recursos hídricos (Lima, Peru: 2009), 1-37. <p>RECOMMENDATIONS</p> <p>The project team should consider having a third-party authority periodically monitor their water systems. They should also consider increasing the extent and comprehensiveness of the project’s long term monitoring activities, as well as incorporating the monitoring activities to the operations of the project in order to allow operators to make adjustments in the operations to reduce negative impacts and improve the plant’s efficiency.</p>
RA 0.0 Innovate Or Exceed Credit Requirements		N/A
	51	

NATURAL WORLD		
	Score	CHILCAUNO THERMOELECTRIC PLANT
NW1.1 Preserve Prime Habitat	0	<p>No score</p> <p>This credit rewards projects that make efforts to avoid impacts on sites of high ecological value, defined as “prime habitat”, and those that invest in establishing protective buffer zones.</p> <p>The original construction of the ChilcaUno plant took place in the year 2006 in Chilca, in the Cañete Province 63 kilometers to the southeast of Lima and it s considered as an industrial area, therefore no prime habitat has been identified on the area. The site for the location of the project was originally chosen not only due to its proximity with Lima, but also for its closeness to the Camisea gas pipeline, to the Chilca electrical substation, and to the availability of large extensions of land in the area. Although this area did not use to be considered prime habitat, it did serve as farming land before the area began hosting infrastructure projects. Today, the area where the project is located hosts at least four other large infrastructure projects. In the case of the site of the ChilcaUno project, the intervention to convert it from a simple cycle to a combined cycle</p>

		<p>incorporates a total area of 2.66 hectares of former farming land known as Fundo San José to the original project. It is important to note that the Chilca district does not have any zoning laws. In general, the area where the project is located is defined as a highly intervened zone in which projects are located next to existing roads, and are adjacent to houses, farms, and parcels.</p>
		<p><u>Source:</u> 1. Walsh Perú S.A., Descripción del proyecto (Peru), 1-2. 2. Walsh Perú S.A., Descripción del área de influencia (Peru), 20.</p>
		<p><u>RECOMMENDATIONS</u> Since the construction of the project has already been finished, the project team should consider assessing whether the site of the project is near any area that needs to be preserved. In that case the project team should consider creating a buffer zone between the area to be protected and the site of ChilcaUno. They should also consider assessing the natural habitats around the project in order to understand their current state and decide whether it is pertinent to generate restoration programs for them.</p>
<p>NW1.2 Preserve Wetlands and Surface Water</p>	<p>14</p>	<p>Conserving</p> <p>The Chilca valley is extremely arid, reason for which surface water is almost inexistent. From the beginning of the design process of the transformation of the plant from a simple cycle to a combined cycle, the ChilcaUno team planned not to use potable water for the operation of its steam turbine. This decision was made responding to the potable water shortage in the area where the project is located. Instead, the project team decided to use salt water that it would extract from the Pacific Ocean, which would be treated in a desalination plant and later transported to the ChilcaUno plant. The site for the desalination plant—with an area of around 1.5 hectares—was located around 600 meters away from the sea, in an area next to the coast where one can also find wetlands.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 16-17. 2. Walsh Perú S.A., Descripción del proyecto (Peru), 8. 3. Walsh Perú S.A., Descripción del área de influencia (Peru), 11.</p> <p><u>RECOMMENDATIONS</u> Although the desalination plant has already been built, the project team should consider creating a vegetation and soil protection zone (buffer zone) between the latter and the shoreline, ensuring the protection of the ocean and the wetlands from a possible damage caused by the operations of the plant.</p>
<p>NW1.3 Preserve Prime Farmland</p>	<p>0</p>	<p>No score</p> <p>This credit emphasizes the importance of preserving prime farmland found on the site of infrastructure projects. According to Walsh Perú, the Chilca district does not have any zoning laws. In general, the area where the project is located is defined as a highly intervened zone in which projects are located next to existing roads, and are adjacent to houses, farms, and parcels. Although in the past before this area was populated by infrastructure projects the land was indeed used for farming, since it was never categorized that way, the team could not have planned to preserve prime farmland, therefore is considered out of the scope of this project.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 20.</p> <p><u>RECOMMENDATIONS</u></p>

