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8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE PERU



Fig 01: 8 de Agosto hydroelectric plant and 138 kV transmission line
Source: Generación Andina S.A.C.

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EXECUTIVE SUMMARY

The 8 de Agosto hydroelectric power plant and 138 kV transmission line are located in the district of Monzón, Huamalíes province, in the Huánuco region of Peru. This run-of-river hydropower plant is designed to restore the entirety of the water used to produce energy back to the Aucantagua, the river in which it operates, without altering its overall original quality. Its construction, projected to be finished by the beginning of 2016, represents a significant contribution to Peru's efforts to increase renewable energy generation. With an installed capacity of 19 MW and an annual energy generation potential of 140,000 MWh, the project aims to provide long-term access to clean energy to 15 towns across Monzón, a region currently suffering from limited power supply.

The project team, a collaboration between Generación Andina and Union Group, is actively involved in the economic revitalization of communities inside the project's area of direct impact. The team conducted several studies that aimed at understanding the current living conditions of the people in the area, as well as the environmental characteristics of the site. Following this, they implemented numerous in-depth programs with detailed plans for creating new economic opportunities, along with protection of the ecosystem, to achieve sustainable long-term improvement in the quality of life of these communities.

To effectively respond to the economic needs of the community, efforts were made to encourage a democratic participation from every local group, entity, and organization with interests in the development of project. The project team was able to collaborate with stakeholders in the implementation of programs to encourage short-term economic growth, including hiring local labor as well as educating farmers on cultivation of alternatives such as coffee and cacao in place of illegal coca growing. The team has also pursued initiatives to increase the quality of education and public health in existing elementary schools and medical centers respectively. To keep strengthening community relations, public participation and feedback will be extended throughout the project's lifespan to aid identification of and responsiveness to current socioeconomic challenges. Overall, the economic prospects provided both directly and indirectly by this project are also likely to draw new migrants into the area.

Policies that address social responsibility, safety, and environmental sustainability are integrated into the company's principles. These are further explained in community workshops where public statements of sustainable plans by the project team leadership, along with collaboration goals with government authorities, are shared with the community. The project team also shows a clear line of authority that not only facilitates proper delegation inside the company but clearly prioritizes objectives and goals aligned with current community needs.

Moreover, its sustainable business approach takes into consideration the importance of negotiating transparent transactions that clearly outline the obligation of the project owner and stakeholders to the community and the project's related activities. The management team not only incorporated these philosophies into their comprehensive investment plans, which included in-depth studies and cost estimates for the implementation of proper monitoring and maintenance of the project's infrastructure, but prioritized the creation of environmental programs for restoring physical and biological on-site resources.

As a development based on a renewable energy resource, this project will contribute to expanding the regional electric grid while incorporating its own energy production into the daily operational energy demands of the project. Through the implementation of different hydrological monitoring systems, the project seeks to register and analyze the current condition of the Aucantagua river, including its nominal flow, abnormal discharges, temperature, oxygen and pH levels, and the increase of sediments (among others), to protect the quality of water and preserve its original biodiversity. To minimize any adverse impact on human health and the environment, the project's environmental subprograms have been designed to address the need to protect surface and groundwater resources, and the importance of reusing excavated soils to revegetate deforested areas.

Due to its direct contact with the Aucantagua, the project team studied the impact its infrastructure would have on the wider ecosystem of the area. In response to this study, the project was designed to make only a limited use of the river's water, with a main focus on restoring the presence of fish species that were predicted to be impacted in the near future during the operation phase of the station. With respect to agriculture, the project contributes to reducing the amount of land close to the water's edge dedicated to crop farming, which tends to increase the chance of water pollution from runoff of agricultural chemicals. Similarly, in terms of revegetation, considerations have been made for the use of plant species that will help to reduce the dependence on fertilizers. A reforestation program is also planned once the on-site construction work is finished.

The evaluation of the 8 de Agosto hydroelectric plant and 138 kV transmission line has shown the project's strengths in terms of making a positive socioeconomic contribution to the community. Robust and comprehensive programs directly and indirectly benefit the people's quality of life through improvements in job development, education, technical training, and access to preventive health programs. While the project generates clean energy and reduces the dependence on polluting fossil fuels, there are still opportunities for improvement worth exploring.

The categories showing the best performance are the ones related to Quality of Life and Resource Allocation, even though they could be further improved by increasing the efforts already ongoing in the project, putting emphasis on clarifying long-term sustainable goals, and tackling areas that the project team has not addressed yet. In the category of Quality of Life, these include considerations on how education can promote development-centered job creation, improving existing public spaces to enhance community livability, and addressing the specific economic demands of women and indigenous groups. In regard to Resource Allocation, the project could take advantage of recommended initiatives related to selecting material suppliers that support sustainable practices, decreasing embodied carbon emissions connected to the extraction of virgin materials by substituting recycled ones, determining effective methods for reducing the use of potable water, and considering ways to reuse its own components once the project reaches the end of its useful life.

The categories with the largest opportunities for improvement are Leadership, Natural World, and Climate and Risk. The project needs to clarify its project delivery method and include its risk-reward sharing strategies into the contract. To strengthen the efforts in the Leadership category, the project team could identify outdated standards and policies that could hinder the integration of sustainable practices in the project, and consider the importance of extending the useful life of the project by allowing for infrastructural flexibility and multiple use reconfiguration. In the category of Natural World, more environmental awareness is crucial. For instance, the project's relationship with farmlands could be improved by combining a strong social agenda with an environmental program that addresses the intrinsic impacts of human activities on natural landscapes. Strengthening ties with national institutions could help the project team in improving living and working conditions of the community's inhabitants as well as preserving the natural quality of the ecosystem, further reinforcing its unique environmental value and character.

Finally, in the category of Climate and Risk more detailed strategies are needed in developing a long-term plan to adapt to climate change. A detailed analysis is needed of both short- and long-term threats related to past climate events and their impacts in order to understand future forecasts. These concerns could be translated into design strategies with programs, targeted to both the project and the community, oriented to developing preparedness and resilience in the aftermath of short- and long-term climatic threats and hazards.

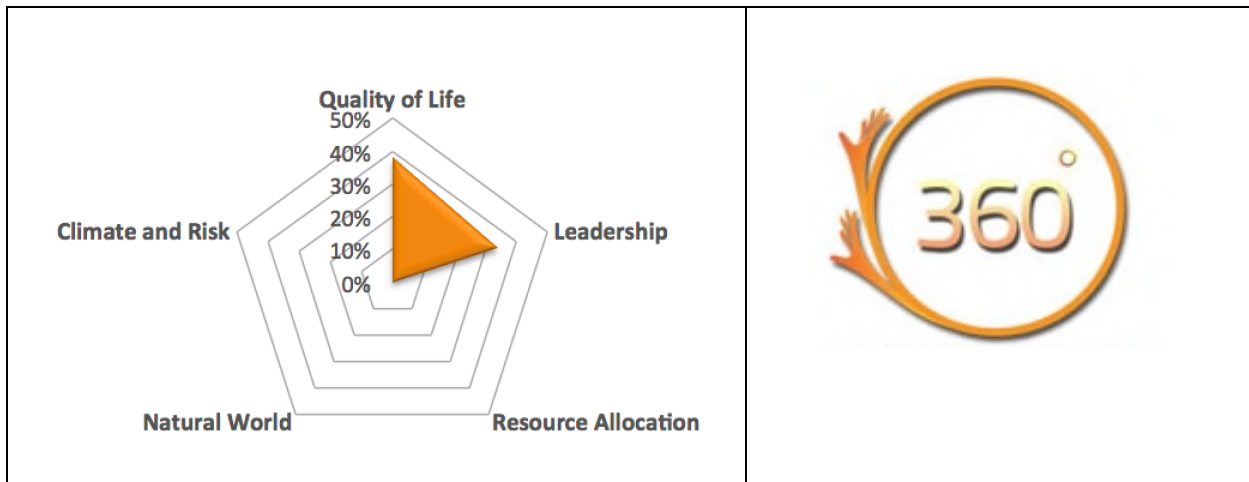


Figure 02: People & Leadership award Summary of results

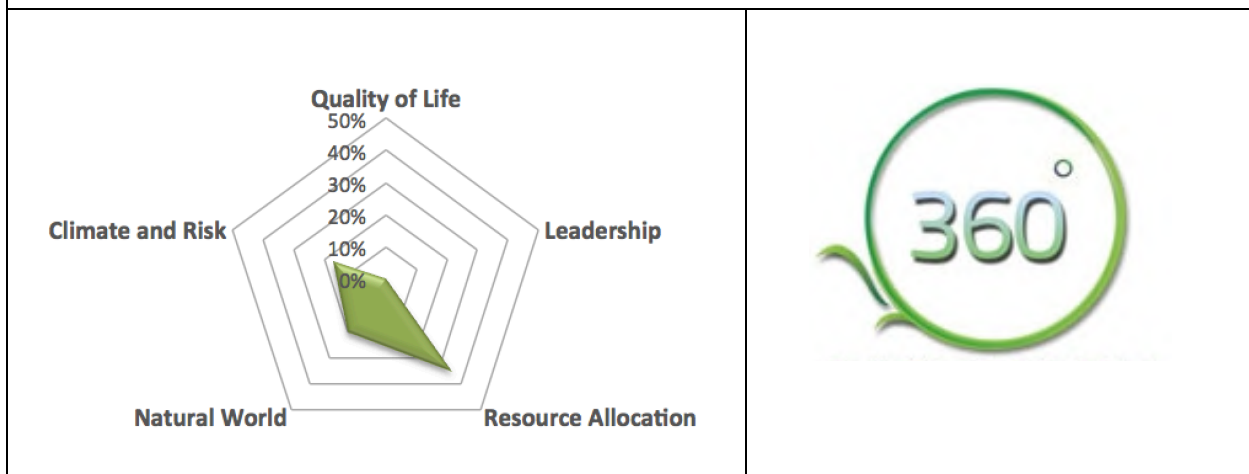


Figure 03: Climate & Environment award Summary of results

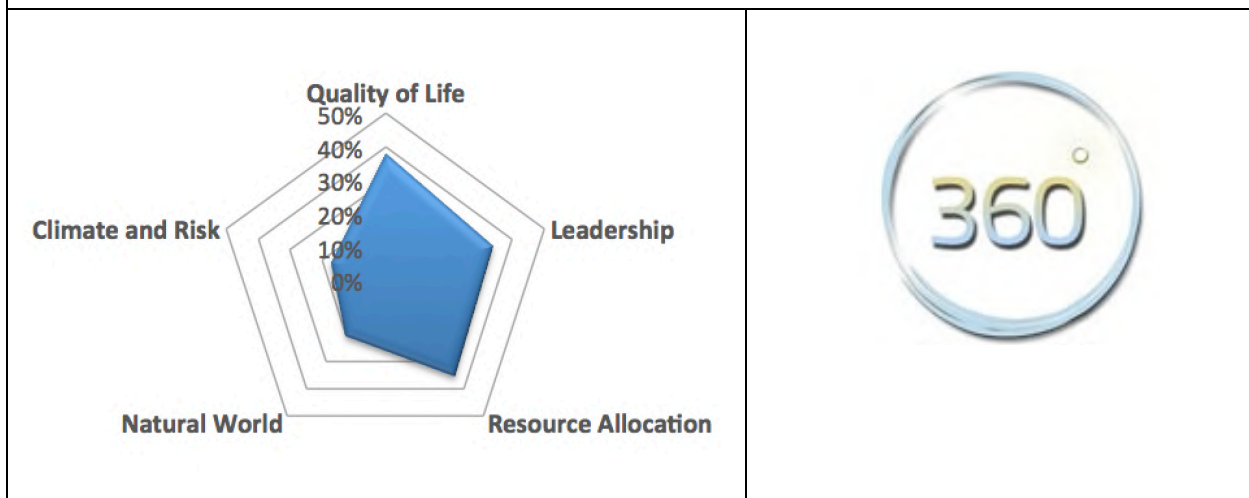


Figure 04: Infrastructure 360 award Summary of results

1. PROJECT DESCRIPTION AND LOCATION

The following case study evaluates the sustainability of the 8 de Agosto hydroelectric power station, which is located in the district of Monzón, Huamalíes province, in the Huánuco region of Peru. The firm of Generación Andina S.A.C. was granted the rights to develop and build the project and is in charge of managing its day-to-day operations and social programs. The project is financially backed by Union Group, a private equity investor interested in businesses that can be collateralized by physical assets in sectors such as energy, natural resources, and infrastructure, among others areas, all operating in Latin America. Project construction began in 2014.¹

Operating on the River Aucantagua, 8 de Agosto is considered a run-of-river hydropower plant that will restore to the river in its entirety the water used to produce renewable energy without altering most of its overall quality composition. The project expects to deliver electricity from an installed capacity of 19 MW, while achieving an annual energy generation potential of 140,000 MWh.² This project is part of a larger El Carmen energy complex, consisting of six hydroelectric plants, all of them located within a 15 km radius of each other, and connected to a substation in Tingo María through a 58.67 km, 138 kV electric transmission line which will harness the water resources of a single basin with a total installed capacity of 55.2 MW.³ Generación Andina is currently finishing construction on two of them, 8 de Agosto and a small hydroelectric plant also named El Carmen, and expects both to be built by January of 2016.⁴ The other stations are in different stages of development and are estimated to be fully constructed by 2019. It is important to mention that the scope of this report includes both the 8 de Agosto hydroelectric power station as well as the 138 kV electric transmission line, but not the other power plans of the El Carmen complex (except as they relate to the larger social and economic initiatives relating to the overall context of the region).

The 8 de Agosto facility will accommodate two 9.5 MW Francis turbines with a nominal flow of 9 m³/s each, and two power generators with an output of 11.15 MVA and 13.8 kV each. The project expects a total nominal flow of 18 m³/s, and a net drop of 145 m. An investment of US \$49.2 million has been estimated as needed, to be repaid with an offered price of US \$5.39 per kWh. The 138 kV transmission line has an installed capacity of 50 MW. Both the facility and the transmission line are estimated to take two years to construct. The transmission line and the 8 de Agosto power station are slated to open on February 15, 2016. There is a 20-year, dollar-denominated, inflation-linked power purchase agreement with the Peruvian government

¹ Organismo Supervisor de la Inversión en Energía y Minería, Gerencia de Fiscalización Eléctrica, "Central Hidroeléctrica 8 de Agosto," 2015, 1.

² Organismo Supervisor de la Inversión en Energía y Minería, "Supervisión de contratos de proyectos de generación y transmisión de energía eléctrica en construcción," 2015, 23.

³ Generación Andina, "Projects," accessed September 4, 2015, <http://www.gandina.com/en/projects.php>.

⁴ Ibid.

guaranteeing energy sales at US \$54 per MWh.

According to the U.N. Office on Drugs and Crime, recent crackdowns on cocaine production in Colombia have caused many drug cartels to increasingly operate within Peru.⁵ Eradicating production is complicated and presents cultural, economic, and ecological challenges. Many people living in the Andean region identify the coca leaf as part of the Andean culture, having medicinal and religious uses as well as in alleviating hunger and fatigue. This, coupled with the fact that production (clandestinely) boosts local economies, has made it difficult for the government to limit coca production in the country. While Peru possesses diverse climatic zones, the Amazon basin on the eastern side of the Andes has the ideal conditions for growing coca.

In the Huánuco region, which is positioned between vast mountains and the jungle, cocaine production accounts for 58% of its agricultural income.⁶ The Monzón Valley, located on the eastern side of Tingo María, has a higher concentration of coca cultivation than anywhere else in Peru. It is within this context that, once completed, the 8 de Agosto hydroelectric power station, along with the other planned stations that are part of the larger power complex, aims to provide long-term access to clean energy in fifteen towns throughout the Monzón region, which currently suffers from limited power supply. This project will bring much-needed additional capacity to the Peruvian electric grid (Sistema Interconectado Nacional) and reduce its dependence on imported fossil fuel.

Moreover, the project will have a direct economic impact in the Monzón Valley, with 50% of sales taxes being reinvested in the area through hydropower royalties. At least 500 workers were working on the plant at the peak of construction, of whom 50% were to be hired locally. At the same time, this project will create new economic opportunities for a region that has been experiencing a decline in jobs at coca plantations from an increased government effort to eradicate the production of cocaine in the area.

Union Group also plans to continue its support of the local school and clinic, while Generación Andina plans to ensure that favorable labor conditions, prevention of contamination, health and safety concerns, and environmental considerations are properly addressed and implemented within the community.

⁵ BBC News, "Boom-time for Peru's Coca Growers," accessed September 10, 2015, <http://news.bbc.co.uk/2/hi/americas/6901175.stm>.

⁶ Ibid.

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 ISI⁷ and Zofnass Program⁸ websites.

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 project’s impact on functional aspects of the

⁷ www.sustainableinfrastructure.org

⁸ www.zofnass.org

community, such as growth, development, job creation, and the general improvement of quality of life. In that sense, positive outcomes of the project include understanding current community needs through the implementation of plans that encourage public participation, an emphasis on increasing the quality of education in local schools, stimulating economic growth by hiring local labor, and providing programs for alternative agricultural methods focused on the cultivating coffee and cacao plantations in an effort to contribute to the eradication of illegal coca plantations.

In order to provide meaningful solutions for sustainable growth in these communities, the project outlined several studies that measured the consequential social impact it will have on two local towns, Maravillas (400 people) and Aucantagua (120 people), closer to the 8 de Agosto hydroelectric power station.⁹ These studies indicated a lack of improvement in road infrastructure, an impoverished economy based on agriculture with no support being given to local farmers, and deficiencies in the communities' health and education systems. The project team notably concentrated its efforts on improving the overall quality of life of the community through the implementation of programs dedicated to increasing economic development. By September of 2015, labor demand accounted for 179 people being hired.¹⁰ The project had stimulated a reawakening of the hospitality industry, with 10 new hotels in operation in the Monzón area, 7 houses making interior modifications to enter the hospitality industry, and 50 other rooms offered for rent; demand and supply of food also increased, with 15 new restaurants and significant expansion of food trading businesses.¹¹ An educational program is aimed at the schools in communities in the project's direct area of influence. In order to enhanced local communities a Local Development Support Program will be implemented in February 2016. This program will provide training and technical assistance to the residents of several towns in the area of influence regarding crops and improved methods of coffee and cocoa farming.

Since March of 2015, the program hired mathematics and verbal comprehension professors in order to academically reinforce elementary and middle school students in the Maravillas and Monzón areas.¹² It intends to keep running during the operation phase of the project and plans to monitor and evaluate the student body at the beginning and end of each academic year. Suggestions from the community were taken into consideration through the collection of written and oral suggestions in three workshops in three locations each (Tingo María, Maravillas, and Cachacoto), 11 public meetings with identified stakeholders, and two public

⁹ Generación Andina, "Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto," 2015, 5.

¹⁰ *Ibid.*, 6.

¹¹ *Ibid.*, 11–17.

¹² Generación Andina, "Plan de desarrollo comunitario," 2015, 20–21.

hearings open to locals and community representatives.¹³ Initiatives for understanding and proposing solutions to community concerns can be correlated with a 41.9% acceptance rate before construction of the project took place.¹⁴ Generación Andina was also involved in the integration of agricultural programs to revitalize the economy of nearby towns. An agricultural program that administers technical advice for alternative farming methods focused on harvesting coffee, cacao, and tropical fruits is delivered to the local farmers¹⁵ who reside in the area of influence in collaboration with DEVIDA, the government commission that helps to control drug traffic in the region.¹⁶

Statistics provide strong evidence of the population's desire to stay in the area.¹⁷ With the implementation of the 8 de Agosto hydroelectric power plant and 138 kV transmission line, the project offers a visible stimulus to local businesses and economic growth. Opportunities for further growth can emphasize shifting from project-centered job creation to economic-development-centered job creation. Also, restoration and improvement of socioeconomic conditions in the community, as well as rehabilitation of existing infrastructures, can be given a notable importance in creating a community rebirth. Moreover, expanding the technical workshops to interested local groups (besides farmers in the area of influence) can expand a significant agricultural knowledge to other communities in the entire region.

Well-being

The Well-being subcategory evaluates the project's impact on specific areas related to individual comfort, health, and mobility. During construction and operation phases, the physical safety of workers and residents can be ensured through measurements that minimize nuisances (including noise vibrations) to legally acceptable levels. Attention can also be given to the rehabilitation of transportation infrastructure and the enhancement of public and environmental safety.

The project's contingency plan presents an evaluation of environmental risks in the activities undertaken by the company, and is intended to provide procedures and preventive signaling measures for the safety of the personnel, as well as a system of control and monitoring for the management team.¹⁸ The project has also established mitigation measures to protect the air and noise quality with the installation of equipment that keeps noise levels and gas emissions

¹³ Gobierno Regional de Huánuco, "7.0 Plan de participación ciudadana," in "Estudio de impacto ambiental línea de transmisión 138 kV S.E. 8 de Agosto – S.E. Tingo María y SSE – Pequeña C.H. 8 de Agosto 19 MW," 2013, 9.

¹⁴ Gobierno Regional de Huánuco, "4.6 Línea de base social," in "Estudio de impacto ambiental," 113.

¹⁵ Gobierno Regional de Huánuco, "6.6 Plan de relaciones comunitarias," in "Estudio de impacto ambiental," 12–13.

¹⁶ Generación Andina, "Plan de desarrollo comunitario," 14–17.

¹⁷ Gobierno Regional de Huánuco, "4.6 Línea de base social," 15–17.

¹⁸ Gobierno Regional de Huánuco, "6.4 Plan de contingencias," in "Estudio de impacto ambiental."

below what is permitted by law.¹⁹ The aim is to increase safety for the environment, workers, and the public by providing procedures for preventing accidents inside the area of direct influence. For the transmission line, one solution was implemented (among various alternatives studied) to minimize the vegetation and solid waste sliding downhill from the project's site.²⁰ In terms of noise and dust, the project team indicates that a limited amount (permitted by law) will be allowed only in areas where electric towers need to be implemented.²¹ Improvements have been made to local roads close to the site's access area by leveling the ground in order to reduce the travel time (between 30 and 60 minutes on average) from one community to the other.²² A total of nine temporary and two permanent roads were facilitated in the areas closer to the transmission line and hydroelectric power station respectively.²³ A constant monitoring of possible landslides will take place during the construction and operating phase in the project's access roads. The intention of these tri-monthly evaluations is to analyze the cause of the slides and have a registry of occurrences for future reference.

While the project makes efforts to address well-being, there are significant opportunities to further minimize noise and vibration levels aside beyond the conventional legal regulations. A local standard that fits the project's needs should be studied and implemented accordingly. The project can also develop a holistic assessment of its own lighting needs (natural and artificial) as well as how this lighting can affect the natural environment surrounding the project. In terms of encouraging alternative modes of transportation, walkways and trails need to be considered as alternative options in terms of convenience, quality, and safety. If possible, considering new modes of transportation by using the existing natural resources (such as the Aucantagua River) is also recommended.

Community

The Community subcategory analyzes the level of improvement and maintenance in the surroundings of the project. While infrastructure is primarily driven by engineering parameters, its visual and functional impacts should be considered during design. By this standard, the project has missed opportunities to preserve the local character of the community through the preservation of views, the improvement of public space, and the preservation of historical and cultural resources beyond standard processes enforced by law.

The project team complied with the submission of the Certificate of Nonexistent Archaeological Remains (CIRA), and an archaeological monitoring plan was provided to local and regional

¹⁹ Gobierno Regional de Huánuco, "6.0 Estrategia de manejo ambiental," in "Estudio de impacto ambiental."

²⁰ Gobierno Regional de Huánuco, "3.0 Descripción del proyecto de ingeniería," in "Estudio de impacto ambiental," 12–16.

²¹ *Ibid.*, 15.

²² Generación Andina, "Diagnóstico social," 9–12.

²³ Gobierno Regional de Huánuco, "5.0 Caracterización de impacto ambiental," in "Estudio de impacto ambiental," 35, 39.

authorities with the approval of the Ministry of Culture.²⁴ While this indicated that no existing archaeological remains were found on the site, the plan proposes to continue the development of a permanent on-site monitoring evaluation every three months in case new remains are unexpectedly found.²⁵ It should also be noted that the project's program of environmental conservation mentions a subprogram dedicated to the control of environmental landscape, according to which the project's temporary access routes will only use paths where the landscape has previously been manipulated to create walkable pathways.²⁶ However, no further plans are given for the protection or preservation of existing views and characteristic natural features of the site. The project assessment concerned only the direct impact of construction activities on the site, which was considered minor (with a low- to medium-intensity impact), having reversible implications and not producing any cumulative effects.²⁷ The project team has also collaborated by providing topographical data, as well as a general design scheme, for the development of a new park and two plazas in the communities of direct influence to the project, but this is an initiative that will be developed by the regional government and no further action is being taken by the company.²⁸

In terms of preservation of cultural resources, it is recommended to engage public opinion (including stakeholders, local leaders, and agencies) to identify other types of worthwhile historic and cultural resources that can help preserve the community's history. Much of the cultural identity could have an intrinsic relationship with the specific natural landscape features of the site. As such, it is necessary to encourage the project team as well as stakeholders to identify all the areas where such views are found to possibly increase preservation efforts. The project team collaborated with the local government to provide the topographical survey and the preliminary design plans to build two soccer fields in Chipaco and Caunarapa, a sports courts (basketball and soccer) in Maravillas and a park in this same town.

Vulnerable Groups

The Vulnerable Groups subcategory addresses the extent to which the project contributes to the quality of life of women and diverse minority groups through developing opportunities for job growth, improving capacity building, extending public involvement, and bringing access to necessary infrastructure and services, among other factors. Without analyzing such concerns, an infrastructure project may affect its intended beneficiaries differently and can reinforce gender and social inequalities.

²⁴ Ministerio de Cultura, "Certificado de inexistencia de restos arqueológicos," 2013.

²⁵ Ibid., 11–12.

²⁶ Gobierno Regional de Huánuco, "6.0 Estrategia de manejo ambiental," 2, 4; Gobierno Regional de Huánuco, "6.8 Plan de inversiones," in "Estudio de impacto ambiental," 1, 4.

²⁷ Gobierno Regional de Huánuco, "5.0 Caracterización de impacto ambiental."

²⁸ Generación Andina, "Plano de Parque Infantil Chipaco," 2012; Generación Andina, "Plano de Plaza de Armas Chipaco," 2012; Generación Andina, "Plano topográfico de Plaza de Maravillas," 2015.

The project team made efforts to encourage a democratic participation from every local group, entity, and organization interested in the project's development and concerned about its impact on the community.²⁹ While there is a clear representation of women and minority groups in various stakeholder meetings, specific necessities related to their well-being, safety, and economic empowerment were not addressed.³⁰ Moreover, no evidence is provided of the project furthering their particular economic growth in the region. Job creation or additional recruitment efforts during design and construction phases lack further documentation.

These groups often lack access to decision making, resources, land ownership, employment, and technical training. For this reason, it is important to identify and assess their needs and constraints so they can all benefit from the opportunities provided by the project's infrastructure. Opportunities for making positive contributions should include documenting results of meetings with designers, community leaders, and decision makers to provide possible solutions to these issues. The project can also consider participating in gender certification or other national, corporate, or industry gender equity and supplier inclusion initiatives to actively increase women's involvement in the project. Furthermore, it is recommended that the project should consider ways of addressing women and indigenous groups' access to social and economic infrastructure through an adaptive design that would give them better access to healthcare, schools, and job sites.

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 the level of stakeholder involvement in the project to fully capture synergies, savings, and opportunities for innovation. This type of collaboration requires a new level of leadership and commitment from the project team and new methods of managing the process. Encouraging discussion and communication among the various teams of interested parties allows stakeholders to contribute with ideas and perspectives. In that sense,

²⁹ Gobierno Regional de Huánuco, "7.0 Plan de participación ciudadana"; Generación Andina, "Plan de desarrollo comunitario."

³⁰ Generación Andina, "Plan de desarrollo comunitario," 11, 16.

the project team of the 8 de Agosto hydroelectric plant is not only committed to providing the effective leadership required to foster this type of collaboration, but its management system understands the importance of active stakeholder involvement for empowering a sustainable-growth development.

Interested parties were identified by the project team through the creation of a community participation plan approved by the regional government of Huánuco. Among them, 9 public institutions, 9 interested groups, and 24 independent representatives located in the direct area of influence were invited to participate in community meetings, as well as another 28 interested groups considered to be indirectly related to the project.³¹ Since the area is heavily influenced by a local economy based on agricultural demands and/or activities, 61 of the stakeholders involved are related to this industry (approximately 87% of the total).³² In terms of management, within the project team there is a clear indication of tasks, obligations, community responsibilities, environmental intentions, and mission statement that considers all phases and possible impacts of the project.³³ Collaboration is the result of an integration of outside input with inside resources that constantly considers the community perspective. For this, the creation of various social programs (aiming toward an integral development of local sustainability that takes into consideration short- and long-term goals in preventive health, nutrition, education, strengthening the local economy, and enhancing living places) intends to foster collaboration between Generación Andina and the community's residents.³⁴ Policies also address social responsibility, safety, environmental concerns, and sustainability and are integrated into the principles of the programs that are delivered. A plan for sustainable agriculture aims to add value to local production for the entire population of the area of influence.³⁵

The project could achieve more in this category by substantially incorporating community feedback in its decision making. If built properly, transparent relationships can ensure a broader community involvement and will assist in breaking project logjams. Documenting the project delivery method can outline how parties agree to collaborate and share possible risk and expected rewards. It is also necessary to clearly define how stakeholders, through Union Group, are involved in developing sustainable practices on this specific project. A signed document by all parties involved should be provided as evidence that a chartering session was conducted, with a clear commitment to sustainable principles by the project owner, designer, contractor, and operators. A Local Development Support Program will start in February 2016 to provide guidance in good practices at the community level.

³¹ Gobierno Regional de Huánuco, "7.0 Plan de participación ciudadana," 2–9.

³² *Ibid.*

³³ Gobierno Regional de Huánuco, "6.6 Plan de relaciones comunitarias."

³⁴ *Ibid.*

³⁵ *Ibid.*, 1–3; World Bank – International Finance Corporation, "Normas de desempeño sobre sostenibilidad ambiental y social," 2012, 1–2.

Management

The Management subcategory analyzes the project's pursuit of synergies between systems, either within its own physical infrastructure or with other types of larger infrastructure systems. While this requires a new way of managing and understanding the project as a whole, it can reduce overall costs, increase sustainability efforts, extend the useful life of a project, and protect against future problems.

In that sense, the impact of maintaining the physical integrity of the project's infrastructure has been evaluated among its various components (geologic and geomorphologic aspects, climate, hydrology, water, soil, air, and landscape), and new parameters have been established to mitigate negative side effects in the long term. However, the project does not identify opportunities to share operational relationships with other existing infrastructure at the community level. While it improves the area's poor mobility conditions through the rehabilitation of 12 roads, both the project and these roads are limited to their existing boundaries.³⁶ Furthermore, the project team does not include documentation of cost-effective uses of unwanted materials near the site as a way of reducing the overall cost of the project.

Opportunities still exist for further development in this subcategory. For instance, it is recommended to prioritize integrating existing infrastructure at the community level to potentially minimize the project's area of intervention. Creating operational linkages to the project's proposed infrastructure could improve synergies and increase efficiency of processes. It is also encouraged to promote active discussions with managers of nearby facilities to pursue by-product synergy opportunities through the identification of available excess resources at other facilities. This assessment should be done in sufficient depth to determine synergy possibilities and successful applications. Forming relationships with nearby facility managers who provide these resources will lead to successful negotiations for securing long-term supply, and implementation of industrial ecology practices and applications.

Planning

The Planning subcategory addresses a project's understanding of long-term planning issues, such as the regulatory environment and future growth trends in the area. Planning effectively for its own future can reduce costs and streamline the entire project process.

The project team understands the importance of planning for long-term monitoring and maintenance of its infrastructure. As such, it aims to constantly monitor water quality, effluents, sediments, air quality, noise levels, nonionized radiation, soil quality, hydrologic

³⁶ Generación Andina, "Diagnóstico social," 9.

resources, solid waste, and landslide registers, through the designation of a specific subprogram for each category.³⁷ The team is planning to have budget specifically dedicated to maintenance of the hydroelectric power plant and the transmission line, as well as all motorized equipment, storage facilities, permanent and temporary access routes, related mechanical and electrical civil structures, and replacement materials, through the project's operational and abandonment phases.³⁸ The project also acts in accordance with IFC norms and the Principios del Ecuador,³⁹ both of which state that the project should comply with the applicable laws and regulations of the jurisdictions in which it operates. These contractual commitments address compliance with social and environmental regulations as well as the procurement of required legal permits. In other words, the standards of practice applied to the project are followed regardless of their intended purpose or compatibility with sustainable policy goals and objectives; the project team does not address standard regulations that could conflict with sustainable development efforts. Similarly, the project team does not address properly how to extend the useful life of the project's infrastructure. While there are several subprograms that aim to minimize the physical, biological, and socioeconomic impacts to the community and enhance the overall performance of the project,⁴⁰ these do not analyze the possibility of planning for infrastructural flexibility, resilience, and ease of upgrading and expansion. The only indication of future reuse opportunities of certain infrastructural parts and/or secondary facilities is a brief description of the possibility of transferring the project's rights to local authorities and/or third parties.

Given the scope of the project, it is recommended that the owner and the project team meet with legal consultants and regulatory agencies to specifically identify how overall design and construction standards could be adjusted or changed to address new problems arising from sustainability issues. The main intent should be to analyze current approaches and address areas where a change in philosophies can be incorporated. Also, if the project takes into consideration the useful life of its infrastructure, determining key areas where increasing investment will offer a reasonable payback, less of it will need to be replaced. Enhancing the project's durability and resilience will have an effect in the amount of energy, water, and materials required for a rebuild.

³⁷ Gobierno Regional de Huánuco, "6.8 Plan de inversiones," 1–5.

³⁸ Gobierno Regional de Huánuco, "1.0 Resumen ejecutivo," in "Estudio de impacto ambiental."

³⁹ World Bank – International Finance Corporation, "Normas de desempeño sobre sostenibilidad ambiental y social," 1–2; Gobierno Regional de Huánuco, "8.0 Principios del Ecuador," in "Estudio de impacto ambiental."

⁴⁰ Gobierno Regional de Huánuco, "6.8 Plan de inversiones," 1–5.

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

The Materials subcategory evaluates the project team's efforts to minimize the total amount of materials used during construction. Reducing the amount of natural resources that must be extracted and processed, as well as the energy required to produce and transport those materials, should be a primary concern of an infrastructural project of this scope.

In terms of use of regional materials, the project team has installed a small concrete plant inside the storage facilities located in Maravillas in order to meet the volumes required and specifications of concrete production for construction, while greatly reducing the transport distance that would otherwise be required for this main resource.⁴¹ The location of this plant (less than 0.6 km away from the project site) saves it from negative environmental or social implications. Moreover, to minimize the potential impacts to the environment and to the community's health, Generación Andina has identified potential waste sources generated in the company's project. The establishment of a subprogram for solid waste management will be extended throughout its construction, operation, and abandonment phases. It is proposed that hazardous and nonhazardous waste be reduced in overall volume, separated according to their physical, biological, and chemical properties, transported to temporary storage facilities, and finally handed to waste management subcontractors registered with the Main Directorate of Environmental Health for disposal at recycling (in the case of paper, plastic, glass, and metals) or compost facilities (for biodegradable materials that can be placed in organic infill).⁴² This initiative diverts up to 25% of the total project waste from landfills.⁴³ Another program supervises the reuse of excavated soil, proposing to place all usable extracted soil (mainly coming from the construction of electrical towers and the power plant's substructure) in

⁴¹ Gobierno Regional de Huánuco, "6.0 Estrategia de manejo ambiental," 24–29.

⁴² *Ibid.*, 84–102.

⁴³ *Ibid.*, 89–90.

temporary nearby storage areas in order to reuse them in the project site for reforestation, construction of temporary access roads, and/or for later use in revegetating natural landscape in Aucantagua and El Carmen.⁴⁴ The total volume of these deposits accounts for at least 50% of the project's excavated materials.

While the project team makes efforts to use regional and excavated materials, the report indicates a lack of emphasis on reducing the net embodied energy, supporting sustainable procurement practices, using existing recycled materials that might be found from local providers, as well as providing ways to enable future deconstruction of the project's infrastructure for recycling purposes. It is important to note that because of the scale of the project, it is recommended to develop a life cycle energy assessment to estimate the energy of key materials used in the project. The assessment, if performed in accordance with accepted methodologies, will include the required energy for the extraction, transportation, refinement, and manufacture of materials used, until the materials are ready to be transported to the construction site. A viable sustainable procurement program, where policies, criteria, and percentages are indicated for supplier selection, should be defined by the project team. Also, reducing the use of virgin materials will avoid sending useful materials to landfills while decreasing embodied carbon emissions and environmental degradation attributed to their extraction and processing. Using this type of materials will increase the local regional market demand for reused materials, thus helping to implement new sustainable approaches that could expand within the region. It is also important to understand that reducing material use must be balanced with safety, stability, and durability when a project reaches the end of its useful life. Even though the amount of materials disposed or excavation produced is low, the project team needs to consider the reuse or recycling of usable components of the project that can be easily dismantled (such as bricks, blocks, stone, concrete, untreated timber, glass, different types of plastic, metal, paper, and cardboard).

Energy

The Energy subcategory analyzes the use of renewable energy in the project as a means to minimize overall fossil fuel consumption. Reducing the total energy use is crucial if the project aims to meet remaining energy demands through renewable sources whenever possible, greatly reducing the impact on the environment and benefiting the long-term safety and health of the communities through a shift to sustainable practices.

As a project centered on a main hydrology resource, its energy production already comes from a clean energy source. Its contract type is classified as "Renewable energy resource" according

⁴⁴ Ibid., 131–138.

to the Organismo Supervisor de la Inversión en Energía y Minería.⁴⁵ Its annual energy generation potential of 140,000 MWh will provide clean energy to the Peruvian electric grid at a regional level (through connecting to the Sistema Interconectado Nacional) while still applying its own energy production to the daily operational energy demands of the project.⁴⁶ For monitoring of its own energy systems, Dessau, a Canadian engineering construction firm that offers consultation services through its office branch in Peru, has completed an assessment that delineates comprehensive monitoring and maintenance procedures for the proper operation of the project's infrastructure. The scope extends to operational rooms in the hydroelectric power plant, substations along the transmission line's route, hydrometric stations and their monitoring systems registering the Aucantagua's nominal flow and nonstandard variational discharges, as well as sampling stations that send data related to quality of water, effluents, sediments, and hydrobiologic diversity.⁴⁷ Maintenance of equipment during construction and operational phases is completed by trained workers according to regulations established for the operation and management of auxiliary installations, camping areas, equipment and heavy machinery, construction materials, underground excavations, handling of explosives, and cleaning and maintenance of temporary access roads.

According to the project team the construction of an auxiliary transmission line will generate a great reduction in energy consumption, nevertheless the project team does not provide significant evidence about the percentage of energy reduced compared to the business as usual scenario during construction or operation phases. By reducing energy consumption throughout the various phases of the project, the owner can consider multiple savings achieved from a single investment. As such, an appropriate analysis that evaluates options for reducing energy consumption of the constructed works needs to be properly documented, along with methods that could be strategically implemented in the project's design.

Water

The Water subcategory addresses the measures taken by the project team to protect the availability of natural water resources. In a growing population where the consumption of potable water is rapidly increasing, the future of freshwater availability is uncertain. Therefore, it is critical that the project enable ways of reducing overall water use (including potable water), which can be through adaptive reuse alternatives. Monitoring and studying the quality and availability of existing freshwater resources is an important step in validating whether a community's water consumption is in balance with the water's source.

⁴⁵ Organismo Supervisor de la Inversión en Energía y Minería, "Supervisión de contratos de proyectos de generación y transmisión de energía eléctrica en construcción," 2015, pp. 5, 10, 23.

⁴⁶ Gobierno Regional de Huánuco, "3.0 Descripción del proyecto de ingeniería," 2.

⁴⁷ Autoridad Nacional del Agua, Dirección de Gestión de Calidad de los Recursos Hídricos, "Informe técnico N047-2013 al estudio de impacto ambiental de la línea de transmisión 138 kv y pequeña C.H. 8 de Agosto 19 MW," 2013, 5-17.

It is important to remember that this project is a run-of-river hydropower plant. As such, the entirety of the river water used to generate renewable energy is returned to another section of the river without altering most of its overall quality composition. Generación Andina has developed an assessment of the hydrological resources of the basin where the project is located.⁴⁸ This evaluation presents detailed information about the current condition of the rivers Aucantagua, Monzón, El Carmen, and Chinchao. Geographic and climatological information (temperature variations, relative humidity) is studied in relation to the rivers' different altitudes above sea level, as well as during seasonal changes. Data on evaporation, precipitation, flow trends, and unusual discharges is collected at monitoring substations to understand annual behaviors. S&Z S.A.C., a consulting firm that specializes in hydroelectric and thermal stations, concluded that the nominal flow generated through the construction of the project would reach a median annual average of 22.8 m³/s, with a maximum of 27.5 m³/s and a minimum of 18.6 m³/s.⁴⁹ Since the availability of natural water resources is deemed as abundant in the region (with a watershed of 318 km² for the Aucantagua river alone),⁵⁰ and without any significant irrigation activities on either Aucantagua or El Carmen rivers, the team estimated that the project could use 25–50% of the flow to produce a significant amount of renewable energy. Water will be restored back to the river through concrete channels that, because of its location at 1019.28 meters above sea level, will guarantee similar flow conditions to those of the native ecosystem.⁵¹ The project also identified possible risks that might affect the quality of water (both at underground and surface levels) through the contamination of soil from runoff of fuels and lubricants.⁵² In response to this, a subprogram for spill control and management of fuels, waste, and effluents was established, as well as one for the protection of surface and underground water in the project's area of direct influence, during construction, operational, and abandonment activities.⁵³ Through automated stations, these will also closely monitor data related to the natural flow of the river to mitigate future abnormal variations.⁵⁴ Another 11 hydrological stations monitor the river's current condition based on physical and chemical natural characteristics (including oxygen, pH, and temperature levels, among others, and its inorganic, and biologic components). Its performance is controlled by Huming Ingenieros, the independent entity in charge of monitoring the project's hydrologic systems, as indicated in their contract with Generación Andina.⁵⁵ A trimonthly monitoring frequency was adopted during the construction phase, with expected biannual evaluations during the first 5 years of the operational phase (with the option to be extended in years to come). Biannual

⁴⁸ S&Z Consultores, "Estudio definitivo de la Central Hidroeléctrica 8 de Agosto," 2012.