		<p>Since the construction of this project has already been finalized, the ChilcaUno team should consider assessing the state of any farmland outside the site of the project which they could help restore or preserve.</p>
<p>NW1.4 Avoid Adverse Geology</p>	<p>2</p>	<p>Enhanced</p>
		<p>Together with Walsh Perú, the project team developed an extensive assessment of the site’s geology. In the document titled “Description of the area of influence,” the project team prior to the construction of the project identified all features of the site’s geology that could potentially become a hazard for the plant’s safety. Having done this assessment, the project team concluded that in order to go ahead with the refurbishment works of ChilcaUno they would need to condition the soil on the site, meaning they would have to clear out and excavate the site of the addition in order to reach a stratum adequate for the construction of the foundations. They also created a document identifying different types of hazards—i.e. earthquakes—that might arise both during the construction and the operation of the project and ways to deal with them. Finally, since the area where the project is located is arid, there were no aquifers in the proximity of ChilcaUno to be protected.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 9-10. 2. Walsh Perú S.A., Descripción del proyecto (Peru), 9. 3. Walsh Perú S.A., Plan de congestión y/o restricción temporal (Peru), 10-14. 4. Walsh Perú S.A., Descripción del área de influencia (Peru), 16-17.
		<p><u>RECOMMENDATIONS</u></p> <p>Since the area where the project is located is considered seismic, the project team should consider identifying and delineating earthquake faults.</p>
<p>NW1.5 Preserve Floodplain Functions</p>	<p>5</p>	<p>Enhanced</p>
		<p>By avoiding to build its desalination plant directly on the coastal wetlands “Humedales costeros” by the Chilca beach and instead setting it back, the ChilcaUno team helped preserve their natural functions of the beach and its wetlands and thus maintained the quality of their infiltration and water. Apart from the existence of these wetlands in the area of impact of the project, the ChilcaUno team also identified floodplains parallel to the Chilca ravine. Since Chilca is a highly arid valley with almost no rainfall throughout the year, this ravine would only be flooded in an extraordinary case. Nonetheless, the project team identified and analyzed these and other natural elements of the landscape around ChilcaUno in order to avoid having a negative impact on them and to understand their context.</p>
		<p><u>Source:</u></p> <ol style="list-style-type: none"> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 11-17.
		<p><u>RECOMMENDATIONS</u></p> <p>Depending on the proximity of the Chilca ravine to the project and even though there are very few chances it will be flooded in the future, the project team should consider monitoring its flooding patterns in the short term in order to be prepared for the event of heavy rainfall in the area.</p>
<p>NW1.6 Avoid Unsuitable Development on Steep Slopes</p>	<p>0</p>	<p>No score</p>
		<p>In order to avoid risks from erosion, landslides, and other natural hazards, this credit encourages the protection of steep slopes and hillsides from unsuitable development. This specific subject represented no issue to the ChilcaUno team since the site where the</p>