⁴⁹ *Ibid.*, 40–41.

⁵⁰ *Ibid.*, 2–3.

⁵¹ Gobierno Regional de Huánuco, "3.0 Descripción del proyecto de ingeniería," 40, 55–56.

⁵² Gobierno Regional de Huánuco, "5.0 Caracterización de impacto ambiental," 36.

⁵³ Gobierno Regional de Huánuco, "6.0 Estrategia de manejo ambiental," 66–74, 148–154.

⁵⁴ *Ibid.*, 70.

⁵⁵ Gobierno Regional de Huánuco, "6.3 Programa de monitoreo ambiental," in "Estudio de impacto ambiental," 1–4.

monitoring is also expected during abandonment and post-abandonment phases.⁵⁶

However, it is also important to note that due to the reduce amount of people working in the facility – around 10 -the project team does not provide documentation in regard to efforts to reduce the amount of potable water needed for operational activities. No alternatives for treating and/or recycling nonpotable water sources were found in the provided documentation. Even though the amount of potable water is low, it is recommended to develop a feasibility and cost analysis to determine the most effective methods for potable water reduction. The incorporation of such results into the design will have positive long-term effects on the availability of potable water for the community. Advanced recycling and reuse methods (such as capturing stormwater to be reused in multiple functions) are always encouraged. It is necessary to provide evidence of how the project will reduce its potable water consumption for operational activities by comparison with industry norms (by estimating annual water consumption over the life of the project). It is also recommended to indicate calculations showing that the project has a long-term net positive impact on the natural fluctuations of ecosystems, in quality and quantity of water intrusions to groundwater sources, and the efficiency of the project's performance.

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

This subcategory stresses the importance of siting infrastructure to avoid direct and indirect impacts on important ecological areas, especially areas of high ecosystem value or that serve as diverse habitats, such as water bodies, wetlands, or temporary waters. This might be done by establishing buffer zones to protect these natural systems. Further, projects should also seek to preserve areas of geologic or hydrologic value and avoid interrupting environmental cycles.

The project's potential impacts on the soil are significantly lessened by the fact that is not in or close to a prime habitat zone. The location is primarily rural, with two small populated centers close to the future power station: Maravillas and Aucantagua. Over time, the land has continued to be used extensively as farmland. At present this is the chief land use in the area,

⁵⁶ Ibid.

though some of the land is either unproductive or occupied by abandoned crops.⁵⁷ While the location of the power station helps prevent risks of pollution from an extensive use of the land for agriculture, agricultural activity has not introduced any major agents of pollution in this area, so the hydropower station is likely the infrastructure with the biggest impact in the area, which is why it is important to take into consideration its various environmental aspects.⁵⁸ The hydroelectric power station has been generally categorized as from moderate to low impact,⁵⁹ since it includes plans to rehabilitate areas damaged during the construction process and incorporates monitoring plans to keep natural conditions stable.

By its very nature, the project will have a direct effect on the Aucantagua River, a tributary of the Monzón,⁶⁰ and this may have consequences for the wider ecosystem. On a positive note, the project team has made significant efforts with respect to water management, studying the Aucantagua's ecological flows to set limits on the use of water. Also commendable is the existence of plans for restoration of some fish species that may be impacted by the station's operations.⁶¹

The environmental strategies of the project in relation to its site are primarily focused on mitigation and reconstruction rather than generating active improvements to help conserve and leverage the natural conditions of the area. In this sense, the project's relationship with farmlands is crucial, and could be better analyzed in terms of the roles the project could play to reduce any negative environmental effects of agriculture without affecting production.

Land and Water

The Land and Water subcategory calls for minimal impact on existing hydrologic and nutrient cycles. Special care should also be taken to avoid the introduction of contaminants, whether through stormwater runoff or pesticides and fertilizers. It is important to remember that the impact of contamination in water bodies such as rivers and streams is often cumulative, and that each project and site shares responsibility for protecting the water quality within the larger system. With proper foresight, infrastructure can avoid harmful disruptions.

Due to the nature and location of this project, water management plays a crucial role in determining its ecological impact. In the case of stormwater management, programs and handling structures could be designed to capture and reuse stormwater on site as part of a comprehensive water management regime for the project and the area. In relation to the

⁵⁷ Gobierno Regional de Huánuco, "1.0 Resumen ejecutivo," 18–19, 39, 44.

⁵⁸ Gobierno Regional de Huánuco, "4.0 Línea base ambiental del proyecto," in "Estudio de impacto ambiental," 29.

⁵⁹ Gobierno Regional de Huánuco, "5.0 Caracterización de impacto ambiental," 38.

⁶⁰ Gobierno Regional de Huánuco, "4.0 Línea base ambiental del proyecto," 191, 291.

⁶¹ Gobierno Regional de Huánuco, "6.5 Plan de compensación," in "Estudio de impacto ambiental," 7.

project's impact on surface and groundwater it is important to consider the effects of agricultural chemicals, revegetation, and control or possible leaks of toxic substances.⁶² In the case of agriculture, the project might contribute by reducing the amount of land dedicated to crop farming close to the water's edge, which tends to increase the possibility of water pollution due to chemical runoff. It could also help minimize the use of pesticides in these areas. In terms of revegetation, it is important to reduce dependence on fertilizers in the project's revegetation plans,⁶³ for which the use of plant species that require less fertilizer, as well as the components and proportion of chemical fertilizers, should be taken into account.

To prevent surface and groundwater contamination, the team has assessed the current properties of the water⁶⁴ and has made it one of its goals to control and preserve its quality as much as possible throughout development of the project.⁶⁵ In addition to this, the buildings erected for the hydropower plant should be maintained in order to avoid later negative impacts from their removal.⁶⁶

For these reasons, the monitoring program during the phases of construction, operation, and closure is very helpful. In terms of design, preventing contamination of the groundwater and the soil could be achieved through correctly locating equipment and facilities that contain potentially polluting substances, and using water runoff controls to direct the flow and block the spread of toxic substances.⁶⁷

Biodiversity

Infrastructure projects should aspire to reduce negative impacts on natural species and their habitats on and near the site. Projects should avoid introducing invasive species or inadvertently facilitating their spread. Through careful design, infrastructure projects can minimize habitat fragmentation and promote connectivity and animal movement. Species of new vegetation should be carefully selected and be appropriate for the location.

The construction and operation of the 8 de Agosto hydropower station could potentially have negative impacts on biodiversity, particularly on natural habitats. Fish⁶⁸ and bird populations⁶⁹ will suffer the most, while earthmoving is estimated to affect flora to a lesser degree. Because

⁶² Gobierno Regional de Huánuco, "4.0 Línea base ambiental del proyecto," 219, 259, 261, 289.

⁶³ Gobierno Regional de Huánuco, "6.1.7 Programa de manejo ambiental para el medio biológico," in "Estudio de impacto ambiental," 31, 32, 33.

⁶⁴ Gobierno Regional de Huánuco, "2.0 Descripción del proyecto de impacto ambiental," in "Estudio de impacto ambiental," 13.

⁶⁵ Gobierno Regional de Huánuco, "6.0 Estrategia de manejo ambiental," 60, 103.

⁶⁶ Gobierno Regional de Huánuco, "6.7 Plan de abandono," in "Estudio de impacto ambiental," 6.

⁶⁷ Gobierno Regional de Huánuco, "4.5 Línea base ambiental del medio biológico," in "Estudio de impacto ambiental," 1, 40, 84.

⁶⁸ Gobierno Regional de Huánuco, "6.1.7 Programa de manejo ambiental para el medio biológico," 112.

⁶⁹ Gobierno Regional de Huánuco, "1.0 Resumen ejecutivo," 103.

this project is a run-of-river hydropower plant, it is expected that the environmental impacts will be lower than in a reservoir-based hydroelectric project. This type of infrastructure project returns the water used to generate electricity back to the river, reducing the effects on water flow. One notable aspect of this project is that it attempts to regulate land use in order to cope with some of the habitat damage in the area and has plans to reintroduce affected species.⁷⁰ Additionally there are plans to restore the vegetation in all of the directly affected area, bringing it back to its original state. This process will be implemented in multiple iterations.⁷¹ Soil regeneration will use local species in order to control the invasive ones and preserve biodiversity. Water bodies are a fundamental component of ecological functions. The hydroelectric station will make use of almost the full extent of the Aucantagua River up to the Monzón.⁷² This is why the programs to monitor and manage the water quality are so valuable.

To better preserve biodiversity, it is recommended to extend the protection, preservation, mitigation, and restoration areas and plans. The goal is to find an appropriate balance between natural world and infrastructure development based on detailed assessment of the original conditions. Measures should be developed to account for a better hydrologic connection, water quality, habitat maintenance, and sediment transportation, the four water services that should be integrated into the project's considerations. It is estimated that water quality and sediment transportation are preserved. It is worth mentioning that the ultimate goal is to shift from habitat protection to restoration.

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

The goal of this subcategory is to promote the recognition and reduction of dangerous emissions, including greenhouse gas emissions and other dangerous air pollutants, at all stages of the project's life cycle. These emissions can present both short- and long-term risk to the project. Minimizing this risk will help forestall any future problems and extend the project's

⁷⁰ Gobierno Regional de Huánuco, "6.5 Plan de compensación," 7.

⁷¹ Gobierno Regional de Huánuco, "6.1.7 Programa de manejo ambiental para el medio biológico," 33.

⁷² Gobierno Regional de Huánuco, "4.0 Línea base ambiental del proyecto," 191, 291.

useful life. While reduction of greenhouse gas emissions may not have direct consequences for the project, it can help to reduce global climate-related risk, and thus have an effect far beyond the borders of the project.

In order to evaluate the project's contribution to climate change, a carbon life cycle analysis was conducted by the project team,⁷³ the conclusion of which was that carbon emissions are reduced by 100%, corresponding to almost 75,000 tons of CO₂.⁷⁴ Nevertheless, specific information supporting this result has not been provided.

As to greenhouse gas emissions, the project should implement measures to reduce carbon emissions below pre-development levels. An example might be implementing measures to capture more emissions (measured in terms of carbon dioxide equivalent or CO₂e) than the project generates. In the same way, a careful study of pollutant agents such as ground-level ozone, sulfur oxides, nitrogen oxides, and lead in the affected area is important for informing mitigation and restoration actions.

Resilience

Development within natural environments may generate climate-related changes which could have direct impacts on the place, the infrastructure, and the communities surrounding the area. Understanding the types of risks and their probability of occurrence allows the project team to deliver informed design and plans that minimize overall vulnerability by anticipating or adapting to these risks. In this regard, strategies which reduce negative impacts on air quality are necessary because they have a considerable influence on the rest of the ecosystem. This makes reducing toxic gas emissions a fundamental part of this infrastructure project.

Most of the project's plans to reduce emissions and environmental effects are directly tied to proper operation and maintenance of machinery and vehicles,⁷⁵ and the preservation of vegetation that will be restored once the work is finished.⁷⁶ However, Generación Andina does not provide specific information on mitigation and adaptation strategies to address climate change and its effects on the hydroelectric station or the surrounding communities.

The project has great potential for improvement in this subcategory if these concerns⁷⁷ are translated into design strategies and management programs that can make the development

⁷³ Gobierno Regional de Huánuco, "5.0 Caracterización de impacto ambiental," 38, 57, 60, 66, 74.

⁷⁴ Zofnass Program, Data Documentation Sheet (filled for 8 de Agosto hydroelectric power plant and 138 kV transmission line by Generación Andina/Union Group), 2015, 29.

⁷⁵ Gobierno Regional de Huánuco, "5.0 Caracterización de impacto ambiental," 57, 60.

⁷⁶ Gobierno Regional de Huánuco, "6.1.7 Programa de manejo ambiental para el medio biológico," 27.

⁷⁷ Gobierno Regional de Huánuco, "5.0 Caracterización de impacto ambiental," 35.

more resilient. Resilience implies the ability to withstand short-term risks, such as flooding or fires, and the ability to adapt to changing climate conditions in the long term, in order to ensure a longer useful life that simultaneously meets the future needs of the community.

One recommendation is to develop an assessment of the associated long-term risks to inform response plans. It would be beneficial to work with the community to conduct a review of the projected resource demands, resource traps, and vulnerabilities, while at the same time considering possible climate change hazards including increased intensity and frequency of extreme weather events, water scarcity, extended droughts, and increased ambient temperature. Additionally, to help reduce the heat island effect it is important to use materials with high solar reflectance index or to make use of increased vegetation to shade the buildings and the hardscape, while providing cooling via evapotranspiration.

APPENDIX:

APPENDIX A: PROJECT PICTURES AND DRAWINGS



Fig 05: Map of the Monzón district.
Source: Generación Andina S.A.C.

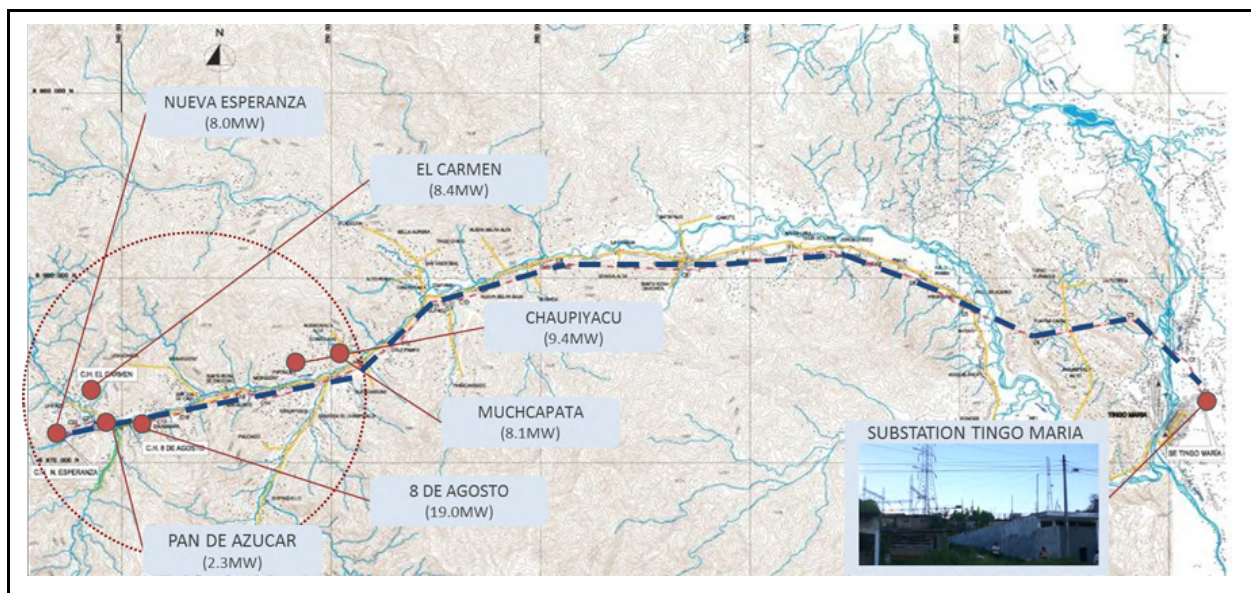


Fig 06: Area of direct influence of El Carmen complex in relation to the 8 de Agosto hydroelectric power plant location and the 138 kV transmission line route.
Source: Generación Andina S.A.C.

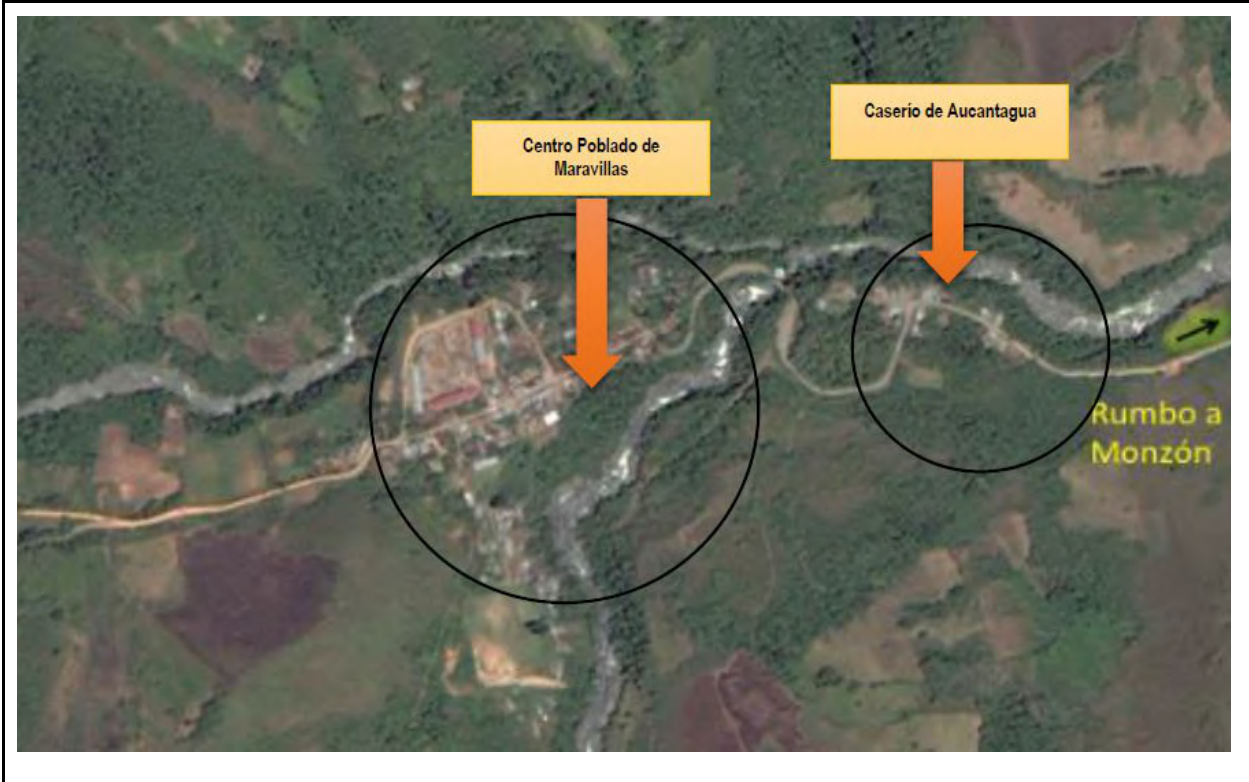


Fig 07: Satellite view of population groups in the ADI.
Source: Google Earth, Huming Ingenieros S.A.C.



Fig 08: View to the right side of the Aucantagua River.
Source: Generación Andina S.A.C.



Fig 09: Intake area, view downstream.
Source: Osinergmin.



Fig 10: On-site construction.
Source: Osinergmin.



Figure 11: Characterization of the landscape's visual components.
Sources: Generación Andina S.A.C.



Figure 12: Landscape of granite mountains inside the ADI.
Sources: Generación Andina S.A.C.



Figure 13: Public hearings at Maravillas.
Sources: Generación Andina S.A.C.



Figure 14: Preventive health and nutrition workshop in Maravillas.
Sources: Generación Andina S.A.C.



Fig 15: Delivery of medicines during a preventive health workshop in Maravillas.
Sources: Generación Andina S.A.C.



Figure 16: Delivery of books for reinforcement classes in Maravillas.
Sources: Generación Andina S.A.C.



Figure 17: Additional reinforcement class in verbal comprehension.
Source: Generación Andina S.A.C.



Figure 18: Topographical variation inside the ADI.
Sources: Generación Andina S.A.C.



Figure 19: Geographic location of 8 de Agosto's engine room.
Sources: Generación Andina S.A.C.



Figure 20: Sampling stage CAG - 01 Aucantagua river.
Sources: Generación Andina S.A.C.



Figure 21: Sampling stage MCAG - 07 Monzon river.
Sources: Generación Andina S.A.C.



Figure 22: Physical presence of human's action on the ADI.
Sources: Generación Andina S.A.C.



Figure 23: Soil constituted by coca crops, which is the major part of the terrain.
Sources: Generación Andina S.A.C.



Figure 24: Rehabilitation of existing roads by project team.
Source: Generación Andina S.A.C.



Figure 25: Units used to irrigate roads.
Source: Generación Andina S.A.C.



Fig 26: Unpaved roads, an existing condition in the ADI, released particles to the atmosphere when heavy vehicles came to the town.
Source: Generación Andina S.A.C.

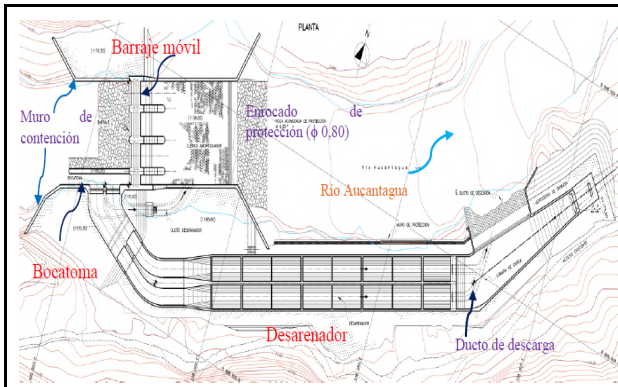


Figure 27: Water egress scheme.
Sources: Generación Andina S.A.C.

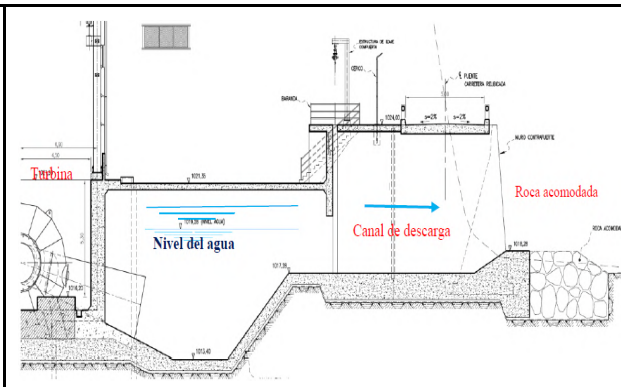


Figure 28: Water discharge scheme.
Sources: Generación Andina S.A.C.



Figure 29: Drainage system built on access road.
Sources: Generación Andina S.A.C.



Figure 30: Tree rescue process.
Sources: Generación Andina S.A.C.

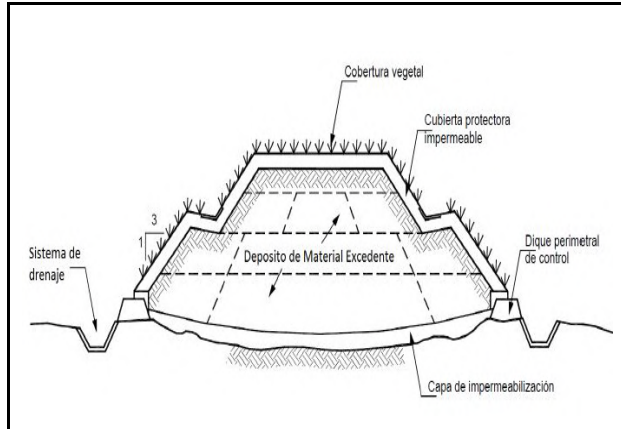


Figure 31: Diagram for excess material deposits (DME).
Sources: Generación Andina S.A.C.



Figure 32: DME landscape revegetation and irrigation system.
Sources: Generación Andina S.A.C.



Figure 33: Little creeks that grow in raining season.
Sources: Generación Andina S.A.C.



Figure 34: Birds with electrocution risk due to non-isolated structures.
Sources: Generación Andina S.A.C.



Figure 35: Company's public information office.
Sources: Generación Andina S.A.C.

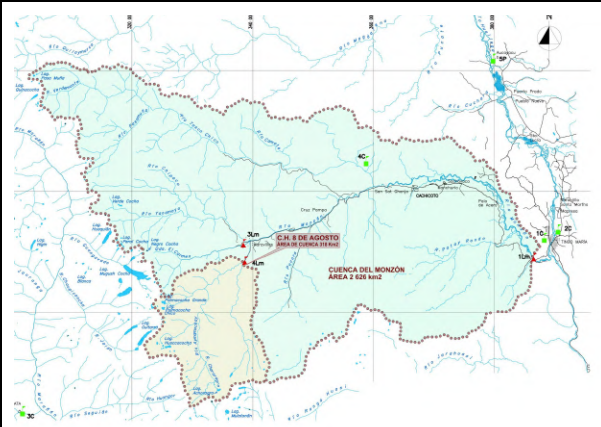


Figure 36: LT8-EIA-027 watershed of interest.
Sources: Generación Andina S.A.C.

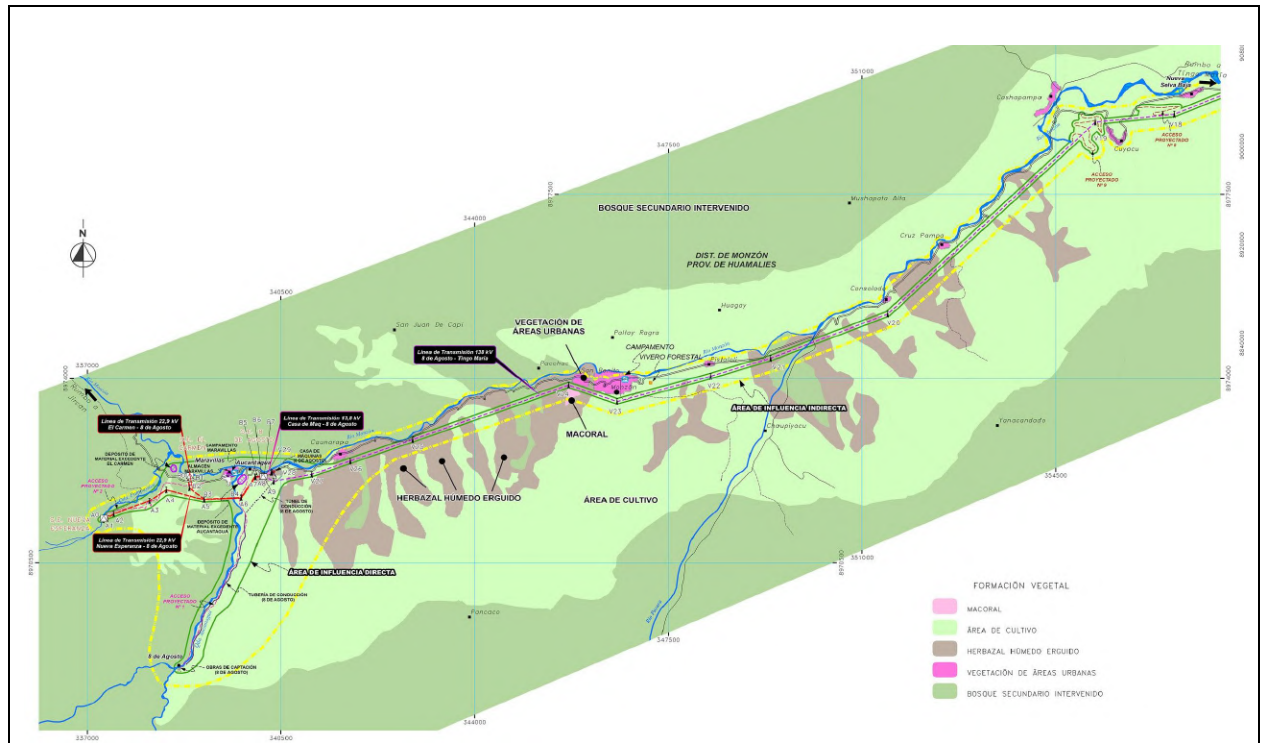


Figure 37: LT8-EIA-057 Vegetal formation map.

Sources: Generación Andina S.A.C.

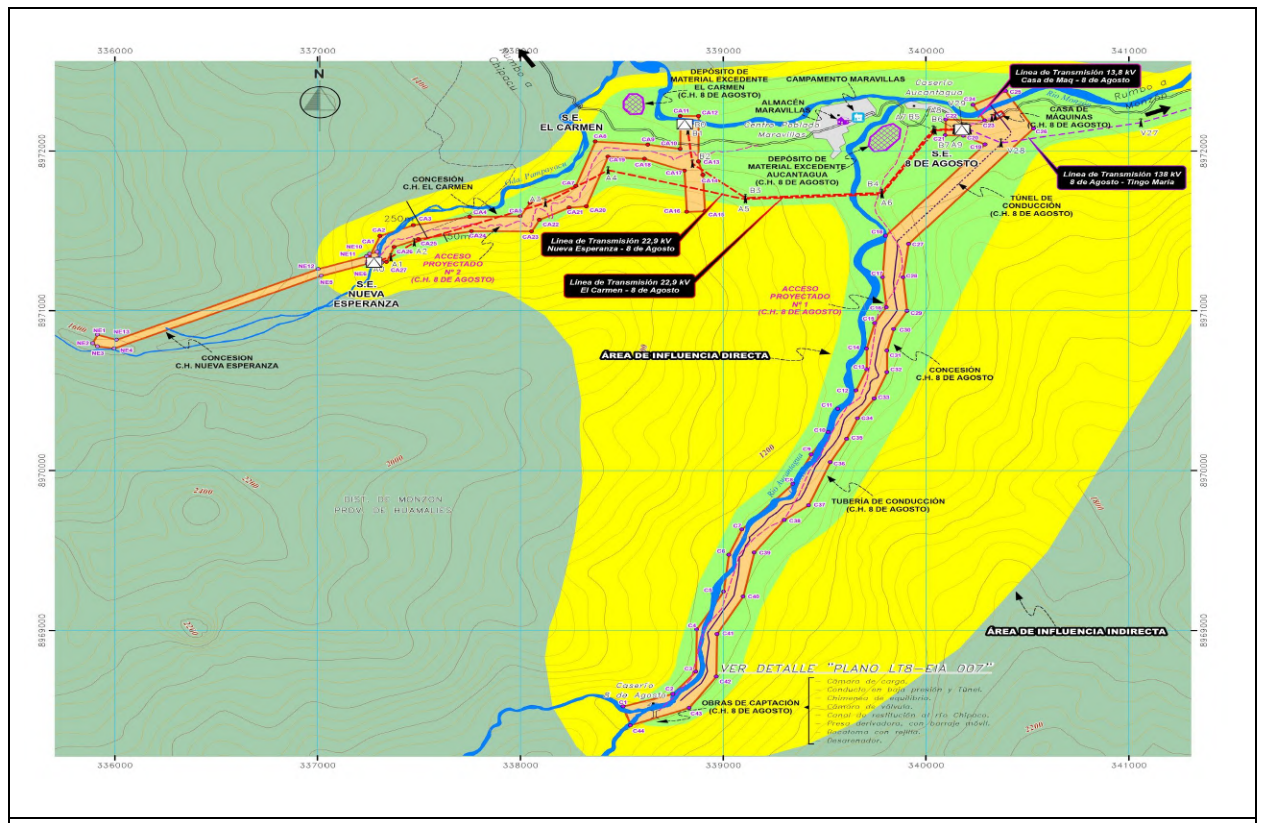


Figure 38: Drainage system built on access road.

Sources: Generación Andina S.A.C.

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 39: 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

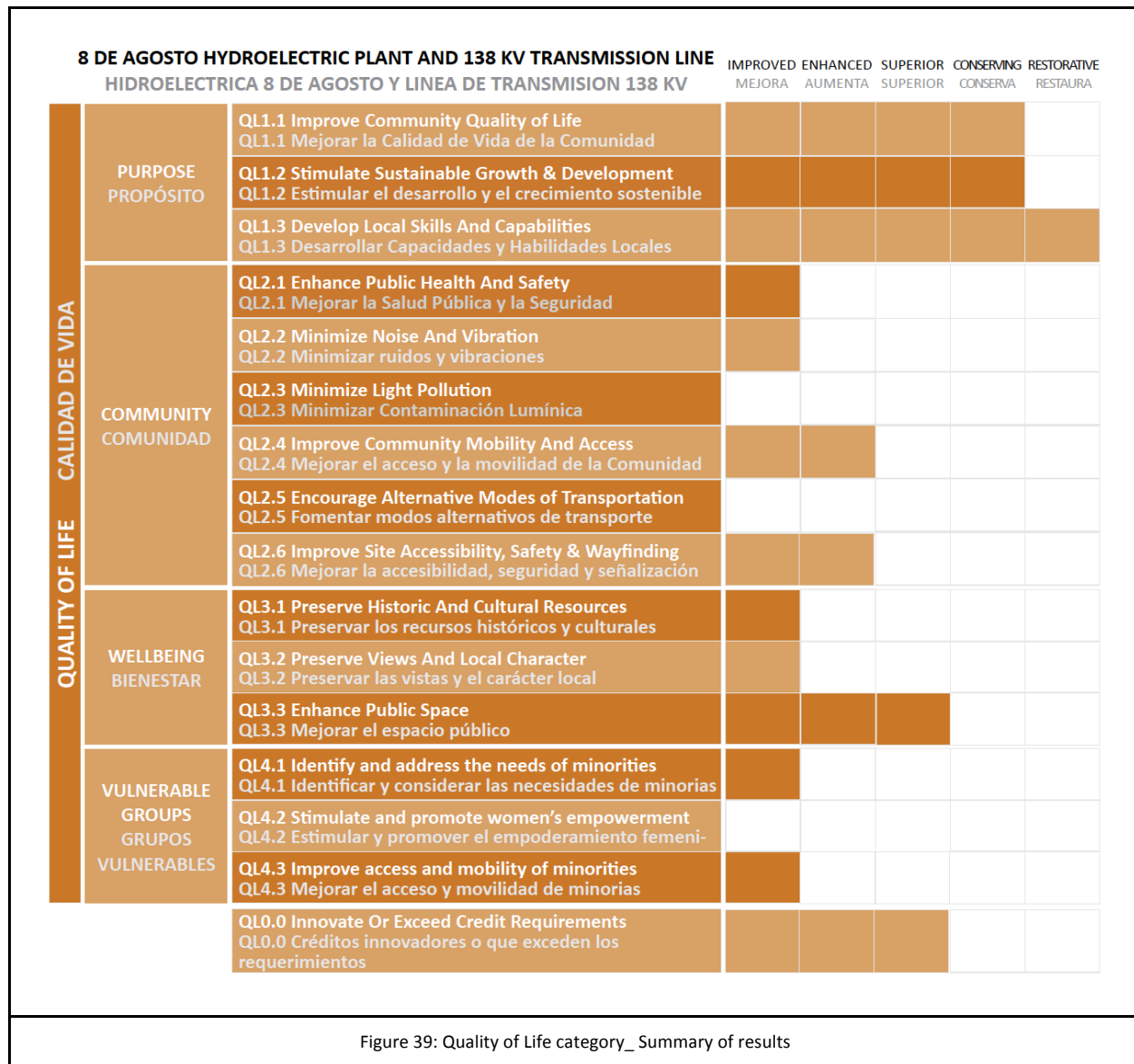


Figure 39: Quality of Life category_ Summary of results

8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE HIDROELECTRICA 8 DE AGOSTO Y LINEA DE TRANSMISION 138 KV			IMPROVED MEJORA	ENHANCED AUMENTA	SUPERIOR SUPERIOR	CONSERVING CONSERVA	RESTORATIVE RESTAURA
LEADERSHIP 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 sostenibilidad					
		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					
	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					
	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 40: Leadership category_ Summary of results

8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE HIDROELECTRICA 8 DE AGOSTO Y LINEA DE TRANSMISION 138 KV			IMPROVED MEJORA	ENHANCED AUMENTA	SUPERIOR SUPERIOR	CONSERVING CONSERVA	RESTORATIVE RESTAURA
RESOURCE ALLOCATION 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					
	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 41: Resource Allocation category_ Summary of results

8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE HIDROELECTRICA 8 DE AGOSTO Y LINEA DE TRANSMISION 138 KV			IMPROVED MEJORA	ENHANCED AUMENTA	SUPERIOR SUPERIOR	CONSERVING CONSERVA	RESTORATIVE 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					
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						
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 42: Natural World category_ Summary of results

8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE HIDROELECTRICA 8 DE AGOSTO Y LINEA DE TRANSMISION 138 KV			IMPROVED MEJORA	ENHANCED AUMENTA	SUPERIOR SUPERIOR	CONSERVING CONSERVA	RESTORATIVE RESTAURA
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						
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 43: Climate & Risk category_ Summary of results

8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU			PT.	Performance
1	PURPOSE	QL1.1 Improve Community Quality of Life	20	Conserving
2		QL1.2 Stimulate Sustainable Growth & Development	13	Conserving
3		QL1.3 Develop Local Skills And Capabilities	15	Restorative
4	COMMUNITY	QL2.1 Enhance Public Health And Safety	2	Improved
5		QL2.2 Minimize Noise And Vibration	1	Improved
6		QL2.3 Minimize Light Pollution	0	No Score
7		QL2.4 Improve Community Mobility And Access	4	Enhanced
8		QL2.5 Encourage Alternative Modes of Transportation	0	No Score
9		QL2.6 Improve Site Accessibility, Safety & Wayfinding	3	Enhanced
10	WELLBEING	QL3.1 Preserve Historic And Cultural Resources	1	Improved
11		QL3.2 Preserve Views And Local Character	1	Improved
12		QL3.3 Enhance Public Space	6	Superior
13	VULNERABLE GROUPS	QL 4.1 Identify and address the needs of women and diverse communities (indigenous or afro-descendant peoples)	1	Improved
14		QL4.2 Stimulate and promote women's economic empowerment	0	No Score
15		QL4.3 Improve access and mobility of women and diverse communities (indigenous or afro-descendant peoples)	1	Improved
		QL0.0 Innovate Or Exceed Credit Requirements	6	N/A
		QL	74	
8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU			PT.	Performance
16	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment	9	Superior
17		LD1.2 Establish A Sustainability Management System	7	Superior
18		LD1.3 Foster Collaboration And Teamwork	4	Enhanced
19		LD1.4 Provide For Stakeholder Involvement	9	Superior
20	MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities	0	No Score
21		LD2.2 Improve Infrastructure Integration	1	Improved
22	PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance	10	Conserving
23		LD3.2 Address Conflicting Regulations & Policies	0	No Score
24		LD3.3 Extend Useful Life	1	Improved
		LD0.0 Innovate Or Exceed Credit Requirements	0	N/A
		LD	41	
8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU			PT.	Performance
25	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	No Score
26		RA1.2 Support Sustainable Procurement Practices	0	No Score
27		RA1.3 Used Recycled Materials	0	No Score
28		RA1.4 Use Regional Materials	3	Improved
29		RA1.5 Divert Waste From Landfills	3	Improved
30		RA1.6 Reduce Excavated Materials Taken Off Site	4	Enhanced
31		RA1.7 Provide for Deconstruction & Recycling	0	No Score
32	ENERGY	RA2.1 Reduce Energy Consumption	0	No Score
33		RA2.2 Reduce Pesticide and Fertilizer Impacts	20	Restorative
34		RA2.3 Commission & Monitor Energy Systems	11	Conserving
35	WATER	RA3.1 Protect Fresh Water Availability	17	Conserving
36		RA3.2 Reduce Potable Water Consumption	0	No Score
37		RA3.3 Monitor Water Systems	6	Superior
		RA0.0 Innovate Or Exceed Credit Requirements	0	N/A
		RA	64	

8 de Agosto Hydroelectric Plant and 138 kv Transmission Line, Peru

8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU			PT.	Performance	
38	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat	9	Superior
39			NW1.2 Preserve Wetlands and Surface Water	0	No Score
40			NW1.3 Preserve Prime Farmland	0	No Score
41			NW1.4 Avoid Adverse Geology	1	Improved
42			NW1.5 Preserve Floodplain Functions	2	Improved
43			NW1.6 Avoid Unsuitable Development on Steep Slopes	0	No Score
44			NW1.7 Preserve Greenfields	3	Improved
45	L & W	NW2.1 Manage Stormwater	0	No Score	
46		NW2.2 Reduce Pesticides and Fertilizer Impacts	1	Improved	
47		NW2.3 Prevent Surface and Groundwater Contamination	4	Enhanced	
48	BIODIVERSITY	NW3.1 Preserve Species Biodiversity	2	Improved	
49		NW3.2 Control Invasive Species	5	Superior	
50		NW3.3 Restore Disturbed Soils	8	Conserving	
51		NW3.4 Maintain Wetland and Surface Water Functions	6	Enhanced	
NW0.0 Innovate or Exceed Credit Requirements			0	N/A	
NW			41		
8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU			PT.	Performance	
52	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions	18	Conserving
53			CR1.2 Reduce Air Pollutant Emissions	0	No Score
54	RESILENCE	CR2.1 Assess Climate Threat	0	No score	
55		CR2.2 Avoid Traps And Vulnerabilities	0	No Score	
56		CR2.3 Prepare For Long-Term Adaptability	0	No Score	
57		CR2.4 Prepare For Short-Term Hazards	3	Improved	
58		CR2.5 Manage Heat Island Effects	0	No Score	
CR0.0 Innovate Or Exceed Credit Requirements			0	N/A	
CR			21		
Total points			241	0	

Figure 44: 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

8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU: CREDIT SPREADSHEET WITH DETAILS