		<p>project is located in the Chilca valley is situated in the lowest part of its basin at a considerable distance southeast of its hillsides that reach an altitude of 300 meters from the lowest part of the valley.</p>
		<p><u>Source:</u> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 17. 2. Ibid, 12.</p>
		<p><u>RECOMMENDATIONS</u> The ChilcaUno project team should consider following all management practices necessary in order to minimize the possible erosion of its site.</p>
<p>NW1.7 Preserve Greenfields</p>	<p>0</p>	<p>No score</p> <p>Aiming to lessen the adverse impact a project can have on wildlife, this credit rewards projects that select greyfields (considered here as previously developed sites) and/or sites classified as brownfields rather than undeveloped greenfields for their site. Considering that the project is located on an area classified as industrial, no greenfield spaces have been identified.</p> <p>The site of the intervention to convert ChilcaUno from a simple cycle to a combined cycle incorporates a total area of 2.66 hectares of former farming land known as Fundo San José to the original project. In that regard, this project is preserving adjacent greenfields by reusing a former site for farming. Nonetheless, since this credit evaluates the percentage of the project located on a previously developed site or greyfield, the project cannot score any points on it. The area where the project is located is defined as a highly intervened zone in which projects are located next to existing roads, and are adjacent to houses, farms, and parcels, not to previously developed industries.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del proyecto (Peru), 1-2.</p> <p><u>RECOMMENDATIONS</u> If there were any sites in the area around the project classified as grey- or brownfields, (previous developed and already obsolete areas and previous contaminated areas respectively) the project team should consider creating cleanup programs to preserve them.</p>
<p>NW2.1 Manage Stormwater</p>	<p>0</p>	<p>No score</p> <p>This credit measures the infiltration and evaporation capacity of the project site with the intention of minimizing the impact of infrastructure on stormwater runoff. The area where the project is located is a highly arid valley with almost no presence of rain throughout the year. Nonetheless, during exceptionally rainy years, such as those that take place during the presence of the climate phenomenon known as El Niño, the rainwater from the Chilca hills reaches the ocean. Thus, considering that the project's site is located somewhere between the Chilca hills and the ocean, it is important for the project team to make an effort to minimize its impact on the quantity and quality of stormwater runoff. However, the project team states that since that water is used in the highest part of the Chilca basin for agricultural purposes and in addition some of it gets lost due to infiltration and evaporation, even during those exceptional events of heavy rainfall almost no water makes it to the lowest part of the basin where the thermoelectric plant is located. Therefore, the impact of the infrastructure project on the quantity and quality of stormwater's runoff does not apply for this project and therefore it cannot score any points in this credit.</p> <p><u>Source:</u> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 16-17.</p>

		<p><u>RECOMMENDATIONS</u> ChilcaUno team should consider addressing this subject in order to be prepared for the extraordinary case in which rainwater from the Chilca hills would reach the site of the project.</p>
<p>NW2.2 Reduce Pesticides and Fertilizer Impacts</p>	<p>0</p>	<p>No score</p>
		<p>This credit measures the project’s efforts to reduce the use of pesticides and fertilizers on site with the intention to reduce nonpoint-source pollution. This applies to natural landscapes as well as maintenance of green spaces within an urban context. Since the weather in the area where the project is located is arid, the ChilcaUno team has not planned to implement any kind of reforestation program and does not have a large amount of plants and trees in its facilities. Therefore, since pesticides and fertilizers are not used at all by the ChilcaUno team, the project cannot score any points in this credit.</p>
		<p><u>Source:</u> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 16-17.</p>
		<p><u>RECOMMENDATIONS</u> The project team should consider making plans and drawings showing runoff patterns in order to analyze which are areas more vulnerable in case of chemicals or fertilizers usage.</p>
<p>NW2.3 Prevent Surface and Groundwater Contamination</p>	<p>1</p>	<p>Improved</p>
		<p>Since the only surface water body in the proximity of ChilcaUno is the Pacific Ocean and since the project does make use of seawater for its operations, the project team is planning to implement a monitoring program in order to prevent the ocean’s water contamination during the construction and operation of the project. Nonetheless, there are no surface or underground potable water reservoirs to be protected in the vicinity. Despite the lack of surface or groundwater near ChilcaUno, the project team has implemented a spill and leak prevention and response plan to avoid the contamination of the soil, both during the construction and the operation of the project. They also developed a document addressing plans of action for the case of an environmental emergency derived from the spillage or leaking of any type of contaminant.</p>
		<p><u>Source:</u> 1. Walsh Perú S.A., Programa del monitoreo del proyecto obra o actividad (Peru), 3-5. 2. Walsh Perú S.A., Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos (Peru), 11-20. 3. Walsh Perú S.A., Plan de congestión y/o restricción temporal (Peru),13-14.</p>
		<p><u>RECOMMENDATIONS</u> N/A</p>
<p>NW3.1 Preserve Species Biodiversity</p>	<p>2</p>	<p>Improved</p>
		<p>No concrete documentation could be found regarding the programs implemented by the ChilcaUno team to mitigate the adverse impacts the project might have on the natural habitat in which it is inserted and on its species biodiversity. However, a document created by Walsh does briefly mention three measures the project team should implement in order to avoid disturbing the local fauna. These measures include having clearly defined areas both for the construction and operation of the project, and prohibiting the hunting and feeding of local species. On a different document, the</p>