CATEGORY I, PEOPLE AND LEADERSHIP		
SUB CATEGORY: QUALITY OF LIFE		
	Score	8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU
QL1.1 Improve Community Quality of Life	20	<p>Conserving</p> <p>A 2012 survey study showed that 42% of people thought this project would be positive for the community compared with 12% who disagreed (46% declined to comment). In an effort to take into account community needs, the project team outlined several studies to measure the potential social impact on two major local towns closer to the 8 de Agosto hydroelectric power station: Maravillas (population 400) and Aucantagua (population 120). The intent was to establish current socioeconomic context and public concerns, present the project's characteristics and objectives to the community, and provide meaningful solutions for sustainable growth.</p> <p>In line with this, Generación Andina has committed to extend public participation throughout the entire life of the project. A series of proposed community programs will further complement its goals. Written and oral suggestions have been gathered in nine workshops, three in each location (Tingo María, Maravillas, and Cachacoto), as well as two public hearings (Tingo María, Maravillas) making up a total of eleven public meetings. There was an option to keep sending information 30 days after the completion of the events. Concerns from meeting attendees have been answered through the submission of written forms. To facilitate the accessing of information and/or reporting of specific needs in the long-term, two offices have been established: one in Maravillas and the other in Tingo María. Other participative workshops will address ongoing compensation and hiring labor demands as well as target the interest of representatives of educational institutions, health facilities, transportation companies, and farmers. Community relations are constantly monitoring and assessed every three months to forestall or resolve any conflict with the community during the various stages of the project. Generación Andina is also constantly engaging the company staff, stakeholders, local authorities, and nearby towns, to actively participate in initiatives that will benefit the community. In March of 2014 it was predicted that there will be increased immigration from Huánuco and Tingo María to Maravillas and Aucantagua as a result of this project. This additional population could be provide a boost to the local economy. Moreover, the current population does not intend to migrate out of these two towns; in fact, by September of 2015, many of its former residents had actually returned to the region.</p>
		<p><u>Source:</u></p> <p>Gobierno Regional de Huánuco, "4.6 Línea de Base Social in <i>Estudio de Impacto Ambiental Línea de Transmisión</i>" 138 kV S.E. 8 de Agosto – S.E. Tingo María y SSEE–Pequeña C.H. 8 de Agosto 19 MW (2013), p. 113.</p> <p>GRH, "7.0 Participación Ciudadana" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 2-13.</p> <p>Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 13-17.</p> <p>Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 6-11.</p> <p>GRH, "6.6 Plan de Relaciones Comunitarias" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 2-7.</p>
		<p>RECOMMENDATIONS</p> <p>The comments and suggestions made during the community engagement should be published. Issues raised by the community should be assessed rigorously to provide a meaningful analysis of the adverse impacts. It would also be advantageous to have a chart that evaluates in detail the ways in which these concerns are being addressed in the short and long-term for use in future local workshops. Further, the developers should continue to monitor the engagement, and keep track of community attitudes to the project not just in the construction phase, but also throughout its operations. This will aid identification of and responsiveness to ongoing issues and provide a holistic view of community needs. Restoration and improvement of community socio-economic conditions, as well as rehabilitation of existing infrastructure should be prioritized in order to instigate community revitalization.</p>

<p>QL1.2 Stimulate Sustainable Growth & Development</p>	<p>13</p>	<p>Conserving</p> <p>Following the eradication of coca leaf production, the population across the Monzon Valley faced an economic crisis. Sale of this product had been their main source of income. With this in mind, the project sought to generate local employment by hiring local labor during the construction phase. By September 2015, 179 people had been hired to meet the demand for labor, with new hiring selections occurring every 3 months.</p> <p>Before the construction of the project, economic activity had been in decline and many business had opted to close permanently. The presence of the project has increased demand for accommodation, particularly for foreign personnel entering the project’s workforce. As of September 2015, 10 new hotels were in operation in the Monzon area, with 7 houses making interior modifications to enter the hospitality industry, and other 50 rooms being offered for rent. Demand and supply of food has increased with 15 new restaurants and a doubling of food trading businesses across Maravillas, Aucantagua, and Monzón. In order to support local communities, a Local Development Support Program is planned to be implemented in February 2016. This will provide training and technical assistance to the residents of several towns in the area of influence regarding crops and improved methods of coffee and cocoa farming. This new Plan could encourage business attractiveness to the area</p> <p><u>Source:</u> Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 11-12. Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 5-9. GRH, “6.6 Plan de Relaciones Comunitarias” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 18-21.</p> <p>RECOMMENDATIONS</p> <p>It is advisable to consider raising the number of local people hired since they represent roughly 30% of the total employees (179 out of 600 as of September of 2015). Comparing the number of people who are hired for a longer period of time with the 4-month job rotations of local hired people reveals an imbalance against the local employees. Considering ways of extending their contracts and training them for other related jobs which the project demands will help to shift from project-centered job creation to economic development-centered job creation.</p> <p>It is also important to make efforts to improve the hospitality and food industries by enhancing and/or delivering the necessary infrastructure. Restoring cultural and recreational resources will increase the economic productivity and capacity for business, thereby making communities more livable. As related industries can also benefit from this, these improvements will help attract other investors and major businesses.</p>
<p>QL1.3 Develop Local Skills and Capabilities</p>	<p>15</p>	<p>Restorative</p> <p>Technical advice for farming of alternatives such as coffee and cacao as well as tropical fruit has been provided to the local farmers by Generación Andina. This program has been done in collaboration with DEVIDA - a government commission that helps to prevent and control drug trafficking in the region - and is planned to run for the duration of the project’s construction, which is approximately 39 months.</p> <p>Additionally, an educational program is aimed at the schools in the communities inside the area of direct influence (ADI) of the project. Since March 2015, the program has hired mathematics and verbal comprehension teachers in the areas in order to reinforce the academic performance/ skills of elementary and middle school students in Maravillas and Monzon. The program is intended to run throughout the operations phase of the project, with plans to monitor and evaluate the student body at the beginning and end of each academic year. Through periodical exams and consistent monitoring of attendance every three months, it is projected that students will gain at least three points annually on their grade reports. These initiatives are expected to contribute to the long-term competitiveness of the area, well beyond the project focus.</p>

		<p><u>Source:</u> GRH, "6.6 Plan de Relaciones Comunitarias" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 12-15. Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 21-22. Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 20-22. GRH, "4.6 Línea de Base Social" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 25-33. Huming Ingenieros, <i>Resultados obtenidos de los Exámenes a los alumnos beneficiarios del programa educativo</i> (2015), p. 1-8.</p> <p><u>RECOMMENDATIONS</u> Extending the agricultural program to local farmers even after construction is done could have a long-term economic benefits for the region. Moreover, expanding the technical workshops to interested local groups (besides farmers) can help develop significant agricultural knowledge within the entire community. With that, the community will be able to appreciate the importance of growing coffee and/or cacao while eradicating cultivation of the coca plant.</p> <p>The school program should also explain in a more explicit manner how it is addressing community competitiveness in the longer term. This can be achieved by incorporating a curriculum that builds up the proposed educational model and incorporates the development of relevant academic and technical skills in high school students and young adults. It is also recommended that they implement an educational program for adults to gain or reinforce their cognitive skills in order to be able to work in other types of job positions within the project (not just in the lowest categories as laborers) or in other related industries. Specific focus on minority and/or vulnerable groups is also recommended.</p>
<p>QL2.1 Enhance Public Health And Safety</p>	<p>2</p>	<p>Improved The project's contingency plan presents an evaluation of standard hazards and/or risks in the activities undertaken by the company, and is intended to provide procedures and preventive measures for the personnel as well as a system of control and monitoring for the management. All actions taken are to comply with legal requirements for both direct (on-site accidents, structural failures, fires) and indirect (natural disasters, epidemic outbreaks, animal bites, and strikes) hazards. Under Peruvian regulation, detailed reports indicating responsibilities and required actions by contractors and owner are mandatory. This credit evaluates explicit and comprehensive analysis of the implications of new technologies, materials, equipment and methodologies along with the implementation of innovative health and safety measures to mitigate associated risks. While Generación Andina has made efforts to evaluate the current condition of the existing medical center in Maravillas and the first-aid station in Aucantagua, refurbished these facilities and provided an additional health station for the community and construction personnel in 2015, these do not classify as new health measures since the project does not employ new technologies or procedures that require new safety regulations.</p> <p><u>Source:</u> GRH, "6.4 Plan de Contingencias" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 1-3, 9. Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 6-20. GRH, "5.0 Caracterización del Impacto Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 5-6, 22-24. GRH, "6.0 Estrategia de Manejo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 2-29. GRH, "1.0 Resumen Ejecutivo," in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 72. GRH, "6.3 Programa de Monitoreo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 6-12.</p> <p><u>RECOMMENDATIONS</u> The risk assessment provided is comprehensive, but it falls under the category of standard safety procedures. This is why it is recommended to identify any non-standard technologies or materials used in the project, address their new health and safety implications and detail the measures that need to be introduced to the project above and beyond the regulatory requirements.</p>
<p>QL2.2</p>	<p>1</p>	<p>Improved</p>

<p>Minimize Noise And Vibration</p>		<p>The project has established mitigation measures for protecting the air and noise quality (including vibration levels) in the various phases of its construction and operation. Every transportation vehicle properly installed mufflers and new filters on the exhaust pipes to reduce noise and gas emissions. The speed level has been limited to 50 km/h, and the use of horns has been restricted to minimum levels. Any installation that threatens to increase noise levels is banned, and the movement of heavy vehicles and machinery is restricted to necessary cases only. Use of protection equipment (EPP, which includes earplugs, masks and protective glasses) is mandatory for all personnel that work with machinery (with the exception of drivers), and the personnel should not be exposed to intermittent noise above the average levels of 85 dB. The project studied three alternatives for connecting the 138 kV electrical transmission line (and other secondary lines) from the hydroelectric powers station 8 de Agosto to its substations in Tingo Maria and nearby towns. The first of these was identified as the best alternative as it avoids large portions of vegetation and solid waste sliding downhill through limited levels of noise and dust that are exclusively permitted in areas where electric towers are constructed. Tri-monthly evaluations, machinery maintenance, and photographic registries aim to verify that such measures are controlling noise levels in accordance with the environmental monitoring plan of the project.</p> <p><u>Source:</u> GRH, "6.0 Estrategia de Manejo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 41-43, 75-81. GRH, "3.0 Descripción del Proyecto de Ingeniería" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 13-16. GRH, "4.0 Línea de Base Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 53-63. GRH, "5.0 Caracterización de Impacto Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 29, 34-39. GRH, "6.3 Programa de Monitoreo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 13-15.</p> <p><u>RECOMMENDATIONS</u> The project team should provide the evaluations undertaken during the construction as well as the operations phases of the project. While these preventive measures follow a national standard, a local standard that fits the project's needs should be studied and implemented accordingly. For reference, target noise levels might aim to be similar to the noise level ordinance from the City of Portland (Oregon, USA). If substantial lower vibration and noise levels are achieved, then higher values will be assigned to the community properties and raise the project's score in this credit.</p>
<p>QL2.3 Minimize Light Pollution</p>	<p>0</p>	<p>No Score</p> <p>No specific information has been provided on how the project impacts to light pollution in the area. The only instances where lighting needs were mentioned was during the excavations phase where the use of explosives was necessary to build the tunnels required for the transmission line. It was specified that the construction of these tunnels would take place during natural lighting hours or with proper artificial lighting conditions.</p> <p><u>Source:</u> Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 7. GRH, "6.0 Estrategia de Manejo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 109, 116, 133, 143. Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 30-31.</p> <p><u>RECOMMENDATIONS</u> The project should develop a holistic assessment of its own lighting needs (natural and artificial) as well as how this lighting might affect to the natural environment surrounding the project. The project team should submit documents or other evidence regarding efforts to reduce light pollution. Considering the specificities of the project location in the Amazon, these efforts could set a precedent for neighboring projects and have a positive impact on communities and the control of light pollution of the area in general.</p>
<p>QL2.4 Improve Community</p>	<p>4</p>	<p>Enhanced</p> <p>The deteriorated condition of unpaved roads in the areas of Maravillas, Aucantagua, and Monzon</p>

<p>Mobility And Access</p>		<p>presents difficulties for local people in traveling to the other major towns, Tingo Maria and Cachicoto, during the rainy season. To address this, the project has made improvements on these roads by leveling the ground in order to reduce the amount of travel hours (between 30 to 60 minutes on average) from one community to the other. A total of nine temporary and two permanent roads have been improved in the areas closer to the transmission line and hydroelectric power station respectively. Although fluvial erosion does not affect the area where the project is located, constant monitoring for potential landslides will take place during the construction and operations phase on the project's access roads. The intention of the tri-monthly report is to analyze the cause of such an event, should it happen, and have a registry of occurrences for future reference.</p> <p><u>Source:</u> Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 9-10. GRH, "4.0 Línea de Base Ambiental del Proyecto" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 29-31, 171, 220-221. GRH, "6.3 Programa de Monitoreo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 21-22. GRH, "5.0 Caracterización de Impacto Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 20, 35, 39, 106-107.</p> <p><u>RECOMMENDATIONS</u> There still exist opportunities to further rehabilitate existing unpaved roads and to invest in a larger network of mobility infrastructure. The analysis produced is limited to the project's internal scope but its assessment could be expanded to a larger transportation framework consisting of new roads that are connected to existing main highways. While an in-depth geologic study has been presented, it is also recommended to evaluate the impact adjacent transportation facilities and key buildings will have on the community. Other modes of transport besides roads should also be considered. Beyond not interfering with existing community roads (which can be classified as a short-term need), it is necessary to give attention to current community needs for mobility and access to important locations (health centers, food supply areas, schools, gathering places, cultural buildings) in the short and long-term. These efforts should improve transportation efficiency, walkability and livability.</p>
<p>QL2.5 Encourage Alternative Modes of Transportation</p>	<p>0</p>	<p>No Score</p> <p>With Maravillas, 8 de Agosto, and Aucantagua being classified as existing in 100% rural conditions in contrast to the nearby towns at Cachicoto and Monzon (which are classified as 100% urban), the project has committed to improve local roads for common types of vehicle transportation (car, and regular wheel-operated machinery). The maintenance of such roads is done in coordination with the regional (Ministry of Transportation and communications - PROVIAS) and the local government. Nevertheless no information has been provided about non-motorized transportation and/or public transit or how these can reduce congestion.</p> <p><u>Source:</u> Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 9-12. Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 34-35.</p> <p><u>RECOMMENDATIONS</u> A report of acceptable walking distances for the working personnel and general population to the facilities of the project is recommended. Usage rates and public modes of transport available to the local working staff should be determined. Walkways and trails need to be considered as alternative options in terms of convenience, quality, and safety. Identification of specific issues in existing transportation policies that are applicable to the community should be done. Comprehensive future plans and designs that show how new infrastructure features can be properly implemented in the community should be also developed. Rehabilitating existing underused or unmaintained pathways and walkways is pivotal when addressing the long-term economic needs of the community. Consideration of new water modes of transportation is also recommended.</p>
<p>QL2.6 Improve Site</p>	<p>3</p>	<p>Enhanced</p> <p>The project's contingency plan describes the installation of reflective temporal, permanent and</p>

<p>Accessibility, Safety & Wayfinding</p>	<p>informational signs on the construction site as well as in the community to protect biodiversity and the natural resources. To protect flora and fauna, the project team has provided pathways with signs to help direct appropriate staff behavior. Because these environmental elements are constantly exposed to a higher risk of deterioration, environmental signaling has been implemented with preventive information about environmental protection. The aim is to increase the safety for the environment, workers, and the public by providing procedures for preventing accidents inside of the area of direct influence (ADI). The project’s personnel also participate in activities to increase their environmental protection knowledge. The project team has also taken into account safety measures for storage and/or handling of fuels, waste, and other types of substances which meet all legally required industrial standards. A detailed report has been submitted with strategies that focus on several types of risk (fires, earthquakes, structural failure, fuel leakage, on-site accidents, failure or delays in materials supply, and work stoppage), preventive measures, and the respective authorities who will comply with a solution.</p> <p><u>Source:</u> GRH, “6.4 Plan de Contingencias” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 9. GRH, “6.0 Estrategia de Manejo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 141, 155.</p> <p><u>RECOMMENDATIONS</u> The team should include traffic calming measures in areas with heavy pedestrian or car traffic. Rehabilitation and/or creation of sidewalks should be considered since many of the existing roads are unpaved. If alternative modes of transportation are considered, the integration of safety measures should be accomplished to increase the safety in the community.</p>
<p>QL3.1 Preserve Historic and Cultural Resources</p>	<p>Improved</p> <p>The project submitted an archaeological monitoring plan to local and regional authorities which indicated that no existing archaeological remains were found on the site. All the regulatory approvals were given to the project under the Certificate of Nonexistent Archaeological Remains (CIRA) awarded by the Ministry of Culture. For the construction stage, besides the standard regulations of the law, the plan expands its scope with the continuation of on-site monitoring every three months to anticipate the possibility of new remains being found unexpectedly. If so, Generación Andina is committed to take preventive measures that will mitigate future damages, and coordinate with the respective authorities to protect such installations.</p> <p>1 <u>Source:</u> Ministerio de Cultura, <i>Certificado de inexistencia de restos arqueológicos-CIRA</i> (2013), p. 11-12. Ministerio de Cultura, <i>Plan de Monitoreo Arqueológico</i>, (2014), p. 1-8. Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 38-39.</p> <p><u>RECOMMENDATIONS</u> Existing archaeological remains are not the only types of resources that should be protected. Increasing the scope of identification to significant and worthwhile historic and cultural resources can aid to preserve the community's cultural history. This larger breadth of interests should negotiate the feasibility of maintaining such heritage infrastructure with the interested stakeholders, leaders and agencies and/or any conflicts that may arise with the community.</p>
<p>QL3.2 Preserve Views and Local Character</p>	<p>Improved</p> <p>1 Among the criteria used to determine areas of direct influence (ADI) for the project are “any significant environmental impacts on flora, fauna, water, air, people, landscapes, and archaeological remains, among others”. Under the project’s program for environmental conservation, the existence of a subprogram dedicated to the control of the environmental landscape gives guidelines for implementing temporary access routes, by only using paths where some portion of the landscape has been previously manipulated to create walkable pathways. The execution of such a program has not been further developed for the preservation of existing views. Regarding construction, the alteration of the landscape due to the operation of the hydropower operation is considered to have an environmental impact that is low to medium, with reversible implications and without cumulative effects.</p>

	<p><u>Source:</u> GRH, “3.0 Descripción del Proyecto de Ingeniería” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 10. GRH, “4.0 Línea de Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 153-169, 306-338. GRH, “4.6 Línea de Base Social” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 3. GRH, “5.0 Caracterización de Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 7, 12, 17-20, 25, 39. GRH, “6.0 Estrategia de Manejo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 5-6, 172-174. GRH, “6.8 Plan de Inversiones” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 2, 4.</p> <p><u>RECOMMENDATIONS</u> While there is an understanding of the site’s geomorphology, hydrography, and landscape, there is no indication of a comprehensive evaluation to determine whether important views or areas with high ecological value were to be salvaged in order to preserve the community’s local character. There should be a plan to identify all of the areas where such views are found, and indicate the level of importance in connection with the community’s cultural identity. These natural landscape features, along with the evidence that supports why they should or should not be preserved, must be properly documented and shared with stakeholders and local officials before the approval of design guidelines for the overall project is done. To restore lost or damaged views, actions such as removing barriers, structures, or vegetation should be correctly assessed.</p>
<p>QL3.3 Enhance Public Space</p>	<p>6</p> <p>Superior The project team collaborated with the local government to provide the topographical survey and the preliminary design plans to build (considered inside the ADI) two soccer fields in Chipaco and Caunarapa, a sport s courts (basketball and soccer)in Maravillas and a park in this same town While there is participation from the project team concerning the overall enhancement of the public space in the community, there is no evidence of long-term plans for specific commitments from the project team, as the actual construction commitment goes to the regional government. Also, there is no supporting documentation that indicates the level of stakeholder satisfaction.</p> <p><u>Source:</u> Generación Andina, <i>Plano de Parque Infantil Chipaco</i> (2012). Generación Andina, <i>Plano de Plaza de Armas Chipaco</i> (2012). Generación Andina, <i>Plano Topográfico de Plaza de Maravillas</i> (2015). Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 42-43.</p> <p><u>RECOMMENDATIONS</u> Improving existing public spaces including parks, plazas, recreational facilities or wildlife refuges is important to enhance community livability. These need to be identified and a description of restoration efforts, initiated by the project team or as a collaboration with local authorities, must be documented. Adverse effects during the rehabilitation or creation of such spaces should be mitigated. The implementation of activities with respect to these spaces should consider the needs of the community. Percentages of overall satisfaction need to be published and shared with local officials. All of these decisions should be done based on public agency and stakeholder judgements.</p>
<p>QL 4.1- Identify and address the needs of women and diverse communities (indigenous or</p>	<p>1</p> <p>Improved Through the public participation exercise, the project team gathered written and oral suggestions from the community. Although women were present at these stakeholder meetings, their priority concerns were those of health and education of children rather than any woman-specific needs and interests. Because the project is located in a rural tropical area with a strong cultural mix of indigenous Andean communities and native tribes who inhabit the rainforest, it is assumed that a direct and/or indirect portion of these communities attended these meetings, but they were never directly addressed nor were their concerns and needs identified.</p>

<p>afro-descendant peoples)</p>	<p><u>Source:</u> GRH, “7.0 Participación Ciudadana” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 9-12. Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 13-17, 24-25. Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 12-16, 22-24. Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 44-45.</p> <p><u>RECOMMENDATIONS</u> Substantive efforts to review, assess, and incorporate minority group perspectives are recommended to reduce or eliminate potential negative impacts for these women and indigenous community groups. . New opportunities for making positive contributions include documenting results of meetings with designers, community leaders, and decision makers to provide possible solutions to these issues. These reports should include the assessment of hazards and risks to women’s health and safety. Evaluating this criteria may illuminate and incorporate unexpected problems into the project design.</p>
<p>QL4.2 - Stimulate and promote women’s economic empowerment</p>	<p>No Score</p> <p>0</p> <p>No evidence is provided for contributing to women’s economic empowerment in relation to job creation or additional recruitment efforts during design and construction phases.</p> <p><u>Source:</u> Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 46-47.</p> <p><u>RECOMMENDATIONS</u> Women-led companies should be identified at a local and/or regional level in order to engage them with addressing specific economic demand needs for women. The project should also aim to achieve a Gender Certification or other national, corporate, or industry gender equity and supplier inclusion initiatives in order to actively increase women’s involvement in the project. The project team should also provide plans and commitments for hiring women in the project, partnership and agreements with relevant stakeholders, and analyses that show the number of women employed with their respective skill level. With that in hand, solutions to train necessary numbers can be developed and implemented.</p>
<p>QL4.3 - Improve access and mobility of women and diverse communities (indigenous or afro-descendant peoples)</p>	<p>Improved</p> <p>1</p> <p>The project team has indicated that women and diverse groups were surveyed among the general population in regards to communicating concerns about the unpaved conditions of the roads in Maravillas, Aucantagua, and Monzon. The stakeholder groups during the meetings that addressed mobility issues included organizations with women and minority groups’ representatives. However, the particular needs and interests of those groups were not completely identified nor were they specifically addressed.</p> <p><u>Source:</u> Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 11-12. GRH, “7.0 Participación Ciudadana” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 2-8. Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 48-49.</p> <p><u>RECOMMENDATIONS</u> The project should consider ways of addressing women and indigenous groups’ access to social and economic infrastructure. As a result of this, women and other diverse groups will have better access to healthcare, schools and jobs. Assessments should be properly documented to study the effects of the constructed works on the access and mobility of minority groups. Subsequent actions can then take place to solve safety and/or transportation issues for women and indigenous groups through making the necessary design adaptations to the original project.</p>

QL0.0 Innovate Or Exceed Credit Requirements	6	In terms of public health, the project is committed to promoting preventive health campaigns every three months during the construction phase (once annually during the operations phase) in Maravillas and Caunarapa. Such efforts include the vaccination of newborns, infants and children against respiratory diseases (since respiratory infections are the leading cause of illness in the population with the most vulnerable segment being children between 0-15 years). Other actions include blood pressure measurement for the elderly, general check-ups (general medicine and odontology) and hygiene workshops as well as family planning for all the community members. The aim is to motivating the local population to visit health centers and understand the importance of preventive health measures.
74		

SUB CATEGORY: LEADERSHIP		
	Score	8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU
LD1.1 Provide Effective Leadership And Commitment	9	<p>Superior</p> <p>The project has developed a community relations plan in which one of its stated goals is to coordinate the sustainable initiatives that emerge in the various phases of the project. These strategies are supported by the stakeholders and coordinated between the representatives of the interested parties (project owner and project team) and the community. Policies that address social responsibility, safety, environmental concerns and sustainability are integrated into the principles of the company. To translate these principles into actual practice, the project has elaborated specific plans that contribute to sustainable economic practices for the entire population of the area of influence which, for instance, include adding value to local production through the incorporation of a plan for sustainable agriculture. Written documentation of these types of programs serve as evidence of the team addressing economic, environmental, and social aspects of the project. Many of these programs involve government authorities and are further explained in public workshops where public statements of sustainable plans by the leadership are currently stated to the community. Signed documentation by the regional government provides evidence of the project team’s interest and commitment for developing sustainable practices in the affected area. The project also aimed to voluntarily comply with the World Bank’s IFC norms that outline performance in social and environmental sustainability. The signed contract also provides agreement on providing preventive and corrective measures for the operations and maintenance of the power plant.</p> <p><u>Source:</u> GRH, “6.6 Plan de Relaciones Comunitarias” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 1-3, 11-12. GRH, <i>Certificación Ambiental de la Declaración de Impacto Ambiental</i> (2011), p. 2-4. Generación Andina, <i>Agreement for the Operation and Maintenance of the 8 de Agosto and El Carmen hydroelectric power plants</i> (2015), p. 5-9. World Bank - International Finance Corporation, <i>Normas de Desempeño sobre Sostenibilidad Ambiental y Social</i> (2012), p. 1-2.</p>
		<p><u>RECOMMENDATIONS</u></p> <p>The company and stakeholders have availed their policies and values through their respective websites, which include principles of behavior, socially responsible actions and environmental care. However, it is necessary to clearly identify how stakeholders, through Union Group, are involved in developing sustainable practices on this specific project. A signed document by all parties involved should be provided as evidence that a chartering session was conducted and commitment to sustainable principles were clearly outlined from the project owner, designer, contractor and operators. Also, annual sustainable performance reports should be documented to coordinate future chartering sessions to achieve commitment.</p>
LD1.2	7	Superior

<p>Establish A Sustainability Management System</p>	<p>There is evidence of a well-defined line of authority so that roles and assigned responsibilities are clearly outlined in the contract, in government agreement documents, and on each social, economic or environmental program that the project team has developed. After defining various impacts of the project by analyzing and evaluating existing conditions through a consultancy company (Huming Ingenieros S.A.C.), priority was given to objectives and goals that were aligned with current community necessities. Once strategies that address these concerns are further expanded in the creation of programs, the project team plans to monitor short-term results (which usually happens every 3 months for most programs) to closely follow the compliance of such goals in the longer term. Sustainability goals intentionally follow the World Bank's International Finance Corporation (IFC) guidelines of sustainable growth and risk management in order to identify and mitigate future negative impacts, as well as implement necessary preventive measures. A sustainable business approach is taken into consideration to negotiate transparent transactions that clearly outline the obligation of the project owner and stakeholders to the community and related project activities.</p> <p><u>Source:</u> Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 1-5, 21-22. GRH, <i>Certificación Ambiental de la Declaración de Impacto Ambiental</i> (2011), p. 2-4. Generación Andina, <i>Cronograma del Plan de Desarrollo Comunitario 2015</i> (2015), p. 1. Generación Andina, <i>Organigrama Generación Andina</i> (2015), p. 1. Dessau, <i>Organigrama de Supervisión en Obra CC.HH. 8 de Agosto, El Carmen y Subestaciones y Línea Transmisión a Tingo Maria</i> (2015), p. 1. Generación Andina and Huming Ingenieros, <i>Contrato de Prestación de Servicios de Consultoría</i> (2014) p. 1-2. World Bank - International Finance Corporation, <i>Normas de Desempeño sobre Sostenibilidad Ambiental y Social</i> (2012), p. 1-2.</p> <p>RECOMMENDATIONS The project team should provide the performance results of such assessments and indicate which actions were taken to implement the necessary corrective actions. Business processes need to be clearly outlined in a separate category to show that the management of impacts and opportunities is comprehensive and can handle unexpected changes of events. While the mechanisms implemented are sufficient for the project's scope, they are not robust enough to improve economic sustainability efforts in a region with previous socio-political and cultural tensions such as this one.</p>
<p>LD1.3 Foster Collaboration And Teamwork</p>	<p>Enhanced</p> <p>4</p> <p>There is indication of tasks, obligations and mission statement within the organization of the project owner and team. The company is constantly finding ways to engage stakeholders and local authorities with community necessities. This collaboration is materialized in the integration of outside input and resources to the betterment of the outlined programs. Through the development and achievement of these programs the company intends to establish permanent ties of teamwork between Generación Andina and the community residents while strengthening ties of mutual cooperation. Public and written promotion of these processes generates social participation which creates self-managing capabilities to the residents of the community. With this, it is expected to aim toward an integral development of local sustainability that takes into consideration short and long term goals in community platforms of preventive health, nutrition, education, strengthening the local economy, and enhancing living places. To prevent possible internal conflicts in the project team relations, the contract and insurance policy documents obligations of Generación Andina and the contractors (S.T.W. Energy S.P.A. and Sacyr Peru S.A.C.) and their respective affiliates; financial considerations of services provided and additional unexpected costs as well as legal and civil liability. However, this is part of standard insurance procedures that need to follow as part of the normal legal procedures for the construction of an infrastructure project. Thus, a risk sharing agreement, signed by the different parties on the project and which elaborates on the specific terms of sharing risk and rewards under the project's delivery system, is not clearly stated beyond the standard regulations required by law (standard insurance contracts).</p>

		<p><u>Source:</u> GRH, “6.6 Plan de Relaciones Comunitarias” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 1-5. Generación Andina, <i>Plan de Desarrollo Comunitario</i> (2015), p. 1-5. Generación Andina, <i>Agreement for the Operation and Maintenance of the 8 de Agosto and El Carmen hydroelectric power plants</i> (2015), p. 2-10. Rimac Seguros, <i>Póliza de Responsabilidad Civil</i> (2015), p. 1-2, 4-6.</p> <p><u>RECOMMENDATIONS</u> It is necessary to indicate how such collaboration efforts were taken into consideration during the design phase of the project, as well as after construction began. The project delivery method is not clearly defined in one specific document that outlines how all the parties agree to collaborate and share possible risk and expected rewards. Because most information is dispersed in different legal contracts, it is recommended to recognize the importance of integrating processes, management procedures, and design methodologies into one compiled document that can be shared with all the parties involved, thus eliminating unnecessary redundancies.</p>
<p>LD1.4 Provide For Stakeholder Involvement</p>	<p>9</p>	<p>Superior</p> <p>Interested parties were identified by the project team through the creation of a community participation plan. Among them, 9 public institutions, 9 interested groups, and 24 independent representatives located in the area of direct influence (ADI) were invited to participate in community workshops, as well as 28 interested groups considered to be indirectly related to the project. These mechanisms are mandatory before and during the environmental impact study of the area. The participatory aspect of the program, where locals can express further concerns and be engaged with the project’s current activities, aims to be active throughout the entire life of the project facilitated by setting up of 2 offices in Maravillas and Tingo Maria, the project team indicated that they also have suggestion and inquiries offices and informational panels. All these stakeholder engagement procedures are coordinated by the Community Relationship Program. Through providing written and audiovisual documentation, these offices will keep analyzing main concerns of the population and strengthening community relations. However, while the project team understands the importance of potential community involvement with engaging locals in active dialogue, there does not seem to be opportunities for the feedback to guide the project’s decision making.</p> <p><u>Source:</u> GRH, “7.0 Plan de Participación Ciudadana” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 1-8, 13-14.</p> <p><u>RECOMMENDATIONS</u> Active two-way communication should promote the use of feedback to inform, assess, and modify design decisions and produce meaningful collaborations throughout the various phases of project. Documentation of frequent communication with stakeholders during the operations phase is not outlined as a necessity or requirement in the plan of community participation. If built properly, transparent and solid relationships can ensure a broader community involvement and will assist in breaking potential project stalemates.</p>
<p>LD2.1 Pursue By-Product Synergy Opportunities</p>	<p>0</p>	<p>No Score</p> <p>No documentation of cost-effective uses of unwanted materials near the site (to reduce the overall cost of project) has been provided by the project team.</p> <p><u>Source:</u> Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), 64-65.</p> <p><u>RECOMMENDATIONS</u> Promote active discussions with managers of nearby facilities to pursue by-product synergy opportunities. Searching for facilities nearby that may have discarded materials will lead to comprehensive efforts of identifying available excess resources. This assessment should be done in sufficient depth to determine synergy possibilities and successful applications. Authorities that can be engaged in communications regarding potential conflicts with existing regulations should include regulatory agencies, policy and/or standard setting organizations. The research developed could be incorporated into regional by-product</p>

		synergy projects to identify a broader selection of unwanted by-products. Forming relationships with nearby facility managers who provide these resources will lead to successful negotiations for securing long-term supply, and implementation of industrial ecology practices and applications.
LD2.2 Improve Infrastructure Integration	1	Improved The project team recognizes that poor road conditions have made difficult for local people to travel across communities within the project’s area of influence. Such circumstances are exacerbated during the rainy season on roads connecting Maravillas, Aucantagua, and Monzon. Following the rehabilitation of 12 existing routes, time spent to drive from one community to the other has been greatly reduced. Further coordination with regional government agencies and local authorities seeks to provide constant maintenance to permanent and temporary access roads. However, operational relationships between the enhancement of these roads and the project are not clearly delineated as both perform according to the boundaries of their own scope. No other existing elements of community infrastructure are identified for a possible integration to the project’s proposed infrastructure.
		<u>Source:</u> Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015), p. 9-10.
		<u>RECOMMENDATIONS</u> Prioritizing the extent to which the design integrates existing infrastructure at the community level can potentially minimize the project’s area of intervention. These elements should be evaluated to create operational linkages to the project’s proposed infrastructure, improve synergies, and increase efficiency of processes. Taking advantage of valuable community assets such as knowledge and social capital, performance optimization should aim to be expanded at a city infrastructure level where restoration efforts eliminate design conflicts.
LD3.1 Plan For Long-Term Monitoring & Maintenance	10	Conserving An investment plan for constant monitoring and maintenance of the infrastructure of the project, as well as programs for rehabilitating and restoring physical and biological resources, has been delineated detailing how the required funds will be allocated. The project team constantly monitors water quality, effluents, sediments, air quality, noise levels, non-ionized radiations, soil quality, hydrologic resources, solid waste, and landslide registers, through the designation of a specific subprogram for each category. The masterplan includes funding and operational cost information for the construction, operations, abandonment, and post-abandonment phases of the project. Criteria for indicating the cost of maintenance for the hydroelectric power plant and the transmission line, as well as all motorized equipment, storage facilities, permanent and temporary access routes, related mechanical and electrical civil structures, replacement materials, and maintenance through professional and operator personnel are also included. The impact of maintaining the physical integrity of the project’s infrastructure has been evaluated among its various components (geologic and geomorphologic aspects, climate, hydrology, water, soil, air, and landscape) and, through that analysis, new parameters have been established to mitigate negative side effects in the long-term.
		<u>Source:</u> GRH, “6.8 Plan de Inversiones” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p.2-3, 5-11. GRH, “3.0 Descripción del Proyecto de Ingeniería” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 13-16, 19, 55-56. GRH, “5.0 Caracterización de Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 5, 81-82, 88-92. GRH, “Resumen Ejecutivo” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 110-117. Generación Andina, <i>Cronograma General del Proyecto - Anexo 4</i> (2012), p. 2-3. Generación Andina, <i>Agreement for the Operation and Maintenance of the 8 de Agosto and El Carmen hydroelectric power plants</i> (2015), p. 6-18.
		<u>RECOMMENDATIONS</u> Include assessments that demonstrate that the maintenance program is functioning as designed and that environmental impacts are within design parameters.
LD3.2 Address	0	No Score

<p>Conflicting Regulations & Policies</p>		<p>According to the information provided by the project team, 8 de Agosto and the 138 kV transmission line meet Peru's legal requirements and national standards. IFC norms and the "Principios del Ecuador", both non-standard guidelines that the project chose to follow, state that the project should comply with the applicable laws and regulations of the jurisdictions in which they operate. Huming Ingenieros S.A.C is the firm in charge verifying that all standard regulations complied with the legal framework. However, in terms of sustainable policies, the contractual commitments prescribed at the "Principios del Ecuador" legal framework only address the compliance with social and environmental regulations as well as the procurement of its legal permits, all of which are mandatory anyway. Policies or standards of practice applied to the project are followed regardless of their intended purpose or compatibility with sustainable goals and objectives. The project team has not provided documentation proving they worked with regulatory bodies to mitigate any potential negative effects or conflicts arising from regulations that are contrary to sustainable practice.</p> <p><u>Source:</u> World Bank - International Finance Corporation, <i>Normas de Desempeño sobre Sostenibilidad Ambiental y Social</i> (2012), p. 6, 13-18, 31, 46. GRH, "8.0 Principios del Ecuador" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 12-14. Generación Andina and Huming Ingenieros, <i>Contrato de Prestación de Servicios de Consultoría</i> (2014), p. 2.</p> <p><u>RECOMMENDATIONS</u> The owner and the project team should meet with legal consultants and regulatory agencies to identify how overall design and construction standards, policies and practices can be changed if need be to address problems arising from sustainability issues. Because many laws and regulations were formulated in a different era, well before efforts on sustainable development were introduced, many of them may unintentionally run counter to sustainable objectives. The intent is to analyze current approaches and address areas where a change in philosophies can be incorporated.</p>
<p>LD3.3 Extend Useful Life</p>	<p>1</p>	<p>Improved</p> <p>Several subprograms exist which aim to enhance the infrastructural performance of the hydroelectric power plant and transmission line by addressing physical, biological and socio economic impacts that may occur during the project's operations phase. However, these criteria stay within traditional project delivery boundaries; while it separates operational and decommissioning activities for planning in-depth performance studies for both categories, it makes no consideration of the possibility of planning for infrastructural flexibility, resilience, and ease of upgrading and expansion. There is some indication of future reuse opportunities for certain infrastructural parts and/or secondary facilities through the transfer of rights to community authorities and/or third parties.</p> <p><u>Source:</u> Generación Andina, <i>Estudio Definitivo de la Central Hidroeléctrica 8 de Agosto</i> (2012), 8-25, 40-41. GRH, "3.0 Descripción del Proyecto de Ingeniería" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 17, 57-59. GRH, "Resumen Ejecutivo" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 4, 19-22, 89, 92, 96-97, 103.</p> <p><u>RECOMMENDATIONS</u> The longer the useful life of the project, the less it will need to be replaced, substantially reducing the energy, water, and materials needed for a rebuild. It is therefore recommended to enhance the durability and resilience of the project by identifying key areas where increasing investment to extend useful life will offer a reasonable return. Design should aim to allow for expansion, reconfiguration and/or multiple future uses.</p>
<p>LD0.0 Innovate Or Exceed Credit Requirements</p>	<p>0</p>	<p>N/A</p>
<p>41</p>		

CATEGORY II: CLIMATE AND ENVIRONMENT		
RESOURCE ALLOCATION		
	Score	8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU
RA1.1 Reduce Net Embodied Energy	0	No Score
		Embodied energy calculations would help to identify ways to conserve energy by reducing the net embodied energy of the materials used over the project life. No data is available to show that a Life-Cycle Energy Assessment has been performed in accordance with recognized and accepted methodologies.
		<p><u>Source:</u> Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 80-81.</p> <p><u>RECOMMENDATIONS</u> Due to the scale of the project, it is recommended to develop a Life-Cycle Energy Assessment (LCA) to estimate the energy of key materials used. If the assessment is performed in accordance with recognized and accepted methodologies and software, it will include the required energy for the material extraction, transportation, refinement, manufacture, as well as the processes performed until the materials are ready to be transported to the construction site. The evaluation should provide evidence of team efforts to reduce the net embodied energy of the project, and its estimation should also include the materials to be used in the project's construction as well as the materials for the maintenance and operations phases.</p>
RA1.2 Support Sustainable Procurement Practices	0	No Score
		According to the contract provided by Generación Andina, the contractor (S.T.E. Energy S.P.A.) keeps records of electromechanical equipment manufacturers and inventory parts, among other operational aspects, in order to provide maintenance as needed. While there are other clauses that specify the terms of collaboration with subcontractors hired by the company, there is no evidence of the project's intent to support sustainable procurement practices. Materials are only mentioned in relation to amount consumed and quality of works executed, but there is no identification of sustainable practices in the procurement of materials or equipment.
		<p><u>Source:</u> Generación Andina, <i>Agreement for the Operation and Maintenance of the 8 de Agosto and El Carmen hydroelectric power plants</i> (2015), p. 8-9. Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 82-83.</p> <p><u>RECOMMENDATIONS</u> The project team should develop a sound and viable sustainable procurement program that delineates policies and criteria for supplier identification and selection. This includes defining a percentage of materials to be purchased from suppliers with sustainable practices. Documentary evidence that the team procured materials from sustainable sources should be provided through the certification of materials and supplies. It is also recommended that the team provide evidence on efforts to identify any unresolved worker health and safety or environmental violations by manufacturers or suppliers.</p>
RA1.3 Used Recycled Materials	0	No Score
		<p>This credit encourages the use of recycled materials and avoidance of virgin materials to minimize the amount of waste sent to landfills. The project team mentions in the self-evaluation sheet provided by the Zofnass program that, because of the nature of the project, the reuse of materials was not expected. This information is not followed by an explanation of the methods by which this decision was determined.</p> <p><u>Source:</u> Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 84-85.</p>

		<p>RECOMMENDATIONS</p> <p>Reducing the use of virgin materials will avoid sending useful materials to landfills while decreasing embodied carbon emissions and environmental degradation attributed to their extraction and processing. Using these type of materials will also increase the local and regional market demand for reused materials thus helping to establish new sustainable approaches that could spread within the region. In that case, it is necessary to provide an inventory of specifications for materials including name of product, manufacturer, weight/volume of the material, and the percentage of recycled content. These materials should meet the necessary quality and performance criteria required for the intended application. Design documents should include an estimated quantities of these materials through calculations that multiply the materials' weight or volume by the percentage of recycled content. Mechanical, electrical, water, plant, and soil components can be excluded from the calculations.</p>
RA1.4 Use Regional Materials	3	<p>Improved</p> <p>To meet the required volumes and specifications of aggregates and concrete production for construction, the project team has installed a concrete plant inside the storage facilities located in Maravillas. There are no apparent negative environmental or social implications associated with siting it there. Moreover, the distance from the concrete plant to the project's site meets the distance requirement for concrete transportation (160 km) since they are both located near Maravillas (and less than 0.6km away from each other). Information on the distance travelled for the concrete's raw materials (rock, sand, gravel and cement) is not provided. While documentation shows that concrete is mainly used for the construction, it does not specify the percentage of the locally produced concrete.</p> <p><u>Source:</u> GRH, "6.0 Estrategia de Manejo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 24-29. GRH, "3.0 Descripción del Proyecto de Ingeniería" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 23, 49-51. Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 86-87.</p> <p>RECOMMENDATIONS</p> <p>The percentage of the project's materials sourced from regional suppliers should be documented by type and weight (or volume), source locations and respective distances. In an effort to reduce fossil fuel usage and greenhouse gas emissions as well as other pollutants, distance requirements should follow the "Guidelines and Performance Benchmarks (2009)" of the Sustainable Sites Initiative: soils and mulches, 80 km; aggregates and sand, 80km; concrete, 160 km; plants, 400 km; other materials, 800 km. Minimizing transportation costs will also help retain regional economic benefits by specifying local sources.</p>
RA1.5 Divert Waste From Landfills	3	<p>Improved</p> <p>Generación Andina has identified potential waste sources in the company's project. The project team has further established a subprogram for solid waste management which aims to minimize any adverse effects on human health and the environment caused by the production, handling and disposal of the solid waste generated by the project's activities. These safety measures will extend throughout construction, operations and abandonment phases, and will be revised and updated every year in accordance with the needs of the program. All waste management subcontractors will need to be registered through DIGESA (Main Directorate of Environmental Health) in order to operate according to the relevant laws and regulations. The scope of the program includes the handling of non-hazardous and hazardous waste with an emphasis on minimizing the impact on the water, air, and soil quality. The plan proposes a specific assessment to reduce the volume of the generated waste (for instance, by establishing social practices at the staff level that encourage acquiring reusable products to reduce the unnecessary consumption of resources). The plan also covers separating of waste according to the physical, biological and chemical properties, transporting it to temporal storage facilities and finally disposing of it in recycling facilities (in the case of paper, plastics, glass, and thin metals which add up to 25% of the total waste for the 138 kV transmission line and 8 de Agosto hydroelectric power plant) or transforming it to compost for organic landfills (in the instance of biodegradable materials) through waste management subcontractors.</p> <p><u>Source:</u> GRH, "6.0 Estrategia de Manejo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 5, 84-102.</p>