		<p>project team specifically addresses the biodiversity of the area in great detail. In order to generate this document listing all species that inhabit the area around Chilca beach, the project team took a boat and used the total count method counting all of their sightings within 300 metres of their location. During these rounds, the project team experienced six sightings of marine mammals with a total number of 34 individuals observed that correspond to two different types of mammals: sea lions and bottlenose dolphins. In addition, 323 birds were spotted during the full length of this evaluation (November 9 - 12, 2008), 18 of which are classified as marine species and one as continental, which also belongs to 11 genres and 10 families. All of these species were consulted in international listings of endangered animals, in which none appeared. Apart from these animals, the project team also analyzed the seawater by the Chilca beach in order to determine the species biodiversity present in these. Through this evaluation done at shallow and medium-level waters the ChilcaUno team found around 93 different species of algae and plankton.</p> <p><i>Source:</i> 1. Walsh Perú S.A., Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos (Peru), 7-13. 2. Walsh Perú S.A., Descripción del área de influencia (Peru), 22-57.</p> <p>RECOMMENDATIONS The ChilcaUno team should consider using the document created by Walsh Perú, in which it describes the biodiversity of the area to make an assessment of how these are being affected by the presence of the plant. Once they have done this, they should consider creating programs to both help preserve the existing habitats around the project and restore the ones that need it.</p>
<p>NW 3.2 Control Invasive Species</p>	<p>0</p>	<p>No score</p> <p>This credit measures the degree to which projects have taken into consideration the use of appropriate noninvasive species and have made efforts to eliminate existing invasive species.</p> <p>No documentation could be found regarding the efforts made by the ChilcaUno team to use appropriate non-invasive species and control or eliminate existing invasive species inside and around the plant. No proof could be found either of how the plant selection for the green areas inside ChilcaUno was made. There is one document which describes the area of influence of the project, in which native plant species are listed. Nonetheless, since no document addresses the selection of species for the plant’s gardens, no proof could be found whether this list of locally appropriate plants was put to use.</p> <p><i>Source:</i> 1. Walsh Perú S.A., Descripción del área de influencia (Peru), 22-26.</p> <p>RECOMMENDATIONS The project team should consider using only locally appropriate species inside ChilcaUno’s site, using the document listing them as a reference. They should also consider making an assessment in order to know whether invasive species exist, not only inside the site of the project, but also in the habitats around it. If they happened to find invasive species, they should consider creating a plan to actively eliminate them.</p>
<p>NW3.3 Restore Disturbed Soils</p>	<p>0</p>	<p>No score</p> <p>This credit rewards projects that have made significant efforts to restore soils and areas that have been disturbed during the construction phase of the project, and on the excavated land.</p> <p>No documentation regarding the efforts made by the project team to restore soils disturbed during the construction of the project or by previous development to bring</p>