		<p>RECOMMENDATIONS</p> <p>While there is waste minimization and efforts to classify waste for future reuse, the project does not clearly state the exact percentage of recycled/reused materials expected through its waste plan. Generacion Andina only uses waste percentages along with a classification of type of material in its waste management program, but further there is no further coordination to maximize efforts for recycling and reusing waste with subcontractors. The project team should provide the calculations of the total waste reduction percentages of materials diverted to recycling or reuse (done by weight or volume) along with more information on the waste management procedures of its subcontractors. The team should consider not only the quantity of waste being generated, but the recyclability or toxicity of that waste stream. Besides waste reduction and materials sent to recycling facilities, another acceptable means of diversion includes sending materials to manufacturers to be used as post-consumer recycled content. Unacceptable means include incineration of materials (unless classified as bio-mass materials and incinerated for acceptable energy generation) and burying waste material unsuited for infill (non-biodegradable).</p>
<p>RA1.6 Reduce Excavated Materials Taken Off Site</p>	<p>4</p>	<p>Enhanced</p> <p>This credit measures the extent to which the project team has considered limiting the movement off site of soil and excavated materials during construction, reducing the need for transportation and in turn minimizing environmental impacts.</p> <p>In the subprogram for the proper handling of construction materials, the project team indicates that if the excavated soil is deemed reusable during the construction process, then it will be temporarily taken to a nearby storage area until it can be incorporated again to the site. Moreover, the project’s subprogram for handling deposits of excess material delineates procedures for the reuse of the large quantities of excavated soils (which are usually extracted for the construction of electrical towers and its substructure) in areas needed for reforestation, for the construction of temporary access roads, and/or for the creation of deposits of surplus materials (also known as DME). These deposits not only help to revegetate the natural landscape in Aucantagua and El Carmen, but their volume (193,750 m³ and 117,750m³ respectively) accounts for at least 50% of the project’s excavated materials.</p> <p><u>Source:</u> GRH, “6.0 Estrategia de Manejo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 124-125, 139.</p> <p>RECOMMENDATIONS</p> <p>The project team should provide a more detailed explanation of the calculations used to estimate the percentage of reused excavated materials. During planning and design, the project team should identify opportunities to minimize grading, retain the majority of soil on-site, and/or eliminate the need to transport additional soil to the site. The project should also demonstrate how it has been designed to balance cut and fill.</p>
<p>RA1.7 Provide for Deconstruction & Recycling</p>	<p>0</p>	<p>No Score</p> <p>This credit encourages the project team to think about the long-term capacity of the project to be efficiently disassembled or taken apart at the end of its useful life for the reuse or recycle of its parts. There is no documentation provided that addresses recycling initiatives or future reuse opportunities for the project. The project team mentions in the self-evaluation sheet provided by the Zofnass program that, because the project will not be unmounted, its materials cannot be recycled. But this does not consider a comprehensive long-term evaluation that implements deconstructing initiatives during the abandonment phase.</p> <p><u>Source:</u> Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 90-91.</p> <p>RECOMMENDATIONS</p> <p>When a project reaches the end of its useful life, the project should consider the reuse or recycling of usable elements such as structures and components that can be easily dismantled (bricks, blocks, stone, concrete, untreated timber, glass, different types of plastic, metal, paper, and cardboard). The project team should therefore consider the likely effects of time and facilities operation on materials before determining if they will retain recyclability or reuse value. The team should provide evidence of efforts to facilitate the future disassembly through the creation of an inventory of possible recyclable materials</p>

		classified by use, cost, and/or weight.
RA2.1 Reduce Energy Consumption	0	No Score
		The energy provided for the operation of the project will be generated by two 9.5 MW Francis turbines with a nominal flow of 9 m ³ /s each, and two power generators with an output of 11.15 MVA and 13.8 kV each. However, the project team has not provided evidence that it considered alternatives modes for reducing its own energy consumption during the construction or operations phases.
		<u>Source:</u> Osinermin, <i>Supervisión de Contratos de Proyectos de Generación y Transmisión de Energía Eléctrica en Construcción</i> (2015), p. 78.
		RECOMMENDATIONS Since energy generation is the primary source of greenhouse gas emissions, the primary goal of the project should be to reduce the overall energy consumed as much as possible. By reducing overall operations and maintenance energy consumption throughout the various phases of the project, the owner can reap multiple saving benefits from a single investment. An appropriate analysis of options for reducing energy consumption of the constructed works would help identify strategic modifications to the design. The calculation of annual energy consumption over the life of the project needs to be compared to the industry norm and be used as a benchmark.
RA2.2 Use Renewable Energy	20	Restorative
		The main energy source for this project is the river Aucantagua, and is classified as type RER for “Renewable Energy Resource” according to the Organismo Supervisor de la Inversión en Energía y Minería (Osinermin). With an annual energy generation potential of 140,000 MWh, it will provide clean energy for the Peruvian electric grid at a regional level (through connecting to the Sistema Interconectado Nacional) while still meeting the daily operational energy demands of the project.
		<u>Source:</u> GRH, “3.0 Descripción del Proyecto de Ingeniería” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 2. GRH, “Resumen Ejecutivo” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 15. Osinermin, <i>Supervisión de Contratos de Proyectos de Generación y Transmisión de Energía Eléctrica en Construcción</i> (2015), p. 5, 10, 23.
		RECOMMENDATIONS Break down energy needs at the operational level by source type.
RA 2.3 Commission & Monitor Energy Systems	11	Conserving
		Dessau, a Canadian engineering-construction firm, has delineated comprehensive monitoring and maintenance procedures for the proper operation of the project’s infrastructure. The documentation provided describes in detail the maintenance activities that should be completed during regular inspections to ensure the correct operation of the project’s substructures and systems. The scope of this of assessment extends to operational rooms in the hydroelectric power plant, substations along the transmission line’s route, hydrometric stations and their monitoring systems registering the Aucantagua’s nominal flow and non-standard variational discharges, as well as sampling stations that send data related to quality of water, effluents, sediments, and hydrobiologic diversity. Trained workers are to carry out maintenance of equipment during construction and operations phases according to the regulations of the subprograms for the operation and management of auxiliary installations, camping areas, equipment and heavy machinery, construction materials, underground excavations and explosives, as well as access to (and cleaning) of temporary roads. Additional information related to the geography and climate of the site (in terms of how it impacts the main renewable energy source of the project) is also analyzed and registered in collaboration with the Servicio Nacional de Meteorología e Hidrología del Perú (SENAMHI), located in Cachicoto and Tingo Maria.

		<p><u>Source:</u> Autoridad Nacional del Agua - Dirección de Gestión de Calidad de los Recursos Hídricos, <i>Informe Técnico N047-2013 al Estudio de Impacto Ambiental de la Línea de Transmisión 138 kv y Pequeña C.H. 8 de Agosto 19 MW</i> (2013), p. 5-17.</p> <p><u>RECOMMENDATIONS</u> While the project has made significant efforts to properly document the energy monitoring systems in the design, it is important to specify and expound on the energy goals motivating these plans.</p>
RA3.1 Protect Fresh Water Availability	17	<p>Conserving</p> <p>It is important to remember that this project is a run-of-river hydropower plant, and as such, the entirety of the volume of water used to generate energy is returned to another section of the river without altering of its overall quality composition (for the most part). To facilitate the returning of the water back to the river, Generación Andina has developed an assessment on the hydrologic resources of the basin where the project is located. This evaluation presents detailed information about the current condition of the rivers Aucantagua, Monzon, El Carmen and Chinchao. Geographic and climatological information (variations on temperature, relative humidity) have been studied in relation to their different altitudes, as well as during seasonal changes. Data on evaporation, precipitation, flow trends and unusual discharges is collected through monitoring substations to understand annual behaviors. S&Z S.A.C., a consulting firm that specializes in hydroelectric and thermal stations, has concluded that the nominal flow generated through the construction of the project will reach a median annual average of 22.8 m³/s, with a maximum of 27.5 m³/s and a minimum of 18.6 m³/s. Since natural water resources are abundant in the region (with 318 km² of area for the Aucantagua river alone), and without any significant irrigation activities on both Aucantagua and El Carmen rivers, the team estimates that the amount that would produce a significant amount of renewable energy is between 25 to 50%. Water levels will be discharged back into the river through concrete channels that, because of the altitude at 1019.28 MASL will guarantee similar flow conditions to those of the native ecosystem.</p> <p><u>Source:</u> Generación Andina, <i>Estudio Definitivo de la Central Hidroeléctrica 8 de Agosto</i> (2012), p. 8-25, 40-41. GRH, "3.0 Descripción del Proyecto de Ingeniería" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 55.</p> <p><u>RECOMMENDATIONS</u> The ultimate performance goal should be to achieve and/or maintain the ecological condition of the undeveloped native ecosystem, which the project team does and document its efforts in depth. It is also recommended to indicate calculations showing that the project has a long-term net positive impact not only in the natural fluctuations on ecosystems, but also in quality and quantity of water infiltration to groundwater sources.</p>
RA3.2 Reduce Potable Water Consumption	0	<p>No Score</p> <p>The project team does not provide evidence of efforts made to reduce the amount of potable water needed for operational activities, or treating and/or recycling non-potable water sources in order to avoid depleting potable water supplies.</p> <p><u>Source:</u> Owen Kane, Anthony. <i>Envision, Rating System for Sustainable Infrastructure</i> (2015), p. 100-101.</p> <p><u>RECOMMENDATIONS</u> In many cases, it is not necessary to use potable water for regular operational tasks. The project team should develop a feasibility and cost analysis to determine the most effective methods for potable water reduction, and to seek ways of incorporating the results theinto the design. Advance recycling and reuse methods are encouraged. Evidence indicates how the project will reduce its potable water consumption for operational activities should be compared with industry norms by estimating annual water consumption over the life of the project.</p>
RA3.3 Monitor	6	Superior

<p>Water Systems</p>		<p>In the study of the identification of the project’s environmental impacts, Generación Andina indicates that the quality of water at both underground and surface levels may be affected by soil contaminated by the runoff of fuels and lubricants. Considering that this occurrence could take place during handling heavy equipment and powered industrial machinery on site, the project team created 2 subprograms which establish measures for prevention, mitigation and control of surface and underground water quality and quantity levels of the Aucantagua river (or in close proximity with water resources within the ADI) during construction, operations, and abandonment activities. Both the subprogram for spill control and management of fuels and the subprogram for the protection of surface and underground water aim to prevent accidental discharges through the circulation of correct practices for the management of fuel, waste and effluents, as well as a close daily monitoring system (through automated stations) to maintain the natural flow level of the river (2.28 m³/s) and mitigate abnormal variations. Another 11 hydrological stations monitor the river’s current condition based on physical and chemical characteristics (including oxygen, pH, and temperature levels, among others), inorganic and biological compounds. Its performance is controlled by Huming Ingenieros, the independent entity contracted by Generación Andina to be in charge of monitoring the project’s hydrologic systems. This will be done tri-monthly during the construction phase, and bi-annually during the first 5 years of the operations phase (with the option to be extended). Bi-annual monitoring is also expected during abandonment and post-abandonment phases.</p> <p><u>Source:</u> GRH, “5.0 Caracterización del Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 36. GRH, “6.0 Estrategia de Manejo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 66, 70, 148. Generación Andina and Huming Ingenieros, <i>Contrato de Prestación de Servicios de Consultoría</i> (2014), p. 2. GRH, “6.3 Programa de Monitoreo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 66, 70, 148.</p> <p><u>RECOMMENDATIONS</u> While monitoring activities are integrated into daily operations to reduce the project’s negative environmental impact, these measures should be evaluated to understand how they can improve the efficiency of the project’s performance in the long-term.</p>
<p>RA 0.0 Innovate Or Exceed Credit Requirements</p>	<p>0</p>	<p>N/A</p>
	<p>64</p>	

NATURAL WORLD		
Score	8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU	
NW1.1 Preserve Prime Habitat	9	<p>Superior</p> <p>The project has been developed in an area considered not prime habitat since most of the territory is used as farmlands to grow coffee, coca, cacao, as well as tropical fruits plantations. In this regard it is important to mention that the developers of the project have made studies of the different impacts that human activity is already causing in the area in order to compare and evaluate the possible effects of the construction in the Aucantagua Valley.</p> <p>There are two strategies implemented by the hydroelectric station 8 de Agosto, which are important to mention: First, it delimited the direct area of influence by an edge of 300 m within each side of the transmission line in order to control damage caused by the project . Second, some steps for the reshaping of the land are provided, in order to return the land to its natural condition and maintain it as it was before the project started. This is relevant because the land is full of vegetation that will need to be restored if new accesses and stations are going to be built for the construction of the platform. Nevertheless, since that the project’s location is not in a prime habitat, there does not exist a plan for increasing them. Although neither of the strategies implemented can be regarded to preserve or improve prime habitats, they add value as they take into consideration in the mitigation of the project’s impacts.</p>
		<p><u>Source:</u> GRH, “3.0 Descripción del Proyecto de Ingeniería” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 11, 15, 57. GRH, “4.0 Línea Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 79, 80, 323. GRH, “4.5 Línea Base Ambiental del Medio Biológico” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 1, 32-34.</p>
		<p>RECOMMENDATIONS</p>
		<p>It is recommended to provide more precise information on the buffer zones established in order to protect areas with higher ecological value than the project site.</p>
NW1.2 Preserve Wetlands and Surface Water	0	<p>No Score</p> <p>As it is a run-of-river hydropower plant, the project is located right on the Aucantagua river, which is a tributary of the Monzon River. The nature of the project demands a direct relationship with the water, therefore protection or buffer areas are not provided for here as since water will be used generate electricity for the area. This is an area of approximately 318 km² where resources from the river Aucantagua will be used, as it is shown in maps LT8-EIA-065 and LT8-EIA-027 in the Environmental Impact Analysis (EIA). This is an important consideration, because there appears to be no other activity that has a comparable impact to the water bodies in the surroundings, aside from the farmlands that constitute most of the valley.</p> <p>A water collection site has been located down in the river, right between the confluence of the rivers Pan de Azucar and Ayanunga. The project plans to drive this water through the right edge of the river, due to its moderate slopes (30° to 40°). The opposite edge has slopes of 80 to 90°. The area is covered by a wide range of vegetation and it will require deforestation in order to make accesses for the conduction platform.</p>

		<p><u>Source:</u> GRH, "4.0 Línea Base Ambiental del Proyecto" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 29- 78-79, 191, 323. GRH, "4.5 Línea Base Ambiental del Medio Biológico" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 153. Ley N° 29338 in Reglamento de la Ley de Recursos Hídricos, (Lima, 2010). S & Z Consultores Asociados, "LT8-EIA-065 Muestreo del Caudal Ecológico- Método Eco-Hidráulico" in <i>EIA</i> (Lima, 2012). S & Z Consultores Asociados, "LT8-EIA-027 Cuencas de Interés" in <i>EIA</i> (Lima, 2012).</p>
		<p><u>RECOMMENDATIONS</u></p> <p>Where possible the project team should consider the creation and restoration of buffers zones with the water to help to protect the river. As a reference, the minimum distance recommended between constructions and the water is 50 feet and an optimum distance is at least 300 feet.</p>
NW1.3 Preserve Prime Farmland	0	<p>No Score</p> <p>Farming is one of the most important activities in the Monzon district and it covers most of the hydroelectric power station's development area (more than 75% as expressed in the plan LT8-EIA-057). For this reason, the project team has assessed the site, which is currently used to grow coffee, coca and cacao and believes that the project will not decrease the production capacity of the land. However, since the project reduces the area of land available for farming, it will certainly impact in the productivity of the region. In addition, the clearing of vegetation for road construction will expose the soil to erosion and to subsequent loss of nutrients. In the environmental impact study the project team considers this a moderate negative impact because of its medium intensity and because it only affects the immediate area.</p> <p>It is also important to mention that before it was farmland, the area was used for logging, and its representative tree species were "tacona" <i>Cecropia</i> sp., "pomarrosa" <i>Spondias mombin</i>, "pushico paca" <i>Inga conferta</i> and "bolaina" <i>Guazuma crinita</i>.</p>
		<p><u>Source:</u> GRH, "4.5 Línea Base Ambiental del Medio Biológico" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 32. GRH, "5.0 Caracterización de impacto ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 38. S & Z Consultores Asociados, "LT8-EIA-057 Mapa de formación vegetal" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (Lima, 2012).</p>
		<p><u>RECOMMENDATIONS</u></p> <p>Any previously developed areas deemed prime farmland that are not directly affected by the project could be restored to a productive state. Additionally, some of the affected farmlands could be relocated to other areas in order to maintain the production capacities of the population that depends on the farmland used for the project.</p>
NW1.4 Avoid	1	Improved

<p>Adverse Geology</p>		<p>The location of the hydroelectric power station is in a valley that is part of the Eastern Cordillera and the Andean sub-regions of Peru which are characterized by a topography of hillsides of low to moderate slope that vary between 25% and 50% in almost the entire extension of the zone. This area is rich in metamorphic rocks from Precambrian times such as esquistos, fillitas, gneis and small amounts of slate. As it is located on the river Aucantagua, there are also aquifer sandstones and red quartzites.</p> <p>Given the seismic characteristics of Peru, the location of the project is not particularly vulnerable to the earthquakes. The natural slopes seem to be stable and thus do not represent any apparent risk. However, given its morphological elements, it is probable that there are geological faults arranged diagonally or parallel to the axis.</p> <p>Studies provided by the development team indicate that the project is therefore able to avoid dangerous conditions such as earthquakes, landslides, collapses, floods and fluvial erosion; however, there appear to be some risks of sinking and formation of settlements of residual materials because of the area's pluviosity.</p> <p><u>Source:</u> GRH, "4.0 Línea Base Ambiental del Proyecto" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 80, 82, 87, 170-172. Tavera, <i>Evaluación del Peligro Asociado a los Sismos y Efectos Secundarios en El Peru</i> (Lima, Instituto Geofísico del Perú, 2014), p. 5.</p> <p>RECOMMENDATIONS</p> <p>It is mentioned that in the study they found that part of the location area was susceptible to sinking due to the construction and to rainfall, yet no protection strategy is expressed in the documentation provided. Base on this, it is recommended to evaluate the project in looking to reduce risks of damages due to external forces. For this, it is not only important to carry out assessments, to define and avoid adverse geologic areas by establishing buffer zones around them, but also to prevent damage and contamination by designing and executing operating procedures, runoff controls, spill prevention and cleanup plans.</p>
<p>NW1.5 Preserve Floodplain Functions</p>	<p>2</p>	<p>Improved</p> <p>In order to maintain water management capacities, the team has studied river Aucantagua's ecological flows to set limits in the use of water. They have also specified that the water used for energy generation will be restored to the Monzon River in an appropriate manner, protecting the water ground from erosion by using a bed of rocks. Nevertheless, no specific information has been provided specifically about how floodplains functions are used and developed in the project. From the information analyzed no activities have been proposed to restore the initial water body conditions. Furthermore, the strategies that the project team is considering focus mainly on mitigating the negative impacts that it can have in the floodplain functions and not necessarily on compensating for it.</p> <p><u>Source:</u> GRH, "4.0 Línea Base Ambiental del Proyecto" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 215, 291, 292, 305. GRH, "3.0 Descripción del Proyecto de Ingeniería" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 20, 55.</p> <p>RECOMMENDATIONS</p> <p>The team itself recommends installing pluviometric stations in order to enhance their knowledge of rainfall in the area. However, since water conditions are crucial for this project, they should provide material that makes evident that Generacion Andina is taking into consideration the effects of the project in the adjacent floodplains, or the strategies to be implemented if water level drops affecting ecological flows.</p>
<p>NW1.6 Avoid</p>	<p>0</p>	<p>No Score</p>

<p>Unsuitable Development on Steep Slopes</p>	<p>The project is located in a valley and according to the analysis of the area, 42% of the site has slopes ranging between 25% and 50%. In particular, the slope of the hillside on the left bank varies between 80 °and 90 °; while, on the right bank, alluvial deposits, consisting of heterogeneous sizes and bolonería subangular blocks, have slopes of 30° to 40 °.</p> <p>Construction is planned to occur on the right bank of the river Aucantagua, where the creation of temporary access routes involves activities that will clear vegetation from certain areas and that probably generate changes in may can increase the instability of soils. In order to prevent landslides the project team plans to make use of the Manual of Geometric Design of Highways for their design and construction.</p> <p>No specific information is provided about the relationship between the hydroelectric power main building and the topography, therefore this category cannot be completely evaluated.</p> <p><u>Source:</u> GRH, “4.0 Línea Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 78- 79. GRH, “5.0 Caracterización de impacto ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 35.</p> <p>RECOMMENDATIONS</p> <p>Minimizing the use of hillsides or steep slopes in the construction of the buildings, the infrastructure, and the road that constitutes the hydroelectric station can help to prevent future problems due to landslides or erosion. Moreover, in cases where avoiding construction is impossible, protection for downslope buildings, facilities and infrastructure should be provided to shield them from the effects of erosion and landslides. Another appropriate strategy in this regard is to institute geotechnical management practices that can be monitored and implemented over time to control erosion and prevent landslides.</p>
<p>NW1.7 Preserve Greenfields</p>	<p>Improved</p> <p>As most of the land occupied by the project is dedicated to farming and is therefore already developed land, the project is not classified as being in a greenfield. The distribution of the land uses is apparent from the area’s vegetation map, and the information shows that only a little portion of the area dedicated to the hydroelectric station is actually urban. The rest is all cover by farmlands or unproductive lands; there are no greenfields being disturbed.</p> <p>The project team admits that the project may produce “moderate negative impacts”. In contrast, it is important to note that new developments of farmland are forbidden in the area in order to prevent additional natural habitat loss. In this respect, the project may be able to help control some of the negative effects of the expansion of agriculture. There is need to remediate soils contaminated by fertilizer waste, which is the principal source of pollution in the area around the project.</p> <p><u>Source:</u> GRH, “4.0 Línea Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 29. S & Z Consultores Asociados, “LT8-EIA-057 Mapa de formación vegetal” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (Lima, 2012). GRH, “1.0 Resumen ejecutivo” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 19, 39, 99.</p> <p>RECOMMENDATIONS</p> <p>It would be useful to determine the specific land uses in the area in order to know and evaluate to what extent the project is impairing crop-growing or any other type of land use. What are the real implications for the long term or permanent condition of the environment? In addition, and related to the last point, it is not a requirement but it might be rewarding to establish a buffer area of prime habitat around the project, as this strategy would reduce some negative impacts and also would provide support for the ecosystem.</p>

<p>NW2.1 Manage Stormwater</p>	<p>0</p>	<p>No Score</p> <p>Because the project has a very close relationship with the water, stormwater management is fundamental, both for the Aucantagua River and for the possible overflows of water in the river course, either before or after the power station. More information is required to asses this point regarding how the project is assessing the stormwater management and whether it is maintaining the area's water storage capacity.</p> <p><u>Source:</u> N/A</p> <p><u>RECOMMENDATIONS</u></p> <p>Stormwater management programs and stormwater handling structures could be designed to capture and reuse stormwater on-site as part of a comprehensive water management regime for the project and area.</p>
<p>NW2.2 Reduce Pesticides and Fertilizer Impacts</p>	<p>1</p>	<p>Improved</p> <p>The project takes into consideration the toxic effects of chemical fertilizers. Programs have been designed to control and reduce fertilizer use by increasing the use of compost. Regarding the plants, the program proposes keeping the existent vegetal species and using them for revegetation. However, application of chemical fertilizers is proposed to take place at least twice a year in the revegetation process. The revegetation program does not specify the planned uses of recovered lands, an aspect that could help to reduce the use of chemicals in the soil.</p> <p>By implementing this program, the project reduces the need for pesticide and fertilizer use, therefore reducing the amount of chemical runoff getting into rivers. Analysis of soil samples made by the project team shows that at present there is a relatively high concentration of these chemicals due to use by farmers. Fertilizer waste residue has been found on the land according to the studies, but no runoff controls have been installed at this point.</p> <p><u>Source:</u> GRH, "4.0 Línea Base Ambiental del Proyecto" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 219, 259, 261, 289. GRH, "6.1.7 Programa de Manejo Ambiental para el Medio Biológico" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 31, 32, 33.</p> <p><u>RECOMMENDATIONS</u></p> <p>In order to completely assess the levels of soil damage, the use of plant species that require less fertilizer, as well as the components and proportion of chemical fertilizers should be taken into account in the revegetation plans. The team should also consider the negative consequences of long-term use of fertilizers and try to remediate the soil.</p>
<p>NW2.3 Prevent Surface and Groundwater Contamination</p>	<p>4</p>	<p>Enhanced</p> <p>The team has assessed the water properties, measuring its pH, oxygen and so on, and has established as a goal to control and preserve the quality of water and of soil as much as possible with the development of the project. Therefore the monitoring program is crucial during the phases of construction, operations and closure. In the construction stage, monitoring will be is performed every three months while in the operations stage it will occur every six months for the first five years. At the end of this period the need to extend the monitoring will be evaluated.</p> <p>As the project will produce wastewater and solid waste (hazardous and nonhazardous) during the stages of construction, operations, and closure, the substances produced will need to be pre-treated and handled in accordance with the relevant regulations. In addition, the project contemplates measures to prevent soil and water contamination, including contingency strategies in case of spills or leaks of any possible polluting fluid, and the construction of water-canals and sand barriers to divert and contain the spread of any possible leak.</p> <p><u>Source:</u> GRH, "6.0 Estrategia de Manejo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 26, 60, 103, 143, 150. GRH, "6.3 Programa de Monitoreo Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 28.</p> <p><u>RECOMMENDATIONS</u></p>

		<p>Although there is some information about the prevention and response plans in case of the spill or leak of any toxic substance, it is important to be more specific about how the project responds to these problems. Likewise, there needs to be more detailed information about the physical elements that are being designed to prevent spill or leak of toxic substances,.</p> <p>In terms of the design, it is recommended that the project team identify the equipment and facilities that contain potentially polluting substances and locate them away from sensitive environments. It could also be very useful to consider into what extent the polluting substances can be removed from the construction and operation stages of the project. As an addition to these on-site design measures, at a bigger scale, the project could restore some of the surrounding lands and help to establish land use controls to prevent future contamination.</p>
<p>NW3.1 Preserve Species Biodiversity</p>	<p>2</p>	<p>Improved</p> <p>Information provided specifically mentioned that farmland expansion will be forbidden in order to preserve current habitats. However, during the construction and operations of the hydroelectric power station animal habitats will be altered, particularly for aquatic wildlife. The project will have a direct effect on the fish population as Aucantagua’s water levels drop because of works to capture water for the operation. Uncontrolled discharge of water could lead to supersaturation of oxygen in water, resulting in fish suffocation, as well as dying stuck inside turbines when these start to operate again.</p> <p>Fishes are not the only species in danger, birds are also affected by transmission lines; they are in risk of colliding with them and be electrocuted. To help ameliorate these problems, part of the mitigation and conservation project consists in identifying the species of plants and animal present in the area in order to know which species they will need to introduce in revegetation and wildlife return plans.</p> <p><u>Source:</u> GRH, “6.1.7 Programa de Manejo Ambiental para el Medio Biológico” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 112. GRH, “4.0 Línea Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 219, 259, 261. GRH, “6.3 Programa de Monitoreo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 25. GRH, “1.0 Resumen ejecutivo” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 99, 103. GRH, “5.0 Caracterización de Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 99.</p>
		<p><u>RECOMMENDATIONS</u></p> <p>As an important part of the wildlife is going to be negatively affected, efforts to plant the right kind of species as well as to enhance and widen natural corridors to connect existing habitats are required. It would be rewarding that the project the preserved portions of the site which are contiguous to natural areas outside of site in an undisturbed condition, and also create new connections between areas of important habitat; or remove existing barriers to movement. This last will help to shift from protecting or restoring existing habitats to upgrading them.</p>
		<p>Superior</p> <p>The project contemplates appropriate local plans which have been carefully identified and used. Revegetation plan is defined as a very dynamic instrument which incorporates actions involved with the construction and operation stage. Regarding the control of invasive species, the project will use the same local specie that will be removed for the construction. In addition to this, a comprehensive, and multi-year management plan to control invasive species is contemplated in the construction, operation and closure phases.</p> <p><u>Source:</u> GRH, “6.3 Programa de Monitoreo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 25. GRH, “6.5 Plan de Compensación” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 7.</p>
<p>NW 3.2 Control Invasive Species</p>	<p>5</p>	<p><u>RECOMMENDATIONS</u></p>

		<p>The appropriate use of non-invasive species to control or eliminate existing invasive species is crucial to keep habitats as healthy and stable as it is possible. In this respect, providing information about invasive species on site would be very useful along with the implementation of an identification system to manage and control both the invasive species that are being actively eliminated as well as those local species newly planted. It would also be useful to expand this program to areas indirectly affected i.e. outside of the ADI.</p>
<p>NW3.3 Restore Disturbed Soils</p>	<p>8</p>	<p>Conserving</p> <p>Maintaining the balance of the soil is important to restore ecological and hydroelectric functions, therefore the restoration of 100 % of the area with damaged soils inside directly affected areas will be done after the construction process using the material taken from the deforestation process and using it as compost in the revegetation process.</p> <p>After decompressing and reshaping the soils used for temporary access roads, the revegetation areas, the density of species re-planted and surfaces to cover will be defined during the whole project, in real time, following a process of identifying the project’s impact the affected species. Native plants will be planted, giving priority to endangered species and varieties. These activities are going to be developed in a multi-year plan during operations phase.</p> <p><u>Source:</u> GRH, “6.5 Plan de Compensación” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 7. GRH, “6.1.7 Programa de Manejo Ambiental para el Medio Biológico” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 5, 15, 36- 55. GRH, “6.0 Estrategia de Manejo Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 43, 58, 96. GRH, “5.0 Caracterización de Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 24.</p> <p>RECOMMENDATIONS</p> <p>Negative impacts are easier to see in directly affected areas, but given that the ecosystem is a continuum and is therefore not delimited the same way as the project, it is recommended that the project considers extending its revegetation plan beyond the limits of directly affected areas. If the project aims to have a greater positive impact in this particular aspect, it could contribute to the effort to restore 100% of soils disturbed as a result of previous development.</p>
<p>NW3.4 Maintain wetland and surface water functions.</p>	<p>6</p>	<p>Enhanced</p> <p>There are four main ways to improve ecosystem functions: maintain or enhance hydrologic connection, maintain or enhance water quality, maintain or enhance habitats, and maintain or enhance sediment transport. It is very important to assess the water functions, since the hydroelectric station 8 de Agosto is going to be sited on the Aucantagua River, and will as a consequence also impact the Monzon River. Certain water functions would be affected if no plan to preserve its natural qualities is implemented. In this regard, hydrologic connections are maintained, as well as habitats and sediment transport. The project does not contemplate definitive detours or waterway cuts, and zone’s samples were studied to keep values as they are after works are ended, including its living species.</p> <p>Water quality, is not ensured to remain the same way as a consequence of possible pollution due to accidents in the operation process such as leaks. However, there is a monitoring plan in which water quality will be assessed continuously to prevent damage and proceed to solve it if that was the case.</p> <p><u>Source:</u> GRH, “4.5 Línea Base Ambiental del Medio Biológico” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 150. S & Z Consultores Asociados. “Anexo C -Hidrología” in <i>Estudio Definitivo de la Central Hidroeléctrica 8 de Agosto</i> (Lima, 2012), p. 2, 6, 36. GRH, “5.0 Caracterización de Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 23.</p>

		RECOMMENDATIONS To guarantee ideal conditions of balance between natural world and building projects all disturb functions must be restored whether if they were consequence of the project or not. In this regard, it is important to mention that organic waste, plastic, and other dangerous polluters as batteries and pesticides cans are often seen in the project influence area. Therefore developing measures to account for the four water services hydrologic connection, water quality, habitat maintenance and sediment transportation should be integrated into the project.
NW 0.0 Innovate Or Exceed Credit Requirements		N/A
	41	

CLIMATE AND RISK		
Score	8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU	
CR1.1 Reduce Greenhouse Gas Emissions	18	Conserving In order to evaluate the project’s contribution to climate change due to the emission of Greenhouse Gases, a carbon lifecycle assessment is necessary to evaluate and reduce the anticipated amount of net greenhouse gas emissions during the life cycle of the project. According to the project developer, carbon emissions are reduced by 100%, or almost 75,000 tons of CO2. Nevertheless, more detailed information about this matter is needed. The developing team acknowledges the importance of the proper operation and maintenance of machinery and vehicles to help reduce emissions.
		<u>Source:</u> GRH, “4.0 Línea Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 219, 259, 261. GRH, “Resumen ejecutivo” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 99, 103.
		RECOMMENDATIONS It is important to provide more specific information that corroborates how carbon emissions are reduced. Other information that could be relevant could be provided by performing a carbon life-cycle assessment or carbon footprint analysis using recognized methodology.
CR1.2 Reduce Air Pollutant Emissions	0	No Score Air pollutant emissions scoring is based on several criteria pollutants including particulate matter (including dust), ground level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead, and noxious odors. However, as the team only availed information on three of them, therefore there is not enough information to make a complete assessment. According to the California Ambient Air Quality Standards, particles produced by smoke and soil are considered less dangerous than those produced by burning solid waste because the latter are lighter, so they travel longer distances and remain in the atmosphere longer. The California Air Resources Board also revised the carbon monoxide standards, but it is not possible to compare with project data since no information is provided. Regarding noxious odors, the project team mentions burning waste as a harmful activity gives no mitigations or solutions.
		<u>Source:</u> GRH, “5.0 Caracterización de Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 86-97. California Environmental Protection Agency. “Particulate Matter overview”. Last modified April 25, 2005. http://www.arb.ca.gov/research/aaqs/caaqs/caaqs.htm California Environmental Protection Agency. “California Ambient Air Quality Standards (CAAQS)”. Last modified November 24, 2009. http://www.arb.ca.gov/research/aaqs/caaqs/caaqs.htm California Environmental Protection Agency. “Carbon Monoxide”. Last modified November 24, 2009. http://www.arb.ca.gov/research/aaqs/caaqs/co/co.htm

		<p>RECOMMENDATIONS</p> <p>The project team should make an accurate study of pollutant agents such as ground level ozone, sulfur oxides, nitrogen oxides, and lead. It should also expound on the information obtained in the research on carbon monoxide emissions and noxious odors and compare the results with the minimum air quality standard.</p> <p>In order to make a positive environmental impact, the project could implement measures with the aim of improving air quality to surpass pre-development levels.</p>
CR2.1 Assess Climate Threat	0	<p>No score</p> <p>The project team does not have a Climate Impact Assessment and Adaptation Plan that identifies climate change risks and possible responses. It is however important to recognize that they acknowledge this shortcoming and have declared their intention to have plans to develop Climate Adaptation Plans for later projects in the area.</p> <p>An important factor to recognize is that clearing of vegetation for construction will alter the microclimate of the affected area. This will manifest in increased temperatures and a reduction in relative humidity levels.</p> <p><u>Source:</u> GRH, “5.0 Caracterización de Impacto Ambiental” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 13. Ibid. 35.</p> <p>RECOMMENDATIONS</p> <p>It would be of use to develop a Climate Impact Assessment and Adaptation Plan that studies the important design variables and associated assumptions used in the design of the project. What impact might climate change have over the design life of the project and how might it challenge these assumptions? To complement this, an assessment of the effects of climate change on operating conditions and how these might influence project performance could help the project team to develop a more comprehensive adaptation plan.</p>
CR2.2 Avoid Traps And Vulnerabilities	0	<p>No Score</p> <p>The project design must be reviewed in order to avoid traps and vulnerabilities that could create high, long-term, climate-related costs and risks for the affected communities. Also of interest is the degree to which these were addressed in the project design and in community design criteria. In this regard, according to the assessment for CR2.1, the project does not consider the possible effects of climate change; and as a result, the team has not evaluated the costs of any related vulnerabilities over time.</p> <p>Due to site conditions, the project could be negatively affected by changes in the rain patterns or water levels resulting from changes in climate. These considerations have been taken into account in the monitoring process and in collection of hydrologic data of water during the rainy and dry seasons in the initial stages of the project, but no design adjustments to respond to these vulnerabilities are detailed.</p> <p>The performance improvement for this credit is based on the extent to which the designer has taken community’s increased long-term cost, risk, and vulnerabilities into account and created a project that is responsive to these issues. The ultimate objective is to make a significant contribution to community robustness and resiliency in the face of change.</p> <p><u>Source:</u> GRH, “4.0 Línea Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 219, 259, 261. GRH, “Resumen ejecutivo” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 99, 103.</p> <p>RECOMMENDATIONS</p> <p>Working with the community to conduct a review of the projected resource demands, resource traps, and vulnerabilities could prove very helpful in order to make an assessment of the associated long-term risks and inform response plans. Moreover, it is important to have documentation showing the extent to which project concepts, configuration and design respond to the need to reduce the significant risks, traps and vulnerabilities identified.</p>
CR2.3 Prepare	0	No Score

<p>For Long-Term Adaptability</p>		<p>No information has been provided regarding long-term adaptability plan in the face of challenges arising from changing climate such as shortfalls or other significant long-term changes in operational or environmental conditions. Despite the fact that significant design changes have not been provided, some considerations about managing risk have been made nonetheless. For example, the team chose to locate the project on the right bank of the river because conditions on the left side are more hostile due to high slopes and soil characteristics.</p> <p><u>Source:</u> N/A</p> <p><u>RECOMMENDATIONS</u></p> <p>The project team should prepare plans and designs for long-term impacts of climate change, particularly increased intensity and frequency of extreme weather events, water scarcity, extended droughts, and increased ambient temperature.</p> <p>It would also be helpful to develop plans, designs, and documents that show restoration and rehabilitation efforts for both existing and longer-term climate-related impacts.</p>
<p>CR2.4 Prepare For Short-Term Hazards</p>	<p>3</p>	<p>Improved</p> <p>The project team has done a study listing the potential natural and manmade hazards in the project area. The list includes programs to respond to spills of fuel and other hazardous substances, blasting explosives, fires, and work accidents due to human error or animal attacks, seismic events, mudslides, landslides and social conflict.</p> <p>The project has also developed a closure plan for the period following the operational lifespan (i.e 30 years) of the hydroelectric station. Although this is a good starting point, considerations of the specific effects of climate change are not made.</p> <p><u>Source:</u> GRH, “4.0 Línea Base Ambiental del Proyecto” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 170-172. GRH, “Resumen ejecutivo” in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 108.</p> <p><u>RECOMMENDATIONS</u></p> <p>Since the project makes use of water it would be helpful to incorporate preparation plans and measures to address short-term hazards due to climate change. At the same time it is important to consider that many hazards may be worsened by degraded environments, therefore the restoration and rehabilitation of natural systems could help mitigate these risks.</p> <p>Another important improvement in preparing for short-term hazards is to expand the scope of the risks to include events occurring within 50 years to allow the project team to plan for prevention of damage to any remaining structures and the resultant prevent environmental degradation that might have negative consequences for population in the area.</p>
<p>CR2.5 Manage Heat Island Effects</p>	<p>0</p>	<p>No Score</p> <p>Many hard surfaces such as rooftops and pavement absorb a large percentage of the incident solar radiation, which ends up heating the surfaces and the surrounding air. This in turn alters the microclimate around them, leading to an increase in energy consumption for additional cooling. It also affects local vegetation and wildlife.</p> <p>To address this, the project has plans for revegetation, which could reduce heat island effect by shading the ground or particular buildings. However, there is no study to support or analyze this possibility in more detail. From the plans analyzed it was not possible to identify areas in the hydroelectric station shaded either by trees or by roof structures. It is therefore not possible to determine the level of improvement that is being generated.</p>

8 de Agosto Hydroelectric Plant and 138 kv Transmission Line, Peru

		<p><u>Source:</u> GRH, "5.0 Caracterización de Impacto Ambiental" in <i>Estudio de Impacto Ambiental Línea de Transmisión 138 kV - C.H. 8 de Agosto 19 MW</i> (2013), p. 13.</p>
		<p><u>RECOMMENDATIONS</u> To evaluate heat island effects, more accurate information is necessary. The heat island effect can be mitigated and managed for this credit through the use of materials with a high solar reflectance index (SRI) or through increased vegetation, which provides cooling via evapotranspiration and increased shade. For the hydroelectric station, shading might be provided either through structures such as shade panels that meet the SRI requirements or by use of trees.</p>
<p>CRO.0 Innovate Or Exceed Credit Requirements</p>	<p>N/A</p>	
	<p>21</p>	

OVERALL:

<p>241</p>	<p>8 DE AGOSTO HYDROELECTRIC PLANT AND 138 KV TRANSMISSION LINE, PERU</p>
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APPENDIX E: SOURCES

DOCUMENTATION PROVIDED
General Information.
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Generación Andina, <i>Diagnóstico social sobre impacto del Proyecto en el crecimiento y desarrollo de las localidades del área de influencia del Proyecto</i> (2015).
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