		back its original hydrological or ecological qualities were found.
		<u>Source:</u> N/A
		<u>RECOMMENDATIONS</u> Documentation of soil restoration activities should be provided. The main objective is to bring back soil functions to their original state before the development of the project.
NW3.4 Maintain wetland and surface water functions.	9	Superior
		Since the area where the project is located is a couple hundred meters away from the ocean whose water it uses for the operation of its steam turbine, the Pacific Ocean and its wetlands are ecosystem functions the project team is planning on maintaining. Thus, they created a document to address the monitoring of the quality of seawater in the beach where their desalination plant is located, which will take place both during the construction and operation of the project. They have also implemented measures to avoid disturbing the beach and its surroundings. The monitoring of the quality of the ocean's water by the Chilca beach is important because the plant does not only take water for its operation from it, but it also returns brine as a result of the desalination process to it. In addition, the ChilcaUno team also analyzed the quality of the sediments in the seawater of the Chilca beach. The samples for this analysis were taken from two main areas of the beach: its shallow waters and its medium-level waters. This analysis allowed the project team to have a previous understanding of the physical and chemical conditions of the sediments in the ocean's water before the beginning of the operations of the project, and thus helped avoiding for ChilcaUno's operations to have a negative impact on the Pacific Ocean waters and its sediment transport. Since there is no legislation in Peru that establishes standards of organic matter and sulfur concentration, or limits to metal concentrations in ocean sediments the project team used the Canadian Environmental Quality Guidelines (CEQGS) as reference.
		<u>Source:</u> 1. Walsh Perú S.A., Programa de monitoreo del proyecto obra o actividad (Peru), 3-5. 2. Walsh Perú S.A., Medidas de prevención, mitigación, corrección y compensación de impactos ambientales negativos (Peru), 12-13. 3. Walsh Perú S.A., Descripción del proyecto (Peru), 8-9. 4. Walsh Perú S.A., Descripción del área de influencia (Peru), 44.
		<u>RECOMMENDATIONS</u> The project team should consider making an assessment of the functions of the ocean and wetlands that are being maintained or restored with their programs, in order to make sure there are no functions that are being left out by these or negatively impacted by ChilcaUno's operations.
NW 0.0 Innovate Or Exceed Credit Requirements		N/A
	33	

CLIMATE AND RISK

	Score	CHILCAUNO THERMOELECTRIC PLANT
CR1.1 Reduce Greenhouse Gas Emissions	13	Superior
		<p>The intent of this credit is to ensure the project team reduces the amount of net greenhouse gas emissions created during the life of the project.</p> <p>The project's transformation into a combined cycle was conceived in order to double the plant's capacity while not increasing its greenhouse gas emissions. If the project team had not decided to increase its capacity by installing a steam turbine and had continued installing turbines operated with gas, like the existing ones, its greenhouse gas emissions would have also almost doubled as it can be seen in one of the documents provided by the project team. Therefore, even though they did not reduce the greenhouse gas emissions ChilcaUno produced before being refurbished, they did plan ahead and avoided to double them which should also count as a reduction.</p>
		<p><u>Source:</u></p> <p><u>1. Generación de emisiones de Central ChilcaUno, 1-2.</u></p>
		<p><u>RECOMMENDATIONS</u></p> <p>The project team should consider implementing a life cycle carbon assessment or a carbon footprint analysis of the ChilcaUno operations. Although the project team mentions that the decision to install a steam turbine was made in order to reduce the greenhouse gas emissions of the plant, there is no information according to the extent of this measure.</p>
CR1.2 Reduce Air Pollutant Emissions	2	Improved
		<p>The intention of this credit is to reduce the emission of pollutants, such as particulate matter (including dust), ground-level ozone and carbon monoxide, sulfur oxides, and lead, as well as noxious odors.</p> <p>According to an evaluation made by the project team, during ChilcaUno's construction the gas emissions registered lower levels than those established by environmental quality standards and would not represent a significative change in the quality of the air. In order to understand the impact the refurbishment of ChilcaUno would have on the quality of the air around the plant, the project team developed a simulation in an atmospheric dispersion model before the construction of ChilcaUno's refurbishment project. In regards to particulate matter, according to the project team although dust would inevitably be released during the construction of the project, its levels would not go beyond environmental quality standards. Similarly, according to the project team the level of emissions of nitrogen dioxide (NO₂) and carbon monoxide (CO) during the operation of the thermoelectric plant would not go beyond the permissible values established by the ECA. In addition, after the completion of the construction of the project, the ChilcaUno team plans to monitor the quality of the air every three months in two specific points: the Chilca and the Papa León XII towns. As a result of this monitoring program, the project team has created documents with charts displaying the CO, NO₂, and O₃ concentrations found in the emissions studied by them.</p>
		<p><u>Source:</u></p> <p>1. Walsh Perú S.A., Descripción y evaluación técnica de los efectos previsibles directos e indirectos, acumulativos y sinérgicos en el ambiente (Peru), 15-18.</p> <p>2. Walsh Perú S.A., Descripción y evaluación técnica, 27-28.</p> <p>3. EnerSur, Informe de Gestión Ambiental Anual del Período 2013 Central Térmica Chilca 1 (Peru: 2013), 37.</p>

		<p><u>RECOMMENDATIONS</u></p> <p>The project is encouraged to look not just at the national standards that apply to the facility in a mandatory manner, but also to include international regulations such as the California Ambient Air Quality Standards, or the sections XI and XIV of the South Coast Air Quality Management Rules (SCAQM) that could raise the bar in terms of air pollutant reductions.</p>
CR2.1 Assess Climate Threat	0	No score
		No information could be found among the documents provided by the project team proving they created a climate impact assessment or an adaptation plan in order to identify potential climate change risks and their possible responses to it.
		<p><u>Source:</u></p> <p>N/A</p>
		<p><u>RECOMMENDATIONS</u></p> <p>Considering that ChilcaUno is so close to the ocean, the project team should consider creating a Climate Threat Assessment or an Adaptation Plan in order to be prepared for climate variation and other natural hazards caused by it. This plan should include the calculation of expected changes in flood elevation or sea rise and an inventory of potential areas of possible inundation.</p>
CR2.2 Avoid Traps And Vulnerabilities	0	No score
		This credit measures the extent to which the project team has assessed potential traps, vulnerabilities and risks due to long-term changes (such as climate change) and measured the degree to which these affect the community. No information could be found regarding any further action to avoid traps and vulnerabilities that could create high, long-term costs and risks for the Chilca community.
		<p><u>Source:</u></p> <p>N/A</p>
		<p><u>RECOMMENDATIONS</u></p> <p>The ChilcaUno team should consider making a thorough assessment of traps, vulnerabilities, and risks due to long-term changes such as climate change. This assessment should preferably be done from the project design phase and together with the authorities and members of the community. In response to this assessment, the project team should consider creating plans to address the potential issues caused by these changes.</p>
CR2.3 Prepare For Long-Term Adaptability	0	No score
		No document could be found showing how the project team prepare the infrastructure systems of ChilcaUno to be resilient to the consequences of long-term climate change, to perform adequately under altered climate conditions, or to adapt to other long-term change scenarios.
		<p><u>Source:</u></p> <p>N/A</p>
		<p><u>RECOMMENDATIONS</u></p> <p>Since the construction of ChilcaUno has already been finalized, the project team should consider making an assessment of the current state of all elements that compose the project in order to</p>

		figure out whether those will be resilient and adaptive to changes and function under altered climate conditions, supply shortfalls, or other significant long-term changes. If any of these elements would not allow for the project to be resilient, the ChilcaUno team should consider making the appropriate changes.
CR2.4 Prepare For Short-Term Hazards	3	Improved
		In a document created with Walsh Perú, the ChilcaUno team lists all potential natural and man-made hazards that could take place in the area of the project both during the construction and during the operation of the plant. However, the project team does not address how the frequency and severity of these disasters might change over the life of the project. This document describes each one of these hazards and also lists the people who would be responsible to control and mitigate them in case they would occur. In this regard, it is also important to consider that many hazards may be worsened by degraded environments, reason why the project team should consider restoring and rehabilitating the natural systems of its context in order to minimize the risks of natural hazards.
		<u>Source:</u> 1. Walsh Perú S.A., Plan de gestión y/o restricción temporal (Peru), 1-20.
		<u>RECOMMENDATIONS</u> The ChilcaUno team should consider going beyond only providing a list of hazards that could potentially occur in the area where the project is located. Instead, they should consider restoring and rehabilitating natural systems—such as the wetlands in the Chilca beach—in order to minimize risks of natural hazards. All actions taken by the project team should aim at strengthening the project against these hazards or allow it to adapt to the impacts caused by these.
CR2.5 Manage Heat Island Effects	0	No score
		The intention of this credit is to encourage the minimization of surfaces with low solar reflectance in order to reduce heat accumulation and manage microclimates. In this regard, the project team created a document to address all effects ChilcaUno would have on its immediate context. Unfortunately, none of these included the localized heat accumulation on hard surfaces, such as rooftops and pavement, which can alter the microclimate around them.
		<u>Source:</u> 1. Walsh Perú S.A., Descripción y evaluación técnica de los efectos previsibles directos e indirectos, acumulativos y sinérgicos en el ambiente (Peru), 1-37.
		<u>RECOMMENDATIONS</u> The project team should make an assessment of all ChilcaUno surfaces in order to figure out whether some of them have a high solar reflectance index (SRI). After doing this, they should consider minimizing these as much as possible in order to reduce localized heat accumulation.
CR0.0 Innovate Or Exc. Credit Requirements		N/A
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CHILCAUNO THERMOELECTRIC PLANT

APPENDIX E: SOURCES

DOCUMENTATION PROVIDED
General Information.
Walsh Perú S.A., <i>Descripción del área de influencia</i> (Peru).
GDF Suez, Peru: <i>Our Activities, Our Commitments</i> (Peru).
Walsh Perú S.A., <i>Plan de relaciones comunitarias</i> (Peru).
EnerSur, <i>Suplemento Chilcano Mayo 2013</i> (Peru: EnerSur, 2013).
EnerSur, <i>Suplemento Chilcano Mayo 2012</i> (Peru: EnerSur, 2012).
Walsh Perú S.A., <i>Medidas de prevención, mitigación, prevención, corrección y compensación de impactos ambientales negativos</i> (Peru).
Walsh Perú S.A., <i>Plan de congestión y/o restricción temporal</i> (Peru).
Walsh Perú S.A., <i>Programa de monitoreo del proyecto obra o actividad</i> (Peru), 3.
Walsh Perú S.A., <i>Descripción y evaluación técnica de los efectos previsible directos e indirectos, acumulativos y sinérgicos en el ambiente</i> (Peru).
Ministerio de Cultura del Peru, <i>Certificado de Inexistencia de Restos Arqueológicos Tramo 1 y 2</i> (2011: Lima, Peru).
Ministerio de Cultura del Peru, <i>Certificado de Inexistencia de Restos Arqueológicos Tramo 3</i> (2011: Lima, Peru).
EnerSur, <i>Suplemento Chilcano Septiembre 2012</i> (Chilca, Peru: 2012).
Segundo convenio de cooperación y apoyo voluntario para la ejecución de obras, programas y proyectos sociales de desarrollo sostenible en el distrito de Chilca (Peru: 2008).
EnerSur, <i>Suplemento Chilcano Abril 2012</i> (Chilca: 2012).
Walsh Perú S.A., <i>Costos proyectados del PMA</i> (Peru).
EnerSur, <i>Ficha del programa EcoChilca</i> (Chilca: 2012).
Walsh Perú S.A., <i>Descripción del proyecto</i> (Peru).
“Central Termoeléctrica ChilcaUno: Funcionamiento,” YouTube video, posted by “EnerSur ENGIE,” September 22, 2014, https://www.youtube.com/watch?v=GyDeMTpIQLM .
SGS del Perú S.A.C., ISO 9001 (Peru: SGS, 2013).
SGS del Perú S.A.C., ISO 14001 (Peru: SGS, 2013).
SGS del Perú S.A.C. , OHSAS 18001 (Peru: SGS, 2013).
GDF Suez, <i>Sustainable Development Policy</i> (Peru: 2012).
Walsh Perú S.A., <i>Plan de abandono</i> (Peru).
Walsh Perú S.A., <i>Descripción y evaluación técnica de los efectos previsible directos e indirectos, acumulativos y sinérgicos en</i>

el ambiente (Peru).
Walsh Perú S.A., Descripción y evaluación técnica.